

1-

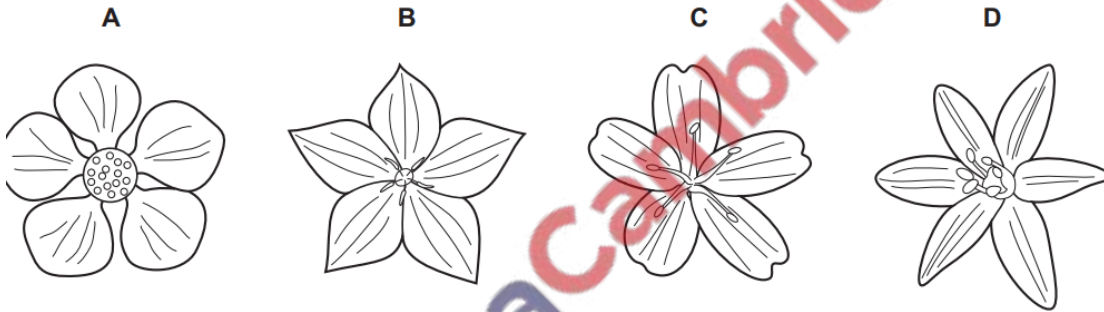
The whole of an island's population of short-haired bumblebees is descended from just two parents. These were introduced from the mainland.

Which statement about the island's short-haired bumblebee population, compared with that of the mainland, is correct?

- A The population is less in danger of collapsing from disease.
- B The population is more able to adapt to environmental changes.
- C The population shows more genetic variety.
- D The population will adapt to environmental changes more slowly.

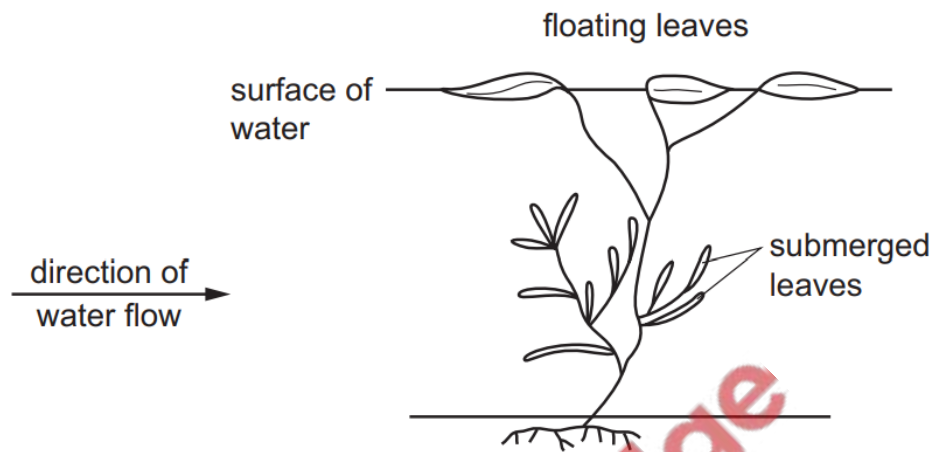
2-

Which diagram shows a flower from a monocotyledon?



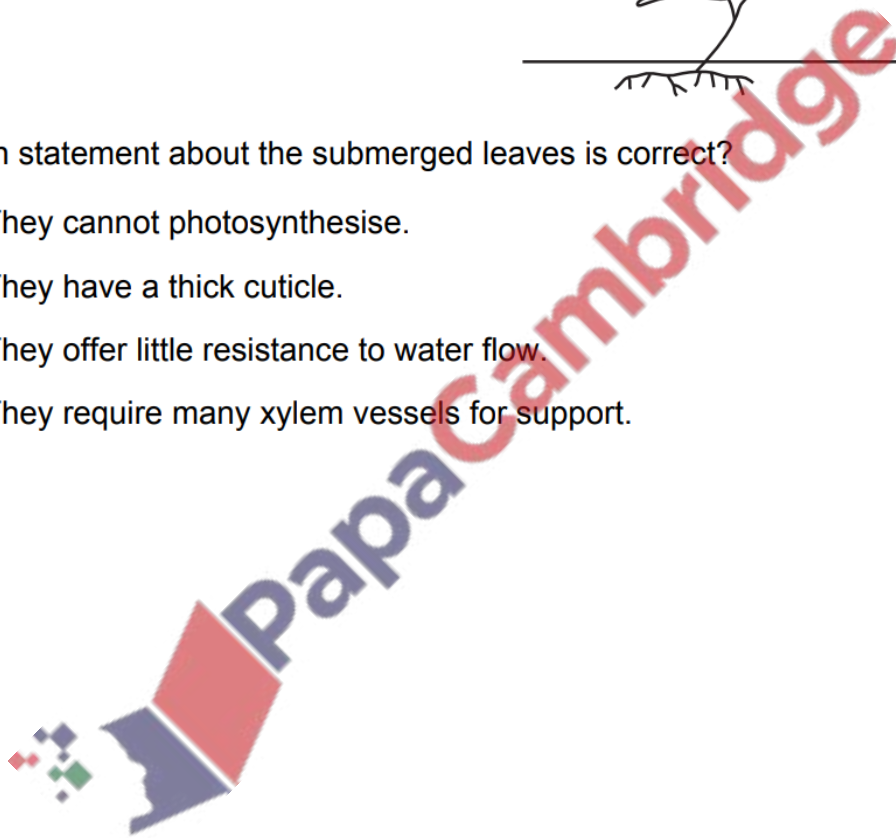
3-

The diagram shows a hydrophyte in a river.



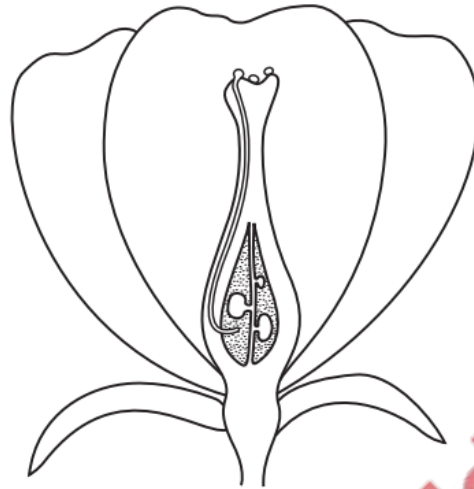
Which statement about the submerged leaves is correct?

- A** They cannot photosynthesise.
- B** They have a thick cuticle.
- C** They offer little resistance to water flow.
- D** They require many xylem vessels for support.



4-

The diagram shows a flower.



Which processes have taken place?

|          | pollination | fertilisation |
|----------|-------------|---------------|
| <b>A</b> | no          | no            |
| <b>B</b> | no          | yes           |
| <b>C</b> | yes         | no            |
| <b>D</b> | yes         | yes           |

5-

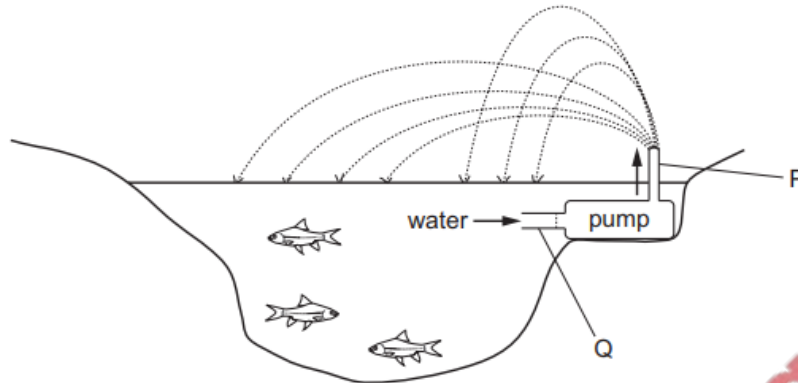
The cholera bacterium produces toxins that cause chloride ions to be secreted into the small intestine.

How does this affect the water potential of blood in the intestinal capillaries and the intestinal contents?

|          | water potential      |                             |
|----------|----------------------|-----------------------------|
|          | blood in capillaries | contents of small intestine |
| <b>A</b> | lowered              | lowered                     |
| <b>B</b> | lowered              | raised                      |
| <b>C</b> | raised               | lowered                     |
| <b>D</b> | raised               | raised                      |

6-

The diagram shows a garden pond with a fountain worked by a pump. The fountain brings oxygen from the air to fish in the pond.



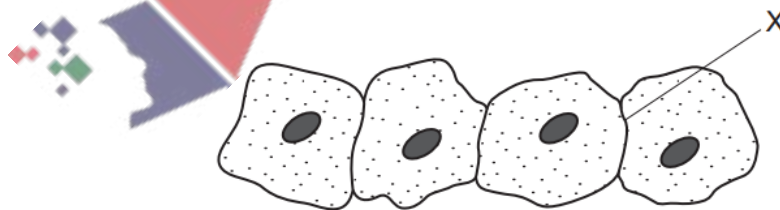
The system can be compared with part of the human circulatory system. The pump is compared with the heart.

What are P and Q compared with?

|          | P                | Q                |
|----------|------------------|------------------|
| <b>A</b> | aorta            | pulmonary artery |
| <b>B</b> | pulmonary artery | vena cava        |
| <b>C</b> | pulmonary vein   | vena cava        |
| <b>D</b> | vena cava        | aorta            |

7-

The diagram shows some animal cells, as seen under the microscope.



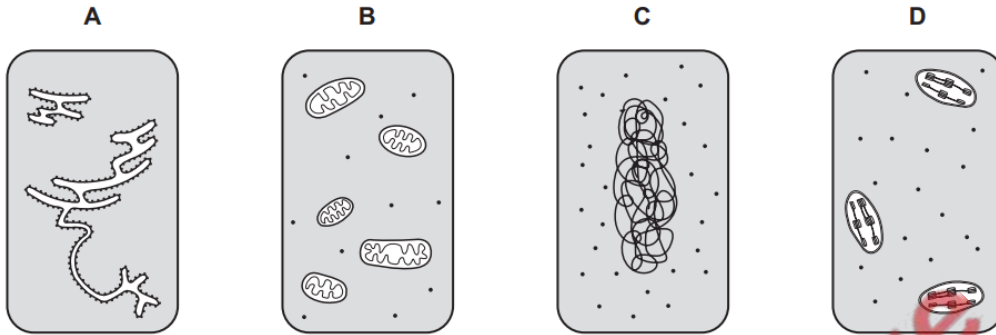
What will be present at X?

- A** one cell membrane
- B** one cell wall
- C** two cell membranes
- D** two cell walls

8-

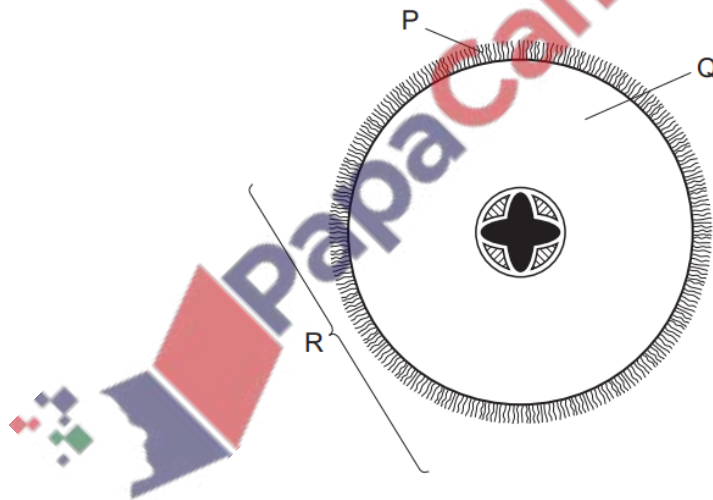
Each of the diagrams shows an area of cytoplasm.

Which is from a prokaryote?



9-

The diagram shows a section through a root.



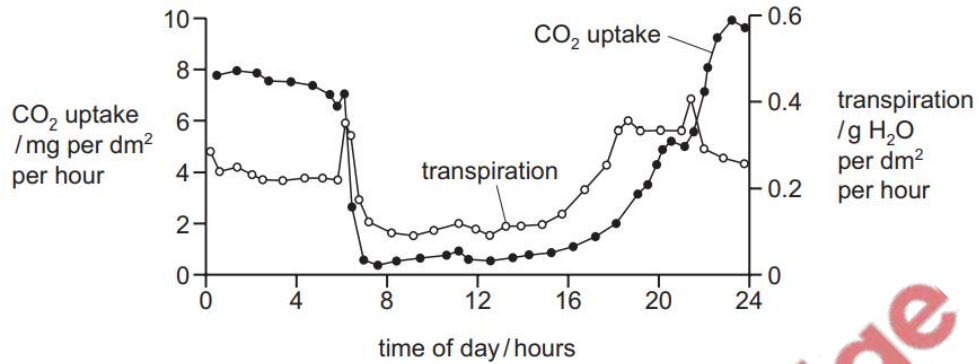
What are the levels of organisation of the labelled structures?

|          | cell | organ | tissue |
|----------|------|-------|--------|
| <b>A</b> | P    | Q     | R      |
| <b>B</b> | P    | R     | Q      |
| <b>C</b> | Q    | R     | P      |
| <b>D</b> | R    | Q     | P      |

10-

The graph shows daily carbon dioxide uptake and transpiration by the plant *Agave americana*.

The plant is adapted to live in very dry conditions.



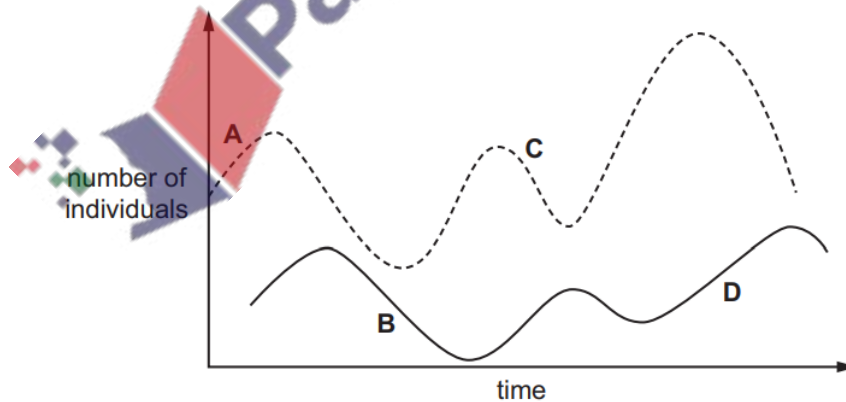
What can be concluded from this graph?

- A More stomata are closed during dark periods.
- B More stomata are closed during light periods.
- C There is no carbon dioxide uptake during dark periods.
- D There is no water uptake during light periods.

11-

The graph shows the changes in the populations of predator and prey over a period of time.

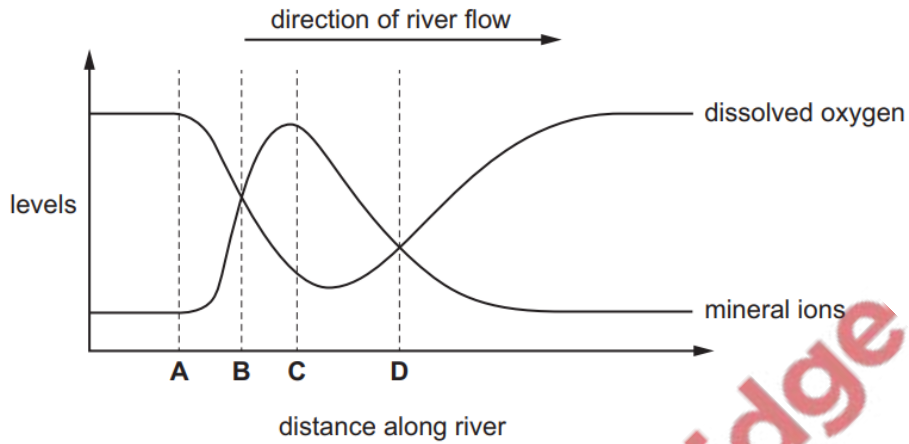
Which point on the graph shows a decrease in predator population?



12-

The graph shows the levels of dissolved oxygen and mineral ions in a river.

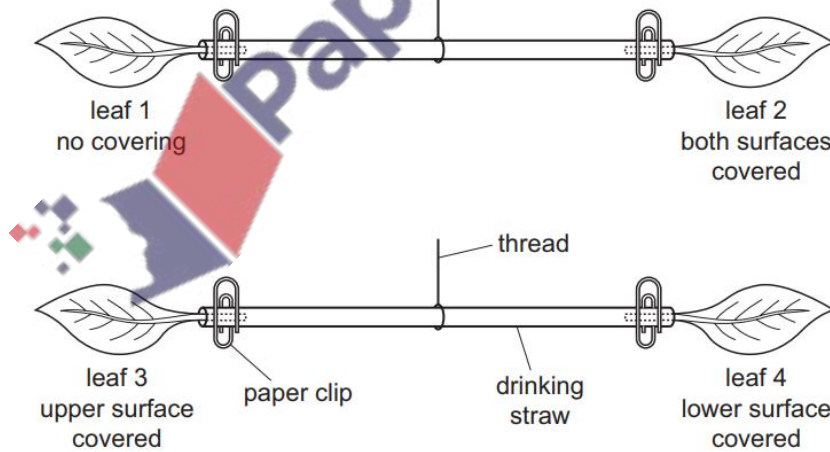
At which point does raw sewage enter the river?



13-

The diagrams show an experiment on transpiration.

Four leaves of the same species are balanced on two drinking straws. One or both sides of the leaves are covered in grease. Any difference in mass causes the heavier end to be lower.



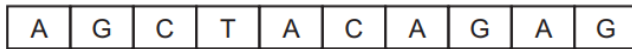
At the start of the experiment the straws were positioned so that the leaves were level.

Which leaves will be lower after an hour?

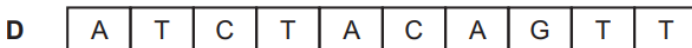
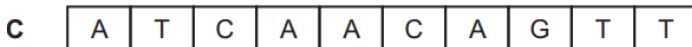
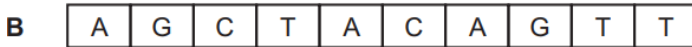
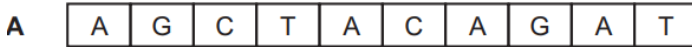
- A** 1 and 3      **B** 1 and 4      **C** 2 and 3      **D** 2 and 4

14-

The diagram shows a section of DNA from a chimpanzee.

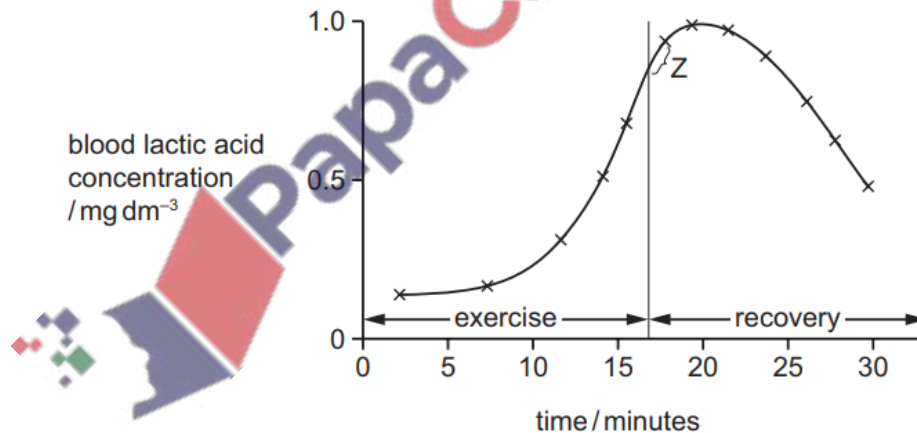


Which diagram shows a section of DNA from the organism that is most closely related to the chimpanzee?



15-

The graph shows the lactic acid concentration in blood during and after exercise.



The continuation of which process accounts for the shape of the graph at Z?

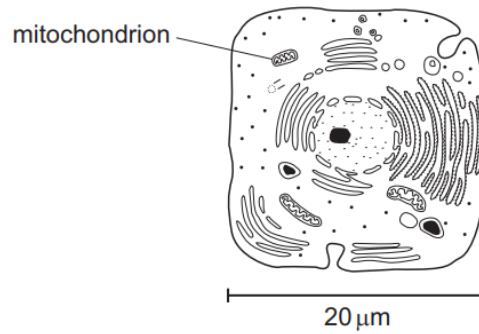
- A deep breathing
- B high heart rate
- C high rate of breathing
- D movement of lactic acid from the muscles



16-

The diagram shows a magnified image of a human liver cell with a mitochondrion labelled. The actual size of the liver cell is  $20\ \mu\text{m}$ .

The image size of the liver cell is 40 mm and the image size of the mitochondrion is 4 mm.



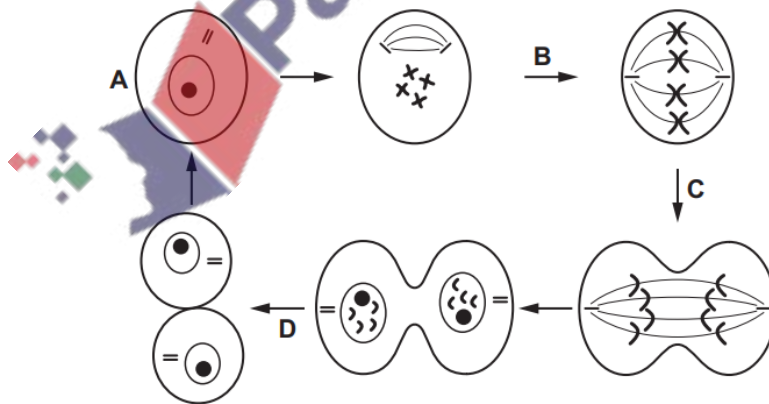
What is the actual size of the mitochondrion shown in the diagram?

- A** 0.002 mm    **B** 0.02 mm    **C** 0.2 mm    **D** 2 mm

17-

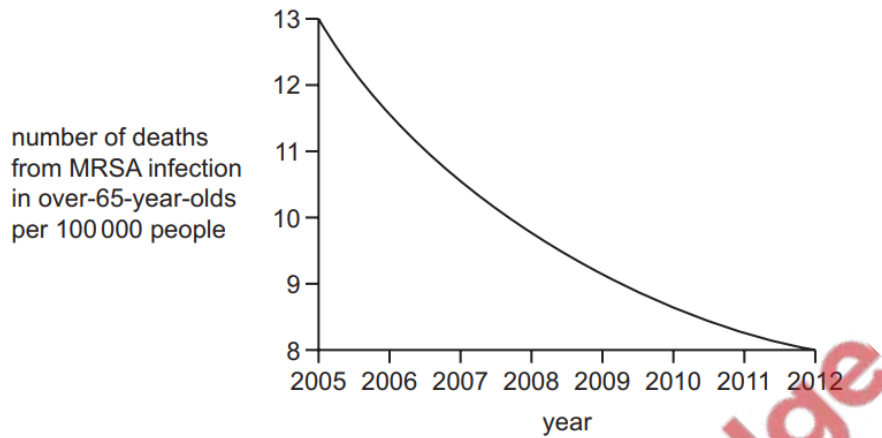
The diagram shows a cell before and during mitosis.

At which stage are the chromosomes copied?



18-

The graph shows the number of deaths from MRSA infection per 100 000 people in a population of over-65-year-olds from 2005 to 2012.



What is a possible explanation for the changes shown in the graph?

- A a decrease in the size of the population of over-65-year-olds
- B antibiotics do not affect viruses
- C more effective antibiotics are being used to treat infected people
- D over-65-year-olds are immune to MRSA infection

19-

The biomass at each trophic level in an ecosystem is measured. The results are shown in the table.

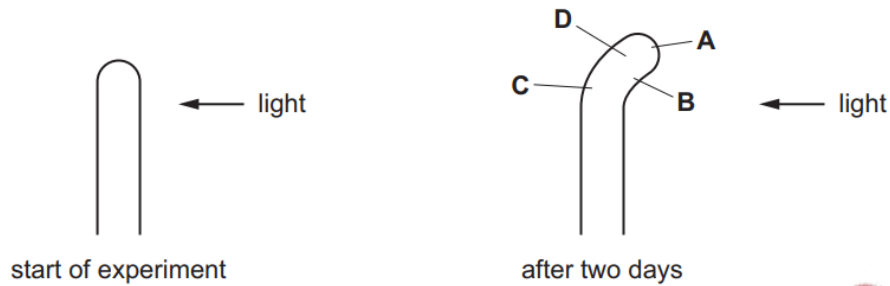
Which trophic level contains herbivores?

| trophic level | mass / $\text{g m}^{-3}$ |
|---------------|--------------------------|
| A             | 0.1                      |
| B             | 0.6                      |
| C             | 1.2                      |
| D             | 17.9                     |

20-

In an experiment to investigate phototropism, a plant shoot is grown with light coming from one side only.

After two days, in which region has the greatest rate of growth occurred?



21-

A student investigates the breakdown of fats in milk by lipase. Four test-tubes labelled A to D are set up.

The table shows the contents of each test-tube.

In which test-tube will the contents become acidic most quickly?

|          | milk | bile | boiled lipase | lipase |
|----------|------|------|---------------|--------|
| <b>A</b> | ✓    | ✓    | x             | ✓      |
| <b>B</b> | ✓    | ✓    | ✓             | x      |
| <b>C</b> | ✓    | x    | ✓             | x      |
| <b>D</b> | ✓    | x    | x             | ✓      |

key

✓ = present

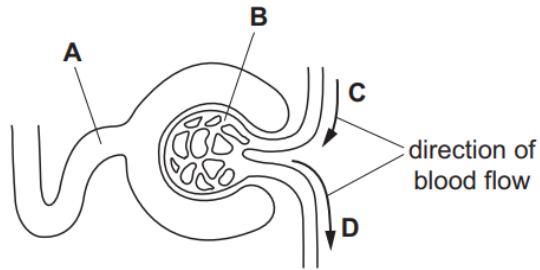
x = absent

22-

The diagram shows the first part of a kidney tubule and its blood supply.

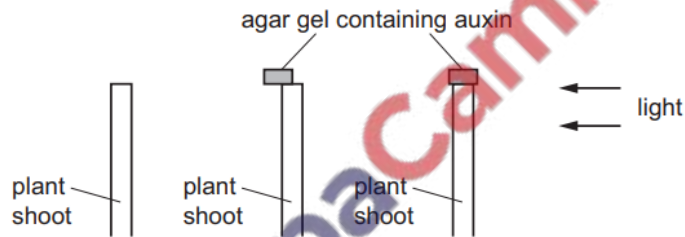
During filtration, protein molecules do not pass through the wall of the glomerulus.

Which part contains the highest concentration of protein?

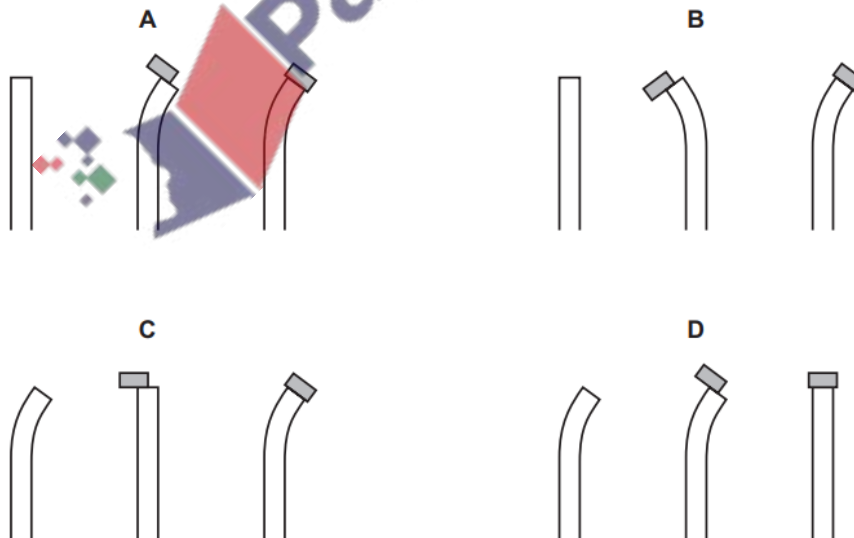


23-

Three plant shoots have their tips removed. Two of the shoots have a piece of agar gel placed on them, as shown in the diagram. The agar gel contains auxin. The shoots are exposed to light coming from one direction.



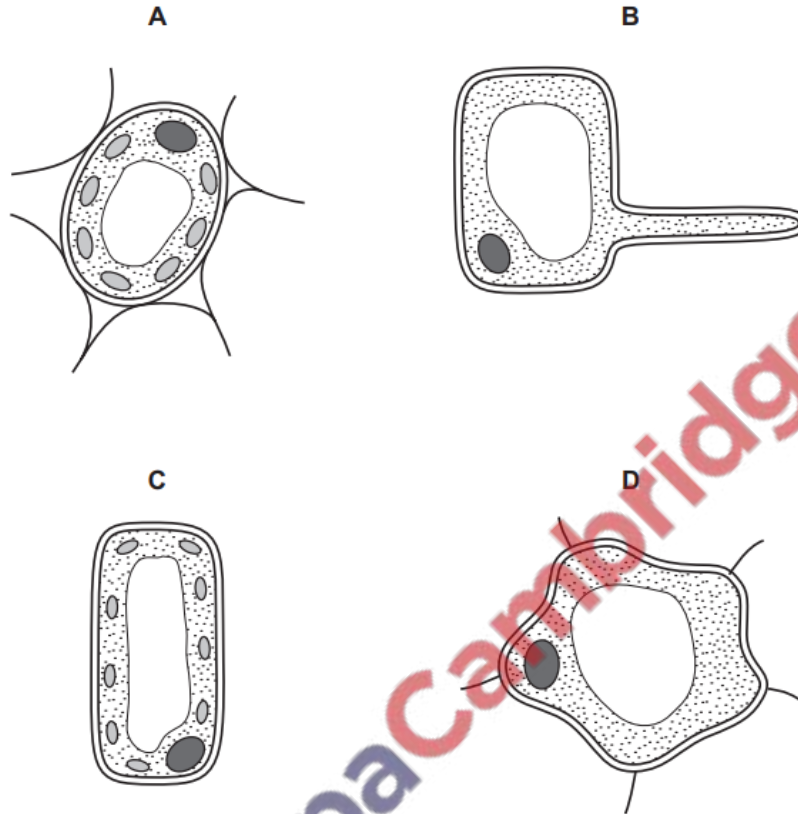
What is the appearance of the shoots after two days?



24-

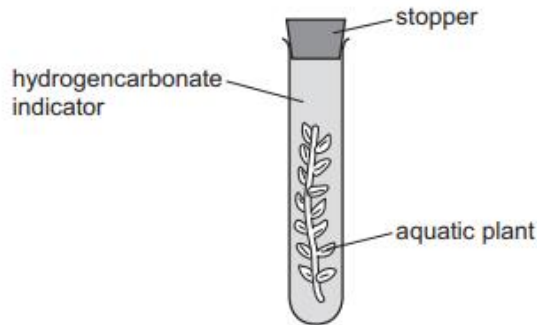
The diagrams show the structure of four different cells from a plant.

Which cell is from the upper epidermis of a leaf?



25-

Two sealed test-tubes containing aquatic plants and hydrogencarbonate indicator were set up.



The indicator in the sealed test-tubes shows the concentration of dissolved carbon dioxide present.

| concentration of carbon dioxide | colour of indicator |
|---------------------------------|---------------------|
| low                             | red                 |
| medium                          | orange              |
| high                            | yellow              |

One of the sealed test-tubes was kept in the light for 24 hours and one of the sealed test-tubes was kept in the dark for 24 hours.

The results are shown in the table.

| test-tube kept in | start colour | end colour |
|-------------------|--------------|------------|
| light             | orange       | red        |
| dark              | orange       | yellow     |

What is the correct explanation of what has taken place?

- A Photosynthesis and respiration both occur in the light, but the rate of photosynthesis is higher.
- B Photosynthesis occurs in the light, but respiration does not.
- C Respiration can only occur when photosynthesis is not taking place.
- D The amount of carbon dioxide used and produced in the light is equal.

26-

How many chromosomes are there in each of the human cells shown in the table?

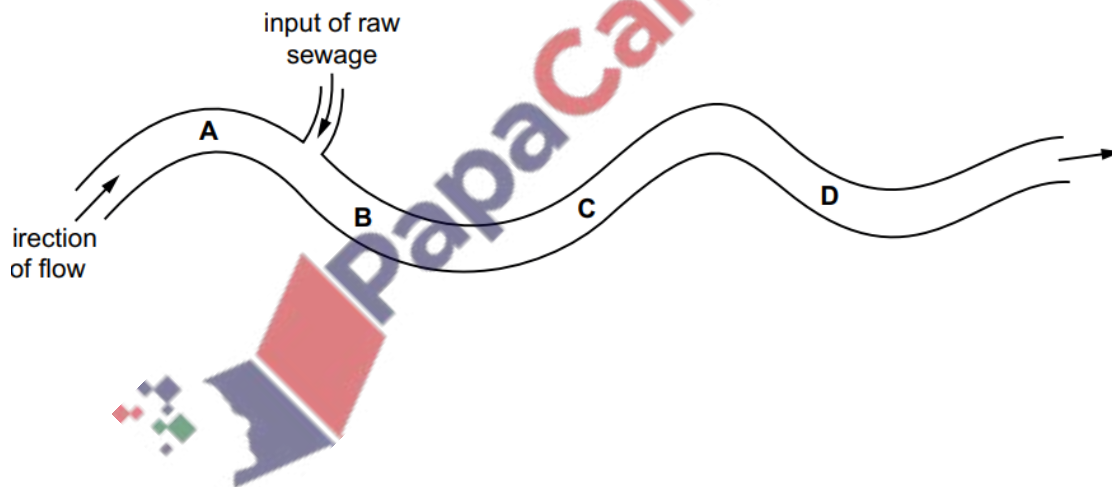
|   | goblet cell | motor neurone | mature red blood cell | sperm |
|---|-------------|---------------|-----------------------|-------|
| A | 0           | 23            | 0                     | 0     |
| B | 23          | 23            | 23                    | 0     |
| C | 46          | 46            | 0                     | 23    |
| D | 46          | 46            | 46                    | 23    |

27-

The bloodworm is an organism that is found in heavily polluted water.

The diagram shows where raw sewage flows into a river.

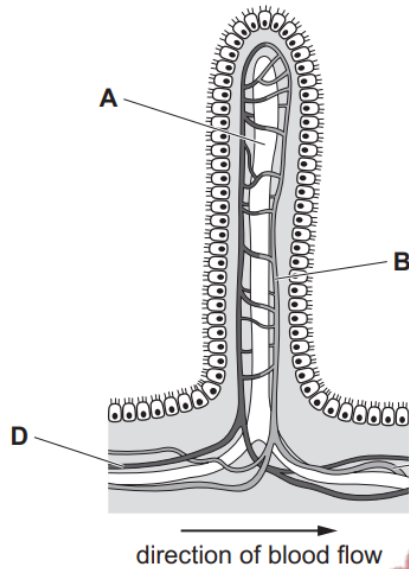
Where would there be fewest bloodworms?



28-

The diagram shows the structure of a villus. The arteriole, capillary, lacteal and venule are labelled with letters.

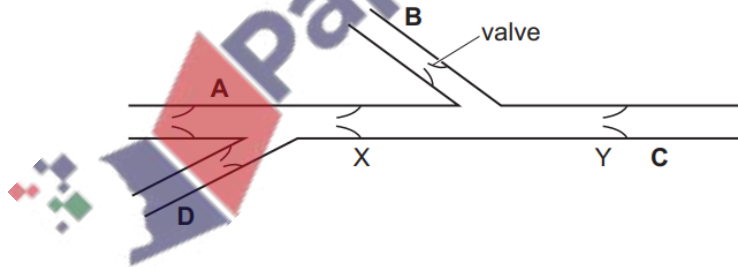
Which letter shows where nutrients are absorbed into the blood?



29-

The diagram shows some veins in the human arm and the valves that they contain.

If blood is squeezed out of section X-Y, where should pressure be placed on a vein to stop blood flowing into this section again?





30-

Insulin is now produced using genetically modified bacteria. Previously, diabetics were given insulin extracted from the pancreas of animals.

Why is the insulin from bacteria regarded as a better ethical choice?

- A insulin is produced from bacterial DNA
- B it is accepted by vegetarians
- C plasmids are involved
- D the genetic code is shared

31-

Which statement describes the relationship between evolution and natural selection?

- A A change in the adaptive features of a population over time causes evolution, resulting in natural selection.
- B Evolution causes a change in the adaptive features of a population over time, resulting in natural selection.
- C Evolution causes natural selection, resulting in a change in the adaptive features of a population over time.
- D Evolution is the change in the adaptive features of a population over time as a result of natural selection.

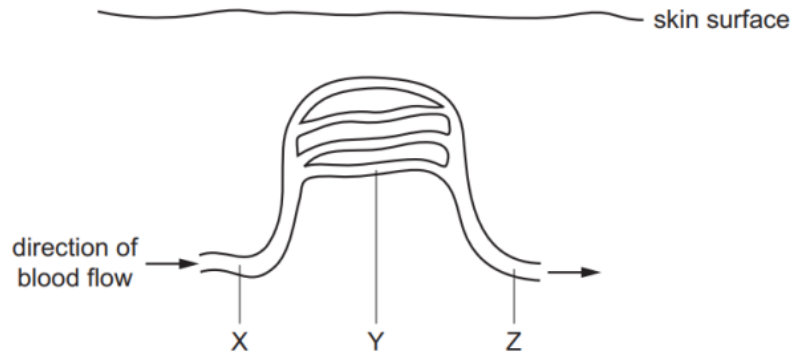
32-

Which structure will be found in the nucleus of a body cell in a woman?

- A X allele
- B X chromosome
- C Y allele
- D Y chromosome

33-

The diagram shows some blood vessels near the surface of the skin.



If vasodilation occurs at X, what happens to the blood flow at Y and Z?

|          | Y         | Z              |
|----------|-----------|----------------|
| <b>A</b> | decreases | decreases      |
| <b>B</b> | decreases | stays constant |
| <b>C</b> | increases | increases      |
| <b>D</b> | increases | stays constant |

34-

Some features that help to defend the body against pathogens are listed.

- 1 mucus
- 2 skin
- 3 stomach acid
- 4 phagocytosis

Which features can prevent pathogens entering body tissues?

- A** 1, 2, 3 and 4
- B** 1, 2 and 3 only
- C** 2 and 3 only
- D** 4 only

35-

What will happen to a green plant grown in soil that is deficient in nitrate ions?

- A** It will have large leaves and good root growth.
- B** It will have purple leaves and poor root growth.
- C** It will have small leaves and a thin stem.
- D** It will have white leaves and a thick stem.

36-

The statements describe how a protein is made.

- 1 mRNA passes through a ribosome.
- 2 mRNA molecules carry a copy of the gene to the cytoplasm.
- 3 The gene coding for the protein is copied in the nucleus.
- 4 Ribosomes assemble amino acids into proteins.

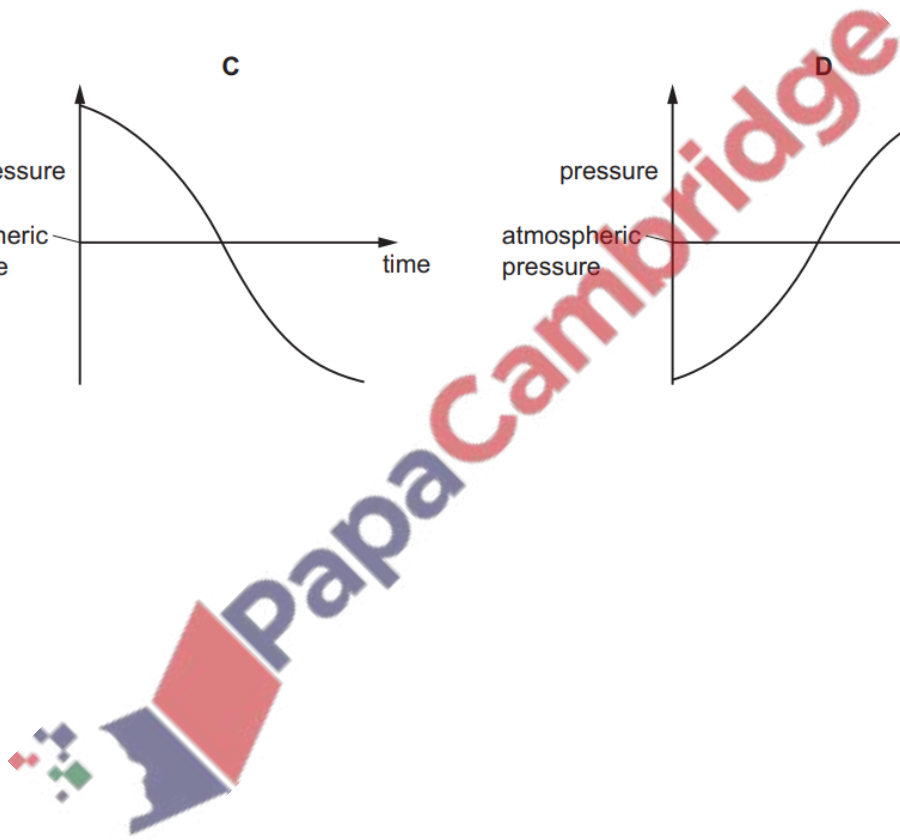
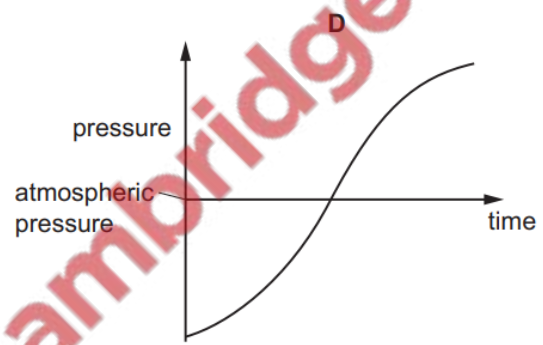
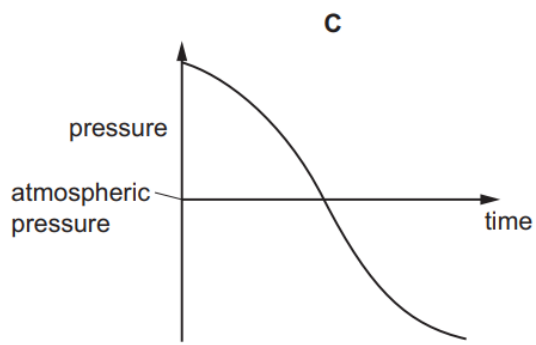
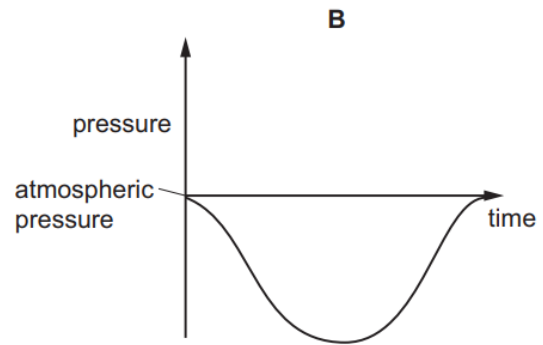
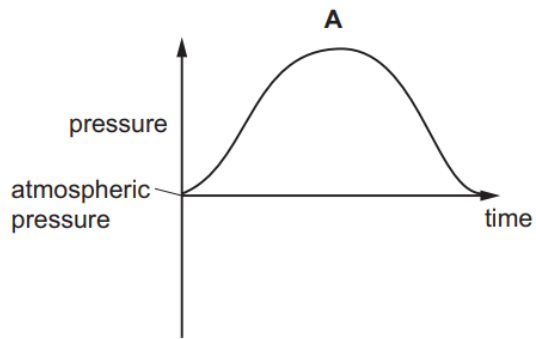
What is the order of statements that correctly describes how a protein is made?

- A** 2 → 1 → 3 → 4
- B** 2 → 3 → 4 → 1
- C** 3 → 1 → 2 → 4
- D** 3 → 2 → 1 → 4



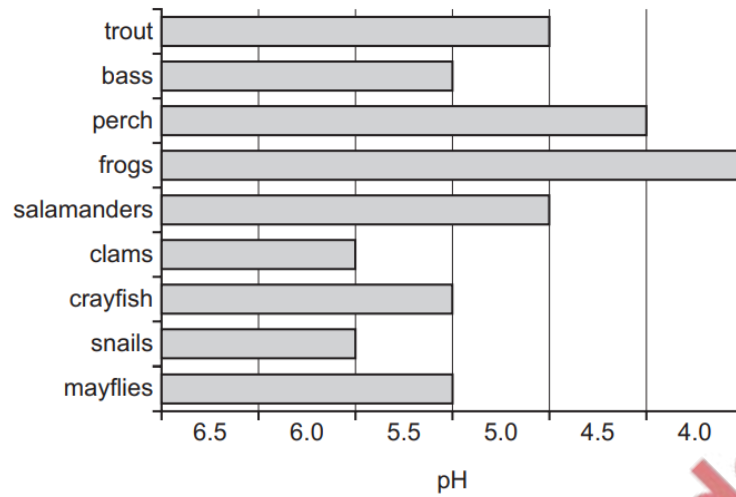
37-

0 Which graph shows how the pressure inside the lungs changes when taking one breath in?



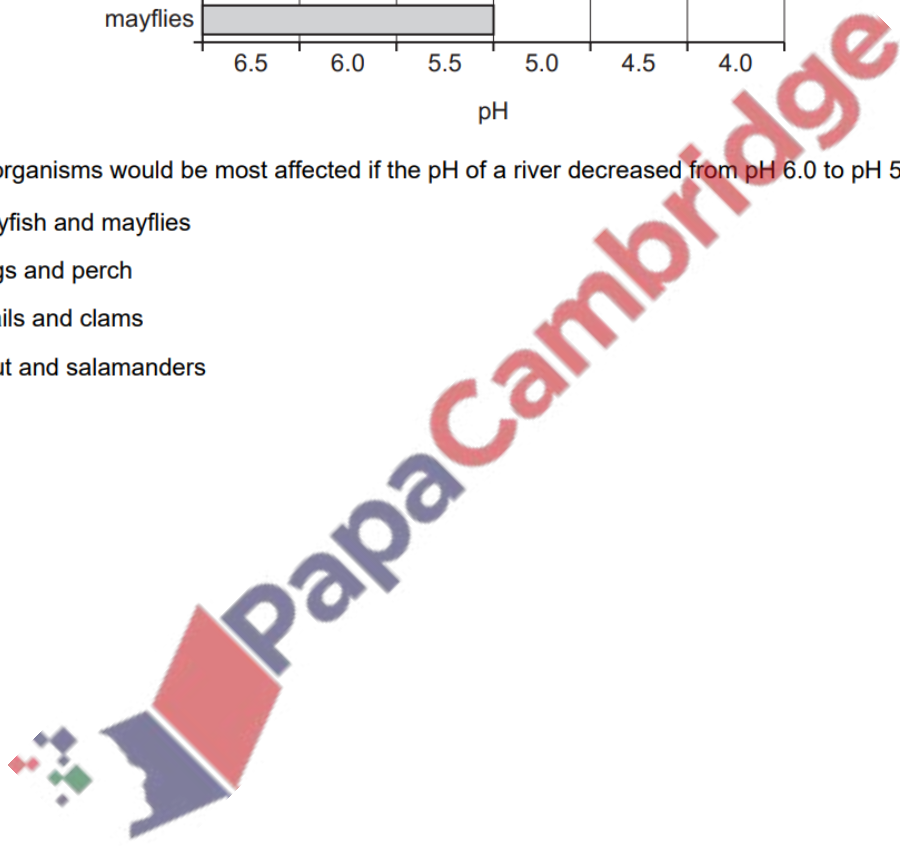
38-

The bar chart shows the tolerance of some river organisms to different levels of pH.



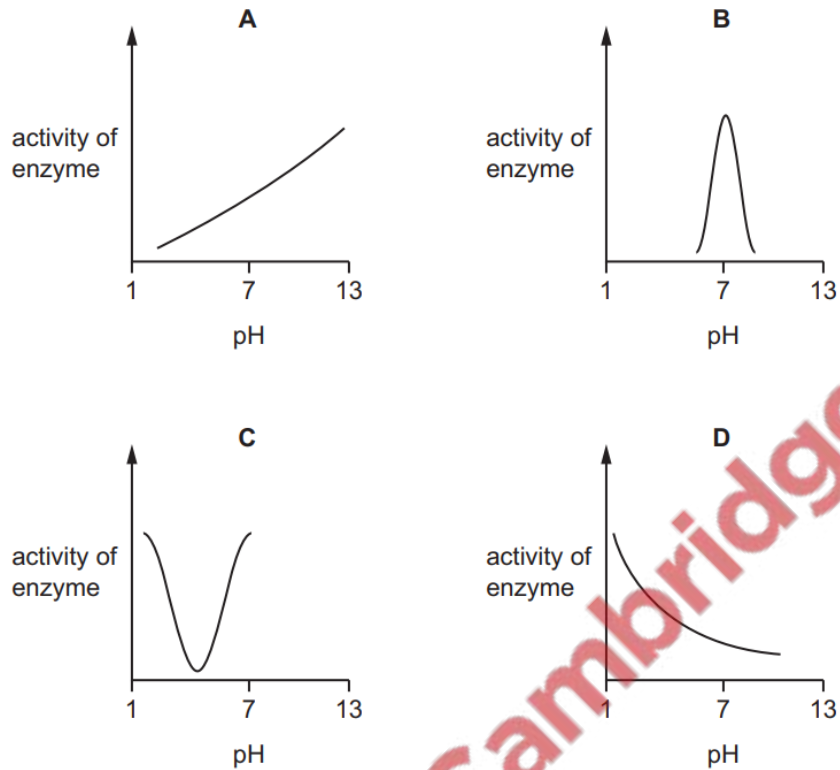
Which organisms would be most affected if the pH of a river decreased from pH 6.0 to pH 5.5?

- A crayfish and mayflies
- B frogs and perch
- C snails and clams
- D trout and salamanders



39-

Which graph represents the effect of pH on the activity of a digestive enzyme?



40-

Which statement about reproduction is correct?

- A** All living species can reproduce asexually.
- B** Gametes are needed for asexual reproduction.
- C** Only organisms that are separated from other organisms of the same species can reproduce asexually.
- D** Some organisms reproduce asexually and sexually.

41-

With which kingdoms do bacteria share the same genetic code?

- A** animal, plant, fungus and protocist
- B** animal, plant and fungus only
- C** animal and plant only
- D** animal only

42-

In guinea pigs, the allele for black fur is dominant and the allele for white fur is recessive.

A test cross can be used to determine the genotype of a black guinea pig.

What would be the expected result of the test cross if the black guinea pig was heterozygous?

- A** 50% black, 50% white
- B** 25% black, 75% white
- C** 100% black
- D** 100% white

43-

What is an example of sustainable use of resources?

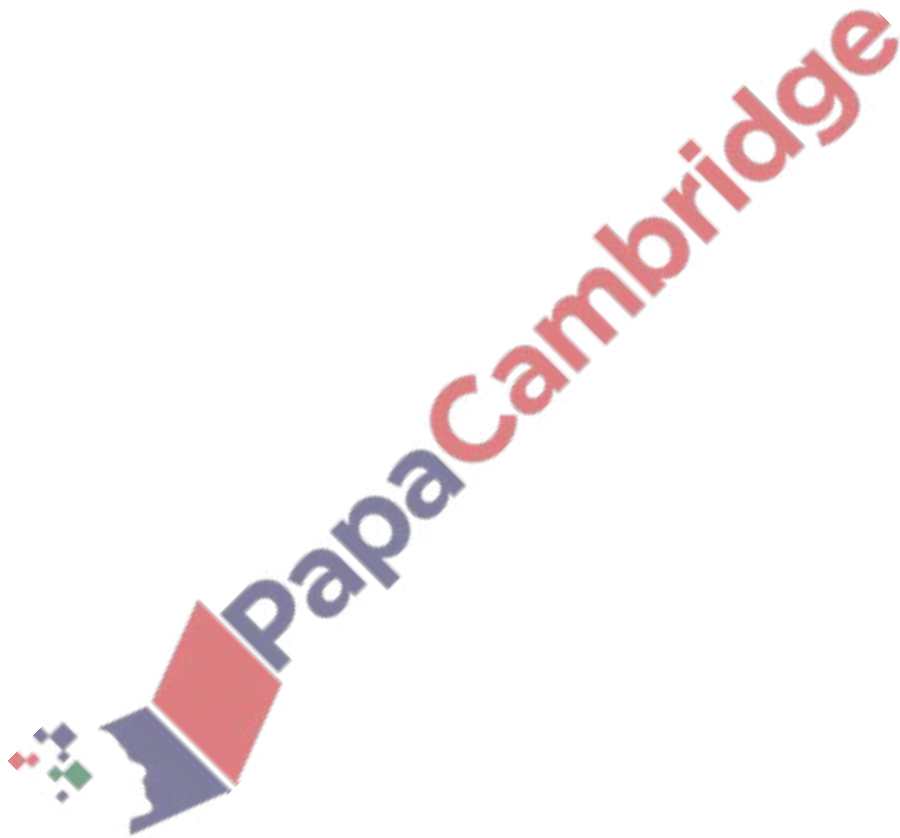
- A** allowing only young fish to be caught
- B** cutting down a forest and not replanting trees
- C** controlling the number of fish caught with quotas
- D** planting deforested areas with one species of crop plant

44-

Two animals have an identical sequence of amino acids in one of the proteins found in their cells.

What does this indicate about these animals?

- A** They have been eating the same types of food.
- B** They have not been exposed to substances that cause mutation.
- C** They must be members of the same genus.
- D** They share an ancestor.





1-D

2-D

3-C

4-C

5-C

6-B

7-C

8-C

9-B

10-B

11-B

12-A

13-D

14-A

15-D

16-A

17-A

18-C

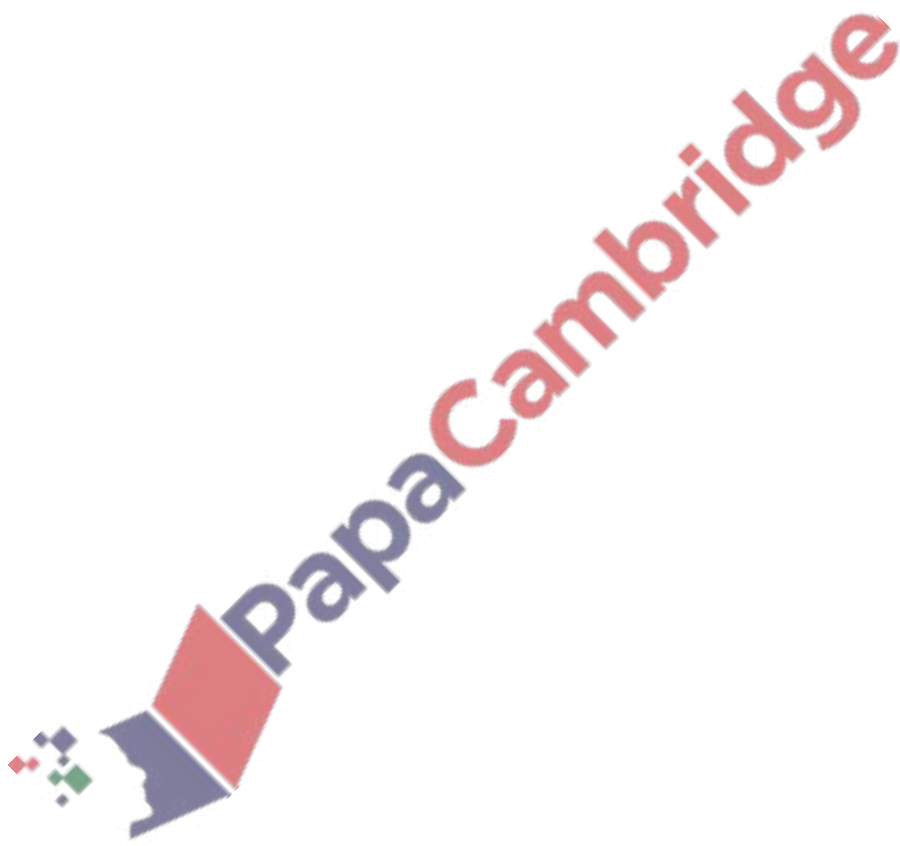
19-C

20-C

21-A

22-D

23-A



24-D

25-A

26-C

27-A

28-B

29-C

30-B

31-D

32-B

33-C

34-B

35-C

36-D

37-B

38-C

39-B

40-D

41-A

42-A

43-C

44-D

