ESSENTIAL READINGS FOR THE IELTS

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TO MY STUDENTS

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Mohammad Ali Salmani-Nodoushan
September, 2005

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PREFACE

Essential readings for the IELTS is designed for adults who are interested in strengthening their reading skills for academic, personal, or career purposes. The book can be used for a variety of purposes. First, it is suitable for EFL learners in undergraduate classes of reading comprehension at university level. Second, the book can be used by undergraduate EFL students who want to expand their reading skills. In addition, the book can be used for coaching purposes; since the design of the book follows the design of the general training reading module of the IELTS test, the book can also be used for coaching.

All the texts in this book emphasize reading practice as well as reading speed. The passages were taken from magazines, journals, encyclopedias, leaflets, books, and newspapers. At least one text in each unit contains detailed logical argument. Moreover, the reading passages are representative of current non-fiction, magazine or newspaper writing. They cover a wide range of subject matter in order to expose the reader to various content demands of general reading materials. Attempts were made to select the readings with great care so that almost no adaptations (simplifying structures and vocabulary, and glossing) would be needed.

The book consists of fifteen units. Each unit is composed of five reading selections. The first reading selection of each unit includes 155 words. The second reading selection in each unit includes 237 words, the third reading selection 379 words, the fourth one 442 words, and the last one 826 words. All the reading selections have a Flesch-Kincaid grade level of 11 to 12, meaning that they are suitable for intermediate to advanced learners.

The readings are of graded difficulty; they are arranged in order of difficulty. Therefore, it is recommended that the units be presented in the given order if the book is to be used as a textbook in classes of reading comprehension, or for coaching purposes.

Each unit consists of three sections and a variety of task-based question types. The first section of each unit includes two reading texts

and two sets of questions: true/false items and sentence-completion practice. The second section, too, consists of two reading selections and two sets of questions: true/false items, and outlining practice (i.e., choosing suitable paragraph headings from a list). Finally, the third section consists of only one reading selection and three sets of questions that fall into two categories: skimming exercises (skimming for dates, and skimming for names); and eliciting the views of the writer (i.e., identification of writers' views or attitudes). On the whole, each unit consists of 40 questions.

When the reading passages are discussed in class, attention should generally be directed to sentence and paragraph content rather than to individual words. If a key word is unfamiliar, the students should be encouraged to guess the meaning from the context. They should also be encouraged to see that words can have different meanings in different contexts.

Mohammad Ali Salmani-Nodoushan
September, 2005

UNIT ONE

SECTION 1: QUESTIONS 1-13

QUESTIONS 1-5

Look at the information below about NATURAL HAZARDS.

mark ⓣ If the statement is true
ⓕ If the statement is false
ⓝ If the information is not given in the passage

EXAMPLE	ANSWER
Natural hazards are responsible for the death of some people.	● ⓕ ⓝ

Now answer the following questions:

1) Volcanoes, hurricanes and earthquakes are chronic and continuous in nature.	ⓣ ⓕ ⓝ
2) The impact of an earthquake on buildings can be predicted before the occurrence of the quake.	ⓣ ⓕ ⓝ
3) Mount Pinatubo is a volcanic mountain that stands in the Philippines.	ⓣ ⓕ ⓝ
4) According to the passage, geologists are scientists who study the behavior of volcanoes.	ⓣ ⓕ ⓝ
5) Water storage and embankments are two engineering solutions that can prevent floods from occurring.	ⓣ ⓕ ⓝ

NATURAL HAZARDS

Continuously occurring or chronic natural hazards are often unrecognized as such and difficult to identify. They may adversely affect lots of people, animals and plants. Many natural hazards, such as earthquakes, volcanoes, and hurricanes are unavoidable, but measures can be taken to lower their impact. Thus buildings can be designed to withstand quakes, and ways are also being developed to predict their occurrence.

In 1991 the volcano Mount Pinatubo in the Philippines erupted. Fortunately a team of geologists from the United States Geological Survey were present, who predicted the eruption and saved the lives of many people who were evacuated. Flood impacts can be reduced by engineering solutions. These solutions may involve water storage and embankments, and warnings and advice given to the public in advance of major storms. When Hurricane Andrew struck Florida in 1992 it caused $12 billion of damage, but due to the advance warning of the storm only 50 people died.

QUESTIONS 6-13

Look at NATIONAL PARKS AND SANCTUARIES below.

Match each of the following sentences with TWO possible endings A-M from the box below.

EXAMPLE	ANSWER
National parks are possessed by governments in …	**A and M**

Write the appropriate letters A-M in boxes headed Answer.

QUESTIONS		ANSWER
6 & 7	Forlandet National Park is …	
8 & 9	Lake District National Park in the United Kingdom encompasses …	
10 & 11	Lake District National Park in the United Kingdom encompasses …	
12 & 13	National parks and sanctuaries in Britain are not supervised and controlled …	

POSSIBLE ENDINGS

A South America.

B England's tallest mountain.

C by the government.

D residence for red deer.

E active farms.

F food for migrating birds on their way to Africa.

G a narrow island and sanctuary located in Norway.

H for purposes of recreation.

I throughout the park.

J ancient settlements.

K an important breeding ground for guillemot ducklike auks.

L habitat for the last surviving wild lynxes.

M the United States.

NATIONAL PARKS AND SANCTUARIES

Governments posses sanctuaries in North and South America. However, the government does not entirely posses them in Britain. Nor are they supervised and managed primarily for purposes of recreation and wildlife. Their residents possess many of these sanctuaries which encompass ancient settlements. Many ancient towns and villages exist within 2331 square km Lake District National Park. Active farms, stone quarries, and ancient mines are scattered throughout the park. These ranches provide residence for red deer, fox, swans, and trout. The hundreds of lakes in the park inspired the park's name. England's tallest mountain, Scafell Pike, also stands here. Stone and Earthen monuments together with burial mounds of England's Stone, Iron, and Bronze Ages are sheltered in 1437 square km Peak National Park and 694 square km Exmoor National Park.

Similarly, national parks in Norway encapsulate colonies of seabirds, walrus, and reindeer herds. Forlandet National Park is a narrow island. Several small glaciers cling to its high peaks. The 640 square km island lies along the northernmost reach of the ocean stream from the Gulf of

Mexico, which creates a mild climate, making this an important breeding ground for guillemot ducklike auks. Seals, eider ducks, and geese also depend on its habitats. Spain's Doana National Park provides a 507 square km wildlife refuge where birds that nest in northern Europe feed while migrating to Africa. The last surviving wild lynxes in southern Europe find sanctuary there as well.

SECTION 2: QUESTIONS 14-27

QUESTIONS 14-20

Look at THE SENSORY SYSTEMS OF SHARKS below and at the following statements.

mark ⓣ If the statement is true

ⓕ If the statement is false

ⓝ If the information is not given in the passage

Now answer the following questions:

14)	Sharks use their developed sensory systems for finding food.	ⓣ ⓕ ⓝ
15)	The largest section of the brain of every shark is devoted to its sense of smell.	ⓣ ⓕ ⓝ
16)	Nocturnal animals have well-developed sense of smell called tapetum lucidum.	ⓣ ⓕ ⓝ
17)	A narrow strip of sensory cells can be found along the sides of the body of a shark which enables it to see its prey in extremely dark waters.	ⓣ ⓕ ⓝ
18)	Almost all species of sharks are color blind.	ⓣ ⓕ ⓝ
19)	A special reception system called clusters of ampullae of Lorenzini capacitates sharks to find prey swimming at distances over 1 meter.	ⓣ ⓕ ⓝ
20)	Sharks usually use their electrosensors for purposes of attacking other animals which are in the final stages of feeding.	ⓣ ⓕ ⓝ

THE SENSORY SYSTEMS OF SHARKS

The well-developed sensory systems of sharks capacitate them with unmatched advantages—in comparison to almost every other animal—when hunting or feeding.

The sense of smell comprises almost one-third of a shark's brain. A shark's sense of smell is so powerful that it can detect perfumes and odors in the water hundreds of meters from their source. Sharks can detect as little as one part per million of substances in the water, such as blood, body fluids, and chemical substances produced by animals under stress. Some sharks can detect as few as ten drops of liquid tuna in the volume of water it takes to fill an average swimming pool.

Sharks' eyes detect and capture virtually small movements and they can sense in gloomy conditions, making them effective hunters in virtually dark depths. Like cats and other nocturnal hunters, sharks have a reflective layer in the back of their eyes, called the tapetum lucidum, which magnifies low levels of light. In clear water, sharks see their prey when it is about 20 to 30 meters away.

Sharks' eyes also contain specific cells that detect color, and behavioral studies suggest that sharks can see colors as well as black, white, and shades of gray. These studies also revealed that luminous and glimmering objects and bright colors, such as yellow and orange, may attract sharks.

Sharks employ an extra sensory system—which scientists call the lateral line—to detect vibrations in the water which fish, boats, surfers or even swimmers often create. A narrow strip of sensory cells running along the sides of the body and into the shark's head comprises the lateral line. This sensory system is especially sensitive to sounds in the low-frequency ranges, such as those which struggling wounded fish or other animals emit.

Additionally, the functioning of neurons and muscles in living animals create electrical currents which sharks sense in no time. The shark's electrosensors—the clusters of ampullae of Lorenzini—exist over the shark's head of all sharks. This reception system is effective only over distances of less than 1 meter. It may aid sharks in the final stages of feeding or attack. Scientists also concede that this system may somehow capacitate sharks to detect the feeble electromagnetic fields of the Earth, ushering them in migration.

QUESTIONS 21-26

Look at CLASSIFICATION OF AIRPLANES below. From the following list (i-xi) choose the most suitable summaries for the paragraphs A, C, and E-H.

Write the appropriate numbers (i-xi) in boxes headed Answer.

i	The general structure and the design of sea planes
ii	Technical characteristics of amphibian planes
iii	The way a space craft takes off and lands
iv	Take off and landing characteristics of carrier-based airplanes
v	General characteristics of helicopters
vi	Technical features of short-range airplanes
vii	The sophisticated under-carriage system of pontoon planes
viii	Major classes of airplanes
ix	Take off and cruise characteristics of Vertical Take-off planes
x	The skis some planes use in the Arctic and Antarctic regions
xi	Gear systems of land planes and the runways they can use

NB There are more summaries than paragraphs, so you will not use them all. (Two examples are provided.)

QUESTIONS	PARAGRAPHS	ANSWER
21	Paragraph **A**	
EXAMPLE	Paragraph **B**	**xi**
22	Paragraph **C**	
EXAMPLE	Paragraph **D**	**i**
23	Paragraph **E**	
24	Paragraph **F**	
25	Paragraph **G**	
26	Paragraph **H**	

CLASSIFICATION OF AIRPLANES

A

Airplanes are classifiable into various classes including land planes, carrier-based airplanes, seaplanes, amphibians, vertical takeoff and landing, short takeoff and landing, and space shuttles.

B

Designers usually design land planes to operate from a paved surface, typically a runway, and equip some of them to operate from grass or other unfinished surfaces. Land planes usually have wheels. Some specialized aircrafts operating in the Arctic or Antarctic regions have skis instead of wheels.

C

As a modified type of land planes which can takeoff from and land aboard naval aircraft bases, carrier-based airplanes have a strengthened structure. A landing gear helps them handle the stresses of catapult-assisted takeoff, in which steam-driven catapults launch the craft. They also make arrested landings by using hooks attached to the underside of their tails.

D

Pontoon planes are technically-modified land planes with floats in place of wheels so they can operate from water. Their designers have designed a number of seaplanes from scratch to operate only from water bases. Pontoon planes may have small floats connected to their outer wing panels to help steady them at low speeds on the water, but the plane's floating hull usually bears the weight of the plane.

E

Amphibians operate from both water and land headquarters. Very often, an amphibian is an extraordinary Pontoon, with a boat-like hull and the addition of specifically designed under-carriage system. When extended, it can capacitate the airplane to taxi right out of the water onto land headquarters. Historically, some Pontoons possessed a beaching gear, a system of cradles on wheels positioned under the floating aircraft. It allowed the pilot to roll the aircraft onto land.

F

Vertical Takeoff and Landing airplanes typically implement the jet thrust from their turbines, pointed down at the Earth, to take off and land straight up and down. After taking off, the airplane usually transitions to wing-borne flight in order to cover a longer distance or carry a significant load. A helicopter is a typical example of such an aircraft.

G

Short-Takeoff-and-Landing aircrafts are able to function on relatively short runways. Their designs usually employ optimized wings and high-lift instruments on the wings for optimum performance throughout takeoff and landing as distinguished from an airplane that has a wing optimized for high-speed cruise at high altitude. These airplanes are usually cargo airplanes. Some serve in a passenger-carrying capacity as well.

H

A NASA space shuttle is an aircraft unprecedented by any other because it flies as a fixed-wing airplane within the atmosphere and as a spacecraft in outer space. After rising from the launching base, the space shuttle flies like a rocket out of the atmosphere. During landing, the shuttle becomes the world's most sophisticated engine-less glider.

SECTION 3: QUESTIONS 27-40

Read the following passage and answer questions 27-40.

MISSION TO MOON

In 1958, the United States and the USSR were both working hard to be the pioneer to send a satellite to the Moon. Their early probes failed. On October 11, 1958, Pioneer 1 was launched by the United States to orbit the Moon. It did not reach a high enough speed to reach the Moon, but reached a height above Earth of more than 110,000 km. In December 1958 Pioneer 3 also failed to leave high Earth orbit. It did, however, discover a second Van Allen belt of radiation around Earth.

On January 2, 1959, after two earlier failed missions, the USSR launched Luna 1, which was expected to hit the Moon. Although it missed its target, Luna 1 did become the first artificial object to escape Earth orbit. On September 14, 1959, Luna 2 became the first artificial object to strike the Moon, impacting east of Moon's Mare Serentitatis. In

October 1959, Luna 3 flew around the Moon and radioed the first pictures of the far side of the Moon, which is not visible from Earth.

In the United States, efforts to reach the Moon did not resume until 1962, with a series of probes called Ranger. The early Rangers were designed to eject an instrument capsule onto the Moon's surface just before the main spacecraft crashed into the Moon. These missions were plagued by failures—only Ranger 4 struck the Moon, and the spacecraft had already ceased functioning by that time. Rangers 6 through 9 were similar to the early Rangers, but did not have instrument packages. They carried television cameras designed to send back pictures of the Moon before the spacecraft crashed. On July 31, 1964, Ranger 7 succeeded in sending back the first quality images of the Moon before crashing, as planned, into the surface. Rangers 8 and 9 repeated the feat in 1965.

By then, the United States had embarked on the Apollo program to land humans on the Moon. With an Apollo landing in mind, the next series of U.S. lunar probes, named Surveyor, was designed to "soft-land" (that is, land without crashing) on the lunar surface and send back pictures and other data to aid Apollo planners. As it turned out, the Soviets made their own soft landing first, with Luna 9, on February 3, 1966. The first pictures of a dusty moonscape from the lunar surface were radioed by Luna 9. Surveyor 1 successfully reached the surface on June 2, 1966. Six more Surveyor missions followed, but only two were successful. Thousands of pictures of the lunar surface were sent back by the Surveyors. Two of the probes were equipped with a mechanical claw, remotely operated from Earth, that enabled scientists to investigate the consistency of the lunar soil.

At the same time, the Lunar Orbiter probes were launched by the United States, which began circling the Moon to map its surface in unprecedented detail. Lunar Orbiter 1 began taking pictures on August 18, 1966. Four more Lunar Orbiters continued the mapping program, which gave scientists thousands of quality photographs covering nearly all of the Moon.

Beginning in 1968, unpiloted Zond probes—actually a lunar version of their piloted Soyuz spacecraft—were sent around the Moon by the USSR. These flights, initially designed as preparation for planned piloted missions that would orbit the Moon, returned high-quality photographs of the Moon and Earth. Two of the Zonds carried biological payloads with turtles, plants, and other living things. Both the United States and the USSR were achieving successes with their unpiloted lunar missions. However, the Americans were pulling steadily ahead in their piloted program. As their piloted lunar program began to lag, the Soviets made

plans for robotic landers that would gather a sample of lunar soil and carry it to Earth. Although this did not occur in time to upstage the Apollo landings as the Soviets had hoped, Luna 16 did carry out a sample return in September 1970, returning to Earth with 100 g (4 oz) of rock and soil from the Moon's Mare Fecunditatis. In November 1970 Luna 17 landed with a remote-controlled rover called Lunakhod 1. The first wheeled vehicle on the Moon, Lunakhod 1 traveled 10.5 km (6.4 mi) across the Sinus Iridium during ten months of operations, sending back pictures and other data. Only three more lunar probes followed. Luna 20 returned samples in February 1972. Lunakhod 2, carried aboard the Luna 21 lander, reached the Moon in January 1973. Then, in August 1976 Luna 24 ended the first era of lunar exploration.

Exploration of the Moon resumed in February 1994 with the U.S. probe called Clementine, which circled the Moon for three months. In addition to surveying the Moon with quality cameras, Clementine gathered the first exact data on lunar topography using a laser altimeter. Clementine's laser altimeter bounced laser beams off of the Moon's surface, measuring the time they took to come back to determine the height of features on the Moon.

QUESTIONS 27-31

Complete the table below. Write a date for each answer. The first one has been done as an example for you. Write your answers in boxes headed DATE.

QUESTION	EVENT	DATE
EXAMPLE	The US launched Pioneer 1 to orbit the Moon.	1958
27	Discovery of the second Van Allen belt around Earth	
28	Ranger7 crashed into the surface of the Moon	
29	The resumption of US efforts to reach the Moon	
30	Clementine went round the Moon for three months	
31	Lunar Orbiter1 began taking photos of the surface of Moon	

QUESTIONS 32-36

Do the following statements reflect the claims of the writer of the Reading Passage? In boxes headed Answer, mark

- (r) if the statement reflects the writer's claims
- (w) if the statement does not reflect the writer's claims
- (n) if the information is not given in the passage

Now answer questions 32 – 36. (as indicated by the example).

	STATEMENTS	ANSWER
EXAMPLE	Pioneer1 could not leave the highest orbit of the earth.	● (w) (n)
32)	The first Van Allen belt of radiation around the earth was discovered by Pioneer1.	(r) (w) (n)
33)	The Russian were more successful in their attempts to reach the Moon than the American.	(r) (w) (n)
34)	Ranger4 was destroyed by a meteor before it managed to land on the Moon.	(r) (w) (n)
35)	Scientists had no other choice than sending astronauts to the Moon to investigate the consistency of the lunar soil.	(r) (w) (n)
36)	Biological payloads succeeded in landing on the Moon before human beings did so.	(r) (w) (n)

QUESTIONS 37-40

Complete each of the following statements with a name from the Reading Passage. Write your answers in boxes below.

QUESTION	YOUR ANSWER
37	
38	
39	
40	

37) Scientists use the name **…** to refer to the radiation belts around the Earth.

38) Luna2 was the Russian spacecraft that hit the Moon in the **…** region.

39) The USSR sent the unpiloted **…** to orbit the Moon in 1968.

40) Lunakhod1 was the first wheeled vehicle which traveled more than ten kilometers across Moon's **….**

UNIT TWO

SECTION 1: QUESTIONS 1-13

QUESTIONS 1-5

Look at the information below about HUMAN NUTRITION.

mark ⓣ If the statement is true
ⓕ If the statement is false
ⓝ If the information is not given in the passage

EXAMPLE	ANSWER
To be able to help our bodies, nutrients such as proteins, carbohydrates, and fats must be released from food by the process of digestion.	● ⓕ ⓝ

Now answer the following questions:

1) Fast recovery after illness can be guaranteed by proper diet.	ⓣ ⓕ ⓝ
2) One calorie is the amount of energy needed to raise the temperature of one gram of water one degree Celcius.	ⓣ ⓕ ⓝ
3) There are six classes of nutrients that can help us avoid diseases and remain healthy.	ⓣ ⓕ ⓝ
4) The standard unit of measure in nutrition is kilocalorie.	ⓣ ⓕ ⓝ
5) Chemical substances found in food that fuel our physical and mental functions are called nutrients.	ⓣ ⓕ ⓝ

HUMAN NUTRITION

Human Nutrition is the study of how food affects the health and survival of the human body. Human beings require food to grow, reproduce, and maintain good health. Without food, our bodies could not stay warm, build or repair tissue, or maintain a heartbeat. Eating the right foods can help us avoid certain diseases or recover faster when illness occurs. These and other important functions are fueled by chemical substances in our food called nutrients. Nutrients are classified as carbohydrates, proteins, fats, vitamins, minerals, and water.

When we eat food, nutrients are released from food through digestion. Once digested, carbohydrates, proteins, and fats provide the body with the energy it needs to maintain its many functions. Scientists measure this energy in kilocalories, the amount of energy needed to raise 1 kilogram of water 1 degree Celsius. In nutrition discussions, scientists use the term calorie instead of kilocalorie as the standard unit of measure in nutrition.

QUESTIONS 6-13

Look at TYPES OF CHOLESTEROL below.

Match each of the following sentences with TWO possible endings A-M from the box below.

EXAMPLE	ANSWER
Saturated fats are ….	**A and M**

Write the appropriate letters A-M in boxes headed Answer.

QUESTIONS		ANSWER
6 & 7	Unsaturated fats can be distinguished from saturated fats on the basis of ….	
8 & 9	Both saturated and unsaturated fats can ….	
10 & 11	Unsaturated fats are ….	
12 & 13	HDL cholesterol ….	

POSSIBLE ENDINGS

A	associated with high levels of bad cholesterol in blood.
B	influence blood pressure.
C	is called linoleic acid.
D	the number of hydrogen atoms found in them.
E	removes excess cholesterol from the body.
F	affect the density of bad blood cholesterol.
G	associated with lower levels of bad blood cholesterol.
H	liquid at room temerature.
I	lowers the risk of heart disease.
J	raise blood levels of LDL cholesterol.
K	their effects on blood pressure.
L	mostly in vegetable, soybean, and canola oils.
M	solid at room temperature.

TYPE OF CHOLESTEROL

Depending on the number of hydrogen atoms found in them, fats are either saturated or unsaturated. Hydrogen-rich saturated fats, found in beef, dairy products, commercially prepared baked goods, and tropical oils, have a hard consistency at room temperature. These fats can raise blood levels of low-density lipoprotein (LDL) cholesterol, commonly referred to as bad cholesterol, to potentially dangerous levels. High levels of LDL cholesterol can lead to an increased risk of heart disease.

Low-hydrogen unsaturated fats are liquid at room temperature. They contain key nutrients, called essential fatty acids, that cannot be manufactured in the body and so are required in the diet in order to promote normal growth, skin integrity, and healthy blood and nerves. Two of the most important fatty acids are linoleic acid, found mostly in vegetable oils like corn and sunflower, and alpha-linolenic acid, found mostly in soybean and canola oils.

Unsaturated fats have been associated with lower levels of blood cholesterol. They have also been shown to lower LDL cholesterol in the

blood while maintaining higher levels of high-density lipoproteins (HDL) cholesterol, often referred to as the good cholesterol. HDL cholesterol removes excess cholesterol from the body. People who have high blood levels of HDL cholesterol typically have a lower risk of heart disease. Unsaturated fats are plentiful in olive oil, canola oil, peanut oil, shellfish, and fish from cold waters, such as salmon, halibut, mackerel, swordfish, black cod, and rainbow trout.

SECTION 2: QUESTIONS 14-27

QUESTIONS 14-20

Look at MALNUTRITION below and at the following statements.

mark ⓣ If the statement is true

ⓕ If the statement is false

ⓝ If the information is not given in the passage

Now answer the following questions:

14)	In early stages of malnutrition, the brain becomes sluggish and reacts slowly.	ⓣ ⓕ ⓝ
15)	Eating too many salty foods often puts strain on the arteries.	ⓣ ⓕ ⓝ
16)	Obesity is the inevitable consequence of a low intake of iron and calcium.	ⓣ ⓕ ⓝ
17)	In most developed countries, malnutrition is more commonly associated with dietary deficiencies.	ⓣ ⓕ ⓝ
18)	Malnutrition sometimes has nothing to do with the amount of calories an individual gets per day.	ⓣ ⓕ ⓝ
19)	Poor food choices are reflected in a person's getting an adequate or excessive amount of calories each day.	ⓣ ⓕ ⓝ
20)	Atherosclerosis causes a reduction in blood flow.	ⓣ ⓕ ⓝ

MALNUTRITION

Malnutrition is a dietary condition caused by a deficiency or excess of one or more essential nutrients in the diet.

Malnutrition is characterized by a wide array of health problems. They include extreme weight loss, stunted growth, weakened resistance to infection, and impairment of intellect. Severe cases of malnutrition can lead to death.

For one thing, deficiency diseases result from inadequate intake of the major nutrients. These deficiencies can result from eating foods that lack critical vitamins and minerals, from a lack of variety of foods, or from simply not having enough food. When the body is not given enough of any one of the essential nutrients over a period of time, it becomes weak and less able to fight infection. The brain may become sluggish and react slowly. The body taps its stored fat for energy, and muscle is broken down to use for energy. Eventually the body withers away, the heart ceases to pump properly, and death occurs.

Although malnutrition is more commonly associated with dietary deficiencies, it also can develop in cases where people have enough food to eat, but they choose foods low in essential nutrients. This is the more common form of malnutrition in most developed countries. When poor food choices are made, a person may be getting an adequate, or excessive, amount of calories each day, yet still be undernourished. For example, iron deficiency is a common health problem among women and young children in the United States. As another example, low intake of calcium is directly related to poor quality bones and increased fracture risk, especially in the elderly.

A diet of excesses may also lead to other nutritional problems. Obesity is the condition of having too much body fat. It has been linked to life-threatening diseases including diabetes mellitus, heart problems, and some forms of cancer. Eating too many salty foods may contribute to high blood pressure, an often undiagnosed condition that causes the heart to work too hard and puts strain on the arteries.

High blood pressure can lead to strokes, heart attacks, and kidney failure. A diet high in cholesterol and fat, particularly saturated fat, is the primary cause of atherosclerosis, which results when fat and cholesterol deposits build up in the arteries, causing a reduction in blood flow.

QUESTIONS 21-26

Look at VITAMINS AND MINERALS below. From the following list (i-xi) choose the most suitable summaries for the paragraphs A, C, and E-H.

Write the appropriate numbers (i-xi) in boxes headed Answer.

i	Fat-soluble of vitamins
ii	Minerals versus vitamins
iii	Disease-preventing function of vitamins
iv	Water-soluble vitamins
v	Checking free radicals
vi	Medicinal aspects of vitamin C
vii	Minerals
viii	Sources of vitamins and minerals
ix	Effects of vitamin B1 on human health
x	Functions of calcium
xi	Functions of vitamins

NB There are more summaries than paragraphs, so you will not use them all. (Two examples are provided.)

QUESTIONS	PARAGRAPHS	ANSWER
21	Paragraph **A**	
EXAMPLE	Paragraph **B**	**xi**
22	Paragraph **C**	
EXAMPLE	Paragraph **D**	**i**
23	Paragraph **E**	
24	Paragraph **F**	
25	Paragraph **G**	
26	Paragraph **H**	

VITAMINS AND MINERALS

A

Vitamins and minerals are found in a wide variety of foods. However, some foods are better sources of specific vitamins and minerals than others. For example, sweet potatoes are rich in vitamin A, but white potatoes contain almost none of this vitamin. Because of these differences in vitamin and mineral content, it is wise to eat a wide variety of foods.

B

Despite their small concentrations, vitamins perform incredible tasks in the body. They enhance the body's use of carbohydrates, proteins, and fats. They are critical in the formation of blood cells, hormones, nervous system chemicals, and the genetic material deoxyribonucleic acid (DNA).

C

Many vitamins also prevent the onset of many disorders. Vitamin C, for example, is important in maintaining our bones and teeth; scurvy, a disorder that attacks the gums, skin, and muscles, occurs in its absence. Diets lacking vitamin B1 can result in beriberi, a disease characterized by mental confusion, muscle weakness, and inflammation of the heart.

D

Vitamins are classified into two groups: fat soluble and water soluble. Fat-soluble vitamins include vitamins A, D, E, and K. They are usually absorbed with the help of foods that contain fat. Excess amounts of fat-soluble vitamins are stored in the body's fat, liver, and kidneys. As such, they do not need to be consumed every day to meet the body's needs.

E

Water-soluble vitamins include vitamins C, B1, B2, B3, B6, B12, and folic acid. They cannot be stored and rapidly leave the body in urine if taken in greater quantities than the body can use. Foods that contain

water-soluble vitamins need to be eaten daily to replenish the body's needs.

F

Vitamins A, C, and E function as antioxidants, which are vital in countering the potential harm of chemicals known as free radicals. If these chemicals remain unchecked they can make cells more vulnerable to cancer-causing substances. Free radicals can also transform chemicals in the body into cancer-causing agents. Environmental pollutants, such as cigarette smoke, are sources of free radicals. Environmental pollutants, such as cigarette smoke, are sources of free radicals.

G

Minerals are minute amounts of metallic elements vital for the healthy growth of teeth and bones. They also help in such cellular activity as enzyme action, muscle contraction, nerve reaction, and blood clotting. Mineral nutrients are classified as major elements (calcium, chlorine, magnesium, phosphorus, potassium, sodium, and sulfur) and trace elements (chromium, copper, fluoride, iodine, iron, selenium, and zinc).

H

The mineral calcium, for example, plays a critical role in building and maintaining strong bones. Without it, children develop weak bones and adults experience the progressive loss of bone mass known as osteoporosis. Osteoporosis increases their risk of bone fractures, especially in the elderly.

SECTION 3: QUESTIONS 27-40

Read the following passage and answer questions 27-40.

FAMINE

Famine refers to the severe shortage of food, generally affecting a widespread area and large numbers of people. Famine results from natural and human causes. Natural causes of famine include droughts, floods, earthquakes, insect plagues, and plant disease. Human causes

include wars, civil disturbances, sieges, and deliberate crop destruction. Widespread, chronic hunger may result from severe poverty, inefficient food distribution, or population increases disproportionate to the food-producing or procuring capacity of people in a region.

One of the most dramatic, large-scale sociological consequences of famine is population migration. For example, about 1.6 million people emigrated from Ireland, chiefly to the United States, to escape Ireland's potato famine, which lasted from 1845 to 1847. Modern migrations have often been from rural areas to cities. The population of Nouakshott, the capital city of Mauritania, quadrupled in the late 1960s and early 1970s, largely as a result of famine in the sub-Saharan region of Africa.

Acute shortages of foodstuffs have existed in isolated areas periodically since ancient times. Historical records, however, cover only a few thousand years, and estimates of the extent of famines have been approximate. This is true even of famines that occurred during the 20th century.

Nevertheless, the catastrophic nature of major famines is unquestioned. Most researchers list about 400 such famines in recorded history. Populations in Asia have been decimated repeatedly by starvation as a result of drought. An estimated 10 million people died in a drought-induced famine in India from 1769 to 1770. A similar number died in the 1877-1878 famine in northern China. Warfare has been another major cause of famines in these regions. In 1943 an estimated 3 to 5 million people died in China's Henan Province as a result of starvation caused by World War II. In the 20th century the Sahel region of Africa has been struck by famine several times. North and South America have been relatively free of large-scale famines. Europe has suffered only occasionally, although during World War II hundreds of thousands died from starvation.

The human body can adapt fairly well to a reduction in the intake of nutrients. Cutting the intake by half will reduce body weight by about one-fourth, but a person may subsist at this level for some time without experiencing adverse health effects. Any additional drop in intake, however, can be dangerous. Starvation is only one of the possible results; equally serious are diseases that successfully attack an undernourished body.

Long-term effects are also serious. Adults can generally recover successfully from a period of famine, but children may suffer permanent physical and mental damage from undernourishment at a vulnerable time of rapid growth.

Relief organizations for the aid of famine victims are fairly recent inventions. The International Red Cross, founded in Switzerland in 1864, mobilizes relief efforts both within and between countries. Religious and other private agencies also provide relief, and aid is provided by many countries including the United States, Canada, and European nations.

After World War II the shortcomings of these individual programs' abilities to alleviate starvation became obvious. The establishment of the United Nations Relief and Rehabilitation Administration in 1945 was followed by the creation of the Food and Agriculture Organization (FAO) to coordinate international famine relief efforts. Other United Nations agencies assist the FAO in its attempts to prevent disasters caused by inadequate food supplies.

Predictions of chronic conditions that may result in famine have not always been correct. In the 1930s and 1940s predictions indicated that China would be plagued by famine by the late 20th century. In the 1950s and 1960s the Indian subcontinent was singled out as a region losing the ability to feed its burgeoning population. Yet China has succeeded in feeding its people; national attention to equity, agriculture, and birth control have significantly reduced the threat of famine. In India, the so-called Green Revolution, characterized by the introduction of high-yield grain crops and increased use of fertilizers and irrigation, has greatly increased food production. Although malnutrition remains prevalent, India is now self-sufficient in cereal production.

Major famines of the late 20th century have occurred in Africa. Contributing factors have included drought, desertification, poor soils, rapid increases in population, and inadequate attention to food production by some governments. Famine in Africa has recently been most severe where wars or civil unrest exist, as in the Democratic Republic of the Congo, Chad, the southern Sudan, Ethiopia, Mozambique, and Somalia.

In the early 1990s the world produced more than enough food for the 5.3 billion people on the planet, and it was probably capable of growing enough to feed the significantly larger population projected for the first part of the 21st century. To eliminate famine and reduce malnutrition, however, attention needs to focus not only on food production but also on food distribution, consumption, and family planning. Many countries are establishing nutrition surveillance systems designed to predict famines before they occur; through such efforts and early government action, future deaths due to starvation may be prevented.

QUESTIONS 27-31

Complete the table below. Write a date for each answer. The first one has been done as an example for you. Write your answers in boxes headed DATE.

QUESTION	EVENT	DATE
EXAMPLE	Irland's famous potato famine began.	1845
27	3 to 5 million people died in China.	
28	Major famines occurred in Africa.	
29	United Nations Relief and Rehabilitation Administration (UNRRA) was founded.	
30	The Red Cross was founded.	
31	Irland's famous potato famine ended.	

QUESTIONS 32-36

Do the following statements reflect the claims of the writer of the Reading Passage? In boxes headed Answer, mark

- (r) if the statement reflects the writer's claims
- (w) if the statement does not reflect the writer's claims
- (n) if the information is not given in the passage

Now answer questions 32 – 36. (as indicated by the example).

STATEMENTS	ANSWER
EXAMPLE History has recorded 400 terrible famines.	● (w) (n)
32) Droughts are the most important cause of famines.	(r) (w) (n)
33) Careless family planning will result in large-scale famines.	(r) (w) (n)
34) China's control of famines was due to birth control.	(r) (w) (n)
35) There are two sets of causes for famines.	(r) (w) (n)
36) Chronic conditions that may result in famine are always predictable.	(r) (w) (n)

QUESTIONS 37-40

Complete each of the following statements with a name from the Reading Passage. Write your answers in boxes below.

QUESTION	YOUR ANSWER
37	
38	
39	
40	

37) The so-called **…**, characterized by the introduction of high-yield grain crops and increased use of fertilizers and irrigation, has greatly increased food production in India.

38) In the 20th century, the **…** region of Africa has been struck by famine several times.

39) Famine-driven migration in Africa caused the population of **...** to quadruple in the second half of the last century.

40) Many United Nations agencies assist the **…** in its attempts to prevent disasters caused by inadequate food supplies.

UNIT THREE

SECTION 1: QUESTIONS 1-13

QUESTIONS 1-5

Look at the information below about EXOBIOLOGY.

mark ⓣ If the statement is true
ⓕ If the statement is false
ⓝ If the information is not given in the passage

EXAMPLE	ANSWER
Exobiologists search for life in other planets.	● ⓕ ⓝ

Now answer the following questions:

1) Life cannot exist in the absence of carbon.	ⓣ ⓕ ⓝ
2) No organisms on Earth is perceviable in the absence of phosphorous, carbon, hydrogen, oxygen, and nitrogen.	ⓣ ⓕ ⓝ
3) Exobiology studies the factors that influenced biological evolution.	ⓣ ⓕ ⓝ
4) The formation of stars and solar systems led to the existence of planets that are suitable for life, and resulted in the evolution of life on Earth and many other planets.	ⓣ ⓕ ⓝ
5) Exobiologists study how life originated, evolved, and expanded in the universe.	ⓣ ⓕ ⓝ

EXOBIOLOGY

Exobiology is the study of the origin, evolution and distribution of life in the universe. Exobiologists investigate how the formation of stars and solar systems led to the existence of planets suitable for life, how life originated on Earth and perhaps elsewhere, and which factors influenced biological evolution. Exobiologists can use their knowledge about life on Earth to begin their search for life elsewhere. All known life on Earth is based on the element carbon. Carbon, hydrogen, oxygen, nitrogen, and phosphorous are elements that exist in all organisms on Earth. Exobiologists can conceive of organisms that would not rely on those elements, but those elements are among the most abundant elements in the universe and would probably be available elsewhere as a basis for living systems. Carbon is particularly important to life on Earth, and based on the available evidence, there is no reason to believe that carbon-based life should be limited to Earth alone.

QUESTIONS 6-13

Look at THE ORGINS OF LIFE below.

Match each of the following sentences with TWO possible endings A-M from the box below.

EXAMPLE	ANSWER
Debris from the young solar system impacting Earth, lightning, and radiation from the sun	**A and M**

Write the appropriate letters A-M in boxes headed Answer.

QUESTIONS		ANSWER
6 & 7	Russian biologist Oparin and British biologist Haldane	
8 & 9	The Miller-Urey experiment	
10 & 11	Life on Earth can	
12 & 13	In the early stages of its life, Earth	

POSSIBLE ENDINGS

A	provided energy necessary to break apart molecules of matter.
B	lived in the 2oth century.
C	warming the atmosphere.
D	believed in chemical and physical origins of life.
E	providing water to help reactions along.
F	was designed to test part of Oparin and Haldane's hypothesis.
G	yielded a variety of amino acids and other organic molecules.
H	had an environment very different from what we see now.
I	be traced back to the chemistry of deep sea hydrothermal vents.
J	have a cosmic origin.
K	experienced more volcanic activity.
L	that trapped the sun’s heat.
M	allowed organic compounds to form on Earth.

THE ORIGINS OF LIFE

During the 1920s, Russian biologist Oparin and British biologist Haldane proposed that life could have arisen as a consequence of the physical and chemical formation of Earth. The early Earth had an environment very different from the conditions on Earth today. The young Earth had more volcanic activity than today’s Earth, warming the atmosphere and filling it with chemicals that trapped the sun’s heat. Debris from the young solar system impacting Earth, lightning, and radiation from the sun provided energy necessary to break apart molecules, allowing new compounds to form. Earth had oceans even in its early existence, providing water to help reactions along.

American chemists Stanley Miller and Harold Urey tested part of Oparin and Haldane’s hypothesis in the early 1950s by simulating conditions of the early Earth. In what has become known as the Miller-Urey experiment, they connected two flasks with a loop of glass tubing that allowed the gases to pass between the flasks. They filled the upper flask with methane, ammonia, and hydrogen, and the lower flask with water.

They then applied electric sparks to the gas mixture. After less than a day, the water in the lower flask contained a variety of amino acids and other organic molecules.

Other scientists claim that organic compounds could have come to Earth from outer space in cosmic dust particles, asteroids, comets, and meteorites. The chemistry of deep sea hydrothermal vents is still another possible source.

SECTION 2: QUESTIONS 14-27

QUESTIONS 14-20

Look at LOOKING FOR LIFE ON MARS below and at the following statements.

mark ⓣ If the statement is true

ⓕ If the statement is false

ⓝ If the information is not given in the passage

Now answer the following questions:

14)	Viking landers provided visual clues to life on Mars.	ⓣ ⓕ ⓝ
15)	Some of the meteorites that were found on Earth are parts of the matter that composes the planet Mars.	ⓣ ⓕ ⓝ
16)	Mars and Earth are twin planets that broke apart from a huge mother planet.	ⓣ ⓕ ⓝ
17)	Mars Pathfinder is an orbiter probe that will revolve round Mars in near future to rend back photos and information concerning the composition of Martian atmosphere.	ⓣ ⓕ ⓝ
18)	Some sort of microscopic life was found in Martian soil.	ⓣ ⓕ ⓝ
19)	Miniature laboratories onboard the Viking probes could detect evidence of life in samples of the Martian soil and atmosphere.	ⓣ ⓕ ⓝ
20)	Mars Global Surveyor will analyze Martian rocks and soil and collect samples for return to Earth.	ⓣ ⓕ ⓝ

LOOKING FOR LIFE ON MARS

The planet Mars appears to have been similar to Earth throughout much of its history, and some of the missions to that planet have included experiments designed to look for signs of life.

In 1976 the American Viking missions placed two landers on the surface of Mars and conducted tests to detect Martian organisms. The Viking landers carried cameras to take pictures of the surrounding landscape and possibly reveal visual clues to life on Mars. They also carried instruments that could analyze soil samples to determine their composition and look for organic compounds.

The Viking missions had miniature laboratories onboard specifically designed to detect evidence of life in samples of the Martian soil and atmosphere. Scientists hoped that any life on Mars could be cultured, or grown, in these laboratories. Instruments connected to the experiments could then determine whether something was growing in the cultures.

None of the Viking experiments returned definite evidence of life. Biologists now know that about 90 percent of Earth microbes do not grow in cultures, so the Viking experiments may have failed to detect life even if there were microbes on Mars. However, Viking did provide scientists with information that allowed them to identify at least 12 meteorites on Earth that originally came from Mars.

Scientists from the NASA and several universities analyzed one of these meteorites, designated ALH84001. The composition of ALH84001 has shown that the Martian surface today is much different than its early subsurface, of which the meteorite was a part. Given recent deep-sea and underground discoveries on Earth, the hostile environment of Mars does not rule out the possibility that life once existed on the planet.

Many more Martian missions are planned. NASA plans to launch orbiter Mars Global Surveyor and lander Mars Pathfinder to Mars every 18 months, culminating in a mission that will bring samples of Martian soil back to Earth in 2008. Orbiters will provide pictures to be analyzed for signs of water and will measure the composition of the Martian surface. Landers will analyze rocks and soil and collect samples for return to Earth. Mars samples will be treated very carefully, both for the scientific results they may contain, and to ensure that any possible Martian life is detected before exposing a sample to Earth’s biosphere.

QUESTIONS 21-26

Look at INNER AND OUTER PLANETS below. From the following list (i-xi) choose the most suitable summaries for the paragraphs A, C, and E-H.

Write the appropriate numbers (i-xi) in boxes headed Answer.

i	Some information about Jupiter
ii	The overall structure of the solar system
iii	The planet Mercury
iv	Some remarks on Uranus
v	The meteorite belt
vi	What Neptune is like
vii	The role of the sun in the solar system
viii	Pluto's distinctive features
ix	The planet Mars
x	Saturn's distinctive features
xi	The structure of Venus

NB There are more summaries than paragraphs, so you will not use them all. (Two examples are provided.)

QUESTIONS	PARAGRAPHS	ANSWER
21	Paragraph **A**	
EXAMPLE	Paragraph **B**	**xi**
22	Paragraph **C**	
EXAMPLE	Paragraph **D**	**i**
23	Paragraph **E**	
24	Paragraph **F**	
25	Paragraph **G**	
26	Paragraph **H**	

INNER AND OUTER PLANETS

A

Mercury orbits closer to the Sun than any other planet. This makes it dry, hot, and virtually airless. Although the planet’s cratered surface resembles that of the Moon, it is believed that the interior is actually similar to Earth’s, consisting primarily of iron and other heavy elements.

B

Venus is the brightest object in our sky, after the sun and moon. Swirling clouds of sulfur and sulfuric acid obscure Venus’s surface and inhibited study of the planet from Earth until technology permitted space vehicles, outfitted with probes, to visit it. These probes determined that Venus is the hottest of the planets, with a surface temperature of about 460° C.

C

Scientists have determined that Mars’s atmosphere consists primarily of carbon dioxide, with small amounts of nitrogen, oxygen, water vapor, and other gases. Because the atmosphere is extremely thin, daily temperatures can vary as much as 100° Celsius. In general, surface temperatures are too cold and surface pressures too low for water to exist in a liquid state on Mars. The planet resembles a cold, high-altitude desert.

D

Jupiter is the largest of the planets, with a volume 1,400 times greater than that of Earth. Jupiter’s colorful bands are caused by strong atmospheric currents and accentuated by a dense cloud cover. It has three sets of moons and a ring.

E

The sixth planet in order of distance from the Sun, and the second largest in the solar system, is Saturn. Saturn's most distinctive feature is its ring system, first seen in by Galileo. These rings are now known to comprise more than 100,000 individual ringlets, each of which circles the planet.

F

Uranus’s blue-green color comes from the methane gas present in its cold, clear atmosphere. The dark shadings at the right edge of the sphere correspond to the day-night boundary on the planet. Beyond this

boundary, Uranus's northern hemisphere remains in a four-decade-long period of darkness because of the way the planet rotates.

G

Neptune, the major planet in the solar system, is the eighth planet from the Sun and the fourth largest in diameter. Neptune maintains an almost constant distance, about 4.5 billion km, from the Sun. It revolves outside the orbit of Uranus and for most of its orbit moves inside the elliptical path of the outermost planet Pluto.

H

Pluto is farther from the Sun than the other planets in the solar system, although it occasionally moves in closer than Neptune due to an irregular orbit. The planet's orbit is so eccentric that at certain points along its path Pluto is slightly closer to the Sun than is Neptune. Discovered in 1930, Pluto is the most recent planet in the solar system to be detected.

SECTION 3: QUESTIONS 27-40

Read the following passage and answer questions 27-40.

LIFE BEYOND OUR SOLAR SYSTEM

Exobiologists are increasingly turning their attention to other places in the solar system. The Pioneer and Voyager missions of the 1970s and 1980s returned data that showed that Saturn's moon Titan had an atmosphere made up of gases similar to those in the Miller-Urey experiment. Jupiter's moon Europa is even more intriguing, with a smooth icy surface and puzzle-like cracks suggesting that a liquid ocean may exist underneath. The Galileo orbiter began an orbit around Jupiter in 1995, studying Jupiter's moons, with an extended mission focusing on Europa. The Cassini probe was launched in 1997 toward Saturn and Saturn's moon Titan.

Solar system exploration may detect extraterrestrial life in the solar system that is not advanced enough to communicate with Earth. However, exobiologists have employed other strategies of searching for life. The Pioneer and Voyager missions carried messages from Earth for their eventual journeys through interstellar space. Pioneer 10 and 11 were the first objects planned to leave the solar system and carried small metal plaques depicting male and female humans with a coded message identifying the time and place of spacecraft origin. A more ambitious message was placed aboard the Voyager 1 and 2 spacecraft

as a kind of time capsule. Each carried a gold-plated copper disk recording of sounds and images portraying the diversity of life and culture on Earth—including a variety of natural sounds, musical selections, and spoken greetings in 55 languages. These messages are on their way to the stars, with Pioneer 10 and Voyager 1 both more than 11 billion km from Earth.

Spacecraft are not the fastest or most efficient way to send messages out of the solar system, or for cultures on other planets to send messages to Earth. Radio waves travel at the speed of light and can be sent out in many different directions. Exobiologists began searching the skies for radio signals from extraterrestrial life in 1960, in the first Search for Extraterrestrial Intelligence (SETI) experiment. Frank Drake used the National Radio Astronomy Observatory in Green Bank, West Virginia, to search for radio signals for four months in 1960. This attempt was named Project Ozma after the queen in American writer L. Frank Baum's novels about the imaginary land of Oz. Project Ozma focused on the stars Tau Ceti in the constellation Cetus and Epsilon Eridani in the constellation Eridanus, both about 11 light-years from Earth. Drake's search lasted six hours a day from April to July 1960, using an 26 m radio telescope tuned to the wavelength of radiation that cold hydrogen gas in interstellar space emits. With the exception of an early false alarm caused by a secret military experiment, no signals were detected.

Project Ozma used just one single-channel receiver, but NASA eventually developed the capability to monitor millions of channels simultaneously. On October 12, 1992, NASA's two-part SETI effort initiated observations with the All-Sky Survey, a survey of space using a 34 m diameter radio telescope in Goldstone, California, and the Targeted Search, which examined solar-type stars using the National Science Foundation's 305 m telescope in Arecibo, Puerto Rico. The project was not appreciated by some in the United States Congress, however, and was canceled in October 1993. The equipment developed for the Targeted Search was transferred to the private SETI Institute, which deployed it to Australia in 1995. SETI continues to operate the search with other equipment at a radio telescope in Green Bank—Project Ozma's former home.

Current exobiology research focuses on understanding how life arose on Earth and discovering potential life-supporting environments other than Earth. Scientists now believe that life on Earth dates back to at least 3.85 billion years before present, so living organisms have populated Earth for more than 80% of its history. Laboratory results have shown that nucleic acids associated with primitive life forms can change

through natural selection. Biologists are focusing new attention on the ability of life on Earth to live in extreme environments—from the cold deserts of Antarctica to superheated springs in the depths of oceans—and life is proving to be remarkably robust. In comparison, planetary bodies such as Mars and Europa show evidence of environments no worse than those in some parts of Earth.

Astronomers have made many recent discoveries of interest to exobiologists. In the mid-1990s astronomers began using special techniques to search for planets around other stars, and found that planets are much more common than previously thought. Scientists are developing instruments that will be able to look more closely at extrasolar planets such as 16 Cygni B. In 1996 the European Space Agency's (ESA) Infrared Space Observatory (ISO) reported the first galactic water vapor found in a deep space object—in a cloud around the dying star NGC 7027. The Milky Way may be full of possible locations for life. The future poses many opportunities to discover new aspects and capabilities of life on Earth and to study exciting places in space that may also have life.

QUESTIONS 27-31

Complete the table below. Write a date for each answer. The first one has been done as an example for you. Write your answers in boxes headed DATE.

QUESTION	EVENT	DATE
EXAMPLE	The Galileo orbiter began an orbit around Jupiter.	1995
27	The Cassini probe was launched toward Saturn and Saturn's moon Titan.	
28	Examination of solar-type stars in Arecibo was canceled.	
29	Frank Drake began to carry out the so-called Project Ozma.	
30	NASA's two-part SETI effort initiated observations with the All-Sky Survey.	
31	Efforts to search for radio signals from extraterrestrial life started.	

QUESTIONS 32-36

Do the following statements reflect the claims of the writer of the Reading Passage? In boxes headed Answer, mark

- (r) if the statement reflects the writer's claims
- (w) if the statement does not reflect the writer's claims
- (n) if the information is not given in the passage

Now answer questions 32 – 36. (as indicated by the example).

	STATEMENTS	ANSWER
EXAMPLE	The Milky Way may be full of possible locations for life.	● (w) (n)
32)	A liquid ocean exists underneath Europa.	(r) (w) (n)
33)	Saturn's moon Titan is able to support Earth-like life forms.	(r) (w) (n)
34)	Natural selection can change nucleic acids associated with primitive life forms.	(r) (w) (n)
35)	Searching the skies for radio signals from extraterrestrial life is doomed to fail.	(r) (w) (n)
36)	The star Tau Ceti in the constellation Cetus is very much like our own sun.	(r) (w) (n)

QUESTIONS 37-40

Complete each of the following statements with a name from the Reading Passage. Write your answers in boxes below.

QUESTION	YOUR ANSWER
37	
38	
39	
40	

37) An extrasolar planet, **…**, has attracted the attention of exobiologists.

38) Epsilon Eridani in the constellation **…**, is about 11 light-years far from Earth.

39) In 1997, the **…** probe was launched toward Saturn and it moon Titan.

40) Jupiter's moon **…** has a smooth icy surface and puzzle-like cracks.

UNIT FOUR

SECTION 1: QUESTIONS 1-13

QUESTIONS 1-5

Look at the information below about DISCOVERY OF THE AMERICAS.

mark ⓣ If the statement is true
ⓕ If the statement is false
ⓝ If the information is not given in the passage

EXAMPLE	ANSWER
Columbus did not begin his voyage with the intention of finding the Americas.	● ⓕ ⓝ

Now answer the following questions:

1) Marco Polo was the pioneer in discovering new lands.	ⓣ ⓕ ⓝ
2) On his very first voyage through the Atlantic ocean, Columbus found a passage through the Caribbean islands to the fabled cities of Asis.	ⓣ ⓕ ⓝ
3) Christopher Columbus is not the real discoverer of the Americas.	ⓣ ⓕ ⓝ
4) Columbus killed millions of native American people by engaging them in war, forced labor, and disease.	ⓣ ⓕ ⓝ
5) The explorations of Columbus led to the opening of the Americas to European colonization.	ⓣ ⓕ ⓝ

DISCOVERY OF THE AMERICAS

While on a voyage for Spain in October 1492 in search of a direct sea route from Europe to Asia, Christopher Columbus unintentionally discovered the Americas. However, in four separate voyages to the Caribbean from 1492 to 1504, he remained convinced that he had found the lands that Marco Polo had reached in his overland travels to China at the end of the 13th century. To Columbus it was only a matter of time before a passage was found through the Caribbean islands to the fabled cities of Asia.

Columbus was not the first European to reach the Americas. However, his explorations had a profound impact on the world. They led directly to the opening of the western hemisphere to European colonization; to large-scale exchanges of plants, animals, cultures, and ideas between the two worlds; and, on a darker note, to the deaths of millions of indigenous American peoples from war, forced labor, and disease.

QUESTIONS 6-13

Look at THE COLUMBIAN EXCHANGE below.

Match each of the following sentences with TWO possible endings A-M from the box below.

EXAMPLE	ANSWER
The earth's land areas ….	**A and M**

Write the appropriate letters A-M in boxes headed Answer.

QUESTIONS		ANSWER
6 & 7	Biological evolution in both the Americas and in Afro-Eurasia ….	
8 & 9	The area of Earth called Afro-Eurasia ….	
10 & 11	The event commonly referred to as the Columbian Exchange ….	
12 & 13	American populations, before the Columbian Exchange, ….	

POSSIBLE ENDINGS

A became welded into a landmass millions of years ago.

B lived in a biologically separate world of their own.

C followed individual paths.

D had no prior experience of most of the Afro-Eurasian diseases.

E was adjacent to the Americas 120 million years ago.

F resulted in the introduction of new food stuff to Afro-Eurasia.

G were introduced to new weeds.

H created two separate biological worlds.

I new food and fiber crops.

J lies on the East of the Atlantic ocean.

K bringing the pleasures and consequences of coffee.

L altered the history of the world.

M were called Pangaea about 120 million years ago.

THE COLUMBIAN EXCHANGE

Geologists believe that millions of years ago, the earth's previously separate land areas became welded into a landmass called Pangaea. About 120 million years ago, however, the formation of Atlantic Ocean divided the Americas from Africa and Eurasia. Over the course of the next several million years in both the Americas and in Afro-Eurasia, biological evolution followed individual paths, creating two separate biological worlds. However, Christopher Columbus made land in the Bahamas in October 1492 and reunited these long-separated worlds. Columbus' voyage, and the ones that followed, disrupted much of the biological segregation brought about by continental drift.

After Columbus' arrival in the Americas, the animal, plant, and bacterial life of these worlds began to mix. This process, first studied by historian Alfred Crosby, was called the Columbian Exchange. The Columbian Exchange had dramatic and lasting effects on the world. New diseases were introduced to American populations that had no prior experience of them. The results were devastating. These populations also were

introduced to new weeds and pests, livestock, and pets. New food and fiber crops were introduced to Eurasia and Africa, improving diets and fomenting trade there. In addition, the Columbian Exchange vastly expanded the scope of production of some popular drugs, bringing the pleasures and consequences of coffee, sugar, and tobacco use to many millions of people. The results of this exchange recast the biology of both regions and altered the history of the world.

SECTION 2: QUESTIONS 14-27

QUESTIONS 14-20

Look at SELECTION OF TOP TEN below and at the following statements.

mark ⓣ If the statement is true
ⓕ If the statement is false
ⓝ If the information is not given in the passage

Now answer the following questions:

14)	The last millenium witnessed great scientific, social, and political revolutions that have left an indelible mark on the world that exists today.	ⓣ ⓕ ⓝ
15)	The question of whose contributions had a lasting influence on history is the main criterion for selecting that individual as a top person.	ⓣ ⓕ ⓝ
16)	Singularity of contribution is the best criterion for selecting top individuals.	ⓣ ⓕ ⓝ
17)	Without the artistic contributions of poets, musiciand, and painters, there would be no such thing as world culture.	ⓣ ⓕ ⓝ
18)	Agnes Hooper Gottlieb is a German essayist.	ⓣ ⓕ ⓝ
19)	Great leaders are identifiable by their charismatic attributes.	ⓣ ⓕ ⓝ
20)	The contribution of modern figures to the world is more difficult to gauge.	ⓣ ⓕ ⓝ

SELECTION OF TOP TEN

The arrival of the year 2000 has provided much of humanity with cause for reflection on the last millennium. Scientific, social, and political revolutions during the last 1,000 years have left an indelible mark on the world that exists today.

Perhaps one of the best ways to examine the sprawling history of the second millennium is to consider the most influential people who shaped it. As American poet and essayist Ralph Waldo Emerson said, “There is properly no history; only biography.” Therefore, in December 1999, American essayist and educator Agnes Hooper Gottlieb identified and profiled ten individuals who changed the course of the last 1,000 years. But how does one go about selecting from 1,000 years of history a representative group of the most influential people? Which individuals most fully represented the triumphs of humanity and shaped the outcome of the millennium?

Agnes Hooper Gottlieb used five criteria to make the selections. The first one was the question of whose contributions had a lasting influence on history. The second criterion was the effect on the sum total of wisdom and beauty in the world. This allowed the consideration of artistic contributions, such as a Beethoven sonata, a Michelangelo fresco, or a Shakespearean sonnet, that may not have directly altered the history books but without which world culture would not be as rich as it is.

The next criterion was influence on contemporaries. How much did each individual affect the world during his or her own time? This standard allowed consideration of more modern figures, whose lasting contribution to the world is more difficult to gauge at this juncture in history.

Another point of evaluation was singularity of contribution. If a single person had invented the automobile or the Internet, that genius might have been considered for our roster. But so many of the innovations and inventions that made their mark on history were the result of collaborative efforts. The criterion of singularity of contribution recognized those people whose singular brilliance charted entirely new territory.

The fifth and final criterion was charisma. This attribute brought to the selection process great leaders who may not have been intellectual giants noted for pathbreaking new discoveries, but who nevertheless exerted great influence by virtue of their ability to inspire other people to act.

QUESTIONS 21-26

Look at ELITE OF THE LAST MILLENNIUM below. From the following list (i-xi) choose the most suitable summaries for the paragraphs A, C, and E-H.

Write the appropriate numbers (i-xi) in boxes headed Answer.

i	The most outstanding religious leader
ii	Gutenberg, the great inventor of all time
iii	Selection of the elite
iv	The unprecedented writer
v	The elite music composer
vi	The most outstanding politician of the last millenium
vii	The outstanding artist
viii	The greatest peacemaker of the world
ix	The most significant scientist
x	The greatest explorer of all time
xi	world's greatest explorer

NB There are more summaries than paragraphs, so you will not use them all. (Two examples are provided.)

QUESTIONS	PARAGRAPHS	ANSWER
21	Paragraph **A**	
EXAMPLE	Paragraph **B**	**xi**
22	Paragraph **C**	
EXAMPLE	Paragraph **D**	**i**
23	Paragraph **E**	
24	Paragraph **F**	
25	Paragraph **G**	
26	Paragraph **H**	

ELITE OF THE LAST MILLENNIUM

A

Gutenberg's major breakthrough was the unique development of a system of movable type. It involved a mold with outlines of letters and other characters stamped in it. Letters of type could be produced rapidly by pouring liquid metal into these pre-made molds. These letters were then assembled to make up pages for printing.

B

Today it is generally recognized that Columbus did not “discover” the Americas. However, he did instigate the European exploration of these lands at the end of the 15th century. This single act of courage and skill set in motion global population shifts and advances in human knowledge that profoundly changed history.

C

Michelangelo was held to be divine by his contemporaries. While Leonardo da Vinci edges Michelangelo as the quintessential Renaissance man, when it comes to sheer artistry there is no real competition. Michelangelo is still seen as a key to the flowering of the Renaissance and is the standard against which all subsequent artists are measured.

D

No government or institution wielded as much power during the last millennium as the Roman Catholic Church and its leadership. It retained an incredible amount of power and prestige. In the Protestant Reformation of the 16th century, however, the church suffered a huge blow to its authority. One man was at the heart of that split: German theologian Martin Luther.

E

There is a galaxy of brilliant writers from which to select one writer as the most influential in the second millennium. In reality, however, there is only one person who has the literary resume to even apply for the job: William Shakespeare. Even today, this English playwright and poet remains the most influential writer who ever lived.

F

There were countless major scientific breakthroughs during the last millennium. To choose one scientist who stands out over the rest requires weighing not just the individual's accomplishments, but also how he or she changed the process of scientific discovery itself. This

criterion leads us to Galilei, who pioneered important aspects of today's scientific method.

G

Choosing one musician as most influential of the millennium is one of the more difficult assignments. Popular music styles change quickly, and musical taste is personal and hard to define. Therefore, the most logical choice is the individual whose work has stood the test of time, enrapturing each new generation as it discovers him: Ludwig van Beethoven.

H

The last millennium saw the invention of some of the most destructive weapons and the waging of some of the most horrific wars imaginable. But there were also individuals who championed peace by using philosophies of nonviolence. Gandhi showed the international community that guns and power were not the only way to topple an empire.

SECTION 3: QUESTIONS 27-40

Read the following passage and answer questions 27-40.

ARTICLES OF COLUMBIAN EXCHANGE

Arriving across the Bering land bridge between 20,000 and 12,000 years ago, the first inhabitants of the Americas brought few diseases with them. For one reason, they had no domesticated animals, the original source of human diseases such as smallpox and measles. In addition, as they passed from Siberia to North America, they had spent many years in extreme cold, which eliminated many of the disease-causing agents that might have traveled with them. As a result, the first Americans and their descendants, strong by 1492, enjoyed freedom from most of the infectious diseases that plagued populations in Afro-Eurasia for millennia. Meanwhile, in Asia and Africa, the domestication of herd animals brought new diseases spread by cattle, sheep, pigs, and fowl.

Soon after Christopher Columbus and his crew made land in the Bahamas in October 1492, sailors inadvertently introduced these diseases to the Americas. As a result, on some Caribbean islands, the Native American population died out completely. In all, between 1492 and 1650, perhaps 90 percent of the first Americans had died. Economically, the population decrease brought by the Columbian Exchange indirectly caused a drastic labor shortage throughout the

Americas, which eventually contributed to the establishment of African slavery on a vast scale in the Americas. By 1650, the slave trade had brought new diseases, such as malaria and yellow fever, which further plagued Native Americans.

In terms of diseases, the Columbian Exchange was a wildly unequal affair, and the Americas got the worst of it. The flow of disease from the Americas eastward into Eurasia and Africa was either trivial or consisted of a single important infection. Much less is known about pre-Columbian diseases in the Americas than what is known about those in Eurasia. Based on their study of skeletal remains, anthropologists believe that Native Americans certainly suffered from arthritis. They also had another disease, probably a form of tuberculosis that may or may not have been similar to the pulmonary tuberculosis common in the modern world. Native Americans also apparently suffered from a group of illnesses that included two forms of syphilis. One controversial theory asserts that the venereal syphilis epidemic that swept much of Europe beginning in 1494 came from the Americas; however, the available evidence remains inconclusive.

Eurasians sent much more than disease westward. On his later voyages, Columbus brought many crops he hoped might flourish there. He and his followers brought wheat, barley, rye, sugar, bananas, and citrus fruits. At first, many of these crops fared poorly; but eventually they all flourished. After 1640, for example, sugar became the mainstay of the Caribbean and Brazilian economies, becoming the foundation for some of the largest slave societies ever known. When it came to animals, however, the Native Americans borrowed eagerly from the Eurasian stables. While Native Americans had plenty of good food crops available before 1492, they had few domesticated animals. The main ones, aside from llamas and alpacas, were dogs, turkeys, and guinea pigs. The Columbian Exchange brought horses, cattle, sheep, goats, pigs, and a collection of other useful species to the Americas.

America’s vast contribution to Afro-Eurasia in terms of new plant species and cuisine, however, transformed life in places as far apart as Ireland, South Africa, and China. Before Columbus, the Americas had plenty of domesticated plants. By the time Columbus had arrived, dozens of plants, including maize and potato, were in regular use. Within 20 years of Columbus’ last voyage, maize had established itself in North Africa and perhaps in Spain. By 1800, maize was the major grain in large parts of what is now Romania and Serbia, and was also important in Hungary, Ukraine, Italy, and southern France.

Despite maize's success, the humble potato probably had a stronger impact in improving the food supply and in promoting population growth in Eurasia. It had the most significant effect on Ireland, where it promoted a rapid population increase until a potato blight ravaged the crop in 1845, bringing widespread famine to the area. After 1750, Scandinavia, the Low Countries, Germany, Poland, and Russia also gradually accepted the potato, which helped drive a general population explosion in Europe. This population explosion may have laid the foundation for world-shaking developments such as the Industrial Revolution and modern European imperialism. The potato also fed mountain populations around the world, notably in China, where it encouraged settlement of mountainous regions.

In contrast, the animals of the Americas have had very little impact on the rest of the world. One domesticated animal that did have an effect was the turkey. Wild animals of the Americas have done only a little better. Probably after the 19th century, North American muskrats and squirrels successfully colonized large areas of Europe. Deliberate introductions of American animals, such as raccoons fancied for their fur and imported to Germany in the 1920s, occasionally led to escapes and the establishment of feral animal communities. However, no species introduced from the Americas revolutionized human affairs or animal ecology anywhere in Afro-Eurasia.

QUESTIONS 27-31

Complete the table below. Write a date for each answer. The first one has been done as an example for you. Write your answers in boxes headed DATE.

QUESTION	EVENT	DATE
EXAMPLE	Columbus made land in the Bahamas.	1492
27	Slaves brought diseases to the Americas.	
28	Raccoons were imported to Germany.	
29	Maize became the major grain Romania.	
30	Sugar became the mainstay of the Brazilian and Caribbean economies.	
31	Scandinavian countries accepted potato.	

QUESTIONS 32-36

Do the following statements reflect the claims of the writer of the Reading Passage? In boxes headed Answer, mark

- (r) if the statement reflects the writer's claims
- (w) if the statement does not reflect the writer's claims
- (n) if the information is not given in the passage

Now answer questions 32 – 36. (as indicated by the example).

STATEMENTS	ANSWER
EXAMPLE The first inhabitants of the Americas brought few diseases with them.	● (w) (n)
32) The Columbian exchange has resulted in more damage than comfort.	(r) (w) (n)
33) The people of Germany Poland, and Russia do not like potato-rich food types.	(r) (w) (n)
34) Turkey is a native animal of the Americas.	(r) (w) (n)
35) Native Americand are much healthier than Afro-Eurasian people.	(r) (w) (n)
36) Arthritis and tuberculosis have reached Afro-Eurasia through the Columbian exchange.	(r) (w) (n)

QUESTIONS 37-40

Complete each of the following statements with a name from the Reading Passage. Write your answers in boxes below.

QUESTION	YOUR ANSWER
37	
38	
39	
40	

37) As a result of the Columbian exchange, on some **…**, the Native American population died out completely.

38) Native Americans arrived in the Americas across the **…** between 20,000 and 12,000 years ago

39) Within 20 years of Columbus' last voyage, maize became the mainstay of the economies of **…** and perhaps of Spain.

40) The potato encouraged settlement of mountainous regions in **….**

UNIT FIVE

SECTION 1: QUESTIONS 1-13

QUESTIONS 1-5

Look at the information below about VOLCANOES.

mark (t) If the statement is true
(f) If the statement is false
(n) If the information is not given in the passage

EXAMPLE	ANSWER
Volcanoes are formed by the accumulation of materials erupted through volcanic vents.	● (f) (n)

Now answer the following questions:

1) Most volcaneos lie beneath the oceans and seas.	(t) (f) (n)
2) Under-water volcanoes crisscross the deep ocean floor.	(t) (f) (n)
3) Each year, new volcanoes are formed on the surface of Earth and at deep ocean floors.	(t) (f) (n)
4) Volcanic eruptions have killed 1511 people over the past 10000 years, and continue to kill between 50 to 60 people on a yearly basis.	(t) (f) (n)
5) The Smithsonian Institution, a branch of the United Nations, is responsible for predicting volcanoe eruptions that threaten the lives of people throughout the world.	(t) (f) (n)

VOLCANOES

Volcanoes are formed by the accumulation of materials erupted through one or more openings (called volcanic vents) in the earth's surface. The term volcano can also refer to the vents themselves. Most volcanoes have steep sides, but some can be gently sloping mountains or even flat tablelands, plateaus, or plains.

The volcanoes above sea level are the best known, but the vast majority of the world's volcanoes lie beneath the sea, formed along the global oceanic ridge systems that crisscross the deep ocean floor. According to the Smithsonian Institution, 1511 above-sea volcanoes have been active during the past 10,000 years, 539 of them erupting one or more times during written history. On average, 50 to 60 above-sea volcanoes worldwide are active in any given year; about half of these are continuations of eruptions from previous years, and the rest are new. Volcanic eruptions in populated regions are a significant threat to people, property, and agriculture.

QUESTIONS 6-13

Look at VOLCANO FORMATION below.

Match each of the following sentences with TWO possible endings A-M from the box below.

EXAMPLE	ANSWER
All volcanoes ….	**A and M**

Write the appropriate letters A-M in boxes headed Answer.

QUESTIONS		ANSWER
6 & 7	Magma ….	
8 & 9	The volcanic materials that pile up around the volcanic vent ….	
10 & 11	Volcanic vents …	
12 & 13	Once formed, tiny droplets of magma …	

POSSIBLE ENDINGS

A	are formed by the accumulation of magma.
B	between minerals within the solid rock.
C	usually form mountains.
D	may form a long crack, called a fissure vent.
E	move upward toward lower pressure regions.
F	within the upper part of the mantle.
G	is molten rock that forms below the earth's surface.
H	deep within the earth.
I	can be a single opening.
J	rise and join to form ever-larger blobs.
K	create topographical features that we recognize as volcanoes
L	can erupt through volcanic vents.
M	can remain inactive for several years.

VOLCANO FORMATION

All volcanoes are formed by the accumulation of magma (molten rock that forms below the earth's surface). Magma can erupt through one or more volcanic vents, which can be a single opening, a cluster of openings, or a long crack, called a fissure vent. It forms deep within the earth, generally within the upper part of the mantle (one of the layers of the earth’s crust), or less commonly, within the base of the earth's crust. High temperatures and pressures are needed to form magma. The solid mantle or crustal rock must be melted under conditions typically reached at depths of 80 to 100 km below the earth’s surface.

Once tiny droplets of magma are formed, they begin to rise because the magma is less dense than the solid rock surrounding it. The processes that cause the magma to rise are poorly understood, but it generally moves upward toward lower pressure regions, squeezing into spaces between minerals within the solid rock. As the individual magma droplets rise, they join to form ever-larger blobs and move toward the surface.

Rising magma accumulates in one or more underground storage regions, called magma reservoirs, before it erupts onto the surface. With each eruption, the material erupted adds another layer to the growing volcano. After many eruptions, the volcanic materials pile up around the vent to form such topographic features as hills, mountains, plateaus, or craters, that we recognize as volcanoes.

SECTION 2: QUESTIONS 14-27

QUESTIONS 14-20

Look at TYPES OF VOLCANOES below and at the following statements.

mark ⓣ If the statement is true

ⓕ If the statement is false

ⓝ If the information is not given in the passage

Now answer the following questions:

14)	Basaltic lava flows are very fluid volcanic materials thet cover many thousands of square kilometers.	ⓣ ⓕ ⓝ
15)	When the ground collapses because of explosive eruptions, a caldera is formed.	ⓣ ⓕ ⓝ
16)	Explosively erupted materials sandwitched between nonexplosively erupted lava flows and deposits of volcanic debris form fissure vents.	ⓣ ⓕ ⓝ
17)	Pyroclastic flows are the result of explosive volcanic activities.	ⓣ ⓕ ⓝ
18)	Mount Fuji in Japan is a composite volcano.	ⓣ ⓕ ⓝ
19)	Shield volcanoes are formed as a result of numerous lava flows that are similar to the spreading out of hot syrup poured onto a plate.	ⓣ ⓕ ⓝ
20)	Cinder cones are the smallest type of volcanoes while volcanic plateaus are the largest type of volcanoes.	ⓣ ⓕ ⓝ

TYPES OF VOLCANOES

Volcanoes come in different shapes and sizes, depending on the makeup of the magma, the style of the eruption, and how often they erupt. The major types of volcanoes, roughly in order of increasing size, are cinder cones, composite volcanoes, shield volcanoes, calderas, and plateaus.

Cinder cones and composite volcanoes have the familiar conelike shape that people most often associate with volcanoes. Some of these form beautifully symmetrical volcanic hills or mountains such as Mount Fuji in Japan. Cinder cones consist exclusively of fragmental lava.

Composite volcanoes are composed of explosively erupted materials layered with nonexplosively erupted lava flows and deposits of volcanic debris. They are mostly built from materials that come from lava. In some composite volcanoes that undergo a major explosive eruption, nonexplosive extrusions of lava within the summit crater can later construct a bulbous mound of accumulated lava called a lava or volcanic dome.

Shield volcanoes get their name from their distinctive mound-like shapes that resemble the shields of ancient warriors. Their shapes reflect that they are constructed mainly of countless basaltic lava flows that erupted nonexplosively. Such flows can easily spread great distances from the feeding volcanic vents, similar to the spreading out of hot syrup poured onto a plate. Volcanic shields may be either small or large, and the largest shield volcanoes are many times larger than the largest composite volcanoes.

A caldera is a round or oval-shaped low-lying area that forms when the ground collapses because of explosive eruptions. An explosive eruption can explode the top off of the mountain or eject all of the magma that is inside the volcano. Either of these actions may cause the volcano to collapse. Calderas can be bigger than the largest shield volcanoes in diameter. Calderas potentially pose the greatest volcanic hazards to society; luckily, they are very rare geological events.

Volcanic plateaus do not actually look like volcanoes. Instead, they form extensive, nearly flat-topped accumulations of erupted materials. These materials form volcanic plateaus or plains covering many thousands of square kilometers. The volcanic materials can be either very fluid basaltic lava flows or far-traveled pyroclastic flows. The Columbia Plateau in the states of Oregon, Washington, and Idaho is an example of flood basalts. The Yellowstone Plateau of Wyoming and Montana is built of pyroclastic flows.

QUESTIONS 21-26

Look at VOLCANIC MATERIALS below. From the following list (i-xi) choose the most suitable summaries for the paragraphs A, C, and E-H.

Write the appropriate numbers (i-xi) in boxes headed Answer.

i	Composition of Lava
ii	Famous volcanoes of the world
iii	Types of Tephra
iv	Composition of magma
v	Volcanic bombs
vi	Kinds of Volcanic eruptions
vii	Volcanic Gases
viii	What is Tephra
ix	Composition of Volcanic Gases
x	Types of Lava
xi	What is Lava

NB There are more summaries than paragraphs, so you will not use them all. (Two examples are provided.)

QUESTIONS	PARAGRAPHS	ANSWER
21	Paragraph **A**	
EXAMPLE	Paragraph **B**	**xi**
22	Paragraph **C**	
EXAMPLE	Paragraph **D**	**i**
23	Paragraph **E**	
24	Paragraph **F**	
25	Paragraph **G**	
26	Paragraph **H**	

VOLCANIC MATERIALS

A

Three different types of materials may erupt from an active volcano. These materials are lava, tephra (rock fragments), and gases. The type and amount of the material that erupts from an active volcano depends on the composition of the magma inside the volcano.

B

Lava is magma that breaks the surface and erupts from a volcano. If the magma is very fluid, it flows rapidly down the volcano's slopes. Lava that is more sticky and less fluid moves slower.

C

Lava flows that have a continuous, smooth, ropy, or billowy surface are called pahoehoe flows, while aa flows have a jagged surface composed of loose, irregularly shaped lava chunks. Once cooled, pahoehoe forms smooth rocks, while aa forms jagged rocks. The words pahoehoe and aa are Hawaiian terms that describe the texture of the lava.

D

Lava may also be described in terms of its composition and the type of rock it forms. Basalt, andesite, dacite, and rhyolite are all different kinds of rock that form from lava. Each type of rock, and the lava from which it forms, contains a different amount of the compound silicon dioxide. Basaltic lava has the least amount of silicon dioxide, andesitic and dacitic lava have medium levels of silicon dioxide, while rhyolitic lava has the most.

E

Tephra, or pyroclastic material, is made of rock fragments formed by explosive shattering of sticky magma. The term *pyroclastic* is of Greek origin and means "fire-broken." Tephra refers to any airborne pyroclastic material regardless of size or shape.

F

The best-known tephra materials include pumice, cinders, and volcanic ash. These fragments are exploded when gases build up inside a volcano and produce an explosion. The pieces of magma are shot into the air during the explosion. Ash refers to fragments smaller than 2 mm in diameter. The finest ash is called volcanic dust and is made up of

particles that are less than 0.06 mm in diameter. Volcanic blocks, or bombs, are the largest fragments of tephra, more than 64 mm in diameter.

G

Gases, primarily in the form of steam, are released from volcanoes during eruptions. All eruptions, explosive or nonexplosive, are accompanied by the release of volcanic gas. The sudden escape of high-pressure volcanic gas from magma is the driving force for eruptions. Gases come from the magma itself or from the hot magma coming into contact with water in the ground.

H

Volcanic plumes can appear dark during an eruption because the gases are mixed with dark-colored materials such as tephra. Most volcanic gases predominantly consist of steam, with carbon dioxide (CO_2) and sulfur dioxide (SO_2) being the next two most common compounds along with smaller amounts of chlorine and fluorine gases.

SECTION 3: QUESTIONS 27-40

Read the following passage and answer questions 27-40.

VOLCANO HAZARDS

Eruptions pose direct and indirect volcano hazards to people and property, both on the ground and in the air. Direct hazards are pyroclastic flows, lava flows, falling ash, and debris flows. Pyroclastic flows are mixtures of hot ash, rock fragments, and gas. They are especially deadly because of their high temperatures of 850° C or higher and fast speeds of 250 km/h or greater. Lava flows, which move much more slowly than pyroclastic flows, are rarely life threatening but can produce massive property damage and economic loss. Heavy accumulations of volcanic ash, especially if they become wet from rainfall, can collapse roofs and damage crops. Debris flows called lahars are composed of wet concretelike mixtures of volcanic debris and water from melted snow or ice or heavy rainfall. Lahars can travel quickly through valleys, destroying everything in their paths. Pyroclastic and volcanic debris flows have caused the most eruption-related deaths in the 20th century.

Indirect hazards are usually nonvolcanic effects that accompany or follow eruptions. Examples are earthquakes, tsunamis, rainfall-caused

debris flow, and posteruption disease and famine. Tsunamis are large seismic sea waves generated by sudden movement of the seafloor. This sudden seafloor movement can be caused by a large earthquake or by the collapse of an island volcano during or after an eruption. Tsunamis can devastate low-lying coastal areas and can be deadly if people living in such areas are not evacuated. Indirect hazards also include volcanic deposits from large eruptions. These deposits can blanket farm fields and grazing lands, leading to the loss of crops and livestock and ultimately to the starvation of people dependent on them for life. During the period from the 17th century to the 19th century, tsunamis and posteruption starvation and disease caused most eruption-related deaths.

Starting in the early 1980s, another indirect volcanic hazard began to attract increasing attention: jet aircraft encounters with airborne volcanic ash. More than 60 airplanes, mostly commercial jetliners, have been damaged by such encounters.

An ancient South Pacific legend says that at some long-ago time, during the childhood of Chief Tongoa, the island of Kuwae was broken in two, creating the islands of Tongoa and Epi. Early missionaries discounted the legend, but in the 1960s archeologists found that some of its details, such as the location of the chief's grave, were accurate. Volcanologists, suspecting a volcano, flocked to the twin islands, which are located about 1,200 miles east of Australia in what is now Vanuatu. They found that the entire seafloor between Tongoa and Epi was a seven-mile-wide crater—the remnant of a gigantic eruption as powerful as 2 million Hiroshima-type atomic bombs. Vegetation charred during the eruption was also found and carbon-dated to between 1420 and 1475.

In this connection, Kevin Pang, of the Jet Propulsion Laboratory, found that ice cores from Greenland and Antarctica showed that a large amount of sulfuric acid had snowed onto the ice caps sometime between 1452 and 1460. Tree-ring records from California, Europe, and China further narrowed Pang's search: they showed evidence of cold growing seasons—the rings were narrow and damaged by frost—from 1453 to 1455, suggesting that Kuwae had cast its sun-blocking pall over the planet during that period. Finally, historical records from Europe and China revealed that harvests had been bad all over in 1453 and 1454. Pang concluded that the eruption probably happened in 1453.

As it happens, that is a significant historical date, comparable to 1066 or 1776: it is the year Constantinople, capital of the Byzantine Empire, fell to the Turks after a long siege. (Among other things, the fall of

Constantinople planted the seeds of the recent warfare between Christians and Muslims in Bosnia.) There is never a good time to be besieged, of course, but April and May of 1453 were particularly bad in Constantinople. The city's residents faced unseasonable thunderstorms, hail, and drenching rains, and, on May 22, a terrifying lunar eclipse. Pang attributes the strange weather and the extraordinary darkness of the eclipse to Kuwae's eruption, which he thinks must have happened earlier in the year.

Four days after the eclipse, on May 26, fog enveloped the besieged city. When it lifted in the evening, the defenders saw strange lights on the domes and windows of the buildings. The Hagia Sophia looked as if it were engulfed in flames. In fact, the great cathedral was never damaged by fire, so whatever the Byzantines saw was an optical illusion—one that Pang blames on the eruption on the other side of the world. “After such an eruption,” he explains, “the twilight is intensely red because of the selective attenuation of light by volcanic particles. When this kind of light is reflected off the copper dome of a church, it looks like fire.” The illusion may have been the final devastating blow to the defenders' morale. “These atmospheric phenomena,” Pang says, “were interpreted as omens that the city was about to fall.” On May 29 it did.

QUESTIONS 27-31

Complete the table below. Write a date for each answer. The first one has been done as an example for you. Write your answers in boxes headed DATE.

QUESTION	EVENT	DATE
EXAMPLE	The island of Epi was born.	1453
27	The island of Kuwae was broken in two.	
28	Constantinople, capital of the Byzantine Empire, fell to the Turks.	
29	The island of Tongoa was formed.	
30	Archeologists proved the accuracy of some of the details of An ancient South Pacific legend.	
31	Jet aircraft encounters with airborne volcanic ash began to attract increasing attention.	

QUESTIONS 32-36

Do the following statements reflect the claims of the writer of the Reading Passage? In boxes headed Answer, mark

- (r) if the statement reflects the writer's claims
- (w) if the statement does not reflect the writer's claims
- (n) if the information is not given in the passage

Now answer questions 32 – 36. (as indicated by the example).

	STATEMENTS	ANSWER
EXAMPLE	Eruptions can lead to the loss of livestock and crops and to the starvation of people.	● (w) (n)
32)	Volcanic activity of the earth can result in the creation of new islands.	(r) (w) (n)
33)	Nonvolcanic hazards usually accompany or follow eruptions.	(r) (w) (n)
34)	The fall of Constantinople was due to a catastrophic volcanic eruption at the bottom of the Atlantic ocean.	(r) (w) (n)
35)	Volcanic eruptions can cause disillusionment.	(r) (w) (n)
36)	Tsunamis are large seismic sea waves that are generated by earth's volcanic activities.	(r) (w) (n)

QUESTIONS 37-40

Complete each of the following statements with a name from the Reading Passage. Write your answers in boxes below.

QUESTION	YOUR ANSWER
37	
38	
39	
40	

37) The most famous Byzantine structure in **…** was Hagia Sophia, also called Church of the Holy Wisdom.

38) During the childhood of **…**, the island of Kuwae was broken in two.

39) The twin islands of Tongoa and Epi are located about 1,200 miles east of Australia in what is now **….**

40) Kevin Pang, of the **…**, found evidence of large amounts of sulfuric acid that had snowed onto the ice caps of Greenland and Antarctica after the volcanic eruption in Kuwae.

UNIT SIX

SECTION 1: QUESTIONS 1-13

QUESTIONS 1-5

Look at the information below about POLLUTION.

mark ⓣ If the statement is true
ⓕ If the statement is false
ⓝ If the information is not given in the passage

EXAMPLE	ANSWER
Pollution is the contamination of Earth's environment with materials that interfere with human health, the quality of life, or the natural functioning of ecosystems.	● ⓕ ⓝ

Now answer the following questions:

1) Biodegradables and nondegradables are the two main types of pollutants.	ⓣ ⓕ ⓝ
2) Pollution is sometimes the result of natural causes.	ⓣ ⓕ ⓝ
3) Nondegradable pollutants do not decompose in the natural environment.	ⓣ ⓕ ⓝ
4) Sewage is biodegradable while readioactive wastes are nondegradable.	ⓣ ⓕ ⓝ
5) Radioactive materials are the only nondegradable pollutants that are passed up to living organisms through the process of bioaccumulation.	ⓣ ⓕ ⓝ

POLLUTION

Pollution is the contamination of Earth's environment with materials that interfere with human health, the quality of life, or the natural functioning of ecosystems. Some environmental pollution is a result of natural causes such as volcanic eruptions. Most instances of pollution, however, are caused by human activities.

There are two main categories of polluting materials, or pollutants: biodegradable pollutants, and nondegradable pollutants. Biodegradable pollutants are materials, such as sewage, that rapidly decompose by natural processes. These pollutants become a problem when added to the environment faster than they can decompose. Nondegradable pollutants are materials that either do not decompose or decompose slowly in the natural environment. Once contamination occurs, it is difficult or impossible to remove these pollutants from the environment. Nondegradable compounds and radioactive materials can reach dangerous levels of accumulation as they are passed up the food chain into the bodies of progressively larger animals. Such an accumulation process is known as bioaccumulation.

QUESTIONS 6-13

Look at SOLID WASTES below.

Match each of the following sentences with TWO possible endings A-M from the box below.

EXAMPLE	ANSWER
Landfills ….	**A and M**

Write the appropriate letters A-M in boxes headed Answer.

QUESTIONS		ANSWER
6 & 7	Using natural biological processes to speed the decomposition of organic wastes ….	
8 & 9	Source reduction ….	
10 & 11	Extracting and reusing certain waste materials ….	
12 & 13	Organized waste-pickers ….	

POSSIBLE ENDINGS

A are the cheapest and most common disposal method.

B is the process whereby waste production is prevented.

C search streets and garbage dumps for items such as plastics.

D managed for many Asian countries.

E produces a material that can be used as a natural fertilizer.

F lies in reducing the amount of waste generated.

G play an informal role in solid waste management.

H is commonly referred to as recycling.

I reduces the high costs associated with environmental pollution.

J is commonly called composting.

K used natural processes to recycle solid wastes.

L is a solid waste strategy in developed countries.

M areas where wastes are buried.

SOLID WASTES

Areas where wastes are buried, often called landfills, are the cheapest and most common disposal method for solid wastes worldwide. However, landfills quickly become overfilled and may contaminate air, soil, and water. Incineration, or burning, of waste reduces the volume of solid waste but produces dense ashen wastes (some of which become airborne) that often contain dangerous concentrations of hazardous materials such as heavy metals and toxic compounds.

Composting, using natural biological processes to speed the decomposition of organic wastes, is an effective strategy for dealing with organic garbage and produces a material that can be used as a natural fertilizer. Recycling, extracting and reusing certain waste materials, has become an important part of municipal solid waste strategies in developed countries. According to the Environmental Protection Agency (EPA), more than one-fourth of the municipal solid waste produced in the United States is now recycled or composted. Recycling also plays a significant, informal role in solid waste management for many Asian countries, such as India, where organized waste-pickers comb streets and dumps for items such as plastics, which they use or resell.

Expanding recycling programs worldwide can help reduce solid waste pollution, but the key to solving severe solid waste problems lies in reducing the amount of waste generated. Waste prevention, or source reduction, such as altering the way products are designed or manufactured to make them easier to reuse, reduces the high costs associated with environmental pollution.

SECTION 2: QUESTIONS 14-27

QUESTIONS 14-20

Look at IMPACTS OF POLLUTION below and at the following statements.

mark ⓣ If the statement is true
ⓕ If the statement is false
ⓝ If the information is not given in the passage

Now answer the following questions:

14)	Bioaccumulation causes its greatest damage to human beings.	ⓣ ⓕ ⓝ
15)	A lack of organized, informed community involvement in municipal decision-making processes causes the low-income populations and minorities to receive less protection from environmental contamination.	ⓣ ⓕ ⓝ
16)	Consequences of environmental pollution are not immediately obvious and show up only after living things have reproduced several times.	ⓣ ⓕ ⓝ
17)	Bioaccumulation can interfere with the human body's reproductive and developmental functions.	ⓣ ⓕ ⓝ
18)	Marine life is directly affected by the concentration of nondegradable pollutants.	ⓣ ⓕ ⓝ
19)	Nondegradable pollutants can result in epidemics of nervous disorders, tremors, and paralysis.	ⓣ ⓕ ⓝ
20)	Emission of carbon dioxide has a dramatic effect on such ecosystems as forests, wetlands, coral reefs, and rivers.	ⓣ ⓕ ⓝ

IMPACTS OF POLLUTION

Because humans are at the top of the food chain, they are particularly vulnerable to the effects of nondegradable pollutants. This was clearly illustrated in the 1950s and 1960s when residents living near Minamata Bay, Japan, developed nervous disorders, tremors, and paralysis in a mysterious epidemic. More than 400 people died before authorities discovered that a local industry had released mercury into Minamata Bay. This highly toxic element accumulated in the bodies of local fish and eventually in the bodies of people who consumed the fish. More recently research has revealed that many chemical pollutants, such as DDT and PCBs, mimic sex hormones and interfere with the human body's reproductive and developmental functions.

Pollution also has a dramatic effect on natural resources. Ecosystems such as forests, wetlands, coral reefs, and rivers perform many important services for Earth's environment. They enhance water and air quality, provide habitat for plants and animals, and provide food and medicines. Any or all of these ecosystem functions may be impaired or destroyed by pollution. Moreover, because of the complex relationships among the many types of organisms and ecosystems, environmental contamination may have far-reaching consequences that are not immediately obvious or that are difficult to predict.

Another major effect of pollution is the tremendous cost of pollution cleanup and prevention. The global effort to control emissions of carbon dioxide, a gas produced from the combustion of fossil fuels or of other organic materials, is one such example. The cost of maintaining annual national carbon dioxide emissions at 1990 levels is estimated to be 2 percent of the gross domestic product for developed countries. Expenditures to reduce pollution in the United States in 1993 totaled $109 billion: $105.4 billion on reduction, $1.9 billion on regulation, and $1.7 billion on research and development. 29% of the total cost went toward air pollution, 36% to water pollution, and 36% to solid waste management.

In addition to its effects on the economy, health, and natural resources, pollution has social implications. Research has shown that low-income populations and minorities do not receive the same protection from environmental contamination as do higher-income communities. Toxic waste incinerators, chemical plants, and solid waste dumps are often located in low-income communities because of a lack of organized, informed community involvement in municipal decision-making processes.

QUESTIONS 21-26

Look at TYPES OF POLLUTION below. From the following list (i-xi) choose the most suitable summaries for the paragraphs A, C, and E-H.

Write the appropriate numbers (i-xi) in boxes headed Answer.

i	Soil Pollution
ii	Information pollution
iii	Radioactive pollution
iv	Solid Wastes
v	Hazardous Wastes
vi	Acid rains
vii	Water Pollution
viii	Noise Pollution
ix	Thermal Pollution
x	Air Pollution
xi	Stratospheric Pollution

NB There are more summaries than paragraphs, so you will not use them all. (Two examples are provided.)

QUESTIONS	PARAGRAPHS	ANSWER
21	Paragraph **A**	
EXAMPLE	Paragraph **B**	**xi**
22	Paragraph **C**	
EXAMPLE	Paragraph **D**	**i**
23	Paragraph **E**	
24	Paragraph **F**	
25	Paragraph **G**	
26	Paragraph **H**	

TYPES OF POLLUTION

A

Human contamination of Earth's atmosphere, known as air pollution, can take many forms and has existed since humans first began to use fire for agriculture, heating, and cooking. During the Industrial Revolution of the 18th and 19th centuries, however, air pollution became a major problem. Urban air pollution is commonly known as smog.

B

Excessive production of chlorine-containing compounds such as chlorofluorocarbons (CFCs), commonly used in most refrigerators and Teflon utensils, has depleted the stratospheric ozone layer, creating a hole above Antarctica that lasts for several weeks each year. As a result, exposure to the Sun's harmful rays has damaged aquatic and terrestrial wildlife and threatens human health in high-latitude regions of the northern and southern hemispheres.

C

Sewage, industrial wastes, and agricultural chemicals such as fertilizers and pesticides are the main causes of water pollution. The U.S. Environmental Protection Agency (EPA) reports that about 37 percent of the country's lakes and estuaries, and 36 percent of its rivers, are too polluted for basic uses such as fishing or swimming during all or part of the year.

D

Unhealthy soil management methods have seriously degraded soil quality, caused soil pollution, and enhanced erosion. Treating the soil with chemical fertilizers, pesticides, and fungicides interferes with the natural processes occurring within the soil and destroys useful organisms such as bacteria, fungi, and other microorganisms. This results in heavy fertilizer use and increases polluted runoff into lakes and streams.

E

Solid wastes are unwanted solid materials such as garbage, paper,

plastics and other synthetic materials, metals, and wood. Billions of tons of solid waste are thrown out annually. They typically contains a high percentage of synthetic materials that take longer to decompose than the primarily biodegradable waste materials.

F

Hazardous wastes are solid, liquid, or gas wastes that may be deadly or harmful to people or the environment and tend to be persistent or nondegradable in nature. Such wastes include toxic chemicals and flammable or radioactive substances, including industrial wastes from chemical plants or nuclear reactors, agricultural wastes such as pesticides and fertilizers, medical wastes, and household hazardous wastes such as toxic paints and solvents.

G

Unwanted sound, or noise, such as that produced by airplanes, traffic, or industrial machinery, is considered a form of pollution. Noise pollution is at its worst in densely populated areas. It can cause hearing loss, stress, high blood pressure, sleep loss, distraction, and lost productivity.

H

Thermal Pollution refers to the harmful increase in water temperature in streams, rivers, lakes, or occasionally, coastal ocean waters. Thermal pollution is caused by either dumping hot water from factories and power plants or removing trees and vegetation that shade streams, permitting sunlight to raise the temperature of these waters.

SECTION 3: QUESTIONS 27-40

Read the following passage and answer questions 27-40.

HISTORY AND CONTROL OF POLLUTION

Much of what we know of ancient civilizations comes from the wastes they left behind. Refuse such as animal skeletons and implements from stone age cave dwellings in Europe, China, and the Middle East helps reveal hunting techniques, diet, clothing, tool usage, and the use of fire for cooking. Prehistoric refuse heaps, or middens, discovered by

archaeologists in coastal areas of North America reveal information about the shellfish diet and eating habits of Native Americans who lived more than 10,000 years ago.

As humans developed new technologies, the magnitude and severity of pollution increased. Many historians speculate that the extensive use of lead plumbing for drinking water in Rome caused chronic lead poisoning in those who could afford such plumbing. The mining and smelting of ores that accompanied the transition from the Stone Age to the Metal Age resulted in piles of mining wastes that spread potentially toxic elements such as mercury, copper, lead, and nickel throughout the environment.

Evidence of pollution during the early Industrial Revolution is widespread. Samples of hair from historical figures such as Newton and Napoleon show the presence of toxic elements such as antimony and mercury. By the 1800s, certain trades were associated with characteristic occupational diseases: Chimney sweeps contracted cancer of the *scrotum* (the external sac of skin enclosing the testes, or reproductive glands) from hydrocarbons in chimney soot; hatters became disoriented, or “mad,” from nerve-destroying mercury salts used to treat felt fabric; and bootblacks suffered liver damage from boot polish solvents.

During the 20th century, pollution evolved from a mainly localized problem to one of global consequences in which pollutants not only persisted in the environment, but changed atmospheric and climatic conditions. The Minamata Bay disaster was the first major indication that humans would need to pay more attention to their waste products and waste disposal practices, in particular, hazardous waste disposal. In the years that followed, many more instances of neglect or carelessness resulted in dangerous levels of contamination.

In 1976 an explosion at a chemical factory in Seveso, Italy, released clouds of toxic dioxin into the area, exposing hundreds of residents and killing thousands of animals that ate exposed food. In 1978 it was discovered that the Love Canal housing development in New York State was built on a former chemical waste dump. The development was declared uninhabitable. The world’s worst industrial accident occurred in Bhopal, India, in 1984. A deadly gas leaked from an American chemical plant, killing more than 3,800 people and injuring more than 200,000.

The 1986 Chernobyl nuclear reactor accident demonstrated the dangerous contamination effects of large, uncontained disasters. In an unprecedented action, pollution was used as a military tactic in 1991

during the conflict in the Persian Gulf. The Iraqi military intentionally released as much as 1 billion liters (336 million gallons) of crude oil into the Persian Gulf and set fire to more than 700 oil wells, sending thick, black smoke into the atmosphere over the Middle East.

Because of the many environmental tragedies of the mid-20th century, many nations instituted comprehensive regulations designed to repair the past damage of uncontrolled pollution and prevent future environmental contamination. In the United States, the Clean Air Act (1970) and its amendments significantly reduced certain types of air pollution, such as sulfur dioxide emissions. The Clean Water Act (1977) and Safe Drinking Water Act (1974) regulated pollution discharges and set water quality standards.

The Toxic Substances Control Act (1976) and the Resource Conservation and Recovery Act (1976) provided for the testing and control of toxic and hazardous wastes. In 1980 Congress passed the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as Superfund, to provide funds to clean up the most severely contaminated hazardous waste sites. These and several other federal and state laws helped limit uncontrolled pollution, but progress has been slow and many severe contamination problems remain due to lack of funds for cleanup and enforcement.

International agreements have also played a role in reducing global pollution. The Montréal Protocol on Substances that Deplete the Ozone Layer (1987) set international target dates for reducing the manufacture and emissions of the chemicals, such as CFCs, known to deplete the ozone layer. The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1989) serves as a framework for the international regulation of hazardous waste transport and disposal.

Since 1992 representatives from more than 160 nations have met regularly to discuss methods to reduce greenhouse gas emissions. In 1997 the Kyōto Protocol was devised, calling for industrialized countries to reduce their gas emissions by 2012 to an average 5 percent below 1990 levels. At the end of 2000 the Kyōto Protocol had not yet been ratified; negotiators were still working to find consensus on the rules, methods, and penalties that should be used to enforce the treaty. In most countries, nongovernmental citizen groups have also formed at the local, national, and international levels to combat pollution problems worldwide.

QUESTIONS 27-31

Complete the table below. Write a date for each answer. The first one has been done as an example for you. Write your answers in boxes headed DATE.

QUESTION	EVENT	DATE
EXAMPLE	Conflict in the Persian Gulf	1991
27	3800 deaths in Bhopal	
28	Kyoto Protocol was devised.	
29	The Toxic Substances Control Act	
30	Chemical factory explosion in Seveso	
31	Resource Conservation and Recovery Act	

QUESTIONS 32-36

Do the following statements reflect the claims of the writer of the Reading Passage? In boxes headed Answer, mark

ⓡ if the statement reflects the writer's claims

ⓦ if the statement does not reflect the writer's claims

ⓝ if the information is not given in the passage

Now answer questions 32 – 36. (as indicated by the example).

STATEMENTS		ANSWER
EXAMPLE	Wastes are an excellent spurce of historical information.	● ⓦ ⓝ
32)	The Montreal Protocol will protect the Ozone layer.	ⓡ ⓦ ⓝ
33)	Lack of funds will soon cause the failure of pollution-prevention efforts.	ⓡ ⓦ ⓝ
34)	There is trade-off between the development of new technologies and the magnitude of pollution.	ⓡ ⓦ ⓝ
35)	The United States is the greatest opponent of efforts meant to control the depletion of the Ozone layer.	ⓡ ⓦ ⓝ
36)	The largest uncontaminated disasters are atomic explosions.	ⓡ ⓦ ⓝ

QUESTIONS 37-40

Complete each of the following statements with a name from the Reading Passage. Write your answers in boxes below.

QUESTION	YOUR ANSWER
37	
38	
39	
40	

37) Many historians report cases of chronic lead poisoning in **…** in families that could afford lead plumbing for drinking water.

38) Evidence of pollution during the early **…** is widespread.

39) The **…** disaster is the first major indication of poisoning caused by mercury.

40) In New York State, it was discovered that the **…** housing development was built on a former chemical waste dump.

UNIT SEVEN

SECTION 1: QUESTIONS 1-13

QUESTIONS 1-5

Look at the information below about COMET GROUPS.

mark ⓣ If the statement is true
ⓕ If the statement is false
ⓝ If the information is not given in the passage

EXAMPLE	ANSWER
Comet groups are groups of two or more comets that travel in nearly the same orbit	● ⓕ ⓝ

Now answer the following questions:

1) Comet Ikeya-Seki belongs in the largest comet group discovered in 1965 by Ikeya and Seki, two Japanese amateur astronomers.	ⓣ ⓕ ⓝ
2) An explosion in 1106 broke up a gigantic comet into a comet group.	ⓣ ⓕ ⓝ
3) A comet group can include up to some hundreds or even thousands of comets.	ⓣ ⓕ ⓝ
4) The most spectacular comet group includes eight comets that travel in nearly the same orbit.	ⓣ ⓕ ⓝ
5) Perseid and Leonid meteors travel in the same orbit as most comets do.	ⓣ ⓕ ⓝ

COMET GROUPS

When several comets travel in nearly the same orbit, they are said to be members of a comet group. The most famous group includes the spectacular comet, Ikeya-Seki, of 1965, and seven other comets. An American astronomer has concluded that Ikeya-Seki and the even brighter comet of 1882 split from a parent comet, possibly the one of 1106. This comet and others of the group probably split away from a truly giant comet thousands of years ago. The European Space Agency's Solar and Heliospheric Observatory (SOHO) spacecraft, designed to observe the Sun, has detected over 500 comets from another group, the Kreutz. A close relationship exists between the orbits of comets and the orbits of meteor showers. An Italian astronomer proved that the Perseid meteors, which appear in August, move in the same orbit as comet Swift-Tuttle. Similarly, the Leonid meteors, which appear in November, were found to follow the same orbit as comet Tempel-Tuttle.

QUESTIONS 6-13

Look at IMPACTS OF COMETS below.

Match each of the following sentences with TWO possible endings A-M from the box below.

EXAMPLE	ANSWER
Comets which have collided with Earth in the past …	**A and M**

Write the appropriate letters A-M in boxes headed Answer.

QUESTIONS		ANSWER
6 & 7	Superstition has it that comets are …	
8 & 9	Upon impact, the tremendous kinetic energy of the fragments of Shoemaker-Levy 9 …	
10 & 11	In 1992 Comet Shoemaker-Levy 9 …	
12 & 13	The collision of the nucleus of a comet with a planet can …	

POSSIBLE ENDINGS

A	provided Earth with water and important chemicals.
B	portents of calamity or important events.
C	occasional comets without measurable effect.
D	was released in massive explosions.
E	be catastrophically destructive.
F	broke apart into 21 large fragments.
G	Jupiter’s dense atmosphere.
H	resulted in fireballs larger than Earth.
I	the harbingers of famine, pestilence, and death.
J	Halley's comet to be ominous.
K	lead to the emergence of life there.
L	ventured into the strong gravitational field of the planet Jupiter.
M	had a climatic role in the extinction of the dinosaurs.

IMPACTS OF COMETS

Comets have long been regarded by the superstitious as portents of calamity or important events. Primitive people have long believed that comets have been the harbingers of famine, pestilence, and death. The ancients, for example, considered Halley's comet to be ominous.

The appearance of comets has also given rise to the fear of collision between the comets and Earth. Earth, in fact, has passed through the tails of occasional comets without measurable effect. The collision of the nucleus of a comet with a large city would probably destroy the city but the probability of such an event occurring is exceedingly small. Some scientists suggest, however, that collisions have taken place in the astronomical past. Scientists studying comet Hale-Bopp in 1997 found chemicals in the comet that are very similar to those that are thought to have led to life on Earth. Comets may provide Earth with water and important chemicals, but a collision between Earth and a comet may also have had a climatic role in the extinction of the dinosaurs.

In 1992 Comet Shoemaker-Levy 9 broke apart into 21 large fragments as it ventured into the strong gravitational field of the planet Jupiter.

During a week-long bombardment in July 1994 the fragments crashed into Jupiter's dense atmosphere at speeds of about 210,000 km per hour. Upon impact, the tremendous kinetic energy of the comets was released in massive explosions, some resulting in fireballs larger than Earth.

SECTION 2: QUESTIONS 14-27

QUESTIONS 14-20

Look at LEONIDS below and at the following statements.

mark ⓣ If the statement is true
ⓕ If the statement is false
ⓝ If the information is not given in the passage

Now answer the following questions:

14)	The peak rate for a meteor shower varies from ten to several thousand meteors per hour.	ⓣ ⓕ ⓝ
15)	The time a comet takes to orbit the Sun once is technically referred to as the period of that comet.	ⓣ ⓕ ⓝ
16)	When a planet with a dense atmosphere crosses comet orbits while comets are nearby, meteor showers can be observed from the surface of that planet.	ⓣ ⓕ ⓝ
17)	The impression that the meteors in a meteor shower have a central radiant is an illusion similar to the visual effect that makes train tracks seem to converge on the horizon.	ⓣ ⓕ ⓝ
18)	Comets often leave traces of dust in the atmosphere that can lead to meteor showers.	ⓣ ⓕ ⓝ
19)	Meteor showers are created by meteors, or pieces of rock that enter Earth's atmosphere from space.	ⓣ ⓕ ⓝ
20)	Leonid meteors seem to radiate from one point in space which suggests that they come from far away.	ⓣ ⓕ ⓝ

LEONIDS

Leonids are annual meteor showers that occur in the month of November. Meteor showers are intense displays created by meteors, or pieces of rock that enter Earth's atmosphere from space. The Leonid shower occurs every year between about November 14 and 20, with the peak rate usually falling on November 17. The peak rate for this shower is usually about 10 to 15 meteors per hour, but it can increase to several thousand meteors per hour when Earth crosses comet orbits while comets are nearby.

Comets leave trails of dust in their orbits, and when Earth passes through the comet's orbit, the dust entering the atmosphere causes a meteor shower. The concentration of dust is usually much higher when the comet is nearby at the time that Earth crosses its orbit.

The Leonid meteors appear all over the sky, but they seem to radiate from one point in space. The meteors actually move in parallel paths, but the same effect that makes train tracks seem to converge on the horizon gives the impression that the meteors have a central radiant. The Leonids' radiant is in the constellation Leo. The Leonid meteor shower is mentioned in Arab and Chinese chronicles dating from about AD 900. The modern study of meteor showers was inspired by a Leonid storm in 1833. The storm was most visible in the sky above the eastern United States. Very bright meteors fell at a rate of thousands per hour for an extended period of time and caused a panic. Scientists put forth a number of theories to explain the shower.

American astronomer Denison Olmstead noticed that the meteors seemed to radiate from one point in space, suggesting that they were coming from far away. He also noticed that a similar shower had occurred the previous year in Europe. These observations led him to conclude that the storm was caused by a cloud of particles in space.

Some other astronomers, including German astronomer Heinrich Olbers, French astronomer Ernst Tempel, and American astronomer Horace Tuttle, claim that there is a correspondence between the period—the time a comet takes to orbit the Sun once—of the Tempel-Tuttle comet and the cycle of November meteor storms. Astronomers have recently discovered many historical accounts of comet-created meteor storms and showers.

QUESTIONS 21-26

Look at INTRIGUING ASPECTS OF COMETS below. From the following list (i-xi) choose the most suitable summaries for the paragraphs A, C, and E-H.

Write the appropriate numbers (i-xi) in boxes headed Answer.

i	Comets and Lyrids
ii	Comet Multiple Tails
iii	Shoemaker-Levy and Jupiter
iv	Parabolas or Orbits
v	Comets versus Meteors
vi	Impacts of Comets on Mars
vii	Irregular Orbiting Behavior of Comets
viii	Comet Groups
ix	Comet Temple-Tuttle
x	Formation of Comets
xi	Swift-Tuttle and Perseid Meteor Shower

NB There are more summaries than paragraphs, so you will not use them all. (Two examples are provided.)

QUESTIONS	PARAGRAPHS	ANSWER
21	Paragraph **A**	
EXAMPLE	Paragraph **B**	**xi**
22	Paragraph **C**	
EXAMPLE	Paragraph **D**	**i**
23	Paragraph **E**	
24	Paragraph **F**	
25	Paragraph **G**	
26	Paragraph **H**	

INTRIGUING ASPECTS OF COMETS

A

Comets can be catastrophically destructive. From July 16 to 22, fragments of Comet Shoemaker-Levy 9 smashed into Jupiter, creating a series of spectacular fireballs in the giant planet's atmosphere. The string of explosions was awesome, yet the discovery that comets can wreak havoc would not have come as a surprise to our distant ancestors.

B

Comets can affect meteor showers. For instance, the rate at which the Perseid meteors fall is determined by where Comet Swift-Tuttle is in relation to the earth when the earth crosses Swift-Tuttle's orbit. Repeated passes of the comet have left a ring of debris throughout the comet's orbit, and when this debris enters the earth's atmosphere, a meteor shower is created.

C

In 1865 and 1866 French astronomer Ernst Tempel and American astronomer Horace Tuttle independently discovered the comet that became known as Comet Tempel-Tuttle. Several astronomers noticed a correspondence between the period of the comet and the cycle of November meteor storms, making the Leonids the second meteor shower to be associated with a comet.

D

Sometimes comets do not affect meteor showers. The Lyrids, another meteor shower, last from about April 16 to about April 25. The meteor stream that causes the Lyrids seems to share an orbit with Comet Thatcher. Thatcher orbits the sun only once in 415 years, however, so astronomers do not believe that it causes either the outbursts in the Lyrid shower or the shower itself.

E

Comets can show irregular orbiting behavior. Halley's Comet travels in a very elongated path around the sun, in a direction opposite to that of the planets. The periods between its approach to the earth usually vary from 75 to 79 years because the gravitational forces of other planets changes the comet's orbit slightly.

F

Comets may have elliptical orbits with periods that can range from a few years to tens of thousands of years. The really vast orbits of most comets can technically be termed "parabolas." The bright comet of 1996, Hyakutake, had an estimated orbiting period of 10,000 years.

G

Comets may have long multiple tails. Donati's Comet, discovered in 1858, had a triple tail. When the comet was nearest the earth, its triple tail had an apparent length of 50°, corresponding to the enormous linear figure of more than 72 million km. The orbital period of the comet was estimated at more than 2000 years.

H

Comets can form comet groups. When several comets with different periods travel in nearly the same orbit, they are said to be members of a comet group. The most famous group includes Ikeya-Seki and seven other comets. Comets in a group may have split from a truly giant comet thousands of years ago.

SECTION 3: QUESTIONS 27-40

Read the following passage and answer questions 27-40.

MORE ABOUT COMETS

Comets (taken from Latin *stella cometa* meaning "hairy star") are relatively small, icy celestial bodies revolving around the Sun. When a comet nears the Sun, some of the ice in the comet turns into gas. The gas and loose dust freed from the ice create a long, luminous tail that streams behind the comet.

Comets were once believed to come from interstellar space. Although no detailed theory of origin is generally accepted, many astronomers now believe that comets originated in the outer, colder part of the solar system from residual planetary matter in the early days of the solar system. Astronomer Jan Hendrik Oort proposed that a "storage cloud" of comet material has accumulated far beyond the orbit of Pluto, and that the gravitational effects of passing stars send some of the material sunward, where it becomes visible as comets.

Since the 1990s, it has been realized that long-period comets (those with periods longer than about 200 years) come from the Oort cloud,

while short-period comets come from a ring of debris known as the Kuiper Belt. The Kuiper Belt, which starts just beyond the orbit of the planet Neptune, is flattened in the plane of the solar system. Comets that originate there tend to have orbits in the same plane as the planets.

A comet is generally considered to consist of a small nucleus embedded in a nebulous disk called the coma. American astronomer Fred L. Whipple proposed in 1949 that the nucleus, containing practically all the mass of the comet, is a “dirty snowball” conglomerate of ices and dust.

Major proofs of the snowball theory rest on various data. For one, of the observed gases and meteoric particles that are ejected to provide the coma and tails of comets, most of the gases are fragmentary molecules, or radicals, of the most common elements in space: hydrogen, carbon, nitrogen, and oxygen. The radicals, for example, of CH, NH, and OH may be broken away from the stable molecules CH_4 (methane), NH_3 (ammonia), and H_2O (water), which may exist as ices or more complex, very cold compounds in the nucleus. Another fact in support of the snowball theory is that the best-observed comets move in orbits that deviate significantly from Newtonian gravitational motion. This provides clear evidence that the escaping gases produce a jet action, propelling the nucleus of a comet slightly away from its otherwise predictable path. In addition, short-period comets, observed over many revolutions, tend to fade very slowly with time, as would be expected of the kind of structure proposed by Whipple. Finally, the existence of comet groups shows that cometary nuclei are fairly solid units.

The head of a comet, including the hazy coma, may exceed the planet Jupiter in size. The solid portion of most comets, however, is equivalent to only a few cubic kilometers. The dust-blackened nucleus of Halley’s Comet, for example, is about 15 by 4 km (about 9 by 2.5 mi) in size.

Approximately 2,000 comets have been observed and recorded over the past 2,500 years. Several hundred of those were not visible to naked-eye observers on Earth, and were only discovered during the past few decades with the aid of astronomical instruments. Appearances of large comets were regarded as atmospheric phenomena until 1577, when Danish astronomer Tycho Brahe proved that they were celestial bodies. In the 17th century British scientist Isaac Newton demonstrated that the movements of comets are subject to the same laws that control the planets in their orbits. By comparing the orbital elements of a number of earlier comets, British astronomer Edmond Halley showed the comet of 1682 to be identical with the two that had appeared in 1607 and 1531, and he successfully predicted the comet’s next return, which occurred in

1758. The earlier appearances of what came to be known as Halley's Comet have now been identified from records dating from as early as 240 BC, and it is probable that the bright comet observed in 466 BC was also an apparition of this famous comet. Halley's Comet most recently passed around the Sun again early in 1986.

During its most recent pass of the Sun, Halley's Comet was visited by two Soviet-constructed probes, Vega 1 and 2, and by another instrumented package called Giotto, launched by the European Space Agency. Two Japanese craft observed it at a great distance as it passed. In 1999 the United States launched a spacecraft called Stardust to visit a comet named Wild (pronounced VILT) 2. Stardust is scheduled to return a sample of dust from Wild 2 to Earth in 2006.

In 2002 NASA launched the Contour (Comet Nucleus Tour) mission. Contour was scheduled to approach and analyze comets Encke and Schwassmann-Wachmann, but the spacecraft broke up when its engines fired to take it out of Earth orbit. The European Space Agency's planned Rosetta spacecraft is expected to rendezvous with comet Churyumov-Gerasimenko in 2014. Rosetta will carry a probe for landing on the comet's nucleus.

QUESTIONS 27-31

Complete the table below. Write a date for each answer. The first one has been done as an example for you. Write your answers in boxes headed DATE.

QUESTION	EVENT	DATE
EXAMPLE	Discovery of short-period comets' coming from the Kuiper Belt	since the 1990s
27	Halley's Comet most recent passing around the Sun	
28	Launching Stardust to visit Wild 2	
29	Discovery of long-period comets' coming from the Oort cloud	
30	Start of NASA's Contour mission	
31	Rosetta's rendezvous with Churyumov-Gerasimenko	

QUESTIONS 32-36

Do the following statements reflect the claims of the writer of the Reading Passage? In boxes headed Answer, mark

- (r) if the statement reflects the writer's claims
- (w) if the statement does not reflect the writer's claims
- (n) if the information is not given in the passage

Now answer questions 32 – 36. (as indicated by the example).

STATEMENTS	ANSWER
EXAMPLE The Kuiper Belt is a ring of debris.	● (w) (n)
32) Comets orbit no star other than our sun.	(r) (w) (n)
33) Human landing on the nucleus of comets is possible.	(r) (w) (n)
34) Comets are the oldest celestial bodies formed in the early days of the solar system.	(r) (w) (n)
35) Comets originated in the outer, colder part of the solar system from residual planetary matter soon after the Big Bang.	(r) (w) (n)
36) Ancient astronomers considered comets to be astronomic phenomena.	(r) (w) (n)

QUESTIONS 37-40

Complete each of the following statements with a name from the Reading Passage. Write your answers in boxes below.

QUESTION	YOUR ANSWER
37	
38	
39	
40	

37) The head of a comet, including the hazy coma, may exceed the planet **…** in size.

38) The **…** is mentioned in Arab and Chinese chronicles dating from about AD 900.

39) American astronomer **…** proposed that the nucleus of a comet is a dirty snowball conglomerate of ices and dust.

40) During its most recent pass of the Sun, Halley's Comet was visited by an instrumented package called **…**, launched by the European Space Agency.

UNIT EIGHT

SECTION 1: QUESTIONS 1-13

QUESTIONS 1-5

Look at the information below about FOSSILS.

mark ⓣ If the statement is true
ⓕ If the statement is false
ⓝ If the information is not given in the passage

EXAMPLE	ANSWER
Fossils are remains or traces of prehistoric plants and animals.	● ⓕ ⓝ

Now answer the following questions:

1)	Limestone, sandstone, and shale are different kinds of sedimentary rocks.	ⓣ ⓕ ⓝ
2)	The most accurate fossils found to date are fossils of the hard, indigestible skeletons and shells of animals and the woody material of plants.	ⓣ ⓕ ⓝ
3)	In addition to rocks, natural asphalt, amber, and ice can also trap organisms and fossilize them over time.	ⓣ ⓕ ⓝ
4)	Fossils cannot be found in volcanic (or igneous) and metamorphic (or mineralogically-changed) rocks.	ⓣ ⓕ ⓝ
5)	Fossil studies can reveal the evolution and changes of life throughout the history of earth.	ⓣ ⓕ ⓝ

FOSSILS

Fossils are remains or traces of prehistoric plants and animals which were buried and preserved in sedimentary rocks, or which have been trapped in organic matter. Fossils representing most living groups as well as many fossils representing species that are now extinct have been discovered. Fossils range in age from 3.5-billion-year-old traces of microscopic cyanobacteria (i.e., blue-green algae) to 10,000-year-old remains of animals preserved during the last ice age.

Fossils are most commonly found in limestone, sandstone, and shale. Shale is a specific kind of sedimentary rock. Remains of organisms can also be found trapped in natural asphalt, amber, and ice. The hard, indigestible skeletons and shells of animals and the woody material of plants are usually preserved best. Fossils of organisms made of soft tissue that decays readily are more rare. Paleontologists, scientists who study prehistoric life, use fossils to learn how life has changed and evolved throughout the history of earth.

QUESTIONS 6-13

Look at FOSSIL DISCOVERY AND COLLECTION below.

Match each of the following sentences with TWO possible endings A-M from the box below.

EXAMPLE	ANSWER
Paleontologists are scientists who …	**A and M**

Write the appropriate letters A-M in boxes headed Answer.

QUESTIONS		ANSWER
6 & 7	Fossils of a new species …	
8 & 9	Fossil that have been pyritized …	
10 & 11	Fossils of some important species are …	
12 & 13	It may take only a very short time for some fossils to disintegrate …	

POSSIBLE ENDINGS

A visit sites that have already been documented.

B are donated to museums.

C can be destroyed by the oxidation of iron sulfides.

D returning from a trip.

E preserved and displayed in museums.

F depends on the kinds of minerals in the fossil.

G are displayed for the interested public.

H once they are exposed.

I have survived for many millions of years.

J include a mineral which is composed of iron sulfide.

K although they may have survived from prehistoric times.

L the method of preservation they select.

M study the geology of a region for finding fossils.

FOSSIL DISCOVERY AND COLLECTION

Before paleontologists begin new fieldwork, they first study the geology of the region to determine if it is likely that fossils are present. Sometimes they visit a site that has already been documented. The typical tools of a paleontologist include a hammer, chisels, eye protection, gloves, a hard hat, a notebook and pen, collecting bags, maps, and a compass. Paleontologists take field notes as fossils are collected: For each fossil, they record the precise locality, stratigraphic level, and any associated fossils. Each fossil is given a unique identifier (such as a number) that is attached to it so that data recorded from the site can be related to individual fossils. After returning from a trip, paleontologists examine any unidentified fossils more closely.

Paleontologists usually donate fossils of a new species or of some other importance to museums, where they are preserved and displayed. Although fossils may have survived for many millions of years, it may take only a very short time for them to disintegrate once they are exposed. Scientists have a variety of tools at their disposal to slow or halt this disintegration. The method of preservation they select depends

on the kinds of minerals in the fossil. If a fossil has been pyritized, it can be very difficult to prevent pyrite-rot, or oxidation of iron sulfides, which destroys the fossil. In general, stable humidity and temperature and an acid-free environment help protect fossils from decay.

SECTION 2: QUESTIONS 14-27

QUESTIONS 14-20

Look at WHERE FOSSILS FORM below and at the following statements.

mark ⓣ If the statement is true
ⓕ If the statement is false
ⓝ If the information is not given in the passage

Now answer the following questions:

14)	Currents in the oceans and winds on land are the key factors that determine the distribution of fossils.	ⓣ ⓕ ⓝ
15)	The age of each rock is determined by such factors as active mountain building and volcanic activities.	ⓣ ⓕ ⓝ
16)	Most shallow-water species and dinosaurs lived only at particular localities.	ⓣ ⓕ ⓝ
17)	Regions closer to the equator host the majority of the fossils that paleontologists are likely to find on earth.	ⓣ ⓕ ⓝ
18)	The plates that make up the earth's crust have moved throughout geological time to form large land areas and mountain ranges, and also to form and close off seas and oceans.	ⓣ ⓕ ⓝ
19)	Based on their distribution, fossils can be classified as either localized or global fossils.	ⓣ ⓕ ⓝ
20)	Fossils can be found on top of the highest mountains, and in cores drilled in and retrieved from the ocean floor.	ⓣ ⓕ ⓝ

WHERE FOSSILS FORM

Fossils are found in all parts of the world. They can be found in cores drilled in and retrieved from the ocean floor, and on top of the highest mountains. Their wide geographical distribution is a result of the way the earth's surface has changed throughout its history.

The earth's crust is made up of several large plates that float on the earth's liquid mantle. These plates have moved throughout geological time, forming large land areas and mountain ranges, and forming and closing off seas. Some land that is now in the polar regions was once closer to the equator, and many modern mountain ranges were once under water.

The global climate has also changed over geological time, alternating between periods of warmth and ice ages. These climatic conditions affected the distribution of life on the earth and are reflected in the fossil record. Fossils are abundant in rocks that were formed in tropical and equatorial regions for the same reason that life is most abundant at these latitudes today.

The types of fossils found in a particular region depend on the age of the rocks that are currently eroding at the surface. Some areas have become famous for the types of fossils found there, such as China and the badlands (rugged, rocky areas with little vegetation) of the United States and Canada, where an abundance of dinosaur fossils from 138 to 65 million years before present have been found.

Some fossils are restricted to small areas and some are distributed globally. The most widespread fossils are the remains of organisms that lived in oceans and could move with the currents, and those that lived on land and were spread by wind. Fossils of marine and land invertebrates are now found on all continents. Fossils of certain shallow-water species and dinosaurs are found only at particular localities.

Different types of fossils are found in different geological formations, depending on the prehistoric environment represented and the age of the rock. Older rocks are found on low, eroded continents near the edges of large oceans. Younger rocks are found more commonly where there is active mountain building and volcanic activity. Old fossils are most commonly found where an old mountain range has eroded. Younger fossils are found at the ocean side.

QUESTIONS 21-26

Look at PROCESSES OF FOSSILIZATION below. From the following list (i-xi) choose the most suitable summaries for the paragraphs A, C, and E-H.

Write the appropriate numbers (i-xi) in boxes headed Answer.

i	Recrystallization
ii	Silicification
iii	Replacement
iv	Molds and Casts
v	Metamorphosis
vi	Mummification
vii	Organic Traps
viii	Fossilization
ix	Tracks and Trails
x	Carbonization
xi	Petrifaction

NB There are more summaries than paragraphs, so you will not use them all. (Two examples are provided.)

QUESTIONS	PARAGRAPHS	ANSWER
21	Paragraph **A**	
EXAMPLE	Paragraph **B**	**xi**
22	Paragraph **C**	
EXAMPLE	Paragraph **D**	**i**
23	Paragraph **E**	
24	Paragraph **F**	
25	Paragraph **G**	
26	Paragraph **H**	

PROCESSES OF FOSSILIZATION

A

Plants are most commonly fossilized through carbonization. In this process, the mobile oils in the plant's organic matter are leached out and the remaining matter is reduced to a carbon film. Plants have an inner structure of rigid organic walls that may be preserved in this manner, revealing the framework of the original cells.

B

Another common mode of preservation of plants is petrifaction, the crystallization of minerals inside cells. One forms of petrifaction is silicification, a process in which silica-rich fluids enter plant cells and crystallize, making the cells appear to have turned to stone. Petrifaction may also occur in animals when calcite, silica, or iron fill the pores and cavities of fossil shells or bones.

C

Replacement occurs when an organism is buried in mud and its remains are replaced by sulfide or phosphate minerals. This process may replace soft tissue, preserving rarely seen details of the organism's anatomy. Replacement, though rare, is important in helping paleontologists compare the anatomical details of prehistoric organisms with those of living organisms.

D

Many animal shells are composed of some form of calcium carbonate that breaks down over millions of years to form the more stable mineral calcite. This method of preservation, called recrystallization, destroys the microscopic details of the shell but does not change the overall shape. Most older shells that have been preserved have recrystallized to calcite.

E

Through mummification, hot arid climates dehydrate organisms before their soft tissue fully decay. The animal's skin is preserved for a short time, but the skin impressions in the surrounding sediment is preserved much longer if the sediment turns to rock. Skin impressions of dinosaurs have been preserved by this method.

F

Whole organisms may become trapped and preserved in amber, natural asphalt, or peat. Amber is the fossilized remaining part of tree sap. Natural asphalt, also called tar, is a residue from oil that has seeped to the earth's surface from deposits in the rock below. Some human remains have been found in peat bogs in Denmark and England.

G

Acidic conditions may slowly dissolve away the skeleton of fossil animals preserved in rock, leaving a space where the organism used to be. The impression that is left in the rock becomes a mold which is then filled with a new mineral to form the replica of the original organism called a cast.

H

When animals walk through soft sediment such as mud, their feet, tails, and other body parts leave impressions that may harden and become preserved. When such an impression is filled with a different sediment, the impression and the sediment that fills it form tracks and trails that can help paleontologists understand how the original animals moved.

SECTION 3: QUESTIONS 27-40

Read the following passage and answer questions 27-40.

ICE AGE

Ice Ages are periods in Earth's history when sea ice or glaciers have covered a significant portion of the planet's surface and significant cooling of the atmosphere has occurred. Earth has existed for about 4.5 billion years. During that time it has experienced several ice ages, each lasting tens of millions of years. The total of these episodes may account for as much as 15 to 20 percent of the planet's history. The icy cover has ranged from about 10 percent to about 30 percent of the entire surface of the planet.

The most recent ice age lasted from about 1.6 million years to 10,000 years before present. During that time at least 20 glaciations, or periods when the ice cover increased, occurred. Each of these periods was followed by an interglaciation, or a period when the ice cover shrank. The most recent glaciation in North America, called the Wisconsin

glaciation, lasted from about 115,000 years ago to 10,000 years ago. The climate during that time was much different from what it is today, with temperatures on the continents as much as 15° C colder. In areas that are currently occupied by subtropical deserts, cooler and wetter climates caused large lakes to form from increased rainfall and glacial runoff. The past 10,000 years have been part of a relatively warm interglacial period. However, the presence of massive continental ice sheets on Greenland and Antarctica, along with numerous smaller glaciers in mountainous regions throughout the world, indicates that Earth is still in the grip of an ice age.

During an ice age several geologic changes occur. These alterations range from changes in the shape of the land to a decrease in sea level. Water freezes and settles within the growing glaciers. This process causes worldwide sea level to drop by as much as 150 m below the current sea level. When this process occurs, shallow ocean waters that cover the continental shelves, or the edges of the continents, recede and uncover the submerged land. Advancing ice sheets can block water drainage pathways and create glacial lakes. Elsewhere, rivers are diverted from their original pathways to courses along the ice margin. The added weight of glacial ice sheets causes Earth's crust to lower by as much as several hundred meters. The ground in some areas becomes frozen throughout the year and forms permafrost, or permanently frozen ground. When glaciers recede, the combined effects of rebound from crustal depression and the shifting of ice masses cause the redistribution of rivers and lakes.

Several possible causes of ice ages exist. Scientists have proposed numerous theories to explain their occurrence. In the 1920s Yugoslav scientist Milutin Milankovitch proposed the Milankovitch Astronomical Theory, which states climatic fluctuations and the onset of glaciation can be caused by variations in Earth’s position relative to the Sun. Milankovitch calculated that this deviation of Earth’s orbit from its almost circular path occurs every 93,408 years. The movement of Earth’s crustal plates, called plate tectonics, is also linked to the occurrence of ice ages. The positions of the plates in polar regions may contribute to ice ages. Changes in global sea level may affect the average temperature of the planet and lead to cooling that may cause ice ages. Other theories explaining the causes of ice ages, such as significant variations in the heat output of the Sun, the presence of an interplanetary dust cloud that occasionally blocks some of the Sun's heat from reaching Earth, and meteorite impacts, have not yet been supported by any solid evidence.

The occurrence of Ice Ages can drastically affect the life patterns of different organisms. One such organism greatly affected by Ice Ages of the past was the so-called mammoth. Mammoth is a common name for several extinct species of the elephant family. They had long, curved tusks that reached a length of about 3 m, and a prominent hump on the back. These animals moved northward as the glaciers of the Ice Age receded. The first complete specimen of a frozen mammoth was unearthed near the Lena River in Siberia in 1806 by botanist Mikhail Adams. Since then a number of mammoth specimens have been discovered in Siberia, Europe, and North America, including one of the largest species identified to date, the American mammoth (Mammuthus imperator), which reached a height of 4.3 m.

Scientists first extracted the genetic material deoxyribonucleic acid (DNA) from mammoth remains in 1978. In the early 1980s scientists studying blood samples from mammoth remains found that mammoth blood is more similar to Asian elephants' than to African elephants'. In 1999 scientists working in Siberia recovered the complete remains of a woolly mammoth embedded in frozen mud containing plants and insects that lived 20,000 years ago. Scientists plan to slowly thaw their find and perform tests on the remains to identify the reason the animal died. They also plan to study the frozen plants and insects to learn more about the environment the animal lived in.

QUESTIONS 27-31

Complete the table below. Write a date for each answer. The first one has been done as an example for you. Write your answers in boxes headed DATE.

QUESTION	EVENT	DATE
EXAMPLE	Finding similarities between mammoth and Asian elephants	early 1980s
27	Extraction of DNA from mammoth remains	
28	Recovery of woolly mammoth in Siberia	
29	Unearthing the first frozen mammoth	
30	The end of the last ice age	
31	Distinction between mammoth and African elephants	

QUESTIONS 32-36

Do the following statements reflect the claims of the writer of the Reading Passage? In boxes headed Answer, mark

- (r) if the statement reflects the writer's claims
- (w) if the statement does not reflect the writer's claims
- (n) if the information is not given in the passage

Now answer questions 32 – 36. (as indicated by the example).

	STATEMENTS	ANSWER
EXAMPLE	North America is the home of the most recent glaciation.	● (w) (n)
32)	The most comprehensive theory about the origins of ice ages has been proposed by Milutin Milankovitch.	(r) (w) (n)
33)	Ice ages are the cause of most geological changes that have occurred throughout the history of earth.	(r) (w) (n)
34)	Earth has experiences more that ten thousand ice ages upto the present time.	(r) (w) (n)
35)	Asian and African elephants have come from totally different parants.	(r) (w) (n)
36)	Careless unearthing of prehistoric organisms can result in tragic epidemics of uncontrollable diseases.	(r) (w) (n)

QUESTIONS 37-40

Complete each of the following statements with a name from the Reading Passage. Write your answers in boxes below.

QUESTION	YOUR ANSWER
37	
38	
39	
40	

37) The first complete specimen of a frozen mammoth was unearthed near the **…** in Siberia.

38) **…** states climatic fluctuations and the onset of glaciation can be caused by variations in Earth's position relative to the Sun.

39) The most recent glaciation in North America, called the **…**, lasted from about 115,000 years ago to 10,000 years ago.

40) the presence of massive continental ice sheets on **…** and Antarctica indicates that Earth is still in the grip of an ice age.

UNIT NINE

SECTION 1: QUESTIONS 1-13

QUESTIONS 1-5

Look at the information below about AFRICAN MUD ARCHITECTURE.

mark ⓣ If the statement is true
ⓕ If the statement is false
ⓝ If the information is not given in the passage

EXAMPLE	ANSWER
Mud has been the primary building material in northern Africa.	● ⓕ ⓝ

Now answer the following questions:

1) Mud buildings resist even the strongest earthquakes due to their sturdiness.	ⓣ ⓕ ⓝ
2) One of the weaknesses of mud architecture is that rain can easily erode structures made of mud.	ⓣ ⓕ ⓝ
3) Mud structures located in areas with a damp climate are likely to fall apart much sooner than those located in regions with a dry climate.	ⓣ ⓕ ⓝ
4) The ease with which mud can be used in architecture has made it African masons' first choice in almost any type of building.	ⓣ ⓕ ⓝ
5) Only two rivers and some oases provide the water needed by people who live in northern Africa.	ⓣ ⓕ ⓝ

AFRICAN MUD ARCHITECTURE

Only the Nile and Niger rivers and scattered oases break the seemingly endless khaki landscape of northern Africa. In this brown-tinted world, mud is the primary building material. Using little more than the earth beneath their feet, people have created structures remarkable for their sturdiness, inventiveness, and beauty. Mud houses line streets, along with mosques, churches, shops, and schools all made of mud. Within the house complexes are mud corrals for animals, mud food and water storage jars, and mud ovens.

Mud is cheap, practical, and attractive. It is easy to work with, and it takes decoration well. Mud is also abundant, especially where other building materials, like stone, are lacking. In northern Africa, mud architecture evolved from local necessity. No other building material was available. Although people in damp climates have built with mud in the past, mud is especially effective in dry climates where it dries out and doesn't face erosion from water.

QUESTIONS 6-13

Look at WAYS OF BUILDING IN MUD below.

Match each of the following sentences with TWO possible endings A-M from the box below.

EXAMPLE	ANSWER
Several methods of building in mud …	**A and M**

Write the appropriate letters A-M in boxes headed Answer.

QUESTIONS		ANSWER
6 & 7	Wattle and daub have been used …	
8 & 9	Adobe brick …	
10 & 11	The temperate climate of Europe …	
12 & 13	The jalus technique …	

POSSIBLE ENDINGS

A	have developed over time.
B	left to dry in the sun.
C	is favored by the people of Egypt and Sudan.
D	to house millions of people in Europe.
E	stack them one on top of the other to form walls.
F	differs from the dry hot climate of the Sahara in Africa.
G	are covered with a dung-rich plaster.
H	is the chief method of mud construction in northern Africa.
I	in rural England for the construction of many cottages.
J	requires much less time and area than the adobe process.
K	is not that hospitable to mud architecture.
L	can be strengthened by adding straw, dung, or cement to mud.
M	are possible.

WAYS OF BUILDING IN MUD

Several methods of building in mud have developed over time. Although the temperate climate of Europe is far less hospitable to mud architecture than the dry hot Sahara, mud and woven stick construction, known as wattle and daub, housed millions of people in Europe. Woven sticks formed a frame, and mud filled the spaces in-between. Many of the pretty thatched cottages found in rural England are constructed of wattle and daub.

The chief method of mud construction in northern Africa is adobe brick. The mud is formed into bricks in a mold, allowed to harden partially, then gently knocked out of the mold and left to dry in the sun. Adding straw, dung, or cement strengthens the mud mixture. The bricks are then mortared together and plastered. One problem with adobe construction is the need for a sizable area for drying the bricks.

Extremely sticky mud deposited along the Nile in Egypt and Sudan requires a different technique. There, people form long strips of mud, known as jalus, by hand or in molds, and stack them one on top of the

other to form walls. After drying, the walls are covered with a dung-rich plaster that the desert heat transforms into a smooth, odorless finish. The jalus technique requires only one pool of mud and much less time and area than the adobe process. Walls erected using jalus can match adobe walls in strength, thickness, and height.

SECTION 2: QUESTIONS 14-27

QUESTIONS 14-20

Look at LIMITATIONS OF MUD below and at the following statements.

mark ⓣ If the statement is true
ⓕ If the statement is false
ⓝ If the information is not given in the passage

Now answer the following questions:

14)	The perception that mud is a primitive material is a great barrier to the innovation of mud architecture.	ⓣ ⓕ ⓝ
15)	Regular reapplication of coats of dung plaster, whitewash, or paint is important in the maintenance of mud constructions.	ⓣ ⓕ ⓝ
16)	Mud buildings of Africa are much stronger than many of the shoddily built modern buildings found in some African cities.	ⓣ ⓕ ⓝ
17)	Tensile strength is a quality of building materials that determines the height of buildings that can be built with them.	ⓣ ⓕ ⓝ
18)	Stacking fodder on the roofs of mud structures can provide insulation from the heat of the sun.	ⓣ ⓕ ⓝ
19)	Buildings made of steel, concrete, and glass are seen as universal symbols of progress.	ⓣ ⓕ ⓝ
20)	A hundred years ago, Omdurman was the capital of Sudan.	ⓣ ⓕ ⓝ

LIMITATIONS OF MUD

Mud buildings are usually very sturdy, so long as strong foundations support them. The same cannot be said of many of the shoddily built modern buildings found in some African cities. But using mud for building does pose certain problems.

The chief disadvantage of mud for building is its lack of tensile strength, a quality that limits the height of mud buildings and creates difficulties in roof construction. Nevertheless, in some places, such as Shibam in Yemen, buildings that rise 30 m are not uncommon. In most of northern Africa, however, low population density eliminates a need to build upward.

Building walls of mud presents no problem, but mud pulls away from a door or window frame as it dries. Builders traditionally worked around this difficulty by creating only a few openings, leading many people to believe that mud buildings could not be adequately lit or ventilated.

Builders in northern Sudan have found a way to provide a mud house with both light and ventilation. They leave a gap between the top of the walls and the ceiling, so that houses appear to have their roofs jacked up on blocks. Even a slight breeze pulls rising hot air out of the house and carries a cool draft through its doors.

Many residents improve this traditional air conditioning by stacking fodder on the roof to provide insulation from the sun and by wetting the dirt floors to cool the rooms and keep dust under control.

Traditional mud architecture erodes, as wind, rain, and other abrasions tear at it. As with any building, maintenance is important. Regular reapplication of coats of dung plaster, whitewash, or paint can protect surfaces and enable mud structures to last. Much of Sudan's former capital of Omdurman was built from mud more than a century ago.

The major barrier to the increased use and innovation of mud architecture, however, is a perception that mud is a primitive material and mud architecture is "backwards."

In rural areas of Sudan, for example, mud construction methods remain effective and virtually unchanged. Yet people in Sudanese cities view mud architecture as inferior. Many African governments and Western financiers reject traditional building materials in favor of what they see as universal symbols of progress: buildings made of steel, concrete, and glass.

QUESTIONS 21-26

Look at NATIVE AMERICAN ARCHITECTURE below. From the following list (i-xi) choose the most suitable summaries for the paragraphs A, C, and E-H.

Write the appropriate numbers (i-xi) in boxes headed Answer.

i	Wigwam
ii	Seminole
iii	Plank House
iv	Earth Lodge
v	Navajo
vi	Longhouse
vii	Kiva
viii	Pueblo
ix	Hogan
x	Chickee
xi	Tipi

NB There are more summaries than paragraphs, so you will not use them all. (Two examples are provided.)

QUESTIONS	PARAGRAPHS	ANSWER
21	Paragraph **A**	
EXAMPLE	Paragraph **B**	**xi**
22	Paragraph **C**	
EXAMPLE	Paragraph **D**	**i**
23	Paragraph **E**	
24	Paragraph **F**	
25	Paragraph **G**	
26	Paragraph **H**	

NATIVE AMERICAN ARCHITECTURE

A

There are many kinds of Native American dwellings. Plains tribes that practiced agriculture lived in earth-lodge villages. Earth lodges were made by constructing a wooden frame of logs and beams. The walls and roof rafters were covered with small branches, brush, and grass. The exterior was packed with a thick layer of earth or sod.

B

The tipi was a cone-shaped tent covered with animal hides. A hole at the top permitted smoke from the central fire to escape. This opening was adjustable with outer flaps of the cover and could be closed in rainy weather. It was used primarily by nomadic tribes of the Plains. Women were responsible for making, setting up, and moving tipis.

C

The longhouse was a large, long building that typically housed six to ten families of five or six people each. The framework, constructed of slender wooden poles or young trees, was covered with elm bark sewn on in overlapping layers like shingles. Light came from smoke holes in the roof that were covered during snow or rain.

D

The wigwam was a domed hut made of flexible saplings or poles set into the ground and bent into an arched frame. The frame was covered by sheets of bark, woven mats, or animal hides with a hole in the roof to let smoke out.. An opening was left in the frame for a low doorway, which could be covered with mats or a hide. Most wigwams housed one or two families.

E

The Navajo hogan was a round or polygonal domed house made of logs or poles and plastered with mud or earth. The entrance traditionally faced east to greet the rising sun. It had one large room, and was designed for a single family.

F

The Pueblo Indians constructed kivas, underground or partly underground chambers entered through roof hatchways with ladders. Seldom entered by women, the kiva was a men’s club, used for religious ceremonies and rituals, council meetings, and weaving cloth.

G

The wooden plank house was made by Northwest Coast Indians, who had access to bountiful cedar forests. They used large cedar logs to make a rectangular frame and then attached hand-split cedar planks to the frame either vertically or horizontally. Plank houses typically housed several families. Plank-house villages were often located on beaches.

H

The Seminole and Miccosukee tribes of Florida lived in distinctive structures open-sided homes known as chickees. Chickees consisted of a wooden platform raised a short distance above the ground and covered with a roof. The steeply pitched roof, made from the leaves of the palmetto tree, created a natural storage space where articles remained dry even in slanting rain. Palmetto logs provided the central frame.

SECTION 3: QUESTIONS 27-40

Read the following passage and answer questions 27-40.

BAMBOO SOLUTION

Bamboo, writes Mary Roach in June 1996 in *Discover Magazine,* is a plant that can be seen in Chinese brush paintings and along the quiet pathways of Buddhist monasteries. But the beauty of this particular piece, in Janssen's eyes, has nothing to do with its graceful proportions or its polished yellow hull. It has to do with the 78 newtons per square millimeter of compression force it has just withstood.

Jules Janssen is not a botanist but a civil engineer. He works in a basement lab at the Eindhoven University of Technology in Holland. There, amid the shudder and clang of rebar and aluminum, he ponders the biomechanics of lignin and nodes. While his colleagues grapple with the finer points of better bridges and faster freeways, he gives thought to the pleasing practicalities of bamboo houses.

Janssen believes that for building affordable housing in tropical countries, bamboo is usually best. Ounce for ounce, bamboo is stronger than wood, brick, and concrete. Consider the aforementioned compression test. What that figure means is that, compared with, say, concrete, bamboo can withstand twice as much force bearing down on it. A short, straight column of bamboo with a top surface area of 10 square centimeters could support an 11,000-pound elephant.

Janssen explains the importance of quantification. Everyone who has worked with bamboo knows it is strong, but exactly how strong was a question no one had bothered to answer. Quantification of a material's specific strengths and weaknesses is critical to its acceptance as a building material. Without a formal grading system, such as exists with lumber, or any international standards or building codes, bamboo has thus far failed to see widespread use in large-scale housing projects. Janssen and an international task force of bamboo researchers are currently working on an international model for bamboo building codes.

This is not to say that no one ever builds with bamboo. On the contrary, countries as geographically and culturally distinct as New Guinea, Colombia, Bangladesh, and Thailand have built traditional bamboo structures for centuries. But these are village-scale, one-at-a-time efforts. Large government-funded, bureaucracy-approved projects have been reluctant to embrace bamboo. Since 1974, when aid workers in southeast Asia approached the Eindhoven University for advice on how to construct bamboo trusses large enough to support a school roof, Janssen has volunteered his services as a consultant to tropical countries seeking information on cultivating and building with bamboo.

The largest and most successful of these efforts has been the National Bamboo Project in Costa Rica. Beginning in 1987, Janssen organized and oversaw the development of 700 hectares of bamboo plantations, the training of local builders, and the construction of more than 700 low-cost homes. The project was so successful that in 1994 plans were laid to build an additional 1,000 homes annually.

The impressive economy of bamboo housing stems largely from the material's extraordinarily low cost of production. The energy needed to produce bamboo is approximately half that required for wood. For one thing, bamboo grows quickly, up to three feet a day. While a tree can be harvested only once every 20 years, bamboo can be harvested every year. Also, the harvesting is simpler. A machete or hacksaw is all that is needed, and sawmills are unnecessary.

Bamboo compares even more impressively with concrete and steel. It requires one-eighth the production energy concrete does to create material of the same bearing capacity. With steel, which must be smelted, poured, forged, alloyed, cast, and tempered, the figure is closer to one-fiftieth.

Janssen and his Costa Rican colleagues were especially pleased with the results of what Janssen calls an unplanned full-scale test. In April 1991 an earthquake of magnitude 7.5 struck Costa Rica. Twenty

bamboo houses stood at the quake's epicenter. Jorge Gutierrez, the project's technical supervisor, recalls driving to the site that day, passing several collapsed concrete homes and hotels. Fearing the worst, he arrived to find all 20 houses intact. “Not one of them had a single crack,” he recalls.

Why, given all this, does bamboo need an international advocate? Why isn't everyone building with it? Is it only a matter of standards and codes? This is because bamboo has disadvantages as well. For starters, pandas and humans are not the only species that eat bamboo plants. Termites and beetles bore into the culms and feed on the lignin. To prevent this, bamboo must be soaked in preservative, a process requiring equipment and technical expertise that many villages lack. A well-constructed bamboo home, on the other hand, will easily last 30 years.

By far the largest obstacle is attitude which is particularly glacial on the government level. Bamboo has always been viewed as the poor man's timber. From a social point of view, as soon as you belong to the middle class you will not use bamboo anymore, because that does harm to your status. Therefore you switch to brick or timber or concrete. This is beginning to change now, but slowly.

QUESTIONS 27-31

Complete the table below. Write a date for each answer. The first one has been done as an example for you. Write your answers in boxes headed DATE.

QUESTION	EVENT	DATE
EXAMPLE	Mary Roach's essay in *Discover Magazine*	1996
27	Earthquake of magnitude 7.5 in Costa Rica	
28	Eindhoven University's advice on bamboo trusses to aid workers in southeast Asia	
29	Start of National Bamboo Project in Costa Rica	
30	Costa Rican's plan to build 1,000 bamboo homes annually	
31	Jorge Gutierrez's finding bamboo houses intact after earthquake	

QUESTIONS 32-36

Do the following statements reflect the claims of the writer of the Reading Passage? In boxes headed Answer, mark

- (r) if the statement reflects the writer's claims
- (w) if the statement does not reflect the writer's claims
- (n) if the information is not given in the passage

Now answer questions 32 – 36. (as indicated by the example).

STATEMENTS	ANSWER
EXAMPLE Attitudes toward bamboo are changing.	● (w) (n)
32) Buddhist clerics were the first people who attempted to build bamboo houses.	(r) (w) (n)
33) A change of attitude, especially at governmental level, can flourish bamboo architecture.	(r) (w) (n)
34) To prevent massive destructions caused by large-scale earthquakes, concrete buildings should give way to bamboo constructions.	(r) (w) (n)
35) Southeast Asians have a head start in the race for bamboo architecture.	(r) (w) (n)
36) Bamboo is eight times stronger than concrete and steel for construction.	(r) (w) (n)

QUESTIONS 37-40

Complete each of the following statements with a name from the Reading Passage. Write your answers in boxes below.

QUESTION	YOUR ANSWER
37	
38	
39	
40	

37) Jules Janssen is a civil engineer who works in a basement lab at the **…** in Holland.

38) A Latin American country that has a tradition of building bamboo structures for centuries is **….**

39) **…** recalls driving to the Costa Rican earthquake site to see several collapsed concrete homes and hotels.

40) The most successful project to build bamboo constructions was conducted in **….**

UNIT TEN

SECTION 1: QUESTIONS 1-13

QUESTIONS 1-5

Look at the information below about ROLE OF ANTS IN ECOSYSTEM.

mark ⓣ If the statement is true
ⓕ If the statement is false
ⓝ If the information is not given in the passage

EXAMPLE	ANSWER
Ants play crucial roles in the ecosystems where they live.	● ⓕ ⓝ

Now answer the following questions:

1) Ant nests with their numerous openings and tunnels make oxygen and moisture available to plant roots.	ⓣ ⓕ ⓝ
2) By dispersing seeds in areas that are distant from the parent plants, ants play an important role in the survival of many plant species.	ⓣ ⓕ ⓝ
3) Species of ants which damage wooden buildings are considered pests.	ⓣ ⓕ ⓝ
4) There are three classes of organisms that feed on ants.	ⓣ ⓕ ⓝ
5) Ants reduce the size of other insect populations and recycle organic matter in nature.	ⓣ ⓕ ⓝ

ROLE OF ANTS IN ECOSYSTEM

Ants play crucial roles in the ecosystems where they live. Many species dig underground nests that have numerous openings and tunnels. Air and water pass into the soil through these passageways, making oxygen and moisture available to plant roots. Seed-eating ants remove seeds from plants and transfer them to underground storage chambers within their nests. This activity disperses the seeds, so that some of them can sprout in areas that are distant from the parent plants.

Ants of many species feed on other insects, which may be either living or dead. In this way, ants reduce the size of some other insect populations and recycle organic matter. In turn, ants are a source of food for other animals, such as spiders, other insects, woodpeckers, and blue jays; toads, salamanders, and turtles; and anteaters, armadillos, and aardvarks. A few ant species are considered pests because they sting, invade human houses and yards, or damage wooden buildings.

QUESTIONS 6-13

Look at ANT DEFENSE BEHAVIOR below.

Match each of the following sentences with TWO possible endings A-M from the box below.

EXAMPLE	ANSWER
Different species of ants …	**A and M**

Write the appropriate letters A-M in boxes headed Answer.

QUESTIONS		ANSWER
6 & 7	Ants that occupy the same area …	
8 & 9	Workers from a given ant colony …	
10 & 11	Battles among European wood ants …	
12 & 13	The most timid ants …	

POSSIBLE ENDINGS

A	show differences in obtaining food.
B	only their food finds and nests.
C	compete for food, nest sites, or space.
D	result in thousands of dead ants each day.
E	defend their territories against invasion.
F	their mandibles to injure an enemy.
G	sometimes invade other ant territories.
H	rely on stealth, luck, and speed to get food.
I	are not allowed to enter a colony other than their own.
J	help the victorious colonies.
K	may last for weeks.
L	often remain in their nests to defend it.
M	promote the survival of their colonies.

ANT DEFENSE BEHAVIOR

Ants display a rich diversity of behaviors. Different species of ants show differences in obtaining food, promoting the survival of their colonies, and defending against predators. Different species of ants that occupy the same area usually compete for food, nest sites, or space. Some species defend territories against invasion by workers from other colonies of their own species, and sometimes colonies of other species as well. Some ant species defend only their food finds and nests, while the most timid ants defend only their nests, relying on stealth, luck, and speed to get food.

Some species of ants respond to an invasion by rolling themselves into balls and remaining motionless. This response makes it hard for other ants to distinguish them from particles of soil or sand. Many ants respond more aggressively to danger. Ants commonly fight by biting each other or by gripping enemy ants while dismembering them. Some ants use their mandibles to injure an enemy and then squirt poison into the wounds.

Battles among ants may involve a huge number of individuals. Many species use trail pheromones to attract workers to the site of skirmishes. Among European wood ants, battles may last for weeks and result in thousands of dead ants each day. These huge casualties of war help the victorious colonies because battles typically occur in the spring, a time of protein shortage, and the surviving colony members eat the protein-rich dead ants.

SECTION 2: QUESTIONS 14-27

QUESTIONS 14-20

Look at ANT COMMUNICATION below and at the following statements.

mark (t) If the statement is true
(f) If the statement is false
(n) If the information is not given in the passage

Now answer the following questions:

14)	Pheromone is a chemical signal that is used in a key form of ant communication.	(t) (f) (n)
15)	Depending on the type of message they want to get through to others, ants use a different pheromone signal in their communications.	(t) (f) (n)
16)	Queen ants used their pheromones to control the maturation of adult worker ants.	(t) (f) (n)
17)	Ants use touch communication to attract other ants to a large food source that they have discovered.	(t) (f) (n)
18)	The tasks to be done provide ants with cues that they readily take to perform those tasks.	(t) (f) (n)
19)	The specialized tasks of ants are often coordinated through different modes of ant communication.	(t) (f) (n)
20)	The ability of ants to respond directly to tasks controls the number of ants that will perform a given task.	(t) (f) (n)

ANT COMMUNICATION

Ants use sophisticated communication to coordinate their specialized tasks. A key form of ant communication is the chemical signal called a pheromone. Many species emit alarm pheromones to alert nestmates to danger and attract them to the site of a disturbance. Some ants spread streaks of so-called trail pheromones on the ground to guide nestmates to food, areas needing defense, or new nest sites. The long lines of ants sometimes seen streaming from a nest are following these signals.

Certain ants also use pheromones to mark territory boundaries. Intruders that enter a nest are attacked because they have a different odor than the inhabitants. Workers use chemical signals on the larvae's body surfaces to identify and feed young in the dark interior of a nest. Workers groom one another in response to odors, and ants even rely on odor to learn whether a colony member has died.

The queen emits a large number of pheromones, which serve various purposes in the colony. Some of a queen's pheromones attract workers to groom and feed her. Some of her pheromones affect ant physiology. For example, certain pheromones released from a queen prevent the ovaries of adult workers from maturing, and certain others may determine the caste of the developing larvae.

Some ant species use sounds to communicate alarm. Carpenter ants drum their heads on the floor of their chambers, and leafcutter ants and harvester ants make squeaking sounds if their nest caves in. Nestmates follow these sounds to find and rescue the trapped ants.

Ants also use touch to communicate. Ants that have discovered a large food source may attract other ants by striking them. Some primitive ants engage in duels that involve hitting one another with their antennae. These duels determine which of the workers will be dominant and remain near the brood.

Much of the work in ant colonies is performed without direct communication. Ants take cues directly from the tasks themselves. For example, the collapse of a passageway will induce certain ants to repair parts of the damage, while other workers respond to later cues to step in to complete the job. The ability of ants to respond directly to tasks avoids attracting huge numbers of workers to participate in a task that requires only a few workers.

QUESTIONS 21-26

Look at TYPES OF ANTS below. From the following list (i-xi) choose the most suitable summaries for the paragraphs A, C, and E-H.

Write the appropriate numbers (i-xi) in boxes headed Answer.

i	Weaver Ants
ii	Harvester Ants
iii	Fungus-Gardening Ants
iv	Aphid-Tending Ants
v	Queen Ants
vi	Fire Ants
vii	Honeypot Ants
viii	Harvester Ants
ix	Acacia Ants
x	Slave-Makers and Social Parasites
xi	Army Ants and Driver Ants

NB There are more summaries than paragraphs, so you will not use them all. (Two examples are provided.)

QUESTIONS	PARAGRAPHS	ANSWER
21	Paragraph **A**	
EXAMPLE	Paragraph **B**	**xi**
22	Paragraph **C**	
EXAMPLE	Paragraph **D**	**i**
23	Paragraph **E**	
24	Paragraph **F**	
25	Paragraph **G**	
26	Paragraph **H**	

TYPES OF ANTS

A

Scientists recognize about 11,000 species of ants. It constructs its earthen mounds in lawns, roadsides, and pastures. Fire ant colonies contain up to about 300,000 workers. They feed primarily on insects, honeydew, and various scavenged foods. Fire ants exist in two social forms with very different ways of life: the single-queen, and the multiple-queen colonies.

B

Army ants create nomadic hunting colonies, many of which live entirely underground. In place of permanent nest structures, army ant workers grasp one another's legs to form hanging sheets of ants, called bivouacs. Army ants found in Africa, called driver ants, form huge colonies, and have extremely powerful mandibles, capable of immobilizing and killing large prey.

C

Many species of ants harvest ants are abundant in the North America. In their colonies, workers use their mandibles to collect and carry seeds into the nest. Other workers, remove the seed's outer husk and carry it outside. They transport the inner, nutritious part of the seed to a deeper chamber that is reserved for storing seeds.

D

Tree-dwelling weaver ants live in the warm places. They construct nests by pulling leaves together and binding them in place with thousands of strands of silk. This silk is obtained from a colony's larvae. If the leaves are too far apart, the workers form living chains to pull the leaves together.

E

Certain agricultural ants cultivate a fungus that they use for food. The most widely known fungus-gardeners are the leafcutter ants. They plant fungus gardens on a surface of chewed-up leaves. They are among the largest consumers of leaves and grass. As a result, they are frequent pests of tropical agriculture.

F

Numerous species of ants collect a sweet substance called honeydew that is excreted by various tiny insects, including aphids, mealy bugs, and scale insects. They stroke the aphids with their antennae to induce them to release drops of honeydew. They then transfer this honeydew to the nest and share it with nest workers.

G

Certain species of ants produce individuals who serve as living food containers, called honeypots, by feeding liquids to young adult workers called repletes. Gradually the repletes become so full that these ants are unable to walk, and become living storage tanks. When food is scarce, the repletes regurgitate their stored liquids back to nestmates through trophallaxis.

H

Slave-making ants exploit the labor or resources of other species of ants by stealing pupae from the nests of a different species. When the pupae emerge as adult workers in the slave-makers' nest, they regard that nest as their own and embark on a life of labor for the ants that captured them. Some species of ants, called Amazon ants, cannot survive without slaves.

SECTION 3: QUESTIONS 27-40

Read the following passage and answer questions 27-40.

MORE ABOUT ANTS

Early attempts at describing ants date back to the 17th century when Leeuwenhoek (1632-1723), described the life cycle of ants, showing how the larvae and pupae originate from eggs. Another person who studied ants was Edward Osborne Wilson, an American evolutionary biologist who completed his doctorate at Harvard University in 1955, and became a zoology professor there in 1956.

Research on ant evolution has revealed that ants evolved from a wasp ancestor that hunted insect prey to feed its larvae in a nest. An important difference between wasps and the earliest ants was the presence of several generations in the same nest, which allowed cooperation to evolve. Increasing cooperation essentially resulted in a wingless worker caste and winged queens.

The oldest known fossil ants are 92 million years old. Preserved in amber, these fossil ants were discovered in 1998 in New Jersey. These ants, which lived 138 million to 65 million years ago, had characteristics that are intermediate between wasps and today's ants. One body structure that marks them as ants, however, is the presence of a metapleural gland in the alitrunk. Ants gradually emerged as one of the Earth's dominant insects. During the Cretaceous Period, ants made up only a small part of the insect life. By the Oligocene Epoch, which spanned from about 38 million to 24 million years ago, ants were far more abundant. By this time, about half of the modern groups of ants were already present. The social evolution of ants is still in progress. Today, some species of ants show only little coordination within colonies, whereas others create highly cooperative societies that function as smoothly as a single organism. This diversity of social characteristics makes ants fascinating to study or observe.

Ants are among those insects that undergo complete metamorphosis. Their body structures dramatically transform during the progression from birth to maturity. An ant begins life as an egg, which hatches to become a larva. Eventually, the larva reaches the size it will have as an adult ant. At this point, it may spin a silk cocoon around itself in preparation for entering the pupal stage. As a pupa, it acquires adult body structures such as legs and antennae. In some species, young ants pass through the pupal stage without forming a cocoon.

The life span of adult ants is highly variable. Queens of many species may live a decade or more. Queens usually live much longer than their workers. For instance, a fire ant queen lives about seven years, but her workers live only for about 50 to 150 days. Large workers usually live longer than small workers. In many species that live in the Earth's temperate regions workers live for one to two years. Male ants usually die within a few weeks.

Ants perform many essential functions in ecosystems. They turn soil, move organic matter and soil nutrients, reduce insect populations, serve as food for other animals, disperse seeds, and sometimes pollinate flowers. In agriculture, they are the most important predators of insects, helping to keep pests under control.

Some people use ants for highly specialized purposes. Native Americans of the southwestern United States sometimes eat honeypot ants as a sweet treat or a form of medicine. In Europe, various species of ants are introduced to timber forests, where they prey on caterpillars, preventing them from eating the leaves on trees. People in the American tropics sometimes welcome army ants into their homes. These people

temporarily move out of their homes while the ants sweep through and consume or drive out any pests that may have infested the home.

The activities of ants occasionally bring them into conflict with humans. A number of ants have become pests, particularly those that have been accidentally transported outside of their natural range. One example is the fire ant. Another ant pest widely transported by humans is the pharaoh's ant, which is native to North Africa but has spread throughout much of the world. The pharaoh's ant cannot tolerate cold temperatures, and so in cold climates it lives in human houses and in other large, heated buildings, such as hospitals and factories. The most widespread ant pest is the Argentine ant. Carpenter ants, native to North America, live in timber instead of soil. Once inside a human home, they make their nests within wooden structures, which they hollow out with their sharp mandibles.

Just as ants sometimes cause harm to humans, humans are a source of harm to ants. Little information is available about endangered species of ants, but scientists suspect many species of ants may be in danger of extinction. The most vulnerable ant species are those that live only in a small geographic area and require a specific type of habitat. An example is a type of leafcutter ant that lives in coastal forests in Brazil. Army ants are increasingly threatened by humans. Army ants live in tropical forests and cannot survive in areas where these forests have been destroyed.

QUESTIONS 27-31

Complete the table below. Write a date for each answer. The first one has been done as an example for you. Write your answers in boxes headed DATE.

QUESTION	EVENT	DATE
EXAMPLE	Leeuwenhoek's year of birth	1632
27	Edward Osborne Wilson's graduation from Harvard University	
28	Start of the Oligocene Epoch	
29	The year Edward Osborne Wilson's became a professor of zoology at Harvard University	
30	Discovery of the oldest ant fossil in New Jersey	
31	Year of Leeuwenhoek's death	

QUESTIONS 32-36

Do the following statements reflect the claims of the writer of the Reading Passage? In boxes headed Answer, mark

- (r) if the statement reflects the writer's claims
- (w) if the statement does not reflect the writer's claims
- (n) if the information is not given in the passage

Now answer questions 32 – 36. (as indicated by the example).

	STATEMENTS	ANSWER
EXAMPLE	Some species of ants show only little coordination within colonies.	● (w) (n)
32)	Social evolution of ants is not complete yet.	(r) (w) (n)
33)	Wasps appeared on earth much sooner than ants.	(r) (w) (n)
34)	The fascinating point about ants is the diversity of their social characteristics.	(r) (w) (n)
35)	The pupal stage in the life of ants has a maturating function.	(r) (w) (n)
36)	Human activities have endangered the leafcutter ants of Brazilian rain forests.	(r) (w) (n)

QUESTIONS 37-40

Complete each of the following statements with a name from the Reading Passage. Write your answers in boxes below.

QUESTION	YOUR ANSWER
37	
38	
39	
40	

37) In the seventeenth century, **…** described the life cycle of ants and showed how the larvae and pupae originate from eggs.

38) During the **…**, ants made up only a small part of the insect life.

39) Another ant pest widely transported by humans is the pharaoh's ant, which is native to **…** but has spread throughout much of the world.

40) Carpenter ants, native to **…**, live in timber instead of soil.

UNIT ELEVEN

SECTION 1: QUESTIONS 1-13

QUESTIONS 1-5

Look at the information below about ENVIRONMENT.

mark ⓣ If the statement is true
ⓕ If the statement is false
ⓝ If the information is not given in the passage

EXAMPLE	ANSWER
Environment refers to all of the external factors affecting an organism.	● ⓕ ⓝ

Now answer the following questions:

1) Abiotic environemtal factors consist of temperature, rainfall, day length, wind, and ocean currents.	ⓣ ⓕ ⓝ
2) Both humans and all other species change their environments, but they do so on different scales.	ⓣ ⓕ ⓝ
3) Ecosystem comprises biotic factors, abiotic factors, organisms, and interactions of organisms with biotic and abiotic factors.	ⓣ ⓕ ⓝ
4) Human-induced changes affect the way animals and plants are distributed in different ecosystems.	ⓣ ⓕ ⓝ
5) Biotic and abiotic factors constitute what scientists commonly refer to as environment.	ⓣ ⓕ ⓝ

ENVIRONMENT

Environment refers to all of the external factors affecting an organism. These factors may be other living organisms (biotic factors) or nonliving variables (abiotic factors), such as temperature, rainfall, day length, wind, and ocean currents. The interactions of organisms with biotic and abiotic factors form an ecosystem. Even minute changes in factor in an ecosystem can influence whether a particular plant or animal species will be successful in its environment.

Organisms and their environment constantly interact, and both are changed by this interaction. Like all other living creatures, humans have clearly changed their environment, but they have done so generally on a grander scale than have all other species. Some of these human-induced changes—such as the destruction of the world's tropical rain forests to create farms or grazing land for cattle—have led to altered climate patterns. In turn, altered climate patterns have changed the way animals and plants are distributed in different ecosystems.

QUESTIONS 6-13

Look at UNDERSTANDING THE ENVIRONMENT below.

Match each of the following sentences with TWO possible endings A-M from the box below.

EXAMPLE	ANSWER
A population's carrying capacity …	**A and M**

Write the appropriate letters A-M in boxes headed Answer.

QUESTIONS		ANSWER
6 & 7	Biotic and abiotic factors …	
8 & 9	Different species that coexist in ecosystems have …	
10 & 11	Natural or human-made disruptions in an environment …	
12 & 13	Earth Science Enterprise …	

POSSIBLE ENDINGS

A determines the ultimate size of that population.

B function singly or in combination.

C transformation of the ecosystem.

D may lead to the extinction or loss of some species.

E established balanced interactions with each other.

F uses artificial satellites to study global change.

G limit the size that any population may attain.

H populations in the area to remain relatively stable.

I have unforeseen consequences.

J is supervised by NASA.

K evolved together for many generations.

L make sound environmental policy decisions.

M occurs when needed resources are in short supply.

UNDERSTANDING THE ENVIRONMENT

In 1840, it was proposed that populations cannot grow indefinitely—a basic principle now known as the Law of the Minimum. Biotic and abiotic factors, singly or in combination, ultimately limit the size that any population may attain. This size limit, known as a population's carrying capacity, occurs when needed resources, such as food, breeding sites, and water, are in short supply.

Population size and distribution may also be affected, either directly or indirectly, by the way species in an ecosystem interact with one another. Typically, the species that coexist in ecosystems have evolved together for many generations. These populations have established balanced interactions with each other that enable all populations in the area to remain relatively stable. Occasionally, however, natural or human-made disruptions occur that have unforeseen consequences to populations in an ecosystem. These disruptions can either directly or indirectly lead to the extinction or loss of some species and a transformation of the ecosystem.

To better understand the impact of natural and human disruptions on the Earth, in 1991 the National Aeronautics and Space Administration (NASA) began to use artificial satellites to study global change. NASA's undertaking, called Earth Science Enterprise, is part of an international effort linking numerous satellites into a single Earth Observing System (EOS). EOS collects information about the interactions occurring in the atmosphere, on land, and in the oceans, and these data help scientists and lawmakers make sound environmental policy decisions.

SECTION 2: QUESTIONS 14-27

QUESTIONS 14-20

Look at ENVIRONMENTAL AWARENESS below and at the following statements.

mark ⓣ If the statement is true

ⓕ If the statement is false

ⓝ If the information is not given in the passage

Now answer the following questions:

14)	Indiscriminate use of DDT has posed grave dangers to the environment in the past.	ⓣ ⓕ ⓝ
15)	The future growth of most nations depends upon conservation methods that protect the environment.	ⓣ ⓕ ⓝ
16)	Moving people to a new level of environmental awareness and activism is necessary to safeguard the environment .	ⓣ ⓕ ⓝ
17)	Pollution and other environmental deterrents will undoubtedly damage ecological cycles and balances in nature.	ⓣ ⓕ ⓝ
18)	Rachel Carson was both a biologist and a poet.	ⓣ ⓕ ⓝ
19)	To avert ecological crises, fundamental changes in human behavior are needed.	ⓣ ⓕ ⓝ
20)	Developing countries are much more responsible for the present levels of environmental pollution.	ⓣ ⓕ ⓝ

ENVIRONMENTAL AWARENESS

In 1962 in her book *Silent Spring,* American biologist Rachel Carson warned of the grave dangers posed by the indiscriminate use of dichlorodiphenyltrichloroethane (DDT) and related pesticides. The book's title suggested a time when birds, their populations greatly reduced by pesticides, could no longer be heard singing in the spring. Carson, by arguing that humans as well as wildlife were at risk, issued a call to action. *Silent Spring* combined solid science, a reverence for nature as strong as that of the transcendentalists, and a wonderfully poetic style that moved people to a new level of environmental awareness and activism.

Today, most scientists agree that if pollution and other environmental deterrents continue at their present rates, the result will undoubtedly be irreversible damage to the ecological cycles and balances in nature upon which all life depends. Scientists warn that fundamental, and perhaps drastic, changes in human behavior will be required to avert an ecological crisis.

To safeguard the healthful environment that is essential to life, human beings must learn the very fact that Earth does not have infinite resources. Earth's limited resources must be conserved and, where possible, reused. In addition, human beings must devise new strategies that mesh environmental progress with economic growth. The future growth of developing nations certainly depends upon the development of sustainable conservation methods that protect the environment while also meeting the basic needs of citizens.

Many nations worldwide have acted to control or reduce environmental problems. For example, Great Britain has largely succeeded in cleaning up the waters of the Thames and other rivers, and London no longer suffers the heavy smogs caused by industrial pollutants. Japan has some of the world's strictest standards for the control of water and air pollution. In Canada, the Department of Commerce has developed comprehensive programs covering environmental contaminants.

In the United States of America, the Environmental Protection Agency (EPA) was established in 1970 to protect the nation's natural resources. In addition, the U.S. Congress has provided governmental agencies with legislation designed to protect the environment. Many U.S. states have also established environmental protection agencies. Citizen groups, such as the Sierra Club and the National Audubon Society, educate the public, support environment-friendly legislation, and help assure that federal and state laws are enforced by pointing out violations.

QUESTIONS 21-26

Look at FACTORS THREATENING THE ENVIRONMENT below. From the following list (i-xi) choose the most suitable summaries for the paragraphs A, C, and E-H.

Write the appropriate numbers (i-xi) in boxes headed Answer.

i	Habitat Destruction and Species Extinction
ii	Natural Hazards as a Source of Pollution
iii	Population Growth
iv	Depletion of the Ozone Layer
v	Biotic Factors Affecting Marine Life
vi	Groundwater Depletion and Contamination
vii	Chemical Risks
viii	Coral Reef Destruction
ix	Environmental Racism
x	Energy Production
xi	Global Warming

NB There are more summaries than paragraphs, so you will not use them all. (Two examples are provided.)

QUESTIONS	PARAGRAPHS	ANSWER
21	Paragraph **A**	
EXAMPLE	Paragraph **B**	**xi**
22	Paragraph **C**	
EXAMPLE	Paragraph **D**	**i**
23	Paragraph **E**	
24	Paragraph **F**	
25	Paragraph **G**	
26	Paragraph **H**	

ENVIRONMENT-THREATENING FACTORS

A

Human population growth is at the root of the world's environmental problems. Although population growth rate has slowed slightly since the 1990s, the world's population increases by about 77 million human beings each year. As the number of people increases, crowding generates pollution, destroys more habitats, and uses up additional natural resources.

B

Like in a greenhouse, certain gases in atmosphere permit the Sun's radiation to heat Earth. This causes a slight increase in global temperature—known as global warming. Such a modest increase in temperature may reduce the average thickness of Arctic ice, whereby causing a rise in sea levels. This may eventually drive many plant and animal species into extinction.

C

Chemicals used in refrigeration, air-conditioning systems, cleaning solvents, and aerosol sprays destroy the ozone layer. The consequences of continued depletion of the ozone layer can cause a decline in plankton populations. It may lead to increased carbon dioxide levels in the atmosphere and thus to global warming.

D

Plant and animal species are dying out at an unprecedented rate. The leading cause of extinction is habitat destruction, particularly of the world's richest ecosystems—tropical rain forests and coral reefs. If the world's population continues to grow at its present rate and puts even more pressure on these habitats, they might well be destroyed sooner.

E

Although groundwater—water that collects beneath the ground—is a renewable resource, reserves replenish relatively slowly. Scientists worry about groundwater depletion and contamination. By some estimates, on average, 25 percent of usable groundwater is contaminated, and in some areas as much as 75 percent is contaminated.

F

Many chemicals have been found to mimic estrogen, the hormone that controls the development of the female reproductive system in a large number of animal species. Preliminary results indicate that these

chemicals may disrupt development and lead to a host of serious problems in both males and females, including infertility, increased mortality of offspring, and behavioral changes such as increased aggression.

G

Studies have shown that not all individuals are equally exposed to pollution. Three of the five largest commercial hazardous-waste landfills in America are in predominantly black or Hispanic neighborhoods, and three out of every five black or Hispanic Americans live in the vicinity of an uncontrolled toxic-waste site. This suggests that the selection of sites for hazardous-waste disposal involves racism.

H

Some countries produce a portion of their electricity using nuclear energy. Many people oppose nuclear energy because an accident can cause massive devastation. The accident at the Chernobyl nuclear power plant scattered radioactive contamination over a large part of Europe. The rate of thyroid cancer in young Ukrainian children was ten times higher than was the norm prior to the accident.

SECTION 3: QUESTIONS 27-40

Read the following passage and answer questions 27-40.

EFFORTS TO PROTECT THE ENVIRONMENT

In an effort to improve the world's environmental status, international agreements have recently been reached. In 1975 the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) went into effect to reduce commerce in animals and plants on the edge of extinction. In 1982 the International Whaling Commission agreed to a moratorium on all commercial whaling. Perhaps the most important international agreement was the 1987 Montréal Protocol on Substances that Deplete the Ozone Layer. It set specific targets for reducing emissions of chemicals responsible for the destruction of Earth's ozone layer. The international community again came together in 1989 to form the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, a treaty that limits the movement of hazardous wastes between countries.

In 1992 the UN Conference on Environment and Development was held in Rio de Janeiro. Popularly known as the Earth Summit, this meeting was the largest gathering of world leaders in history. The conference produced two major treaties: an agreement for nations to voluntarily

reduce emission of gases leading to global warming, and a pact on biodiversity requiring countries to develop plans to protect endangered species and habitats. At the insistence of the United States, however, the final version of the global warming treaty was dramatically scaled back. The United States was also one of the very few countries that refused to sign the biodiversity treaty. United States representatives objected to a part of the treaty that specified that money to come from the use of natural resources from protected ecosystems should be shared equally between the source country and the corporation or institution removing the materials.

The 1992 agreement on global warming limited each industrialized nation to emissions in the year 2000 that were equal to or below 1990 emissions. At a follow-up conference in Kyōto, Japan, representatives from 160 countries signed the Kyōto Protocol. This agreement called for industrialized nations to reduce emissions to an average of about 5% below 1990 emission levels by 2012. For this accord to become international law, however, it had to be ratified by at least 55 countries. The United States has refused to ratify the accord, but Japan and the 15 countries that make up the European Union have ratified it. Even if the Kyōto Protocol does become international law, scientists expect that its emission requirements are too minimal to be effective. Some experts predict that a 60% reduction in emissions will be necessary to stabilize the world's climate.

In 2002 delegates from nearly 200 countries convened at the World Summit on Sustainable Development in Johannesburg, to establish new sustainable development goals for the 21st century. They also negotiated to strengthen commitments from the governments of developed nations to provide aid for sustainable development. Among the outcomes, the 2002 summit created an action plan that called on nations to reduce by half the proportion of people who lack sanitation by 2015, to minimize health and environmental problems caused by chemical pollution by 2020, and to reduce significantly the number of endangered species by 2010.

A desire for environmental change led to the creation of various political parties around the world whose emphasis was largely on environmental protection. The first of these organizations, collectively known as green parties, was the Values Party in New Zealand, created in 1972. In 1993, 23 green parties from eastern and western Europe came together to form the European Federation of Green Parties. They hoped that together they would have the leverage necessary to demand that environmental issues such as pollution control, population growth, and

sustainable development be more fully addressed by various national governments and international bodies.

By far the most successful green party has been Bündnis 90/Die Grünen, the green party of Germany. In 1998 Bündnis 90/Die Grünen formed a coalition with the newly elected Social Democratic Party of German chancellor Gerhard Schröder, marking the first time that the green party had entered Germany's national government.

Green parties have developed in almost all countries that have open elections, but they have had the largest impact in those nations where proportional representation within a parliamentary system occurs. Thus, the green parties have not played a significant role in American politics. However, some experts believe that in the disputed presidential election of 2000, the votes received by Green Party candidate Ralph Nader split the vote so that George W. Bush was able to win enough electoral votes to capture the presidency.

Global environmental collapse is not inevitable. The developed world must work with the developing world to ensure that new industrialized economies do not add to the world's environmental problems. Politicians must think of sustainable development rather than economic expansion. Conservation strategies have to become more widely accepted, and people must learn that energy use can be dramatically diminished without sacrificing comfort. In short, with the technology that currently exists, the years of global environmental mistreatment can begin to be reversed.

QUESTIONS 27-31

Complete the table below. Write a date for each answer. The first one has been done as an example for you. Write your answers in boxes headed DATE.

QUESTION	EVENT	DATE
EXAMPLE	Kyoto Protocol	1992
27	World Summit in Johannesburg	
28	Earth Summit in Rio de Janeiro	
29	International Whaling Commission	
30	Montréal Protocol on the Ozone Layer	
31	CITES of Wild Fauna and Flora	

QUESTIONS 32-36

Do the following statements reflect the claims of the writer of the Reading Passage? In boxes headed Answer, mark

- (r) if the statement reflects the writer's claims
- (w) if the statement does not reflect the writer's claims
- (n) if the information is not given in the passage

Now answer questions 32 – 36. (as indicated by the example).

	STATEMENTS	ANSWER
EXAMPLE	Political structure of nations can affect the success or failure of green parties there.	● (w) (n)
32)	By 2020, the Ozone layer will no longer exist.	(r) (w) (n)
33)	America is against all international efforts aimed at reducing emission of greenhouse gases.	(r) (w) (n)
34)	Whaling industry will result in the extinction of whales by 2050.	(r) (w) (n)
35)	Global warming will cause the Antarctic continent to emerge in the first decade of the next century.	(r) (w) (n)
36)	Green parties are trying to win presidential elections in almost all developing countries.	(r) (w) (n)

QUESTIONS 37-40

Complete each of the following statements with a name from the Reading Passage. Write your answers in boxes below.

QUESTION	YOUR ANSWER
37	
38	
39	
40	

37) The votes received by **…** split the vote so that Bush was able to win enough electoral votes to capture the presidency.

38) The first green party known as **…** was created in New Zealand.

39) The emission requirements of the **…** are too minimal to be effective.

40) Gerhard Shroder is a member of Germany's **….**

UNIT TWELVE

SECTION 1: QUESTIONS 1-13

QUESTIONS 1-5

Look at the information below about ACID RAIN.

mark (t) If the statement is true
(f) If the statement is false
(n) If the information is not given in the passage

EXAMPLE	ANSWER
Acid rain leaches nutrients from soils, slows the growth of trees, and makes lakes uninhabitable for fish.	● (f) (n)

Now answer the following questions:

1)	Acid Rain forms when airborne acids fall to Earth in distant regions.	(t) (f) (n)
2)	Acid rain has a corrosive nature that can cause widespread damage to the environment.	(t) (f) (n)
3)	Urban smog, formed when acid rain combines with other chemicals, can attack the lungs and cause illness and premature deaths.	(t) (f) (n)
4)	Rain, snow, or fog are the means by which acid rains return back to earth.	(t) (f) (n)
5)	The natual wear and tear on man-made structures in polluted cities is accelerated as a result of the impact of acid rain on those structures.	(t) (f) (n)

ACID RAIN

Acid Rain is a form of air pollution in which airborne acids produced by electric utility plants and other sources fall to Earth in distant regions. Its corrosive nature causes widespread damage to the environment. The problem begins with the production of sulfur dioxide and nitrogen oxides from the burning of fossil fuels, and from certain kinds of manufacturing.

Sulfur dioxide and nitrogen oxides react with water and other chemicals in the air to form sulfuric acid, nitric acid, and other pollutants. These acid pollutants reach high into the atmosphere, travel with the wind, and eventually return to the ground by way of rain, snow, or fog, and as invisible “dry” forms. It leaches nutrients from soils, slows the growth of trees, makes lakes uninhabitable for fish and other wildlife, corrodes almost everything it touches, and accelerates natural wear and tear on structures. It combines with other chemicals to form urban smog, which attacks the lungs, causing illness and premature deaths.

QUESTIONS 6-13

Look at FORMATION OF ACID RAIN below.

Match each of the following sentences with TWO possible endings A-M from the box below.

EXAMPLE	ANSWER
The process that leads to acid rain …	**A and M**

Write the appropriate letters A-M in boxes headed Answer.

QUESTIONS		ANSWER
6 & 7	Sulfur dioxide undergoes a complex reaction with water vapor …	
8 & 9	Acid pollutants …	
10 & 11	Clouds or fog formed in acid-laden air …	
12 & 13	Sulfur dioxide pollution …	

POSSIBLE ENDINGS

A	starts with the burning of fossil fuels.
B	called nitrates and sulfates.
C	once it is in the atmosphere.
D	usually comes from power plants.
E	sometimes occur as dry particles and as gases.
F	washed from ground surfaces by rain.
G	to yield sulfuric acid.
H	are carried by wind and air currents over long distances.
I	can make the rain or snow that falls from them acidic.
J	is known as acid deposition.
K	is a side-effect of such industrial activities as metal smelting.
L	may reach the ground without the help of water.
M	can be controlled with a few small steps.

FORMATION OF ACID RAIN

The process that leads to acid rain begins with the burning of fossil fuels. Burning, or combustion, is a chemical reaction in which oxygen from the air combines with carbon, nitrogen, sulfur, and other elements in the substance being burned. The new compounds formed are gases called oxides. When sulfur and nitrogen are present in the fuel, their reaction with oxygen yields sulfur dioxide and various nitrogen oxide compounds. Sulfur dioxide pollution usually comes from power plants, especially those that burn coal, and from industrial activities, including oil refining and metal smelting. Nitrogen oxides enter the atmosphere from many different sources, with motor vehicles emitting the largest share.

Once in the atmosphere, sulfur dioxide and nitrogen oxides undergo complex reactions with water vapor and other chemicals to yield sulfuric acid, nitric acid, and other pollutants called nitrates and sulfates. The acid compounds are carried by air currents and the wind, sometimes over long distances. When clouds or fog form in acid-laden air, they too are acidic, and so is the rain or snow that falls from them.

Acid pollutants also occur as dry particles and as gases, which may reach the ground without the help of water. When these “dry” acids are washed from ground surfaces by rain, they add to the acids in the rain itself to produce a still more corrosive solution. The combination of acid rain and dry acids is known as acid deposition.

SECTION 2: QUESTIONS 14-27

QUESTIONS 14-20

Look at HOW TO CONTROL ACID RAIN below and at the following statements.

mark ⓣ If the statement is true

ⓕ If the statement is false

ⓝ If the information is not given in the passage

Now answer the following questions:

14)	Reducing the amount of sulfur dioxide and nitrogen oxides released by power plants, motorized vehicles, and factories can curtail acid rain.	ⓣ ⓕ ⓝ
15)	Using less energy from fossil fuels is the simplest way for controlling acid rain.	ⓣ ⓕ ⓝ
16)	Cleanable types of coal contain sulfur in a form that can be washed out easily before burning.	ⓣ ⓕ ⓝ
17)	Natural gas contains almost no sulfur and produces very low nitrogen oxides when burnt.	ⓣ ⓕ ⓝ
18)	In the so-called liming process powdered limestone is added to water or soil to neutralize the acid dropping from the sky.	ⓣ ⓕ ⓝ
19)	Acid rain causes its greatest damage to delicate objects like statues that are not sheltered indoors in climate-controlled rooms.	ⓣ ⓕ ⓝ
20)	The burning process can be altered to produce free nitrogen which is harmless and environment-friendly.	ⓣ ⓕ ⓝ

HOW TO CONTROL ACID RAIN

Acid rain can best be curtailed by reducing the amount of sulfur dioxide and nitrogen oxides released by power plants, motorized vehicles, and factories. The simplest way to cut these emissions is to use less energy from fossil fuels. Individuals can help. Every time a consumer buys an energy-efficient appliance, adds insulation to a house, or takes a bus to work, he or she conserves energy and, as a result, fights acid rain.

Another way to cut emissions of sulfur dioxide and nitrogen oxides is by switching to cleaner-burning fuels. For instance, coal can be high or low in sulfur, and some coal contains sulfur in a form that can be washed out easily before burning. By using more of the low-sulfur or cleanable types of coal, electric utility companies and other industries can pollute less. The gasoline and diesel oil that run most motor vehicles can also be formulated to burn more cleanly, producing less nitrogen oxide pollution. Clean-burning fuels such as natural gas are being used increasingly in vehicles. Natural gas contains almost no sulfur and produces very low nitrogen oxides.

Pollution can also be reduced at the moment the fuel is burned. Several new kinds of burners and boilers alter the burning process to produce less nitrogen oxides and more free nitrogen, which is harmless. Limestone or sandstone added to the combustion chamber can capture some of the sulfur released by burning coal.

Once sulfur dioxide and oxides of nitrogen have been formed, there is one more chance to keep them out of the atmosphere. In smokestacks, devices called scrubbers spray a mixture of water and powdered limestone into the waste gases (also called flue gases), recapturing the sulfur. Pollutants can also be removed by catalytic converters. In a converter, waste gases pass over small beads which are coated with metals. These metals promote chemical reactions that change harmful substances to noticeably less harmful ones.

Once acid rain has occurred, a few techniques can limit environmental damage. In a process known as liming, powdered limestone can be added to water or soil to neutralize the acid dropping from the sky. In cities, exposed surfaces vulnerable to acid rain destruction can be coated with acid-resistant paints. Delicate objects like statues can be sheltered indoors in climate-controlled rooms.

QUESTIONS 21-26

Look at EFFECTS OF ACID RAIN below. From the following list (i-xi) choose the most suitable summaries for the paragraphs A, C, and E-H.

Write the appropriate numbers (i-xi) in boxes headed Answer.

i	Effects of Acid Rains on Surface Waters
ii	Effects of Acid Rains on Birds
iii	Acid Rain and Plants and Animals
iv	Acid Rain and Human Health
v	Effects of Acid Rains on Agriculture
vi	Effects of Acid Rains on Viruses
vii	Effects of Acid Rains on Soil
viii	Acid Rain and Human-Made Structures
ix	Acid Rain and Global Warming
x	Effects of Acid Rains on Airplanes
xi	Effects of Acid Rains on Trees

NB There are more summaries than paragraphs, so you will not use them all. (Two examples are provided.)

QUESTIONS	PARAGRAPHS	ANSWER
21	Paragraph **A**	
EXAMPLE	Paragraph **B**	**xi**
22	Paragraph **C**	
EXAMPLE	Paragraph **D**	**i**
23	Paragraph **E**	
24	Paragraph **F**	
25	Paragraph **G**	
26	Paragraph **H**	

EFFECTS OF ACID RAIN

A

Acid rain has been linked to widespread environmental damages. In soil, acid rain dissolves and washes away nutrients needed by plants. It can also dissolve toxic substances, such as aluminum and mercury, which are naturally present in some soils, freeing these toxins to pollute water or to poison plants that absorb them.

B

Acid rain slows the growth of plants, especially trees. It also attacks trees more directly by eating holes in the waxy coating of leaves and needles, causing brown dead spots. If many such spots form, a tree loses some of its ability to make food through photosynthesis. Also, organisms that cause disease can infect the tree through its injured leaves.

C

Most farm crops are less affected by acid rain than are forests. The deep soils of many farm regions can absorb and neutralize large amounts of acid. Mountain farms are more at risk. The thin soils in these higher elevations cannot neutralize so much acid. Excessive amounts of nutrients can be leached out of the soil because of acid rains.

D

Acid rain falls into and drains into streams, lakes, and marshes. Where there is snow cover in winter, local waters grow suddenly more acidic when the snow melts in the spring. Most natural waters are close to chemically neutral, neither acidic nor alkaline, with pH between 6 and 8. In some lakes, the water now has a pH value of less than 5 as a result of acid rain.

E

The effects of acid rain on wildlife can be far-reaching. If a population of one plant or animal is adversely affected by acid rain, animals that feed on that organism may also suffer. Ultimately, an entire ecosystem may become endangered.

F

Acid rain and the dry deposition of acidic particles damage buildings, statues, automobiles, and other structures made of stone, metal, or any

other material exposed to weather for long periods. The corrosive damage can be expensive and, in cities with very historic buildings, like the Parthenon in Greece and the Taj Mahal in India, tragic.

G

The acidification of surface waters causes little direct harm to people. It is safe to swim in even the most acidified lakes. However, toxic substances leached from soil can pollute local water supplies, which can irritate the lungs and make breathing difficult, especially for people who already have asthma, bronchitis, or other respiratory diseases.

H

Acid pollution has one surprising effect that may be beneficial. Sulfates in the upper atmosphere reflect some sunlight out into space, and thus tend to slow down global warming. Scientists believe that acid pollution may have delayed the onset of warming by several decades in the middle of the 20th century.

SECTION 3: QUESTIONS 27-40

Read the following passage and answer questions 27-40.

EFFORTS TO CONTROL ACID RAINS

In the United States, legislative efforts to control sulfur dioxide and nitrogen oxides began with passage of the Clean Air Act of 1970. It has two major objectives: to improve the nation's air quality and to reduce or eliminate certain air pollutants that have been linked to problems for human health or the environment. Such pollutants include ozone, carbon monoxide, sulfur dioxide, hydrocarbons, and smog-forming particles known as particulate. It designates maximum allowable levels of pollutants from automotive and industrial emissions and sets general standards for acceptable levels of pollution in the air. Specific provisions include strict tailpipe emission standards on new automobiles, a requirement that oil companies sell cleaner-burning vehicle fuels in the metropolitan areas that have the worst smog problems, and a requirement that electric utilities reduce harmful emissions from their plants.

The act established emissions standards for pollutants from automobiles and industry. In 1990 Congress approved a set of amendments to the act that impose stricter limits on pollution emissions, particularly pollutants that cause acid rain. These amendments aim to cut the

national output of sulfur dioxide from 23.5 million tons to 16 million tons by the year 2010. Although no national target is set for nitrogen oxides, the amendments require that power plants reduce their emissions from 7.5 million tons to 5 million tons by 2010. These rules were applied first to selected large power plants in Eastern and Midwestern states. In the year 2000, smaller, cleaner power plants across the country came under the law.

These 1990 amendments include a novel provision for sulfur dioxide control. Each year the government gives companies permits to release a specified number of tons of sulfur dioxide. Polluters are allowed to buy and sell their emissions permits. For instance, a company can choose to reduce its sulfur dioxide emissions more than the law requires and sell its unused pollution emission allowance to another company that is further from meeting emission goals; the buyer may then pollute above the limit for a certain time. Unused pollution rights can also be "banked" and kept for later use. It is hoped that this flexible market system will clean up emissions more quickly and cheaply than a set of rigid rules.

Legislation enacted in Canada restricts the annual amount of sulfur dioxide emissions to 2.3 million tons in all of Canada's seven easternmost provinces. A national cap for sulfur dioxide emissions has been set at 3.2 million tons per year. Legislation is currently being developed to enforce stricter pollution emissions by 2010.

Norwegian law sets the goal of reducing sulfur dioxide emission to 76 percent of 1980 levels and nitrogen oxides emissions to 70 percent of the 1986 levels. To encourage cleanup, Norway collects a hefty tax from industries that emit acid pollutants. In some cases these taxes make it more expensive to emit acid pollutants than to reduce emissions.

Acid rain typically crosses national borders, making pollution control an international issue. Canada receives much of its acid pollution from the United States—by some estimates as much as 50 percent. Norway and Sweden receive acid pollutants from Britain, Germany, Poland, and Russia. The majority of acid pollution in Japan comes from China. Debates about responsibilities and cleanup costs for acid pollutants led to international cooperation. In 1988, as part of the Long-Range Transboundary Air Pollution Agreement sponsored by the United Nations, the United States and 24 other nations ratified a protocol promising to hold yearly nitrogen oxide emissions at or below 1987 levels. In 1991 the United States and Canada signed an Air Quality Agreement setting national limits on annual sulfur dioxide emissions from power plants and factories. In 1994 in Oslo, Norway, 12 European

nations agreed to reduce sulfur dioxide emissions by as much as 87 percent by 2010.

Legislative actions to prevent acid rain have results. The targets established in laws and treaties are being met, usually ahead of schedule. Sulfur emissions in Europe decreased by 40 percent from 1980 to 1994. In Norway sulfur dioxide emissions fell by 75 percent during the same period. Since 1980 annual sulfur dioxide emissions in the United States have dropped from 26 million tons to 18.3 million tons. Canada reports sulfur dioxide emissions have been reduced to 2.6 million tons, 18 percent below the proposed limit of 3.2 million tons.

Monitoring stations in several nations report that precipitation is actually becoming less acidic. In Europe, lakes and streams are now growing less acid. However, this does not seem to be the case in the United States and Canada. The reasons are not completely understood, but apparently, controls reducing nitrogen oxide emissions only began recently and their effects have yet to make a mark. In addition, soils in some areas have absorbed so much acid that they contain no more neutralizing alkaline chemicals. The weathering of rock will gradually replace the missing alkaline chemicals, but scientists fear that improvement will be very slow unless pollution controls are made even stricter.

QUESTIONS 27-31

Complete the table below. Write a date for each answer. The first one has been done as an example for you. Write your answers in boxes headed DATE.

QUESTION	EVENT	DATE
EXAMPLE	Passage of the Clean Air Act	1970
27	Amendments to the Clean Air Act	
28	Long-Range Transboundary Air Pollution Agreement	
29	Air Quality Agreement between Canada and the United States	
30	40% decrease in sulfur emissions in Europe	
31	European nations agreement to reduce sulfur dioxide by 87%	

QUESTIONS 32-36

Do the following statements reflect the claims of the writer of the Reading Passage? In boxes headed Answer, mark

- (r) if the statement reflects the writer's claims
- (w) if the statement does not reflect the writer's claims
- (n) if the information is not given in the passage

Now answer questions 32 – 36. (as indicated by the example).

STATEMENTS	ANSWER
EXAMPLE The Clean Air Act sets general standards for acceptable levels of pollution in the air.	● (w) (n)
32) The Clean Air Act has succeeded in eliminating air pollutants.	(r) (w) (n)
33) Attemts to curtail acid rain have been successful.	(r) (w) (n)
34) Alkaline chemicals are best for controlling acid rain.	(r) (w) (n)
35) Stricter control of pollution can prevent Ozone layer depletion.	(r) (w) (n)
36) Controlling power plants in eastern and midwestern regions of the United States can prevent acid rain in the rest of the world.	(r) (w) (n)

QUESTIONS 37-40

Complete each of the following statements with a name from the Reading Passage. Write your answers in boxes below.

QUESTION	YOUR ANSWER
37	
38	
39	
40	

37) The **…** was passed to improve air quality and to reduce or eliminate certain air pollutants in the United States.

38) Legislation enacted in **…** restricts the annual amount of sulfur dioxide emissions in the seven easternmost provinces of the country.

39) To encourage cleanup, **…** collects a hefty tax from industries that emit acid pollutants.

40) Twelve European nations agreed in **…** to reduce sulfur dioxide emissions by 2010.

UNIT THIRTEEN

SECTION 1: QUESTIONS 1-13

QUESTIONS 1-5

Look at the information below about METHANE-ICE HOME.

mark ⓣ If the statement is true
ⓕ If the statement is false
ⓝ If the information is not given in the passage

EXAMPLE	ANSWER
Methane ice is a crystalline compound composed of frozen gas and water ice.	● ⓕ ⓝ

Now answer the following questions:

1) Johnson Sea Link is the name of submarine designed to probe the deep floors of oceans.	ⓣ ⓕ ⓝ
2) Worms that live in methane-ice mounds cannot live individually.	ⓣ ⓕ ⓝ
3) The existence of worms in methane-ice mounds is indicative of the existence of other life forms in or on these mounds.	ⓣ ⓕ ⓝ
4) The microorganisms that live on methane-ice mounds function as food for the worms that live inside.	ⓣ ⓕ ⓝ
5) Woms living in methane-ice mounds can tolerate very cold temperatures.	ⓣ ⓕ ⓝ

METHANE-ICE HOME

In the cold, deep waters about five hundred meters below the surface of the Gulf of Mexico, a hardy type of worm lives in mounds of frozen methane. These worms appear to be of a previously unidentified species. The discovery represented the first time researchers have found animals living in methane-ice mounds. Methane ice is a type of gas hydrate, a crystalline compound composed of frozen gas and water ice.

The research team found the worms while exploring the seafloor with the manned deep-sea submersible Johnson Sea Link. The worms were about three to five cm long and appeared in thick colonies on and in the ice. Although the worms were the first living creature to be found in this extreme environment, scientists suspect that some sort of microorganisms exist on the ice. The worms, which must be finding some sort of food to survive, also provide indirect evidence for the existence of such microorganisms.

QUESTIONS 6-13

Look at RED TIDES below.

Match each of the following sentences with TWO possible endings A-M from the box below.

EXAMPLE	ANSWER
Red tides have occurred …	**A and M**

Write the appropriate letters A-M in boxes headed Answer.

QUESTIONS		ANSWER
6 & 7	Red tides can sometimes …	
8 & 9	Thr Red Tide of the 1946 …	
10 & 11	The high protein content of plankton …	
12 & 13	Dinoflagellates of various species …	

POSSIBLE ENDINGS

A	off the west coast of Florida.
B	even by the largest mammal, the blue whale.
C	killed many different marine organisms.
D	has stimulated research on it.
E	drifts on or near the surface of the water.
F	occurred in the Gulf of Mexico near Fort Myers, Florida.
G	are unicellular aquatic organisms.
H	poison both humans and fish.
I	makes it a potential food source for humans.
J	sometimes cause red tides.
K	ninety percent of all photosynthesis.
L	be really dangerouos.
M	in the coastal waters of New England.

RED TIDES

Plankton is a collective term for a variety of marine and freshwater microscopic organisms that drift on or near the surface of the water. Plankton is of two types: phytoplankton, and zooplankton. Marine phytoplankton is the first link in the vast aquatic food chain. The zooplankton, which feeds on the phytoplankton, is consumed in turn by larger animals such as fish and even by the largest mammal, the blue whale. An estimated ninety percent of all photosynthesis and release of free oxygen takes place in the oceans. The high protein content of plankton has stimulated research on it as a potential food source for humans.

The density of plankton varies, depending on the availability of nutrients and the stability of the water. A liter of lake water may contain more than 500 million planktonic organisms. Marine plankton occasionally becomes so numerous that the organisms color the water. Such sudden population increases are called tides.

Plankton can sometimes be deadly. The so-called red tides are caused by billions of dinoflagellates—unicellular aquatic organisms—of various

species. Such tides are sometimes dangerous, because they can poison both humans and fish. Red tides have occurred off the west coast of Florida and in the coastal waters of New England, southern California, Texas, Peru, eastern Australia, Chile, and Japan. In 1946 such a tide killed fish, turtles, oysters, and other marine organisms in the Gulf of Mexico near Fort Myers, Florida.

SECTION 2: QUESTIONS 14-27

QUESTIONS 14-20

Look at MANATEE DIE-OFF below and at the following statements.

mark ⓣ If the statement is true

ⓕ If the statement is false

ⓝ If the information is not given in the passage

Now answer the following questions:

14)	Manatees have the distinction of being designated Florida's state marine mammal because their pictures appear on the flags of the statet of Florida.	ⓣ ⓕ ⓝ
15)	Manatee is common name for the three species of large walrus-like water mammals popularly called sea cows.	ⓣ ⓕ ⓝ
16)	Toxins produced by red tide can sometimes result in a die-off of some marine species.	ⓣ ⓕ ⓝ
17)	The warmer the sea water, the more probable the prolifration of dinoflagellates and the more frequent the red tides.	ⓣ ⓕ ⓝ
18)	Manatees live in small family groups, although they occasionally travel in herds of fifteen to twenty.	ⓣ ⓕ ⓝ
19)	It is easy to detect the presence of toxins in sea water because the concentration of dinoflagellates in the sea can turn seawater a muddy red color.	ⓣ ⓕ ⓝ
20)	Manatees graze on marine grasses and other water plants.	ⓣ ⓕ ⓝ

MANATEE DIE-OFF

Manatee is common name for each of three species of a large walrus-like water mammal popularly called a sea cow. This mammal grazes on marine grasses and other water plants. They live in small family groups, although they occasionally travel in herds of fifteen to twenty. Manatees are characterized by two front flippers and bristly muzzle hairs. These portly marine mammals can grow to four meters in length, weigh up to a metric ton, and consume about 45 kg of seaweed a day. They inhabit sea grassbeds in shallow inlets along the Gulf and Atlantic coasts and have the distinction of being designated Florida's state marine mammal. Manatees die because of red tides, habitat destructions, and collisions with boats.

Scientists have concluded that a die-off of West Indian manatees in southwest Florida in 1996 was due to a toxin produced by red tide. The die-off began in March 1996 and continued through the end of April. It left 158 of these creatures dead, and has been characterized as the largest and most sudden to affect an endangered species in the United States.

Four months of studying blood, tissue, and organ samples taken from affected manatees led scientists at the Florida Marine Research Institute in St. Petersburg to conclude that the endangered creatures died as a result of consuming sea grasses that were contaminated with high levels of red tide toxin. Red tide occurs when single-celled organisms called dinoflagellates proliferate in seawater, usually warm seawater. Toxic substances released by these organisms are lethal to fish and marine life. It is easy to detect the presence of red tide toxins because of their ability to turn seawater a muddy red color. Although the toxins are not lethal to humans, they can render contaminated mollusks poisonous to those who eat them.

Scientists believe that the colder-than-usual temperatures of the 1995 winter compelled the manatees to seek warmer feeding grounds along Florida's southwest coast, where red tide concentrations were the severest since 1982, a year in which another manatee die-off occurred. The 1982 red tide event killed at least 37 of the marine animals. While scientists have pinpointed red tide toxin as the cause of the 1996 die-off, there is very little they can do. Red tide is a naturally occurring, unpredictable event.

QUESTIONS 21-26

Look at RED TIDES WORLDWIDE below. From the following list (i-xi) choose the most suitable summaries for the paragraphs A, C, and E-H.

Write the appropriate numbers (i-xi) in boxes headed Answer.

i	Causes of Red Tides
ii	How Red Tides Form
iii	Red Tides in China
iv	Chilean Red Tide
v	Measures Against Red Tides
vi	Impacts of Red Tides on Fishing Industry
vii	Scope of Red Tides
viii	Effects of Red Tides
ix	Zooplankton versus Phytoplankton
x	Cysts and Red Tides
xi	Red Tides Worldwide

NB There are more summaries than paragraphs, so you will not use them all. (Two examples are provided.)

QUESTIONS	PARAGRAPHS	ANSWER
21	Paragraph **A**	
EXAMPLE	Paragraph **B**	**xi**
22	Paragraph **C**	
EXAMPLE	Paragraph **D**	**i**
23	Paragraph **E**	
24	Paragraph **F**	
25	Paragraph **G**	
26	Paragraph **H**	

RED TIDES WORLDWIDE

A

In 1995, a toxic strain of red tide in the Strait of Magellan, located off the coast of Punta Arenas, Chile, led to 15 deaths and hundreds of hospitalizations. It virtually shut down the once booming commercial fishing industry and the unrestricted harvesting of shellfish in the region.

B

The Chilean experience is far from unique. Over the last two decades, red tides have been increasing worldwide. Since the 1970s, toxic red tides have been reported off the coasts of the United States, Sweden, Norway, Spain, Japan, and China. Moreover, new types of organisms are being identified.

C

Red tides result from a massive buildup of certain species of the microscopic sea organisms known as phytoplankton, some of which are toxic. Heavy concentrations of both toxic and nontoxic phytoplankton blooms can lend a reddish-brown tint to the surrounding water. Contamination can occur even without visible discoloration.

D

Some scientists think red tides result from rising pollution levels, natural changes in the environment, and climate may cause red tides. Others, however, caution against assuming the existence of a global epidemic of red tides. They note that the apparent increase could be the result of using technologically advanced monitoring equipment and increased scientific awareness.

E

In the absence of sunlight and nutrients, phytoplankton change into cysts. Cysts remain dormant on the ocean floor for years. When favorable growth conditions return, cysts become swimming cells and take advantage of the new conditions to produce a bloom. They can account for the recurring and often perennial nature of red tides.

F

Different species of phytoplankton produce different types and combinations of toxins that build up in shellfish. People who eat the contaminated seafood can fall victim to various kinds of poisoning,

depending on which poisons have accumulated. The most common types of shellfish poisoning are diarrhetic, paralytic, and neurotoxic.

G

The amount of destruction caused by toxic red tides varies. In countries with advanced monitoring technologies, cases of human sickness or death are rare. Instances of human illness and death are much higher in developing countries, especially those where seafood is a dietary staple. Red tides can also cause extensive fish kills and devastate a country's fishing and tourism industries.

H

While industrialized countries are adept at monitoring red tides, they have not yet discovered a way to neutralize their harmful effects or to eradicate their toxic blooms. Moreover, many scientists view the blooms as a natural part of the ocean environment; they are reluctant to interfere with a phenomenon whose role in the ecosystem remains unclear. As such, affected countries are forced to wait for the blooms to disappear. In the meantime, they hope people will heed official warnings against harvesting shellfish.

SECTION 3: QUESTIONS 27-40

Read the following passage and answer questions 27-40.

THE BIODIVERSITY ISSUE

Each spring vast flocks of songbirds migrate north from Mexico to the United States, but since the 1960s their numbers have fallen by up to 50 percent. Frog populations around the world have declined in recent years. The awe-inspiring California condor survives today only because of breeding programs in zoos. Indeed, plant and animal species are disappearing from the earth at an alarming rate, and many scientists believe that human activity is largely responsible. Biodiversity, or the biological variety that thrives in a healthy ecosystem, became the focus of intense international concern during the 1990s. If present trends continue, Harvard University biologist Edward O. Wilson, one of the leading authorities on biodiversity, estimates that the world could lose 20 percent of all existing species by the year 2020.

Biodiversity has become such a vogue word that academics have begun to take surveys of scientists to find out what they mean by it. For Adrian Forsyth, director of conservation biology for Conservation International,

biodiversity is the totality of biological diversity from the molecular level to the ecosystem level. That includes the distinct species of all living things on Earth. Scientists have identified 1.4 million species, but no one knows how many actually exist, especially in hard-to-reach areas such as the deep heart of a rain forest or the bottom of an ocean. Biologists believe there may be 5 million to 10 million species, though some estimates run as high as 100 million.

Habitat destruction as a result of people's use or development of land is considered the leading threat to biodiversity. For example, habitat loss is thought to be causing severe drops in the populations of migratory songbirds in North America, perhaps as much as 50 percent since the 1960s. Scientists studying songbirds that migrate from warm winter quarters in the southern United States, Mexico, and Central America to summer nesting grounds in the northern United States and Canada have found that the birds are losing habitat at both ends of their long journey. In the tropics forests are being cleared for agriculture, and in the north they are being cut down for roads, shopping centers, and housing subdivisions. As a result, bird censuses in the United States have shown a 33 percent decline in the population of rose-breasted grosbeaks since 1980.

Another cause of the decline in biodiversity is the introduction of new species. Sometimes a new species is brought to an area intentionally, but sometimes it happens accidentally. In Illinois the native mussel populations in the Illinois River have fallen drastically since the 1993 summer flooding washed large numbers of zebra mussels into the river from Lake Michigan. Zebra mussels, native to the Caspian Sea, were inadvertently introduced to the Great Lakes, probably in the mid-1980s, by oceangoing cargo ships.

Pollution is yet another threat to plants and animals. The St. Lawrence River, one habitat of the endangered beluga whale, drains the Great Lakes, historically one of the most industrialized regions in the world. The whales now have such high levels of toxic chemicals stored in their bodies that technically they qualify as hazardous waste under Canadian law.

The effects of pollution can be very subtle and hard to prove because often the toxins do not kill animals outright but instead impair their natural defenses against disease or their ability to reproduce. Habitat loss is thought to be one reason for the decline in frog populations worldwide, because frogs live in wetlands, many of which have been filled in over the years for agriculture and development. But researchers

theorize that another possible cause is increased exposure to ultraviolet radiation from the Sun as a result of the thinning of the atmosphere's ozone layer; the increased dose of ultraviolet radiation may be suppressing the frogs' immune systems, making them more vulnerable to a wide range of diseases.

Of all the causes of species extinction and habitat loss, the one that seems to be at the heart of the matter is the size of the population of just one species, Homo sapiens. In 1994 the world population was estimated at more than 5.6 billion, more than double the number in 1950. With a larger population come increased demands for food, clothing, housing, and energy, all of which will likely lead to greater habitat destruction, more pollution, and less biological diversity. The number of people in the world continues to grow, but there is evidence that the population of the industrialized nations has more or less stabilized. That's important because although the population of these countries makes up only 25 percent of the world total, the developed world consumes 75 percent of the world's resources. The United Nations is treating the increase in the world's population as a serious matter. A 1994 UN-sponsored conference on population produced a 113-page plan to stabilize the number of people in the world at 7.27 billion by 2015. Otherwise, the UN feared, world population could mushroom to 12.5 billion by 2050.

QUESTIONS 27-31

Complete the table below. Write a date for each answer. The first one has been done as an example for you. Write your answers in boxes headed DATE.

QUESTION	EVENT	DATE
EXAMPLE	113-page plan to stabilize world population by a UN-sponsored conference	1994
27	loss of 20% of all existing species	
28	Biodiversity as an international concern	
29	50% decrease in migration of songbirds to the United States	
30	Estimation of world population at more than 5.6 billion heads	
31	world population at 12.5 billion heads	

QUESTIONS 32-36

Do the following statements reflect the claims of the writer of the Reading Passage? In boxes headed Answer, mark

- (r) if the statement reflects the writer's claims
- (w) if the statement does not reflect the writer's claims
- (n) if the information is not given in the passage

Now answer questions 32 – 36. (as indicated by the example).

	STATEMENTS	ANSWER
EXAMPLE	Human population growth is the main cause of biodiversity.	● (w) (n)
32)	There is no one single definition for biodiversity.	(r) (w) (n)
33)	Use or development of land can accelerate the rate at which spicies are disppearing from the face of earth.	(r) (w) (n)
34)	habitat loss is the main cause of drops in the populations of songbirds in North America.	(r) (w) (n)
35)	Human introduction of new species to aregion affects biodiversity in that region.	(r) (w) (n)
36)	The effects of pollution on biodiversity are gradual.	(r) (w) (n)

QUESTIONS 37-40

Complete each of the following statements with a name from the Reading Passage. Write your answers in boxes below.

QUESTION	YOUR ANSWER
37	
38	
39	
40	

37) Each spring vast flocks of songbirds migrate north from **…** to the United States

38) The awe-inspiring **…** survives today only because of breeding programs in zoos.

39) Harvard University biologist **…** estimates that the world may lose twenty percent of all existing species soon.

40) For **…**, biodiversity is the totality of biological diversity from the molecular level to the ecosystem level.

UNIT FOURTEEN

SECTION 1: QUESTIONS 1-13

QUESTIONS 1-5

Look at the information below about AIDS.

mark ⓣ If the statement is true
ⓕ If the statement is false
ⓝ If the information is not given in the passage

EXAMPLE	ANSWER
AIDS is the acronym for Acquired Immunodeficiency Syndrome.	● ⓕ ⓝ

Now answer the following questions:

1) AIDS itself is not a disease but is rather a syndrom that paves the way for other diseases to kill human beings.	ⓣ ⓕ ⓝ
2) AIDS is species-specific—in the sense that only human beings are affected by it.	ⓣ ⓕ ⓝ
3) A person who is suffering from AIDS will eventually die as a result of opportunistic infections or rare cancers.	ⓣ ⓕ ⓝ
4) Human immune system can resist almost all opportunistic infections unless it is weakened by HIV.	ⓣ ⓕ ⓝ
5) The degree to which HIV can harm human beings depends on their dietary habits.	ⓣ ⓕ ⓝ

AIDS

Acquired Immunodeficiency Syndrome (AIDS) is a human viral disease that ravages the immune system, undermining the body's ability to defend itself from infection and disease. Caused by the human immunodeficiency virus (HIV), AIDS leaves an infected person vulnerable to opportunistic infections and rare cancers. Opportunistic infections are harmless in healthy people, but in those whose immune systems have been greatly weakened, they tax the weakened immune system, and prove fatal.

Although there is no cure for AIDS, new drugs are available that can prolong the life spans and improve the quality of life of infected people. Infection with HIV does not necessarily mean that a person has AIDS. Some people who have HIV infection may not develop any of the clinical illnesses that define the full-blown disease of AIDS for ten years or more. Physicians prefer to use the term *AIDS* for cases where a person has reached the final, life-threatening stage of HIV infection.

QUESTIONS 6-13

Look at HOW HIV WORKS below.

Match each of the following sentences with TWO possible endings A-M from the box below.

EXAMPLE	ANSWER
When the density of CD4 cells in blood drops …	**A and M**

Write the appropriate letters A-M in boxes headed Answer.

QUESTIONS		ANSWER
6 & 7	AIDS is the result of …	
8 & 9	When HIV infects a CD4 cell, it …	
10 & 11	The human immunodeficiency virus (HIV) …	
12 & 13	White blood cells of the immune system known as T cells …	

POSSIBLE ENDINGS

A the body becomes vulnerable to opportunistic infections.

B a chronic infection with the human immunodeficiency virus.

C destroying the CD4 cell in the process.

D commandeers the genetic tools within the cell.

E destroys the CD4 cells.

F attacks any cell.

G are especially vulnerable to HIV attack.

H manufactures new HIV viruses.

I orchestrate a wide variety of disease-fighting mechanisms.

J binds only with a specific structure.

K two common types of retroviruses called HIV1 and HIV2.

L weakens immune defenses to cause AIDS.

M other types of immune cells cannot easily respond to invading organisms.

HOW HIV WORKS

AIDS is the final stage of a chronic infection with the human immunodeficiency virus. There are two types of this virus: HIV-1, the primary cause of AIDS worldwide, and HIV-2, found mostly in West Africa. On its surface, HIV carries a protein structure that recognizes and binds only with a specific structure found on the outer surface of certain cells. HIV attacks any cell that has this binding structure. However, white blood cells of the immune system known as T cells, which orchestrate a wide variety of disease-fighting mechanisms, are especially vulnerable to HIV attack. Particularly vulnerable are certain T cells known as CD4 cells. When HIV infects a CD4 cell, it commandeers the genetic tools within the cell to manufacture new HIV viruses. The newly formed HIV virus then leaves the cell, destroying the CD4 cell in the process.

The loss of CD4 cells endangers health because these immune cells help other types of immune cells respond to invading organisms. The average healthy person has over 1,000 CD4 cells per microliter of blood. In a person infected with HIV, the virus steadily destroys CD4 cells over

a period of years, diminishing the cells' protective ability and weakening the immune system. When the density of CD4 cells drops to 200 cells per microliter of blood, the infected person becomes vulnerable to opportunistic infections and rare cancers, which take advantage of the weakened immune defenses to cause disease.

SECTION 2: QUESTIONS 14-27

QUESTIONS 14-20

Look at PREVALENCE OF AIDS below and at the following statements.

mark ⓣ If the statement is true

ⓕ If the statement is false

ⓝ If the information is not given in the passage

Now answer the following questions:

14)	Heterosexual men, women, and children in sub-Saharan Africa hosted the HIV virus for thousands of years.	ⓣ ⓕ ⓝ
15)	Life expectancy rate is the technical term used to refer to the number of years people in a given nation can age on the average.	ⓣ ⓕ ⓝ
16)	War, political upheaval, and unrelenting poverty are the prerequisites for an epidemic of AIDS to become critical.	ⓣ ⓕ ⓝ
17)	Homosexual men and intravenous drug users in New York and California intentionally passed the HIV virus to other people to ease their own psychological pains.	ⓣ ⓕ ⓝ
18)	The dissolution of the Union of Soviet Socialist Republics (USSR) in 1991 has spurred the spread of AIDS in several eastern European countries.	ⓣ ⓕ ⓝ
19)	The war in Chechnya has blocked the spread of AIDS from Russia to Iran.	ⓣ ⓕ ⓝ
20)	The HIV virus can lie dormant at the bottom of seas and oceans for several years.	ⓣ ⓕ ⓝ

PREVALENCE OF AIDS

AIDS was first identified in 1981 among homosexual men and intravenous drug users in New York and California. Shortly after its detection in the United States, evidence of AIDS epidemics grew among heterosexual men, women, and children in sub-Saharan Africa. It quickly developed into a worldwide epidemic, affecting virtually every nation. By 2002 an estimated 38.6 million adults and 3.2 million children worldwide were living with HIV infection or AIDS.

In the United States about 40,000 new HIV infections occur each year. More than 30 percent of these infections occur in women, and 60 percent occur in ethnic minorities. In 2001 more than 800,000 U.S. residents were infected with HIV, and more than 300,000 people were living with full-blown AIDS. In Canada about 4,200 new HIV infections occur each year. Nearly 25 percent of these infections occur in women. In 2002 about 55,000 Canadians were living with HIV infection and about 18,000 people were living with full-blown AIDS.

In western Europe the first cases of AIDS were detected in the early 1980s, and by the late 1990s, at least 30,000 new HIV infections occurred each year. In 2002 about 570,000 western Europeans were HIV positive, and 25 percent of these cases were women. Before the dissolution of the Union of Soviet Socialist Republics (USSR) in 1991, eastern Europe reported few HIV cases. But since 1995, HIV infection has spread rapidly in cities of several eastern European countries. The WHO estimates that the total number of HIV infections in this region may have risen from less than 30,000 in 1995 to about 1 million in 2002.

While cases of AIDS have been reported in every nation of the world, the disease affects some countries more than others. More than 95% of all HIV-infected people live in the developing world. In these areas, the disease has sapped the populations of young men and women who form the foundation of the labor force. Most die while in the peak of their reproductive years. Moreover, the epidemic has overwhelmed health-care systems, increased the number of orphans, and caused life expectancy rates to plummet. These problems have reached crisis proportions in some parts of the world already burdened by war, political upheaval, or unrelenting poverty. Nowhere is this better demonstrated than in sub-Saharan Africa.

QUESTIONS 21-26

Look at HOW HIV INFECTION SPREADS below. From the following list (i-xi) choose the most suitable summaries for the paragraphs A, C, and E-H.

Write the appropriate numbers (i-xi) in boxes headed Answer.

i	Blood Transfusion
ii	Sharing a Bath
iii	Organ Donations
iv	Misperceptions About HIV Transmission
v	Mother-to-Child Transmission
vi	Unknown Causes of AIDS
vii	Medical Personnel Infection
viii	Breastfeeding
ix	Using the Same Dishes
x	Sex with an Infected Person
xi	Contact with Infected Blood

NB There are more summaries than paragraphs, so you will not use them all. (Two examples are provided.)

QUESTIONS	PARAGRAPHS	ANSWER
21	Paragraph **A**	
EXAMPLE	Paragraph **B**	**xi**
22	Paragraph **C**	
EXAMPLE	Paragraph **D**	**i**
23	Paragraph **E**	
24	Paragraph **F**	
25	Paragraph **G**	
26	Paragraph **H**	

HOW HIV INFECTION SPREADS

A

HIV transmission occurs most commonly during intimate sexual contact with an infected person, including genital, anal, and oral sex. The virus is present in the infected person's semen or vaginal fluids. During sexual intercourse, the virus gains access to the bloodstream of the uninfected person by passing through openings in the mouth, vagina, and rectum, and through breaks in the skin of the penis.

B

Direct contact with HIV-infected blood occurs when people who use heroin or other injected drugs share hypodermic needles or syringes contaminated with infected blood. Sharing of contaminated needles among intravenous drug users is the primary cause of HIV infection in most countries.

C

Less frequently, HIV infection results when health professionals accidentally stick themselves with needles containing HIV-infected blood. Infection also occurs if an open cut is exposed to contaminated blood.

D

Some cases of HIV transmission from transfusions of infected blood and blood components were reported in the 1980s. HIV infection can happen if donated blood is not screened for the presence of HIV before being used in medical procedures. By some estimates only 25 percent of blood transfusions are screened for the presence of HIV in sub-Saharan Africa. WHO hopes to establish blood safety programs in more than 80 percent of sub-Saharan countries.

E

Organ donations are another source of HIV infection. In most countries, HIV transmission caused by contaminated organ donations is rare. However, the problem continues to concern health officials in sub-Saharan Africa.

F

HIV can be transmitted from an infected mother to her baby while the baby is still in the woman's uterus or, more commonly, during childbirth. Since the fetus is connected to the mother through placenta, HIV can pass to the fetus from the mother. Therefore, the baby will be infected.

G

The virus can also be transmitted through the mother's breast milk during breastfeeding. Mother-to-child transmission accounts for almost 90 percent of all cases of AIDS in children. Mother-to-child transmission is particularly prevalent in Africa, where the number of women infected with HIV is ten times the rate found in other regions.

H

The routes of HIV transmission are well documented by scientists, but health officials continually grapple with the public's unfounded fears concerning the potential for HIV transmission by other means. HIV differs from other infectious viruses in that it dies quickly if exposed to the environment. No evidence has linked HIV transmission to casual contact with an infected person, such as a handshake, hugging, or kissing, or even sharing dishes or bathroom facilities. Studies have been unable to identify HIV transmission from modes common to other infectious diseases, such as an insect bite or inhaling virus-infected droplets from an infected person's sneeze or cough.

SECTION 3: QUESTIONS 27-40

Read the following passage and answer questions 27-40.

AIDS: SOCIAL AND ETHICAL ASPECTS

Although new and effective AIDS drugs have brought hope to many HIV-infected persons, a number of social and ethical dilemmas still confront researchers and public-health officials. The latest combination drug therapies are far too expensive for infected persons in the developing world—particularly in sub-Saharan Africa, where the majority of AIDS deaths have occurred. In these regions, where the incidence of HIV infection continues to soar, the lack of access to drugs can be catastrophic. In 1998, responding to an international outcry, several pharmaceutical firms announced that they would slash the price of AIDS drugs in developing nations by as much as 75 percent. However, some countries argued that drug firms had failed to deliver on their promises of less expensive drugs. In South Africa government officials developed legislation that would enable the country to override the patent rights of drug firms by importing cheaper generic medicines made in India and Thailand to treat HIV infection. In 1998, 39 pharmaceutical companies sued the South African government on the grounds that the legislation violated international trade agreements. Pharmaceutical companies

eventually dropped their legal efforts in April 2001, conceding that South Africa's legislation did comply with international trading laws. The end of the legal battle was expected to pave the way for other developing countries to gain access to more affordable AIDS drugs.

AIDS research in the developing world has raised ethical questions pertaining to the clinical testing of new therapies and potential vaccines. For example, controversy erupted over 1997 clinical trials that tested a shorter course of Zidovudine (or AZT) therapy in HIV-infected pregnant women in developing countries. Earlier studies had shown that administering AZT to pregnant women for up to six months prior to birth could cut mother-to-child transmission of HIV by up to two-thirds. The treatment's $800 cost, however, made it too expensive for patients in developing nations.

The controversial 1997 clinical trials, which were conducted in Thailand and other regions in Asia and Africa, tested a shorter course of AZT treatment, costing only $50. Some pregnant women received AZT, while others received a placebo—a medically inactive substance often used in drug trials to help scientists determine the effectiveness of the drug under study. Ultimately the shorter course of AZT treatment proved to be successful and is now standard practice in a growing number of developing nations. However, at the time of the trials, critics charged that using a placebo on HIV-infected pregnant women—when AZT had already been shown to prevent mother-to-child transmission—was unethical and needlessly placed babies at fatal risk. Defenders of the studies countered that a placebo was necessary to accurately gauge the effectiveness of the AZT short-course treatment. Some critics speculated whether such a trial, while apparently acceptable in the developing nations of Asia and Africa, would ever have been viewed as ethical, or even permissible, in a developed nation like the United States.

Similar ethical questions surround the testing of AIDS vaccines in developing nations. Vaccines typically use weakened or killed HIV to spark antibody production. In some vaccines, these weakened or killed viruses have the potential to cause infection and disease. Critics questioned whether it is ethical to place all the risk on test subjects in developing regions such as sub-Saharan Africa, where a person infected by a vaccine would have little or no access to medical care. At the same time, with AIDS causing up to 5,500 deaths a day in Africa, others feel that developing nations must pursue any medical avenue for stemming the epidemic and protecting people from the virus.

For the struggling economies of some developing nations, AIDS has brought yet another burden: AIDS tends to kill young adults in the prime of their lives—the primary breadwinners and caregivers in families. According to figures released by the United Nations in 1999, AIDS has shortened the life expectancy in some African nations by an average of seven years. In Zimbabwe, life expectancy has dropped from 61 years in 1993 to 49 in 1999. The next few decades may see it fall as low as 41 years. Upwards of 11 million children have been orphaned by the AIDS epidemic. Those children who survive face a lack of income, a higher risk of malnutrition and disease, and the breakdown of family structure.

In Africa, the disease has had a heavy impact on urban professionals—educated, skilled workers who play a critical role in the labor force of industries such as agriculture, education, transportation, and government. The decline in the skilled workforce has already damaged economic growth in Africa, and economists warn of disastrous consequences in the future.

The social, ethical, and economic effects of the AIDS epidemic are still being played out, and no one is certain what the consequences will be. Despite the many grim facts of the AIDS epidemic, however, humanity is armed with proven, effective weapons against the disease: knowledge, education, prevention, and the ever-growing store of information about the virus's actions.

QUESTIONS 27-31

Complete the table below. Write a date for each answer. The first one has been done as an example for you. Write your answers in boxes headed DATE.

QUESTION	EVENT	DATE
EXAMPLE	Pharmaceutical firms' decision to slash the price of AIDS drugs	1998
27	Controversial clinical trials of AZT	
28	Life expectancy of 61 years in Zimbabwe	
29	AIDS drug companies' suing South Africa	
30	Life expectancy of 49 years in Zimbabwe	
31	AIDS drug companies' dropping their legal efforts against South African government	

QUESTIONS 32-36

Do the following statements reflect the claims of the writer of the Reading Passage? In boxes headed Answer, mark

- (r) if the statement reflects the writer's claims
- (w) if the statement does not reflect the writer's claims
- (n) if the information is not given in the passage

Now answer questions 32 – 36. (as indicated by the example).

	STATEMENTS	ANSWER
EXAMPLE	The shorter course of AZT treatment for HIV infection has proved to be successful.	● (w) (n)
32)	AIDS has social, ethical, and economic effects.	(r) (w) (n)
33)	Life expectancy in Zimbabwe will fall below 40 years soon.	(r) (w) (n)
34)	Political upheaval in one part of the world may block the passage of HIV to other parts.	(r) (w) (n)
35)	It is never possible to find a cure for AIDS due to the strange mutational behavior of HIV virus.	(r) (w) (n)
36)	No one is certain what the social, ethical, and economic consequences will be.	(r) (w) (n)

QUESTIONS 37-40

Complete each of the following statements with a name from the Reading Passage. Write your answers in boxes below.

QUESTION	YOUR ANSWER
37	
38	
39	
40	

37) Clinical trials tested a shorter course of **…** therapy in HIV-infected pregnant women in developing countries.

38) Critics questioned whether it is ethical to place all the risk on test subjects in developing regions such as **….**

39) The decline in the skilled workforce due to AIDS has already damaged economic growth in **….**

40) In South Africa government officials decided to importing cheaper generic medicines made in India and **…** to treat HIV infection.

UNIT FIFTEEN

SECTION 1: QUESTIONS 1-13

QUESTIONS 1-5

Look at the information below about MARS.

mark (t) If the statement is true
(f) If the statement is false
(n) If the information is not given in the passage

EXAMPLE	ANSWER
The force of gravity on the surface of Mars is about one-third of that on Earth.	● (f) (n)

Now answer the following questions:

1)	Sol is the name commonly used to refer to the Martian day.	(t) (f) (n)
2)	While Phobos appears to rise in the west and set in the east, Deimos rises in the east and sets in the west.	(t) (f) (n)
3)	The moons of Mars have taken their names from the names of the dogs of the Roman god Mars.	(t) (f) (n)
4)	The moons of Mars are heavily cratered because of the many meteors that hit them on a regular basis.	(t) (f) (n)
5)	The moons of Mars are in fact two large asteroids captured by the gravitational pull of Mars.	(t) (f) (n)

MARS

Mars is a small planet, with about half the diameter of Earth and about one-tenth Earth's mass. The force of gravity on the surface of Mars is about one-third of that on Earth. Mars has twice the diameter and twice the surface gravity of Earth's Moon. The surface area of Mars is almost exactly the same as the surface area of the dry land on Earth.

The Martian day is about a half an hour longer than an Earth day and is sometimes called a sol. Its year is about two Earth years long. Mars has two moons, Phobos and Deimos, which are named after the dogs of the Roman god Mars. These tiny bodies are heavily cratered dark chunks of rock and may be asteroids captured by the gravitational pull of Mars. Phobos appears to rise in the west and set in the east. Deimos rises in the east and sets in the west.

QUESTIONS 6-13

Look at EXPLORATION OF MARS below.

Match each of the following sentences with TWO possible endings A-M from the box below.

EXAMPLE	ANSWER
NASA and other space agencies will probably move forward with serious plans for the first human missions to Mars …	**A and M**

Write the appropriate letters A-M in boxes headed Answer.

QUESTIONS		ANSWER
6 & 7	In 2003 NASA's Mars Exploration Rover mission …	
8 & 9	Mars Reconnaissance Orbiter …	
10 & 11	A planned 2007 enhanced lander-and-rover mission …	
12 & 13	The first missions to retrieve samples from the surface of Mars …	

POSSIBLE ENDINGS

A after they analyze data from Sample-return missions.

B sent two rovers to separate landing sites on Mars.

C is planned to take place around the turn of the decade.

D requires appropriate landing sites.

E were based on the Mars.

F is scheduled to be launched by NASA in 2005.

G to allow them to traverse up to a hundred meters each day.

H tried to search for evidence of water and life on Mars.

I will follow the Mars Reconnaissance Orbiter of 2005.

J to study and map details of the surface and atmosphere.

K will perform high resolution imaging and atmospheric studies.

L will yield samples from Mars for examination on Earth.

M by the middle to end of the second decade of this century.

EXPLORATION OF MARS

The United States and other countries have planned an ambitious, long-term program of Mars exploration. In 2003 NASA's Mars Exploration Rover mission sent two rovers to separate landing sites on Mars to search for evidence of water and life that may be preserved in the geology, chemistry, and mineralogy of the surface. These rovers were based on the Mars Pathfinder Sojourner rover design, but with enhanced mobility to allow them to traverse up to a hundred meters per Martian day. Along the same lines, the European Space Agency (ESA), which is a consortium of fifteen European nations, planed to launch its own mission called Mars Express in 2003. The European mission included an orbiter to study and map details of the surface and atmosphere of Mars and a very small lander called Beagle 2.

NASA plans to launch the Mars Reconnaissance Orbiter in 2005 to perform even higher resolution imaging and atmospheric studies, partly to search for landing sites for a planned 2007 enhanced lander-and-rover mission. The lander-and-rover mission would be followed, probably

around the turn of the decade, by the first missions to retrieve samples from the surface of Mars for examination in laboratories on Earth. Sample-return missions could in turn provide data required before NASA and other space agencies would move forward with serious plans for the first human missions to Mars, perhaps by the middle to end of the second decade of this century.

SECTION 2: QUESTIONS 14-27

QUESTIONS 14-20

Look at THE ATMOSPHERE OF MARS below and at the following statements.

mark ⓣ If the statement is true

ⓕ If the statement is false

ⓝ If the information is not given in the passage

Now answer the following questions:

14)	The dry ice found on Mars during fall and winter is composed of carbon dioxide that has snowed out of the atmosphere as a result of a very low temerature.	ⓣ ⓕ ⓝ
15)	Clouds and frosts do not form on Mars due to the fact that the Martian atmosphere contains very little water vapor.	ⓣ ⓕ ⓝ
16)	Olympus Mons is the highest point on Mars while Hellas Planitia is the lowest point there.	ⓣ ⓕ ⓝ
17)	The dry ice evaporates back into the atmosphere as the surface of Mars warms up in the springtime	ⓣ ⓕ ⓝ
18)	Scientists claim that the atmosphere of Mars was much thicker long ago than it is now.	ⓣ ⓕ ⓝ
19)	Scientists believe that water exists as ice in the subsurface of Mars.	ⓣ ⓕ ⓝ
20)	The atmosphere of Mars consists for the most part of carbon dioxide.	ⓣ ⓕ ⓝ

THE ATMOSPHERE OF MARS

The atmosphere of Mars is 95 percent carbon dioxide, nearly three percent nitrogen, and nearly two percent argon with tiny amounts of oxygen, carbon monoxide, water vapor, ozone, and other trace gases. Atmospheric pressure on Mars changes with season. In the fall and winter at the poles of Mars, the temperature gets so low that carbon dioxide snows out of the atmosphere and forms meters-thick deposits of dry ice on the surface.

In the springtime as the surface warms up, the dry ice evaporates back into the atmosphere. The atmospheric pressure also varies with altitude just as it does here on Earth and is about ten times lower on the top of Olympus Mons than on the floor of Hellas Planitia.

Even though the Martian atmosphere contains very little water vapor, clouds and frosts form on Mars and have been studied in detail by telescopes and spacecraft. Wave clouds, spiral clouds, clouds formed near topographic obstacles such as volcanoes, wispy cirrus-like clouds, and a wide variety of hazes and fogs have all been observed. Along with the dust storms and related clouds described above, these features all reveal the Martian atmosphere to be quite dynamic.

Studies indicate that the atmosphere of Mars was much thicker long ago than it is now. A thicker atmosphere would have been able to trap more solar heat, possibly allowing the surface to warm up to the point where water could have remained liquid for long periods of time.

Scientists do not know, however, what the composition of this thicker atmosphere was, and where it went. They theorize that it may have been driven off in a catastrophic impact event, or that the gases reacted with water and got trapped in rocks and minerals on the surface. Scientists also wonder where the liquid water that formerly existed at the surface went.

Some astronomers believe that it seeped into the ground and is still there as ice in the subsurface today. Others think that it may have evaporated and slowly trickled off into space as sunlight broke apart the water vapor molecules over long periods of time. Determining the history of the Martian atmosphere and finding out whether sizable quantities of water still exist there are among the most important goals of Mars exploration today.

QUESTIONS 21-26

Look at WHITE AND BLACK DWARFS below. From the following list (i-xi) choose the most suitable summaries for the paragraphs A, C, and E-H.

Write the appropriate numbers (i-xi) in boxes headed Answer.

i	Death of Massive Stars
ii	Satr Sizes
iii	Formation of Black Dwarfs
iv	What is a white dwarf
v	Planets versus Stars
vi	How Small Stars Die
vii	Formation of Nebulas
viii	Formation of Black Holes
ix	Mass of Stars
x	Formation of White Dwarfs
xi	How Stars form

NB There are more summaries than paragraphs, so you will not use them all. (Two examples are provided.)

QUESTIONS	PARAGRAPHS	ANSWER
21	Paragraph **A**	
EXAMPLE	Paragraph **B**	**xi**
22	Paragraph **C**	
EXAMPLE	Paragraph **D**	**i**
23	Paragraph **E**	
24	Paragraph **F**	
25	Paragraph **G**	
26	Paragraph **H**	

WHITE AND BLACK DWARFS

A

A White Dwarf is an old star that has exhausted its available nuclear fuel and collapsed. However, it continues to radiate light from thermal energy trapped in it during its collapse. White dwarfs are the final luminous phase in the evolution of low-to-medium-mass stars.

B

To form a star, a cloud of interstellar hydrogen gas and dust particles condenses under the mutually attractive force of gravitation. The cloud's central temperature rises to cause hydrogen atoms to fuse to helium. Then, the resulting outward force of electromagnetic radiation and the inward gravitational force reach equilibrium, and the star stabilizes.

C

In small stars, the fusion of hydrogen to helium goes on until no hydrogen is left. Then, hydrogen fusion slows down and stops. As a result, The radiation released by fusion will dissipate, and the star will collapse under the gravitational pressure of its own weight. Small stars die because they will no longer support fusion reactions of any kind.

D

This is not the end for massive stars. Their collapse will compress the helium-enriched core enough to cause helium fusion. Depending on the mass of the star, it may go through many successive stages using helium and then heavier elements for fuel. They eventually reach a stage where they can no longer support fusion reactions of any kind, and die.

E

When a star is unable to sustain nuclear reactions, it collapses a final time. The mass of the core of collapsed stars vary greatly. If this mass is greater than the Chandrasekhar limit, the core will collapse into a neutron star or perhaps a black hole. Chandrasekhar limit is a critical value equal to the mass of about 1.4 suns.

F

Most stars that collapse, however, have cores with masses less than the Chandrasekhar limit. The cores of these stars collapse to an

intermediate state called a degenerate electron state. The degenerate electron core is known as a white dwarf.

G

Unlike the core, the outer envelope of the collapsed star is blown away during the process of collapse into a planetary nebula. A nebula is an expanding sphere of the gaseous and finely divided dust particles surrounding the collapsing star. Nebulas consist of up to 90 percent of the total mass of the original star.

H

Sizable white dwarfs have temperatures exceeding 80000° C. They glow with a brilliant blue-white color. They gradually lose energy and cool, slowly changing color from blue-white, to white, to yellow, to orange, and finally, to a dull red. White dwarfs at this stage have a temperature of about 4000° C. If a white dwarf cooled beyond this temperature, it would cease to emit visible light and would become a black dwarf.

SECTION 3: QUESTIONS 27-40

Read the following passage and answer questions 27-40.

MARINER SPACE PROBES

Mariner is the name of a series of ten United States space probes launched from 1962 to 1973. Mariner space probes were designed to explore Mercury, Venus, and Mars, the three planets of the inner solar system. All Mariner spacecrafts were launched by an Atlas Agena rocket, a military intercontinental ballistic missile. The probes used four solar panels to gather sunlight for electrical power. The orientation and trajectory of the craft were aligned to the positions of either the sun and the earth, or the sun and the bright star Canopus. The probes communicated with scientists and engineers on the earth by continuous radio transmissions.

To measure the temperatures, atmospheric pressures, and chemical compositions of the planets they flew past, the Mariner spacecraft used on-board radiometers, spectrometers, and magnetometers. Television cameras radioed back to scientists on the earth the first close-up photos of these neighboring planets.

Mariner 1 was launched on the first mission to Venus in July 1962. Its rocket veered off course shortly after launch, however, and the probe

had to be destroyed. About one month later, in August 1962, Mariner 2 was launched toward Venus. On December 14 that year it flew past the planet. Heat-sensing radiometers measured the temperatures and the atmospheric pressure of the planet.

Mariner 3 was launched toward Mars in November 1964. The mission ended prematurely, however, after the probe's protective shroud failed to open and transmission was lost. Later that month, on November 28, Mariner 4 was launched. It flew past Mars in 1965. No radiation belts or magnetic fields were detected around the planet, indicating that Mars does not have a metallic core. Mariner 4 monitors also found that the pressure of the planet's carbon dioxide atmosphere is only one-hundredth that of Earth's atmosphere. The probe relayed 21 photos of meteorite craters on Mars.

By the time that Mariner 5 was launched, in 1967, the design of the Mariner spacecraft had been slightly modified. Mariner 5 was somewhat larger and heavier than the earlier probes. The probe was equipped with a host of new instruments, including a central computer that controlled the other on-board instruments. Mariner 5 flew within 3990 km of Venus in 1967, and provided additional information about the planet's atmosphere.

Mariner 6 and Mariner 7 were identical spacecrafts. These probes were fully automatic, although they could be reprogrammed remotely from Earth. In 1969, Mariner 6 was launched toward Mars and passed by the planet at a distance of 3431 km on July 31. The probe transmitted television images of Mars and analyzed the planet's surface and atmosphere with radio, ultraviolet, and infrared signals. Mariner 7 was launched in 1969, and flew within 3534 km of Mars on August 5. The probe studied the Martian atmosphere and relayed 126 photos of the planet's surface, particularly the southern polar region.

In 1971, 22 days after Mariner 8 failed to launch, Mariner 9 was launched toward Mars. The largest of the Mariner probes, it was equipped with rocket engines that would give the craft the needed boost to jump into the orbit of Mars. On November 13, Mariner 9 entered into orbit around Mars, becoming the first artificial satellite of another planet. The probe relayed more than 7000 photos of the dramatic landforms of Mars, including an equatorial canyon 3700 km long that is larger than the Grand Canyon of Earth, a dormant volcano as large as the state of Arizona, and countless features that resemble dry river beds.

By the time of the launch of Mariner 10 on November 3, 1973, the design of the Mariner spacecraft had become quite complex in order to

render the probes capable of more extensive scientific research over longer periods. In 1974, Mariner 10 passed Venus at a distance of 4200 km. Using the planet's gravity as a slingshot, the probe was catapulted toward Mercury without having to resort to additional on-board propulsion systems. On March 29, 1974, Mariner 10 flew within 704 km of Mercury, circled back a second time on September 21, and passed the planet a third time on March 16, 1975, at only 327 km above the surface. The data relayed by Mariner 10 revealed Mercury to be a heavily cratered, sun-baked planet with an iron core similar to that of Earth, a thin hydrogen atmosphere, and a weak magnetic field.

Mariner probes provided much information about the planets of the inner solar system. They also provided an opportunity for scientists to learn how to use robotic spacecraft to study planets. The knowledge gained from the Mariner program was applied directly to the Voyager program, in which two spacecraft were launched in 1977 to explore the gaseous outer planets of the solar system—Jupiter, Saturn, Uranus, and Neptune. They Voyager probes used these planets' gravities to swing from one planet to the next without relying on large on-board propulsion systems. The Voyager mission has now been extended to explore the solar system beyond the outer planets.

QUESTIONS 27-31

Complete the table below. Write a date for each answer. The first one has been done as an example for you. Write your answers in boxes headed DATE.

QUESTION	EVENT	DATE
EXAMPLE	Mariner 10 flew within 704 km of Mercury.	1974
27	Mariner 1 was launched on the first mission to Venus.	
28	Mariner 4 relayed 21 photos of meteorite craters on Mars.	
29	Mariner 5 flew within 3990 km of Venus.	
30	Mariner 9 entered into orbit around Mars.	
31	Mariner 2 was launched toward Venus.	

QUESTIONS 32-36

Do the following statements reflect the claims of the writer of the Reading Passage? In boxes headed Answer, mark

- (r) if the statement reflects the writer's claims
- (w) if the statement does not reflect the writer's claims
- (n) if the information is not given in the passage

Now answer questions 32 – 36. (as indicated by the example).

STATEMENTS	ANSWER
EXAMPLE Mercury's iron core is similar to that of Earth.	● (w) (n)
32) Air pollution can make other planets warm enough for the appeareance of life on them.	(r) (w) (n)
33) Mercury is a planet suitable for becoming man's second home.	(r) (w) (n)
34) Life forms on other planets can communicate with us by means of continuous radio transmissions.	(r) (w) (n)
35) Countless features that resemble dry river beds on Mars indicate that Mars hosted life in the past.	(r) (w) (n)
36) Mercury, Venus, and Mars are the three planets of the inner solar system.	(r) (w) (n)

QUESTIONS 37-40

Complete each of the following statements with a name from the Reading Passage. Write your answers in boxes below.

QUESTION	YOUR ANSWER
37	
38	
39	
40	

37) No radiation belts or magnetic fields were detected around Mars by **….**

38) The equatorial canyon of Mars is larger than the **…** of Earth.

39) The orientation and trajectory of some Mariner probes were aligned to the positions of the sun and the bright star **….**

40) All Mariner spacecrafts were launched by an **…**, which is a military intercontinental ballistic missile.