

Hydroelectric Power

Hydroelectric power is America's leading renewable energy resource. Of all the renewable power sources, it's the most reliable, efficient, and economical.

Water is needed to run a hydroelectric generating unit. It's held in a reservoir or lake behind a dam, and the force of the water being released from the reservoir through the dam spins the blades of a turbine. The turbine is connected to the generator that produces electricity. After passing through the turbine, the water re-enters the river on the downstream side of the dam.

Hydroelectric plants convert the kinetic energy within falling water into electricity. The energy in moving water is produced in the sun, and consequently is continually being renewed. The energy in sunlight evaporates water from the seas and deposits it on land as rain. Land elevation differences result in rainfall runoff, and permit some of the original solar energy to be harnessed as hydroelectric power. Hydroelectric power is at present the earth's chief renewable electricity source, generating 6% of global energy and about 15% of worldwide electricity. Hydroelectric power in Canada is plentiful and provides 60% of their electrical requirements. Usually regarded as an inexpensive and clean source of electricity, most big hydroelectric projects being planned today are facing a great deal of hostility from environmental groups and local people.

The earliest recorded use of water power was a clock, constructed around 250 BC. Since then, people have used falling water to supply power for grain and saw mills, as well as a host of other uses. The earliest use of flowing water to generate electricity was a waterwheel on the Fox River in Wisconsin in 1882.

The first hydroelectric power plants were much more dependable and efficient than the plants of the day that were fired by fossil fuels. This led to a rise in number of small to medium sized hydroelectric generating plants located wherever there was an adequate supply of falling water and a need for electricity. As demand for electricity soared in the middle years of the 20th century, and the effectiveness of coal and oil power plants improved, small hydro plants became less popular. The majority of new hydroelectric developments were focused on giant mega-projects.

Hydroelectric plants harness energy by passing flowing water through a turbine. The water turbine rotation is delivered to a generator, which generates

electricity. The quantity of electricity that can be produced at a hydroelectric plant relies upon two variables. These variables are (1) the vertical distance that the water falls, called the “head”, and (2) the flow rate, calculated as volume over time. The amount of electricity that is produced is thus proportional to the head product and the flow rate.

So, hydroelectric power stations can normally be separated into two kinds. The most widespread are “high head” plants and usually employ a dam to stock up water at an increased height. They also store water at times of rain and discharge it during dry times. This results in reliable and consistent electricity generation, capable of meeting demand since flow can be rapidly altered. At times of excess electrical system capacity, usually available at night, these plants can also pump water from one reservoir to another at a greater height. When there is peak electrical demand, the higher reservoir releases water through the turbines to the lower reservoir.

“Low head” hydroelectric plants usually exploit heads of just a few meters or less. These types of power station use a weir or low dam to channel water, or no dam at all and merely use the river flow. Unfortunately their electricity production capacity fluctuates with seasonal water flow in a river.

Until only recently people believed almost universally that hydroelectric power was an environmentally safe and clean means of generating electricity. Hydroelectric stations do not release any of the usual atmospheric pollutants emitted by power plants fuelled by fossil fuels so they do not add to global warming or acid rain. Nevertheless, recent studies of the larger reservoirs formed behind dams have implied that decomposing, flooded vegetation could give off greenhouse gases equal to those from other electricity sources.

The clearest result of hydroelectric dams is the flooding of huge areas of land. The reservoirs built can be exceptionally big and they have often flooded the lands of indigenous peoples and destroyed their way of life. Numerous rare ecosystems are also endangered by hydroelectric power plant development.

Damming rivers may also change the quantity and quality of water in the rivers below the dams, as well as stopping fish migrating upstream to spawn. In addition, silt, usually taken downstream to the lower parts of a river, is caught

by a dam and so the river downstream loses the silt that should fertilize the river's flood plains during high water periods.

Theoretical global hydroelectric power is approximately four times larger than the amount that has been taken advantage of today. Most of the residual hydro potential left in the world can be found in African and Asian developing countries. Exploiting this resource would involve an investment of billions of dollars, since hydroelectric plants normally have very high building costs. Low head hydro capacity facilities on small scales will probably increase in the future as low head turbine research, and the standardization of turbine production, reduce the costs of low head hydro-electric power production. New systems of control and improvements in turbines could lead in the future to more electricity created from present facilities. In addition, in the 1950's and 60's when oil and coal prices were very low, lots of smaller hydroelectric plants were closed down. Future increases in the prices of fuel could lead to these places being renovated.

Questions 37 – 40

Using NO MORE THAN THREE WORDS from Reading Passage 3, answer the following questions.

Write your answers in boxes 37 – 40 on your answer sheet.

37 What proportion of the world's electricity supply is provided by hydroelectric power?

38 How is the flow rate of a hydroelectric power station quantified?

39 When do high head power plants use surplus electricity to transfer water to a second reservoir?

40 What underwater action can lead to the production of pollution similar to that produced by fossil fuel power stations?

Anxiety

Anxiety is a common experience that can be a useful motivator or even lifesaver in situations that are objectively dangerous. However, when the anxiety is out of proportion to the danger inherent in a given situation, is persistent and is markedly disabling, an anxiety disorder can be developed.

Anxiety is an emotion that all people experience from time to time, and we do that for very good reasons. It has been built into us; we have inherited it from our evolutionary past, because, in general, anxiety has a survival function. If there is a real danger for a primitive man, then anxiety kicks in in an adaptive way. We freeze, we stop doing whatever we were doing, we devote all of your attention to the danger, and our bodies react with a big release of adrenalin, an increase in blood flow to the muscles, getting us ready to run as fast as we can or fight as fiercely as we can.

So some anxiety is adaptive, not only for primitive man, but in modern society as well. It helps us to focus on things when we have deadlines and, if someone is driving too fast when we cross the road, it helps us to jump out of the way quickly. So, there is nothing wrong with anxiety in general, and in fact, we would have difficulties if we did not experience it to some extent, but of course it can get problematic if the danger is one that is imagined rather than real, or the danger is something that is exaggerated. In those cases, particularly if the perceived danger is out of proportion to the real danger, and it is persistent and disabling, then there is a danger of an anxiety disorder. About 17 per cent of the population will have an anxiety disorder at some stage in their life.

Anxiety can be caused in a variety of different ways, but any mental disorder is always difficult to diagnose. Scientists are looking at what role genes play in the development of these disorders and are also investigating the effects of environmental factors, such as pollution, physical and psychological stress, and diet. Several parts of the brain are key actors in the production of fear and anxiety. Using brain imaging technology and neurochemical techniques, scientists have discovered that the amygdala plays a significant role in most anxiety disorders. By learning more about how the brain creates fear and anxiety, scientists may be able to devise better treatments for these disorders. Anxiety disorders are a very costly problem in terms of society. Some published figures show that, in the US, it cost \$60 billion in one year in terms of lost

productivity and in terms of excessive medical investigations that many people with anxiety seek, often thinking they have a physical problem.

Given all of this, it is rather worrying that anxiety also has a rather low treatment-seeking rate. Only 10 per cent of people with an anxiety disorder will seek treatment. That seems to be largely because people do not realise there are effective treatments available. Most people tend to think they have had it for most of their lives, so it is just their personality and they cannot change their personality, and so they feel rather hopeless about it.

The first psychotherapy treatment that was shown to be effective was exposure therapy, which essentially encourages people in a graded way to go into their feared situations and stay in them as long as they can and build up their confidence that way. Often, the therapist will accompany the person to a feared situation to provide support and guidance. Group cognitive behaviour therapy has also been shown to be effective. This is a talking therapy that helps people to understand the link between negative thoughts and mood and how altering their behaviour can enable them to manage anxiety and feel in control.

There are, of course, drugs that can help people with anxiety. Medication will not cure an anxiety disorder, but it can keep it under control while the person receives psychotherapy. The principal medications used for anxiety disorders are antidepressants, anti-anxiety drugs, and beta-blockers to control some of the physical symptoms. With proper treatment, many people with anxiety disorders can lead normal, fulfilling lives.

There is plenty of evidence that exercise can help with anxiety problems. When stress affects the brain, with its many nerve connections, the rest of the body feels the impact as well. Exercise and other physical activity produce endorphins, which are chemicals in the brain that act as natural painkillers. In addition to this, getting physically tired can help people fall asleep faster and have deeper and more relaxing sleep. As many people suffering from anxiety often have problems with insomnia, just the ability to get a good night's rest can change people's whole perspectives.

Anxiety is a normal, but highly subjective, human emotion. While normal anxiety serves a beneficial and adaptive purpose, anxiety can also become the cause of tremendous suffering for millions of people. It is important that people

recognise excessive anxiety in themselves as soon as possible, as treatment can be very successful and living untreated can be a misery.

Questions 1-3

Complete each sentence with the correct ending (A – E) below.

Write the correct letter (A – E) in answer boxes 1-3 on your answer sheet.

- 1 Experiencing small doses of anxiety can**
 - 2 Imagining or exaggerating problems can**
 - 3 Nearly one in five people can**
-
- A be very beneficial.**
 - B never have to deal with anxiety**
 - C lead to unhelpful levels of anxiety.**
 - D experience anxiety at some point.**
 - E increase the possibility of physical disease.**

PART 3

Questions 21-26

Choose the correct letter, A, B or C.

Talk on jobs in fashion design

- 21 What problem did Chantal have at the start of the talk?
A Her view of the speaker was blocked.
B She was unable to find an empty seat.
C The students next to her were talking.
- 22 What were Hugo and Chantal surprised to hear about the job market?
A It has become more competitive than it used to be.
B There is more variety in it than they had realised.
C Some areas of it are more exciting than others.
- 23 Hugo and Chantal agree that the speaker's message was
A unfair to them at times.
B hard for them to follow.
C critical of the industry.
- 24 What do Hugo and Chantal criticise about their school careers advice?
A when they received the advice
B how much advice was given
C who gave the advice
- 25 When discussing their future, Hugo and Chantal disagree on
A which is the best career in fashion.
B when to choose a career in fashion.
C why they would like a career in fashion.
- 26 How does Hugo feel about being an unpaid assistant?
A He is realistic about the practice.
B He feels the practice is dishonest.
C He thinks others want to change the practice.

Questions 28-30

Choose the correct letter, A, B or C.

28 Before starting an origami activity in class, the students think it is important for the teacher to

- A** make models that demonstrate the different stages.
- B** check children understand the terminology involved.
- C** tell children not to worry if they find the activity difficult.

29 The students agree that some teachers might be unwilling to use origami in class because

- A** they may not think that crafts are important.
- B** they may not have the necessary skills.
- C** they may worry that it will take up too much time.

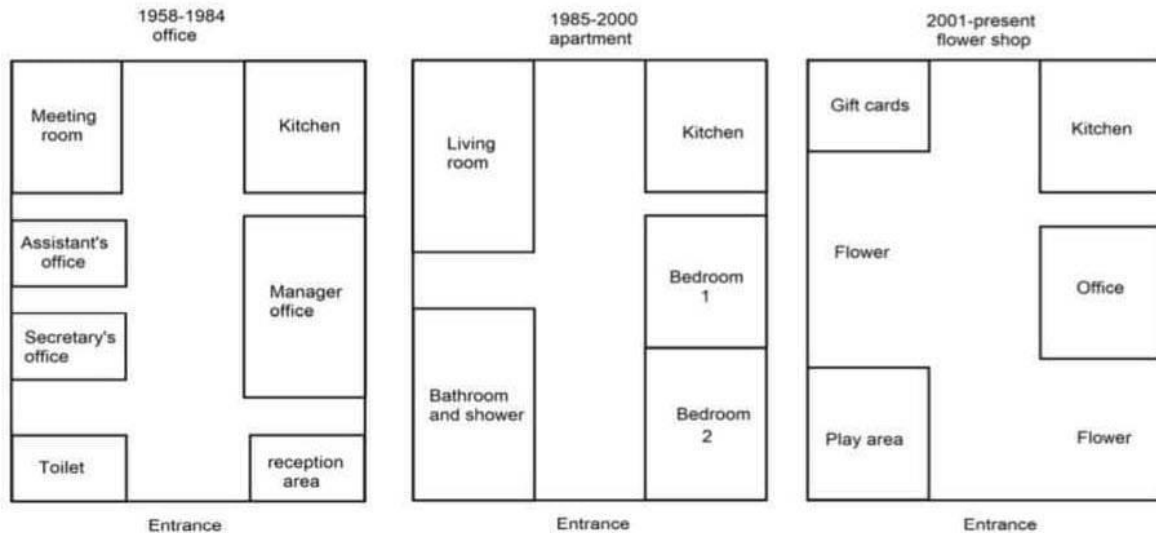
30 Why do the students decide to use origami in their maths teaching practice?

- A** to correct a particular misunderstanding
- B** to set a challenge
- C** to introduce a new concept

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The plans below show how the ground floor of a particular building has changed over time.



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Sentence formations for data depictions:

Present tense: v1 or is/are (to explain the current map)

Flowers are grown over there.

Past tense: v2 or was/were

There was an office on the ground floor.

Introduction:

The assigned maps illustrate the changes that occurred on the ground floor of a specific building from 1958 to present time.

Overall:

Compare the main features of both maps.

Overall, it can be clearly seen that the ground floor has been changed continuously. The kitchen remains unchanged throughout the given time period, while other facilities have been improved.

Basic connectors:

To begin with, moreover, interestingly, moving ahead.

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The assigned maps illustrate the changes that occurred on the ground floor of a specific building from 1958 to present time.

Overall, it can be clearly seen that the ground floor has been changed continuously. The kitchen remains unchanged throughout the given time period, while other facilities have been improved.

To begin with, between 1958 and 1984, there was an office on the ground floor which was converted into an apartment, and then in a flower shop. Interestingly, the location of the kitchen along the entrance has not changed till now. However, in the place of office, a meeting room was constructed which had been renovated into a living room after more than two decades, also currently there is a gift card in the flower shop.

Moving ahead, on the left side, both the assistance office and the secretary office had been demolished, flowers are grown over there. The toilet was rebuilt as the bathroom and shower, surprisingly an area for playing has been introduced. The manager office and reception area was on the right side which was changed into bedroom 1 and bedroom 2, whereas an office is newly erected there along with some flowers planted in the southwest corner.

Elephant Communication

A.

A postdoctoral fellow at Stanford University, O'Connell Rodwell has come to Namibia's premiere wildlife sanctuary to explore the mysterious and complex world of elephant communication. She and her colleagues are part of a scientific revolution that began nearly two decades ago with the stunning revelation that elephants communicate over long distances using low-frequency sounds, also called infrasounds, that are too deep to be heard by most humans.

B.

As might be expected, the African elephant's ability to sense seismic sound may begin in the ears. The hammer bone of the elephant's inner ear is proportionally very large for a mammal, but typical for animals that use vibrational signals. It may therefore be a sign that elephants can communicate with seismic sounds. Also, the elephant and its relative the manatee are unique among mammals in having reverted to a reptilian-like cochlear structure in the inner ear. The cochlea of reptiles facilitates a keen sensitivity to vibrations and may do the same in elephants.

C.

But other aspects of elephant anatomy also support that ability. First, their enormous bodies, which allow them to generate low-frequency sounds almost as powerful as those of a jet takeoff, provide ideal frames for receiving ground vibrations and conducting them to the inner ear. Second, the elephant's toe bones rest on a fatty pad that might help focus vibrations from the ground into the bone. Finally, the elephant's enormous brain lies in the cranial cavity behind the eyes in line with the auditory canal. The front of the skull is riddled with sinus cavities that may function as resonating chambers for vibrations from the ground.

D.

How the elephants sense these vibrations is still unknown, but O'Connell Rodwell who just earned a graduate degree in entomology at the University of Hawaii at Manoa, suspects the pachyderms are "listening" with their trunks and

feet. The trunk may be the most versatile appendage in nature. Its uses include drinking, bathing, smelling, feeding and scratching. Both trunk and feet contain two kinds of pressure-sensitive nerve endings—one that detects infrasonic vibrations and another that responds to vibrations with slightly higher frequencies. For O’Connell-Rodwell, the future of the research is boundless and unpredictable: “Our work is really at the interface of geophysics, neurophysiology and ecology,” she says. “We’re asking questions that no one has really dealt with before.”

E.

Scientists have long known that seismic communication is common in small animals, including spiders, scorpions, insects and a number of vertebrate species such as white-lipped frogs, blind mole rats, kangaroo rats and golden moles. They also have found evidence of seismic sensitivity in elephant seals—2-ton marine mammals that are not related to elephants. But O’Connell Rodwell was the first to suggest that a large land animal also is sending and receiving seismic messages. O’Connell Rodwell noticed something about the freezing behavior of Etosha’s six-ton bulls that reminded her of the tiny insects back in her lab. “I did my masters thesis on seismic communication in planthoppers,” she says. “I’d put a male planthopper on a stem and play back a female call, and the male would do the same thing the elephants were doing: He would freeze, then press down on his legs, go forward a little bit, then freeze again. It was just so fascinating to me, and it’s what got me to think, maybe there’s something else going on other than acoustic communication.”

F.

Scientists have determined that an elephant’s ability to communicate over long distances is essential for its survival, particularly in a place like Etosha, where more than 2,400 savanna elephants range over an area larger than New Jersey. The difficulty of finding a mate in this vast wilderness is compounded by ... elephant reproductive biology. Females breed only when nestrus a period of sexual arousal that occurs every two years and lasts just a few days. “Females in estrus make these very low, long calls that bulls home in on, because it’s such a rare event,” O’Connell-Rodwell says.

These powerful estrus calls carry more than two miles in the air and may be accompanied by long-distance seismic signals, she adds. Breeding herds also use low-frequency vocalizations to warn of predators. Adult bulls and cows have no enemies, except for humans, but young elephants are susceptible to attacks by lions and hyenas. When a predator appears, older members of the herd emit intense warning calls that prompt the rest of the herd to clump together for protection, then flee.

In 1994, O'Connell-Rodwell recorded the dramatic cries of a breeding herd threatened by lions at Mushara. "The elephants got really scared, and the matriarch made these very powerful warning calls, and then the herd took off screaming and trumpeting," she recalls. "Since then, every time we've played that particular call at the water hole, we get the same response the elephants take off."

G.

Reacting to a warning call played in the air is one thing, but could the elephants detect calls transmitted only through the ground? To find out, the research team in 2002 devised an experiment using electronic equipment that allowed them to send signals through the ground at Mushara. The results of our 2002 study showed US that elephants do indeed detect warning calls played through the ground," O'Connell Rodwell observes.

"We expected them to clump up into tight groups and leave the area, and that's in fact what they did. But since we only played back one type of call, we couldn't really say whether they were interpreting it correctly. Maybe they thought it was a vehicle or something strange instead of a predator warning." H. An experiment last year was designed to solve that problem by using three different recordings—the 1994 warning call from Mushara, an anti-predator call recorded by scientist Joyce Poole in Kenya and an artificial warble tone.

Although still analyzing data from this experiment, O'Connell Rodwell is able to make a few preliminary observations: "The data I've seen so far suggest that the elephants were responding like I had expected, when the '94 warning call was played back, they tended to clump together and leave the water hole sooner. But what's really interesting is that the unfamiliar anti-predator call from Kenya

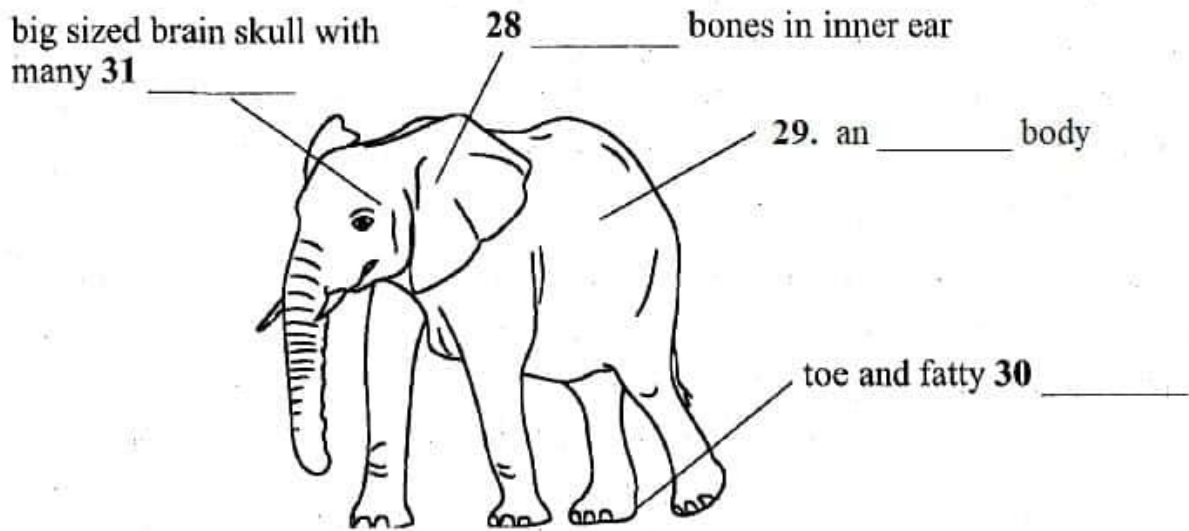
also caused them to clump up, get nervous and aggressively rumble—but they didn't necessarily leave. I didn't think it was going to be that clear cut.

Questions 28-31

Label the diagram below.

Choose **NO MORE THAN TWO WORDS** from the passage for each answer.

Write your answers in boxes 28-31 on your answer sheet.



School Experiments

It is essential when conducting this experiment to wear safety goggles. This experiment is divided into four distinct sections. The first, the reaction stage, is when a glass beaker is placed on top of a tripod, and 20cm of dilute sulphuric

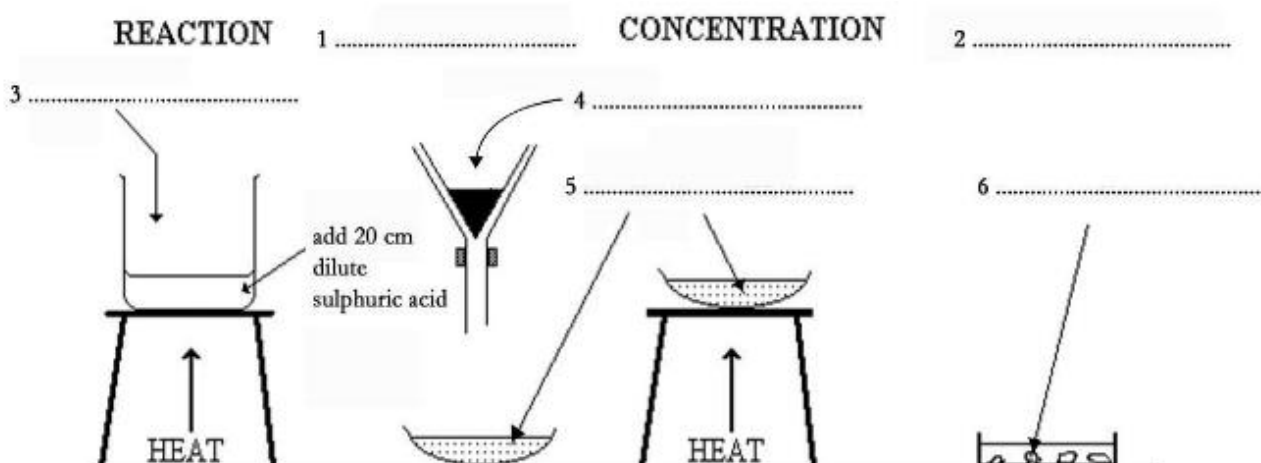
acid poured into it. The acid is then heated. When it is almost boiling, a small quantity of copper oxide powder is added to the beaker. The mixture is then stirred with a glass spatula until the copper oxide has dissolved. This process is then repeated until 1g of powder has been added to the sulphuric acid. The heat is then removed from the beaker and the solution allowed to cool. The second stage is the filtration stage and, as the name suggests, is where a filter and conical flask are used to remove any copper oxide that has not reacted. A clear copper sulphate solution will be left in the glass dish. The third stage is where heat is applied to the copper sulphate solution in order to concentrate the solution: the concentration stage. The final crystallization stage happens when the solution begins to cool, and pure copper sulphate crystals start to form.

Questions 1 – 6

The diagram below shows how copper sulphate can be made using simple laboratory equipment.

Choose **NO MORE THAN THREE WORDS AND/OR A NUMBER** from the passage for each answer.

Label the diagram.



PART 3

Questions 21-24

Choose the correct letter, A, B or C.

- 21 Why do the students think the Laki eruption of 1783 is so important?**
- A It was the most severe eruption in modern times.**
 - B It led to the formal study of volcanoes.**
 - C It had a profound effect on society.**
- 22 What surprised Adam about observations made at the time?**
- A the number of places producing them**
 - B the contradictions in them**
 - C the lack of scientific data to support them**
- 23 According to Michelle, what did the contemporary sources say about the Laki haze?**
- A People thought it was similar to ordinary fog.**
 - B It was associated with health issues.**
 - C It completely blocked out the sun for weeks.**
- 24 Adam corrects Michelle when she claims that Benjamin Franklin**
- A came to the wrong conclusion about the cause of the haze.**
 - B was the first to identify the reason for the haze.**
 - C supported the opinions of other observers about the haze.**

Questions 15-20

Choose the correct letter, A, B or C.

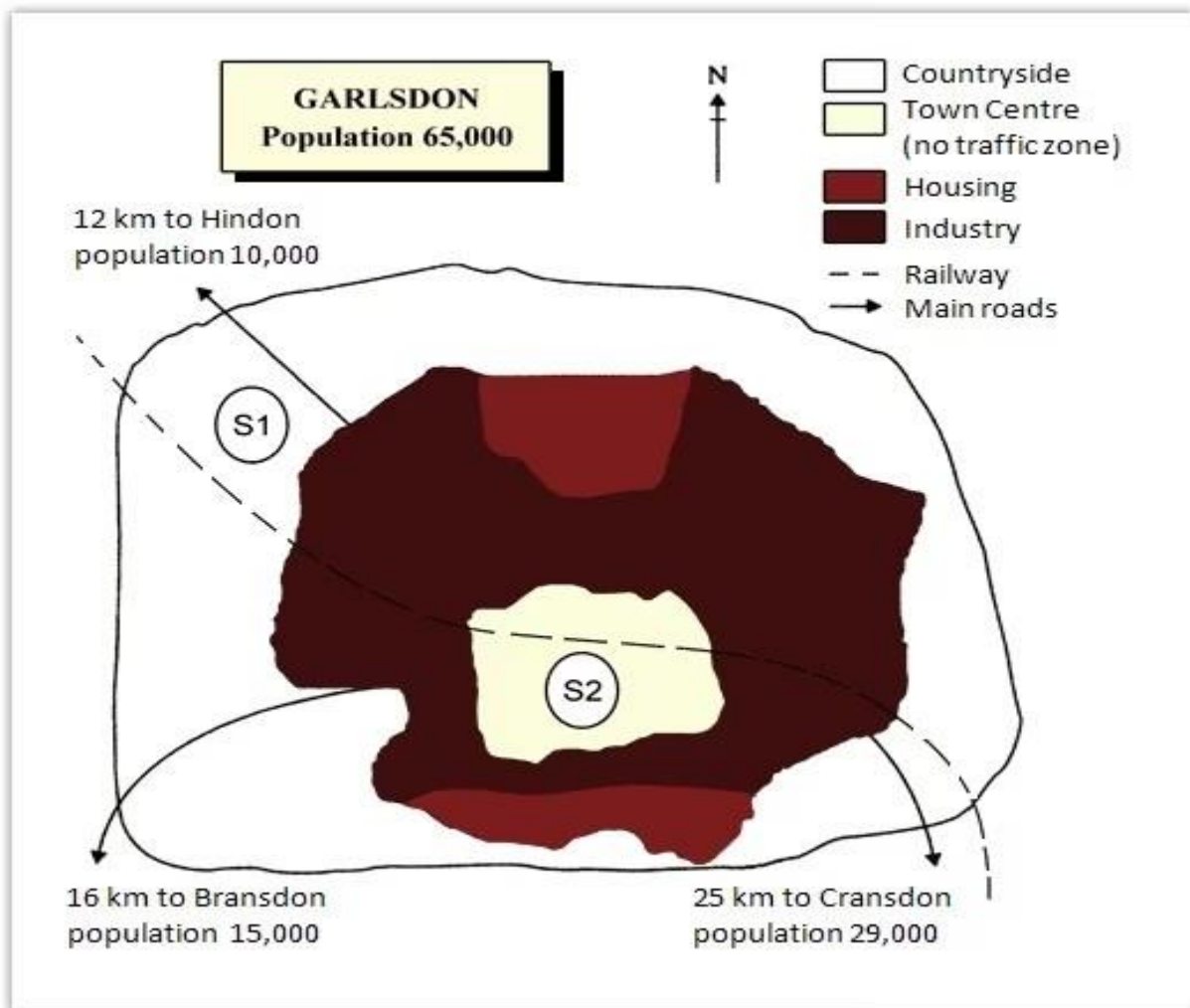
- 15 What advice does Dan give about picking mushrooms in parks?**
A Choose wooded areas.
B Don't disturb wildlife.
C Get there early.
- 16 Dan says it is a good idea for beginners to**
A use a mushroom app.
B join a group.
C take a reference book.
- 17 What does Dan say is important for conservation?**
A selecting only fully grown mushrooms
B picking a limited amount of mushrooms
C avoiding areas where rare mushroom species grow
- 18 According to Dan, some varieties of wild mushrooms are in decline because there is**
A a huge demand for them from restaurants.
B a lack of rain in this part of the country.
C a rise in building developments locally.
- 19 Dan says that when storing mushrooms, people should**
A keep them in the fridge for no more than two days.
B keep them in a brown bag in a dark room.
C leave them for a period after washing them.
- 20 What does Dan say about trying new varieties of mushrooms?**
A Experiment with different recipes.
B Expect some to have a strong taste.
C Cook them for a long time.

Writing

The map below is of the town of Garlsdon. A new supermarket (S) is planned for the town. The map shows two possible sites for the supermarket.

Summarise the information by selecting and reporting the main features, and make comparisons where relevant.

» Write at least 150 words.



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Sentence formations for data depictions:

Present tense: v1 or is/are (to explain the current map)

currently the railway line intersects the city almost in the middle and there are two main roads for transportation and countryside buildings.

Future tense: will+v1

the second location is likely to be beneficial for Bransdon and Carnsdon area's residents.

Introduction:

The assigned map illustrates two possible sites of Garlsdon town where a new supermarket is planned.

Overall:

Compare the main features of both maps.

Overall, it can be clearly seen that the first location would be far away from the town centre ,and the second location is likely to be beneficial for Bransdon and Carnsdon area's residents as this location is near these areas.

Basic connectors:

To begin with, moreover, interestingly, moving ahead

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The assigned map illustrates two possible sites of Garlsdon town where a new supermarket is planned.

Overall, it can be clearly seen that the first location would be far away from the town centre, and the second location is likely to be beneficial for Bransdon and Carnsdon area's residents as this location is near these areas.

To begin with, currently the railway line intersects the city almost in the middle and there are two main roads for transportation and countryside buildings. In addition, the housing is particularly on the South and the North direction, while s2, the town centre (no traffic zone), is surrounded by industry. The first supposed location is Hindon where approximately ten thousand individuals live and it is located in the North-west corner.

Moving ahead, the towns Carnsdon and Bransdon have a large number of population and the supermarket is likely to be far away from these two locations. The s2 is the perfect location as it is surrounded by housing and industry which is assumed to be profitable for the supermarket's economy. Moreover, the railway line passes this location so this place is better in terms of communication.