

## Characteristics & classification

1.

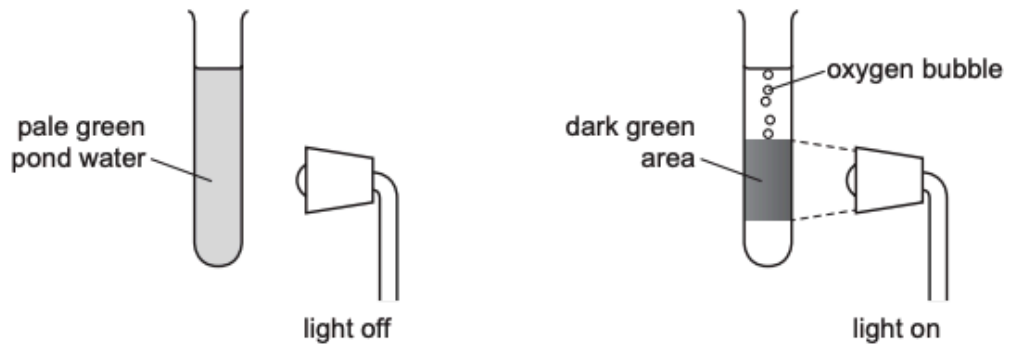
Which process occurs both in plants and in animals?

- A excretion
- B phagocytosis
- C photosynthesis
- D transpiration

A

2.

The diagrams show a test-tube containing pond water. The green colour is caused by microorganisms that have chloroplasts.



Which characteristics of living organisms are shown?

- A excretion, growth and movement
- B movement, nutrition and sensitivity
- C nutrition, reproduction and respiration
- D reproduction, sensitivity and growth

B

3.

Some statements about species are given.

- 1 Members of a species all look identical.
- 2 Members of a species belong to the same genus.
- 3 Members of a species can produce fertile offspring.
- 4 Species are named using an international system.

Which statements are correct?

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

D

4.

Which process provides an organism with the raw materials needed for tissue repair?

- A excretion
- B growth
- C nutrition
- D respiration

C

The repair of tissues requires the use of starting materials which are biomolecules like proteins and carbohydrates. These starting materials are sources from the food that we eat.

### Organisation of the organism

1.

Which row shows structures that are present in both root hair cells and palisade mesophyll cells?

	cell wall	chloroplasts	cytoplasm	vacuole
<b>A</b>	✓	✓	✓	x
<b>B</b>	x	✓	✓	✓
<b>C</b>	✓	x	✓	✓
<b>D</b>	✓	✓	x	✓

key  
✓ = present  
x = absent

C

2.

The cells listed have specialised structures that allow them to carry out their functions.

- 1 ciliated cell
- 2 nerve cell
- 3 root cortex cell
- 4 sperm cell

Which cells have structures that can move?

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

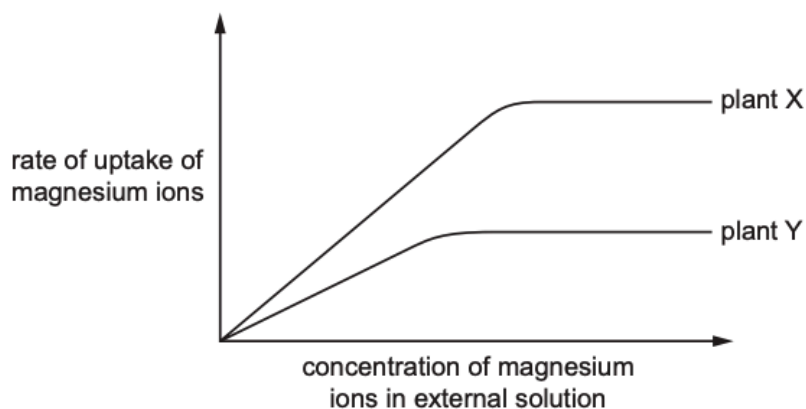
B

### Movement in & out of cells

1.

The graph shows the rate of uptake of magnesium ions by two similar plants, X and Y.

The roots of each plant were placed in a range of solutions. Each solution contained a different concentration of magnesium ions. All other conditions were kept constant.



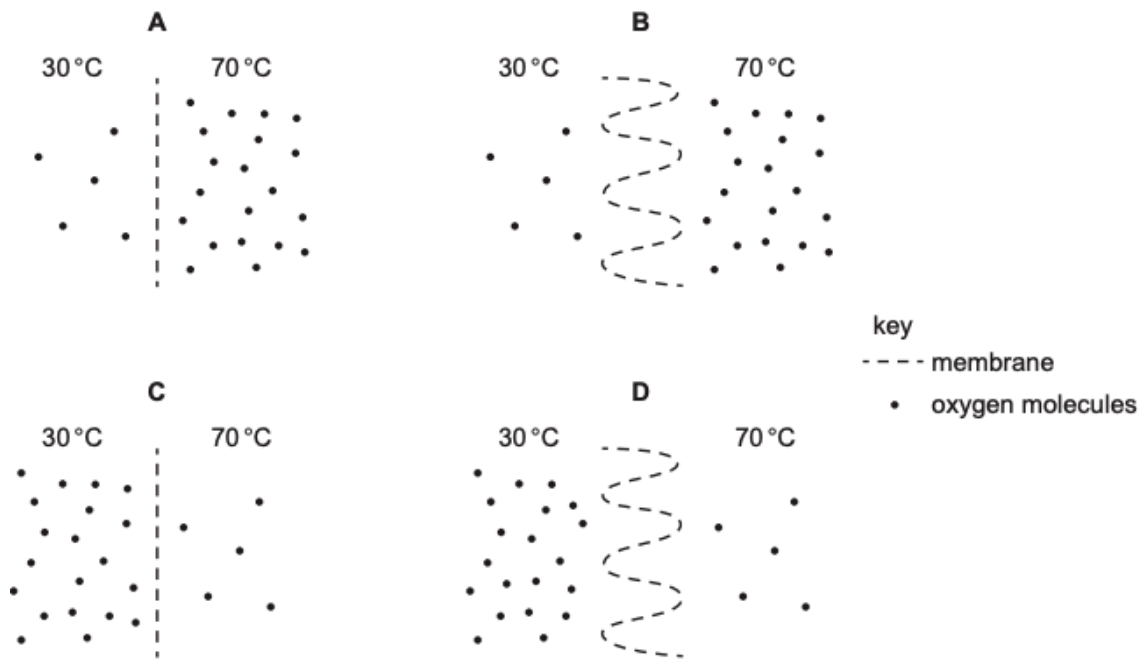
What is a possible explanation for the difference in the results for the two plants?

- A** Plant Y has fewer protein carriers for magnesium ions in its cell membranes.
- B** Plant Y has a higher rate of respiration.
- C** Plant Y has more root hair cells.
- D** The root hair cells in plant Y have a lower water potential.

A

2.

In which diagram would most oxygen molecules diffuse across the membrane per minute?



B

3.

Plant tissue is placed in a solution.

What would cause plasmolysis of the plant cells?

- 1 the external solution having a higher water potential than the plant cells
- 2 the external solution having a lower water potential than the plant cells
- 3 water moving out of the plant cells
- 4 water moving into the plant cells

**A** 1 and 3

**B** 1 and 4

**C** 2 and 3

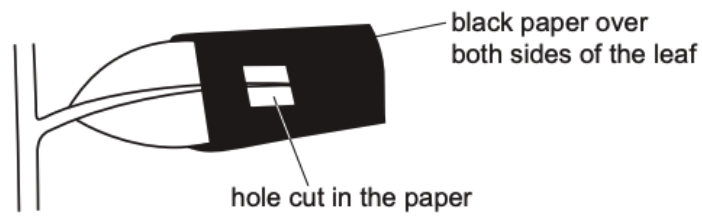
**D** 2 and 4

C

**Plant nutrition**

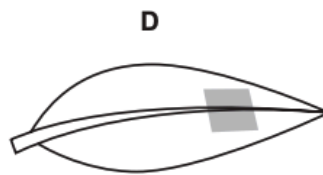
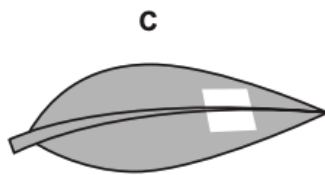
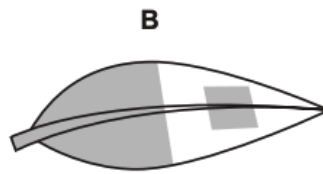
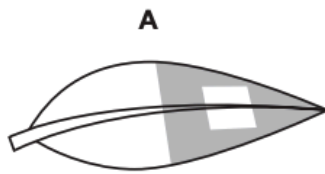
1.

A plant is placed in the dark until all its stored starch is used up. The plant is placed in light with black paper over part of one green leaf.



After eight hours, the leaf is tested for starch.

Which diagram shows the appearance of the leaf after this test?



key

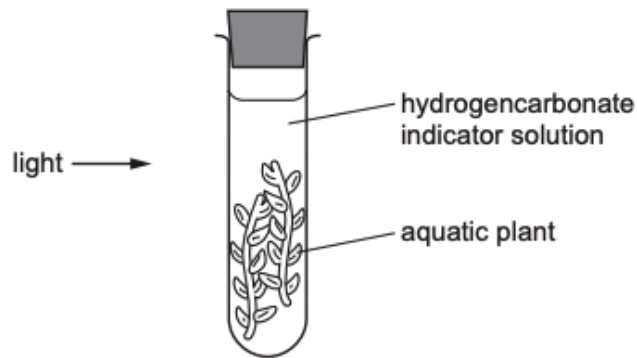
■ = starch present

□ = starch **not** present

B

2.

An experiment is set up to investigate gas exchange in aquatic plants.



The hydrogencarbonate indicator solution is orange at the start.

Which colour is it after three hours?

- A** blue-black
- B** orange
- C** purple
- D** yellow

C

3.

Sucrose and amino acids move around a plant from sources to sinks.

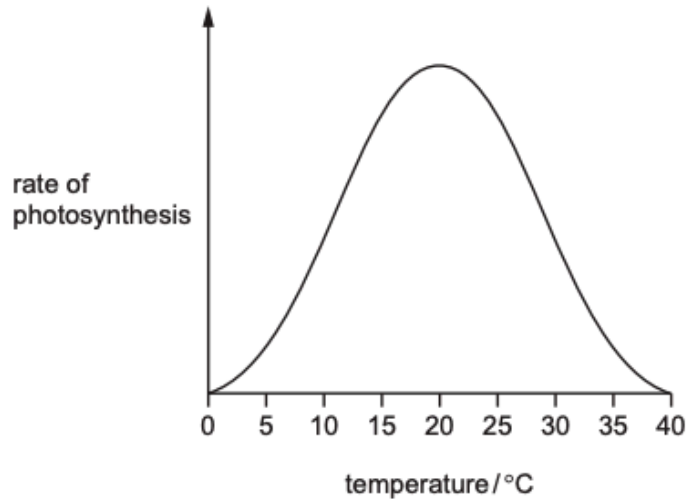
Which row shows the sources and sinks?

	root cortex cells	xylem vessels	palisade mesophyll cells
<b>A</b>	source and sink	neither	source
<b>B</b>	sink	sink	source and sink
<b>C</b>	neither	source and sink	sink
<b>D</b>	source and sink	source	neither

A

4.

The graph shows the effect of temperature on the rate of photosynthesis.



Which statement explains the change in rate of photosynthesis between 15°C and 20°C?

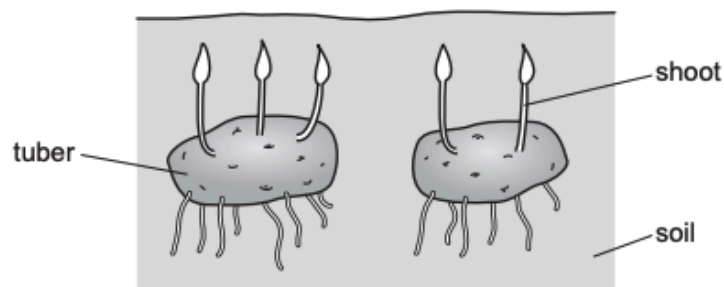
- A Chlorophyll is able to transfer more energy in chemicals to energy in light.
- B Enzymes involved in photosynthesis have denatured.
- C Kinetic energy of molecules is increasing, resulting in more effective collisions.
- D Light intensity and **not** temperature is limiting the rate of photosynthesis.

C

5.

The diagram shows some potato tubers. New shoots are beginning to grow.

Sucrose is being translocated from source to sink.



Which statement is correct?

- A The tuber is a sink.
- B The soil is a sink.
- C The shoots are sources.
- D The shoots are sinks.

D

6.

The statements describe some of the events that occur in a plant after light energy is absorbed by chlorophyll.

- 1 converted to chemical energy
- 2 converted to sucrose for translocation
- 3 starch is stored in the roots or seeds
- 4 glucose is produced

In which order do these events occur?

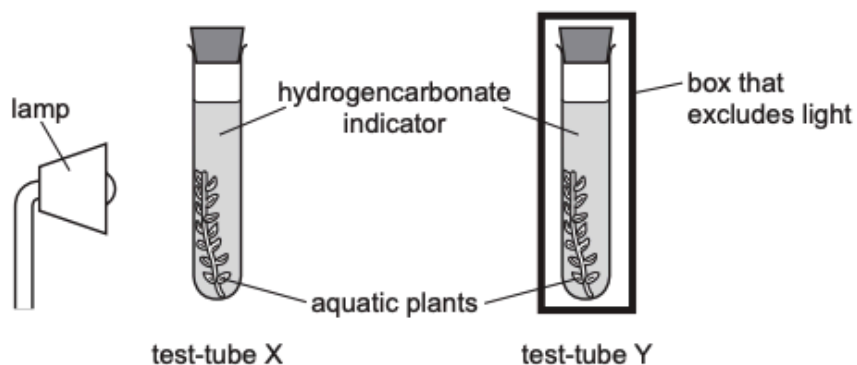
- A** 1 → 4 → 3 → 2
- B** 4 → 2 → 3 → 1
- C** 4 → 1 → 2 → 3
- D** 1 → 4 → 2 → 3

D



7.

Two test-tubes were filled with hydrogencarbonate indicator. An aquatic plant was placed into each test-tube and the test-tubes were sealed with bungs, as shown.



Test-tube X was illuminated and test-tube Y was kept in the dark. The results are shown.

test-tube	colour of the hydrogencarbonate indicator	
	at the start of the investigation	at the end of the investigation
X	orange	red
Y	orange	yellow

What causes the colour changes in the hydrogencarbonate indicator in X and Y?

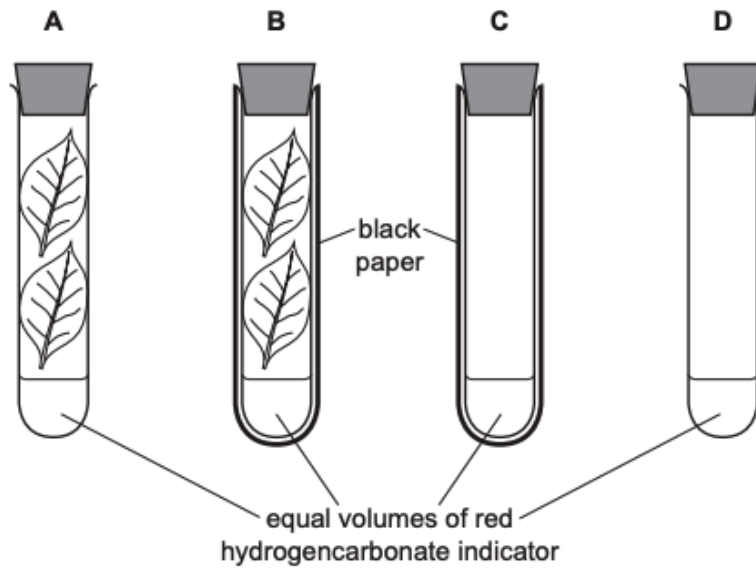
	X	Y
<b>A</b>	a decrease in the concentration of carbon dioxide	an increase in the concentration of carbon dioxide
<b>B</b>	a decrease in the concentration of oxygen	an increase in the concentration of oxygen
<b>C</b>	an increase in the concentration of carbon dioxide	a decrease in the concentration of carbon dioxide
<b>D</b>	an increase in the concentration of oxygen	a decrease in the concentration of oxygen

A

8.

Four test-tubes are set up as shown. The test-tubes are kept at 20 °C in a water-bath, in the light, for two hours.

In which test-tube does the hydrogencarbonate indicator turn yellow?



B

### Plant transport

1.

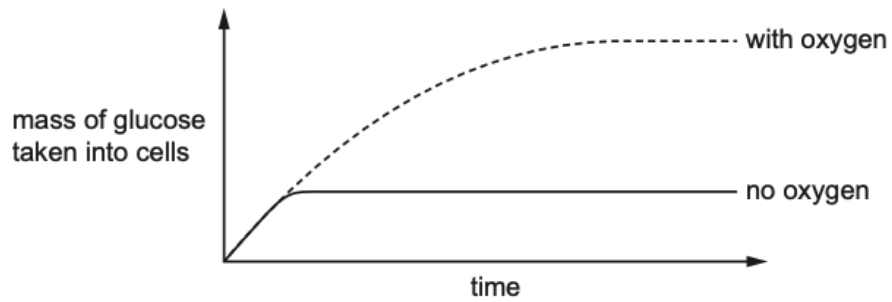
By which process does water escape from stomata in the leaves?

- A active transport
- B diffusion
- C evaporation
- D osmosis

B

2.

The graph shows the results of an investigation into the effect of oxygen on the uptake of glucose by cells.



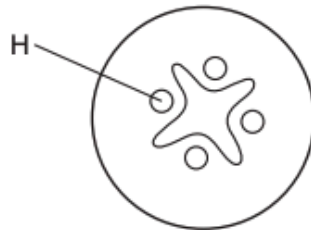
Which conclusion can be made about these data?

- A** Glucose only enters the cells by active transport.
- B** Glucose only enters the cells by diffusion.
- C** Glucose enters the cells by both active transport and diffusion.
- D** Glucose enters the cells by osmosis.

C

3.

The diagram shows a cross-section of part of a plant.



Which part of the plant is shown and what is the tissue labelled H?

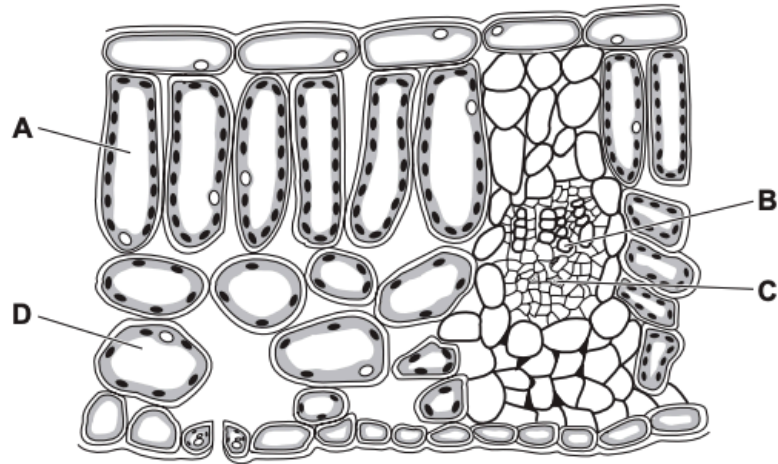
	plant part	tissue H
<b>A</b>	root	phloem
<b>B</b>	root	xylem
<b>C</b>	stem	phloem
<b>D</b>	stem	xylem

A

4.

The diagram shows a cross-section through a leaf.

From which cell will most water evaporate during transpiration?

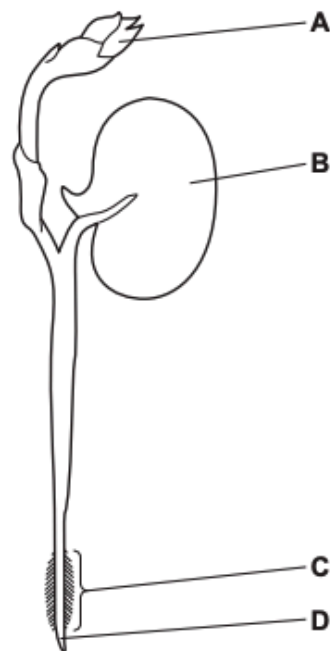


D

5.

The diagram shows a bean seedling soon after it has germinated.

Where is most water absorbed?

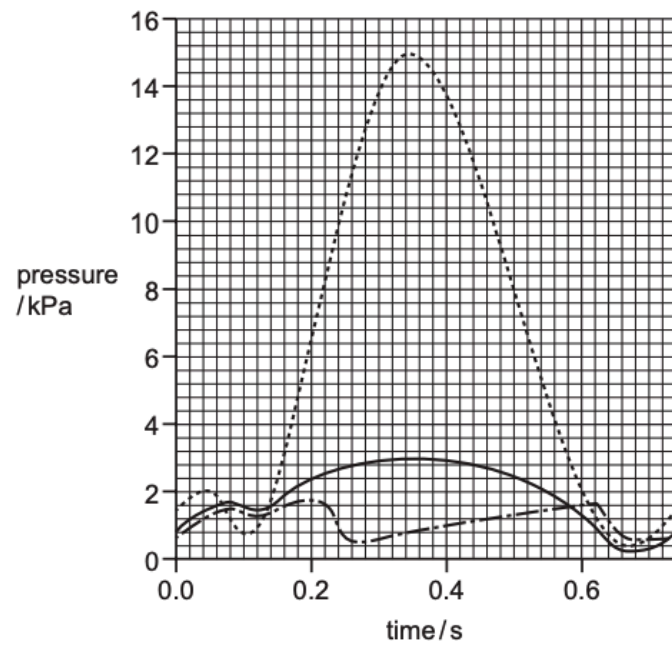


C

Transport in humans

1.

The graph shows pressure changes that take place in the right atrium, right ventricle and left ventricle of a human heart when the muscle walls contract and relax.



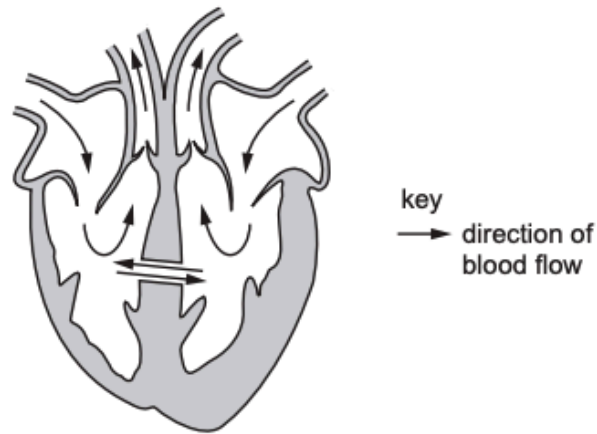
What is the pressure in the right ventricle when the left ventricle is at its maximum pressure?

- A** 0.4 kPa      **B** 2.0 kPa      **C** 3.0 kPa      **D** 15.0 kPa

C

2.

People are sometimes born with a 'hole in the heart'. This is caused by a gap in the septum, as shown.



If the gap in the septum is not repaired, it causes the person to become breathless more quickly.

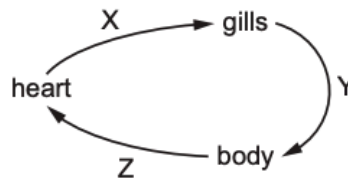
What is a possible explanation for this?

- A** Deoxygenated blood in the left atrium mixes with oxygenated blood from the right atrium.
- B** Deoxygenated blood in the right atrium mixes with oxygenated blood from the left atrium.
- C** Oxygenated blood in the left ventricle mixes with deoxygenated blood from the right ventricle.
- D** Oxygenated blood in the right ventricle mixes with deoxygenated blood from the left ventricle.

C

3.

The diagram shows the circulatory system of a fish.



Where in the circulatory system is the oxygen concentration lowest?

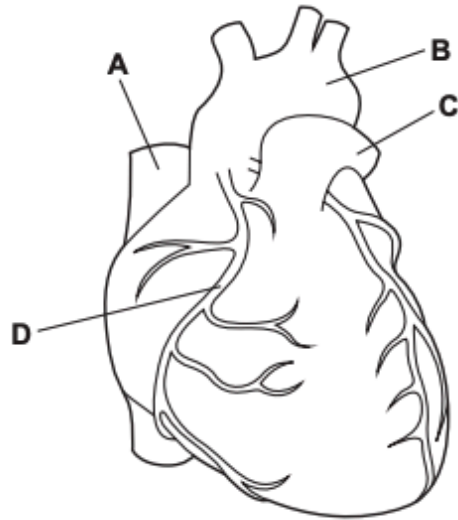
- A** X only
- B** X and Y
- C** Y only
- D** Y and Z

A

4.

The diagram shows the outside of a human heart.

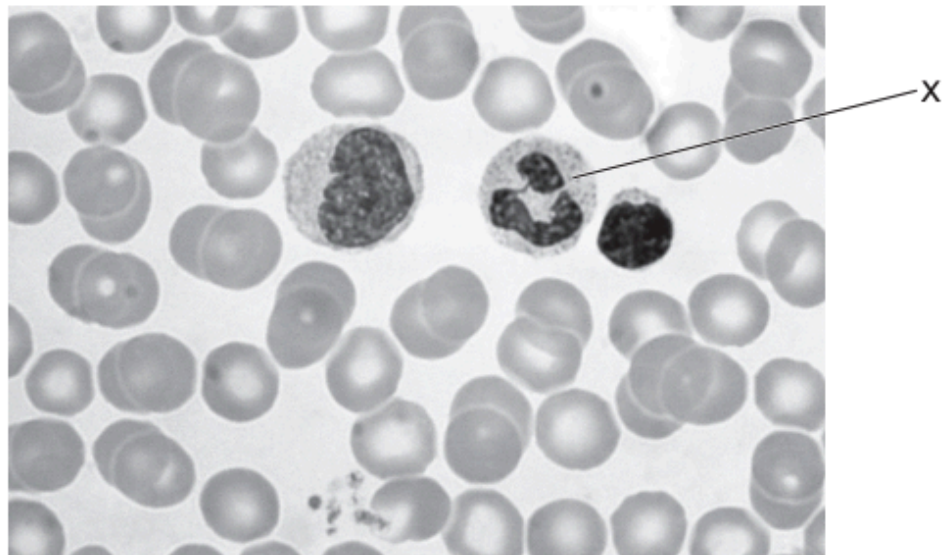
Which structure is a coronary artery?



D

5.

The photomicrograph shows some different types of blood cell.



What is the function of the cell labelled X?

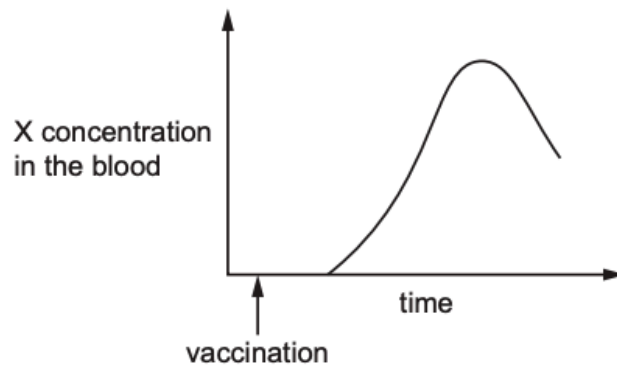
- A clotting blood
- B phagocytosis
- C producing antibodies
- D transporting oxygen

B

## Diseases & immunity

1.

The graph shows the response of the body to vaccination.



Which word should be used to replace the letter X, to complete the label on the y-axis?

- A** antibody
- B** antigen
- C** pathogen
- D** platelet

A

2.

A disease cannot be treated with antibiotics.

What could be the reasons for this?

- 1 It is not a bacterial disease.
- 2 The pathogen is a virus.
- 3 The patient has become resistant to the antibiotic.

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

A

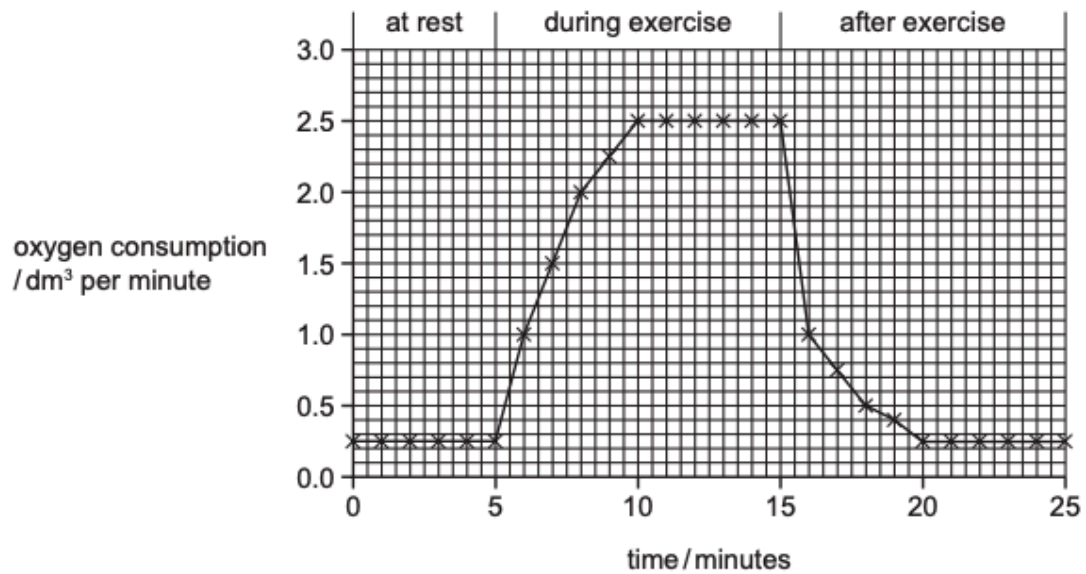
## Gas exchange in humans



1.

A student measured their oxygen consumption before, during and after exercise.

The results are shown in the graph.



At which time is the oxygen debt being removed?

- A 5–10 minutes
- B 5–15 minutes
- C 15–20 minutes
- D 20–25 minutes

C

2.

Different stages in the process of expiration are listed.

- 1 Rib cage moves downwards and inwards.
- 2 Volume of thorax decreases and pressure in lungs increases.
- 3 Air is pushed out of lungs.
- 4 Diaphragm and external intercostal muscles relax.

What is the correct order of these stages?

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

D

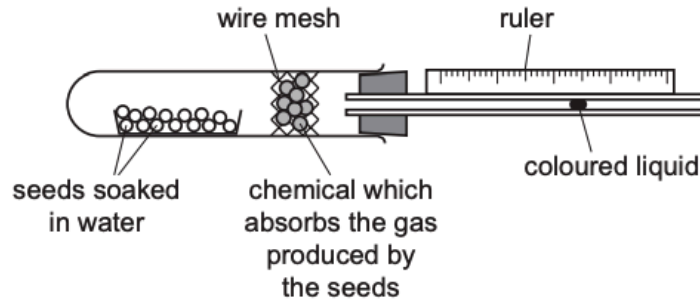
NOTE: the diaphragm and intercostal muscles respond first, and then the rib cage

## Respiration

1.

The apparatus shown was used to investigate aerobic respiration in seeds.

The apparatus was placed in a dark room.



All environmental conditions were kept constant.

What will happen in the apparatus?

	gas taken in by the seeds	gas absorbed by the chemical in the wire mesh	direction of movement of the coloured liquid
<b>A</b>	carbon dioxide	oxygen	towards the seeds
<b>B</b>	carbon dioxide	oxygen	away from the seeds
<b>C</b>	oxygen	carbon dioxide	towards the seeds
<b>D</b>	oxygen	carbon dioxide	away from the seeds

C

2.

After running a fast race, some students have pains in their leg muscles due to a build up of lactic acid. A student wrote this explanation.

- 1 During the race, the cells did **not** have enough oxygen for aerobic respiration.
- 2 Anaerobic respiration occurs so some energy is released from glucose.
- 3 The lactic acid is produced by aerobic respiration.

Which statements explain why the lactic acid built up in the muscles?

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

A

3.

Which statements describe how an oxygen debt is removed after vigorous exercise?

- 1 Lactic acid is transported to the liver.
- 2 Lactic acid is respired aerobically.
- 3 Heart rate stays high to remove lactic acid from the muscles.

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

C

4.

During vigorous exercise, lactic acid builds up in muscles leading to an oxygen debt.

Which statement describes a stage in the removal of the oxygen debt during recovery?

- A** Anaerobic respiration breaks down lactic acid in the muscles.
- B** Aerobic respiration breaks down lactic acid in the muscles.
- C** Anaerobic respiration breaks down lactic acid in the liver.
- D** Aerobic respiration breaks down lactic acid in the liver.

D

5.

What is the word equation for anaerobic respiration in muscle cells?

- A** glucose + oxygen → lactic acid
- B** glucose → carbon dioxide
- C** glucose + carbon dioxide → alcohol
- D** glucose → lactic acid

D

**Excretory system**

1.

Which row shows where glucose will be found in the body of a healthy human after eating a meal?

	renal artery	renal vein	glomerulus	nephron	ureter
<b>A</b>	yes	no	yes	yes	yes
<b>B</b>	yes	yes	no	no	no
<b>C</b>	yes	yes	yes	yes	no
<b>D</b>	no	yes	no	no	yes

C

2.

The table shows the concentration of sodium ions in blood plasma, in glomerular filtrate (the liquid that passes through the glomerulus) and in urine.

	blood plasma	glomerular filtrate	urine
concentration of sodium ions /arbitrary units	141	141	127

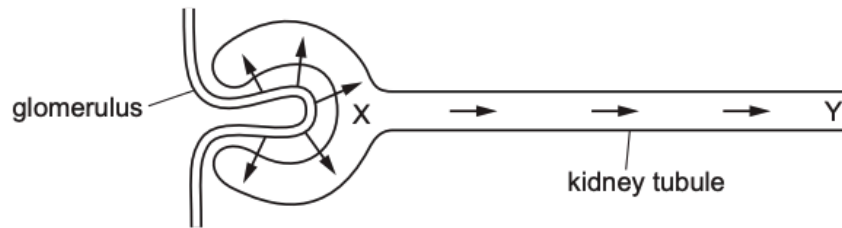
What is the percentage concentration of sodium ions reabsorbed in the kidney tubules?

- A** 0.0%      **B** 9.9%      **C** 10.9%      **D** 14.0%

B

3.

Which statement correctly explains the difference in glucose concentration in the kidney tubule between X and Y?



- A** The glucose concentration is higher at X than at Y because glucose moves out of the kidney tubule by osmosis.
- B** The glucose concentration is higher at X than at Y because glucose has been actively transported out of the kidney tubule.
- C** The glucose concentration is higher at Y than at X because glucose diffuses into the kidney tubule.
- D** The glucose concentration is higher at Y than at X because glucose is actively transported into the kidney tubule.

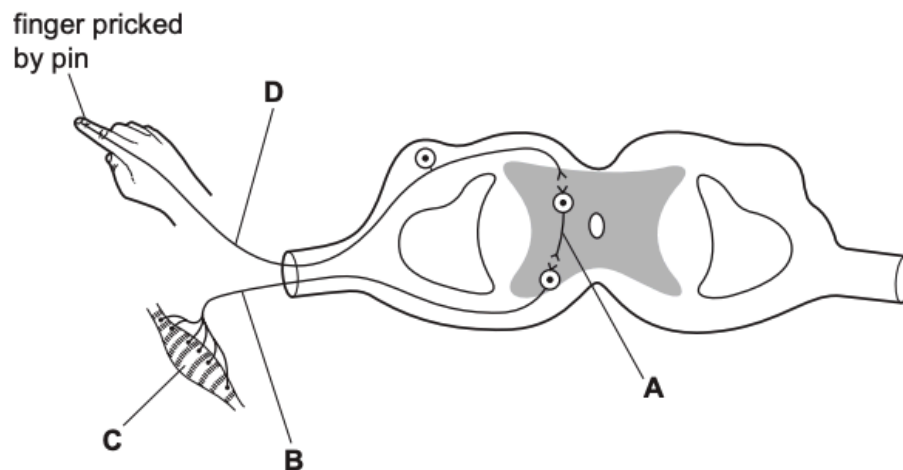
B

### Coordination & response

1.

The diagram shows a reflex arc.

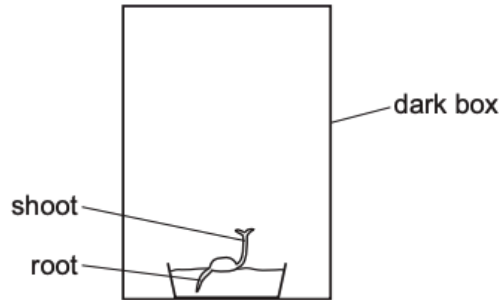
Which label identifies the motor neurone?



B

2.

The diagram shows a seedling growing inside a dark box.



Which type of responses affect the direction of growth of the root and the shoot inside the box?

	response by the root	response by the shoot
<b>A</b>	gravitropism	gravitropism
<b>B</b>	gravitropism	phototropism
<b>C</b>	phototropism	gravitropism
<b>D</b>	phototropism	phototropism

A

3.

Which statements are correct for cone cells in the eye?

- 1 Cone cells are located in the fovea of the retina.
- 2 Cone cells detect colour.
- 3 Cone cells are more sensitive to light than rod cells.

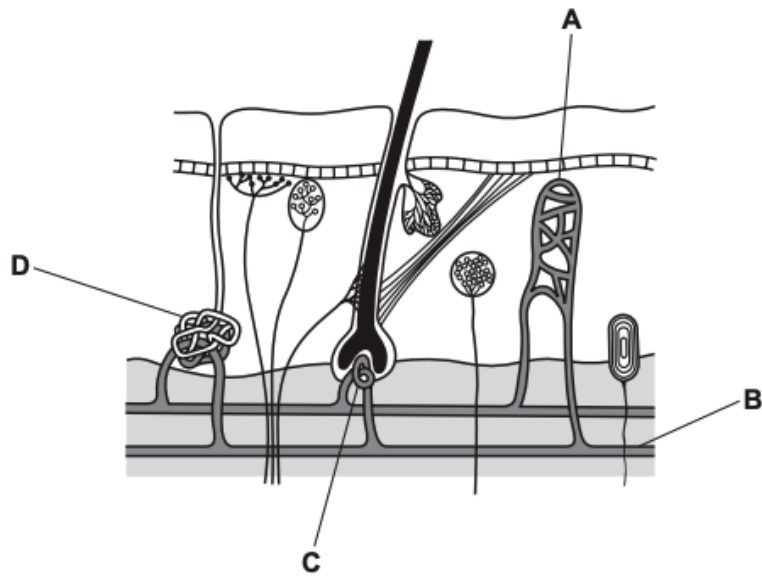
**A** 1, 2 and 3    **B** 1 and 2 only    **C** 1 and 3 only    **D** 2 and 3 only

B

4.

The diagram shows the structure of the human skin.

Which structure constricts to reduce heat loss?

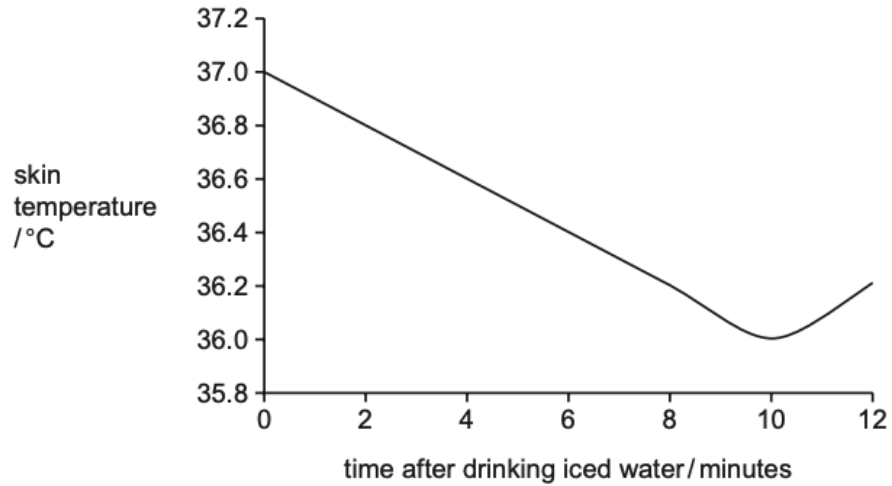


B

5.

A scientist investigated the effect of drinking iced water on skin temperature. They drank a large volume of iced water and monitored the temperature of their skin.

The results are shown on the graph.



Which explanation of the change in skin temperature during the first 10 minutes is correct?

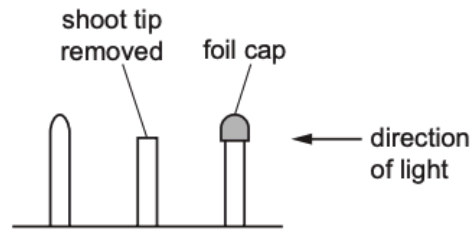
- A** Vasoconstriction occurred increasing blood flow to the skin.
- B** Vasoconstriction occurred reducing blood flow to the skin.
- C** Vasodilation occurred increasing blood flow to the skin.
- D** Vasodilation occurred reducing blood flow to the skin.

B

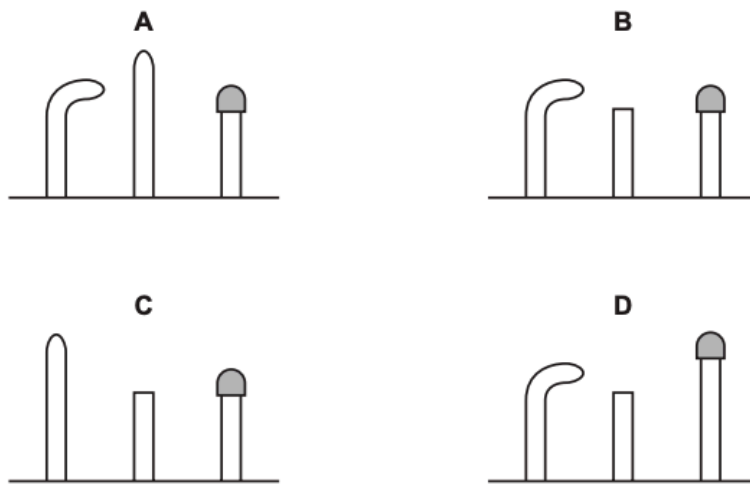


6.

An experiment was set up to investigate the growth of shoots in different conditions, as shown.



Which diagram shows the results that would be seen a few days later?



D

7.

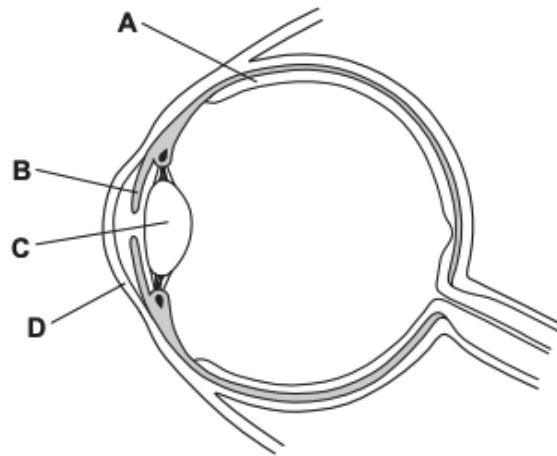
Which factors affect the growth of plants?

- A gravity and light only
- B gravity, light and temperature
- C gravity and temperature only
- D light and temperature only

B

8.

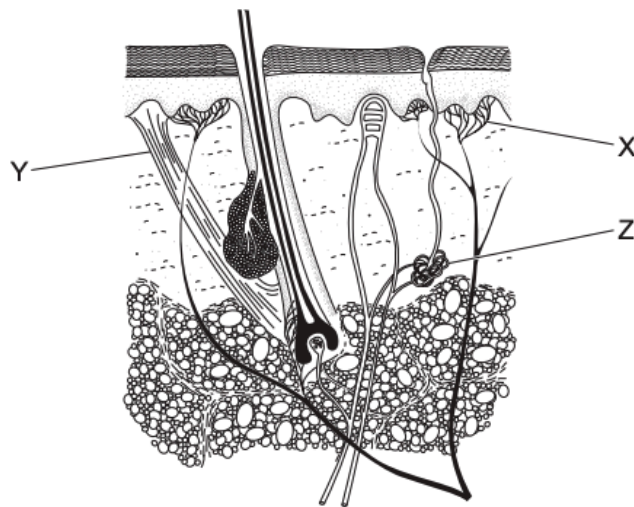
Which structure can reduce how much light enters the eye?



B

9.

The diagram shows a section through human skin.



What are the structures labelled X, Y and Z?

	X	Y	Z
<b>A</b>	receptor	sweat gland	hair erector muscle
<b>B</b>	receptor	hair erector muscle	sweat gland
<b>C</b>	sweat gland	receptor	hair erector muscle
<b>D</b>	sweat gland	hair erector muscle	receptor

B

Reproduction

1.

Where are the hormones oestrogen and progesterone produced during pregnancy?

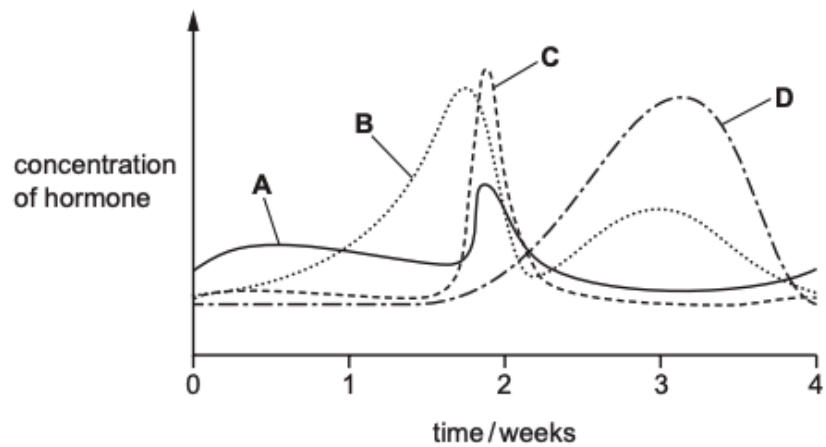
- A amniotic sac
- B oviducts
- C placenta
- D umbilical cord

C

2.

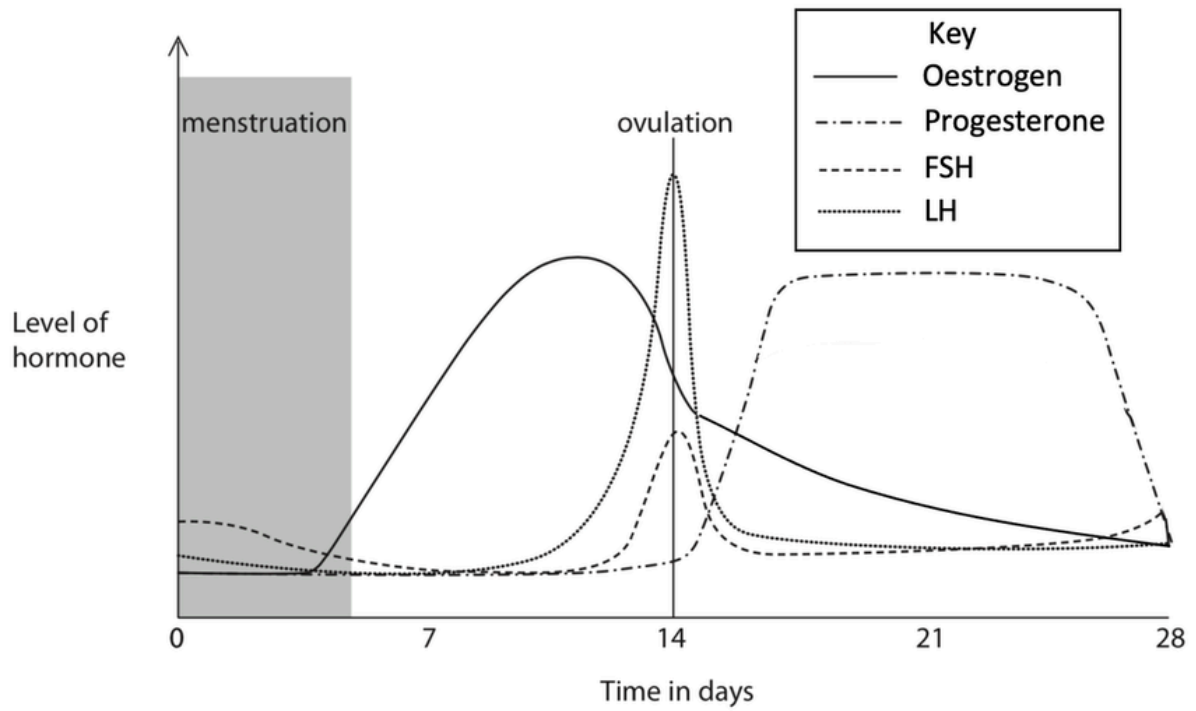
The graph shows the four hormones that control the menstrual cycle.

Which curve on the graph represents the hormone LH?



C

NOTE:



3.

The diagram shows an abnormal sperm cell.



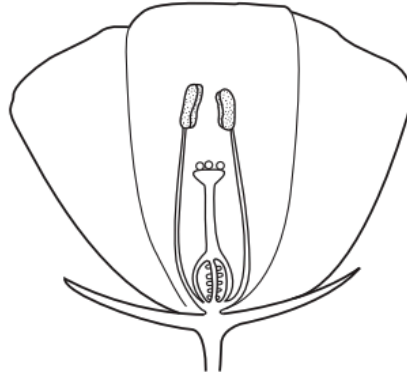
Why would the abnormal sperm cell be unable to fertilise an egg?

- A** It has no acrosome so is unable to digest the jelly coat of the egg.
- B** It has no mitochondria so lacks energy to swim to the egg.
- C** It has no flagellum so cannot swim to the egg.
- D** It has no nucleus so cannot fuse with the egg.

A

4.

The diagram shows a section of a flower that has been cross-pollinated.



Which statements about this flower are correct?

- 1 The pollen produced by this flower will be genetically different from the pollen on the stigma.
- 2 The pollen was carried to the stigma by wind.
- 3 This flower is insect-pollinated because the stigma is enclosed by the petals.
- 4 The pollen was produced by another flower on the same plant.

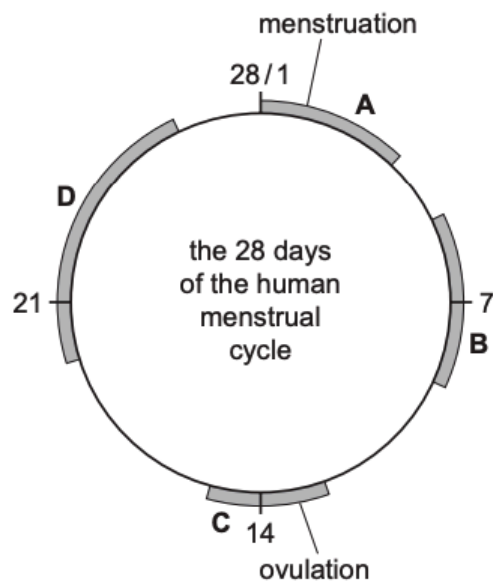
**A** 1, 2 and 4    **B** 1 and 3    **C** 3 only    **D** 2 and 4 only

B

5.

The diagram shows some of the events of the menstrual cycle.

In which shaded zone of the cycle would progesterone levels be the highest?



D

6.

The diagram shows the un specialised cells of a mammalian embryo soon after fertilisation.



What is the correct description of these cells?

- A embryo cells undergoing meiosis
- B gametes undergoing mitosis
- C stem cells undergoing mitosis
- D zygote undergoing meiosis

C

7.

The diagram shows a strawberry plant. These plants can reproduce asexually by producing 'plantlets'.



Why is this method of reproduction useful to strawberry farmers?

- A Plantlets are produced by meiosis and are genetically different.
- B Plantlets are produced by meiosis and are genetically identical.
- C Plantlets are produced by mitosis and are genetically different.
- D Plantlets are produced by mitosis and are genetically identical.

D

## Inheritance

1.

In humans, what is the genotype of a red-green colour-blind male?

- A  $X^R X^R$
- B  $X^r X^r$
- C  $X^R Y$
- D  $X^r Y$

D

2.

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.

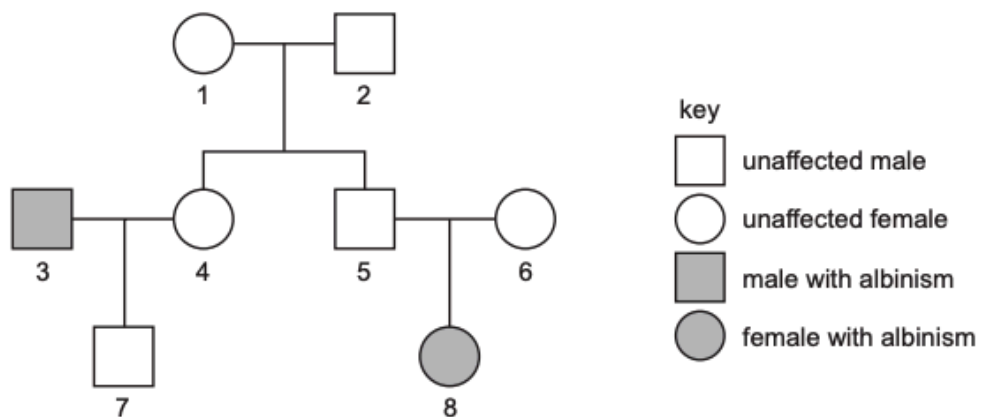
What is the order of statements that describes how a protein is made?

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

D

3.

The diagram shows the inheritance of albinism in one family. Albinism is an inherited condition caused by a recessive allele.



Which individuals **must** be heterozygous for this condition?

- A** 1 and 2      **B** 4 and 7      **C** 5, 6 and 7      **D** 5 and 6 only

C

4.

What happens to the mass of DNA in a nucleus before mitosis occurs?

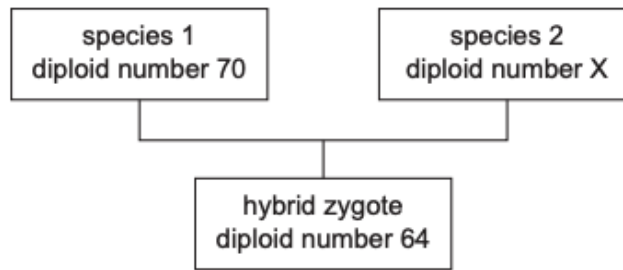
- A It doubles.
- B It halves.
- C It stays the same.
- D It halves and then halves again.

A

5.

Some plants of different species can be crossed with each other to form hybrids that have a diploid number different from either of the two parent species.

The diagram shows a cross between plants with different diploid numbers.



What is the diploid number of species 2?

- A 29
- B 32
- C 35
- D 58

D

6.

Some fruit flies have orange eyes and others have red eyes.

If two orange-eyed fruit flies are crossed, their offspring always have orange eyes.

If two red-eyed fruit flies are crossed, their offspring can have orange eyes or red eyes.

What can be concluded from these observations?

- A The allele for orange eyes is dominant.
- B The allele for orange eyes is recessive.
- C The alleles for orange and red eyes are codominant.
- D This is an example of sex linkage.

B



7.

Sickle cell anaemia is a genetic disorder which results in severe illness in homozygous individuals. In some human populations, being heterozygous can be beneficial.

What could be the reason for this?

- A** Heterozygous individuals are not affected by the disorder.
- B** Heterozygous individuals are more resistant to malaria.
- C** The disorder is caused by a dominant allele.
- D** The disorder is sex-linked.

B

8.

A chromosome was analysed and found to have 6125 pairs of bases. The type of each base was identified and 2345 of the bases were G.

How many of the bases in this chromosome are T?

- A** 1435
- B** 3780
- C** 6125
- D** 7560

B

9.

What is needed in the cytoplasm to make proteins at a ribosome?

- A** DNA and amino acids
- B** DNA only
- C** mRNA and amino acids
- D** mRNA only

C

10.

Which row correctly describes mitosis?

	new cells are genetically identical to the parent cell	duplication of chromosomes occurs	number of chromosomes in a daughter cell compared to the parent cell
<b>A</b>	no	before mitosis	same
<b>B</b>	no	during mitosis	halved
<b>C</b>	yes	before mitosis	same
<b>D</b>	yes	during mitosis	halved

C

## Variation & selection

1.

Which feature is found in a hydrophytic plant?

- A** Leaves are curled with stomata on the inside.
- B** Leaves are reduced to spines.
- C** Stomata are sunk in pits in the epidermis.
- D** There is no waxy cuticle.

D

2.

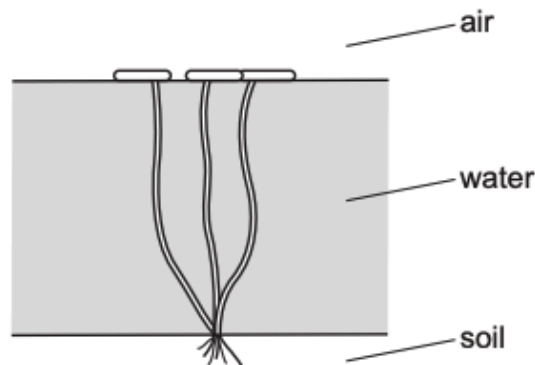
Which statement about variation is correct?

- A** Continuous variation results in few phenotypes with no intermediates.
- B** Discontinuous variation results in few phenotypes with no intermediates.
- C** Phenotypic variation is caused by environmental factors only.
- D** Phenotypic variation is caused by genetic factors only.

B

3.

The diagram shows a hydrophyte.



What is an adaptive feature of this hydrophyte?

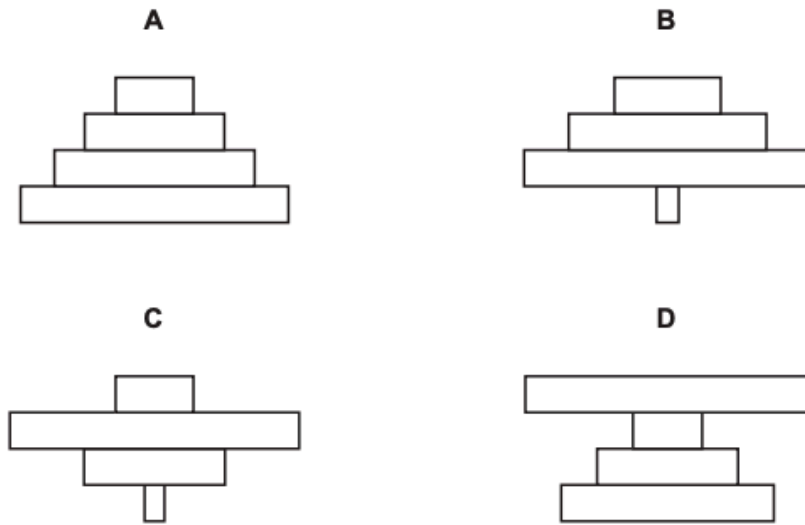
- A** no stomata on the upper surface or the lower surface of the leaves
- B** a network of large air spaces inside the leaves
- C** leaf stalks containing many xylem vessels for support
- D** a thick waxy cuticle on the lower surface of the leaves

B

## Organisms & their environment

1.

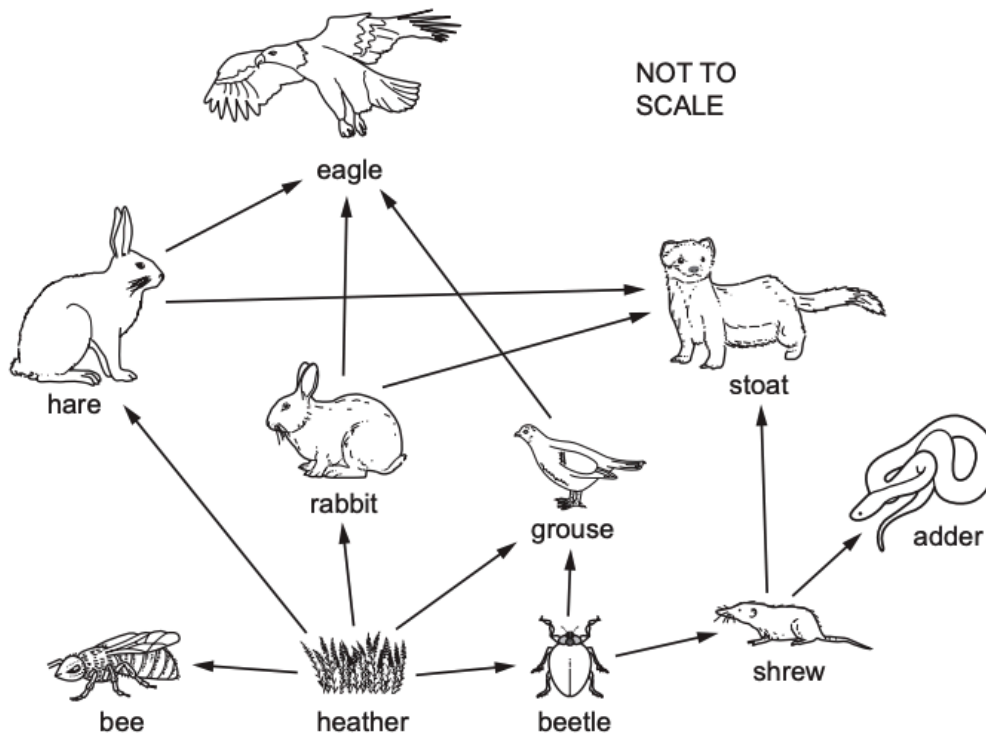
Which diagram shows a pyramid of biomass for a forest?



A

2.

The diagram shows a food web.



How many organisms are feeding at more than one trophic level?

- A** 0                      **B** 1                      **C** 2                      **D** 3

D

## Biotechnology & genetic modification

1.

What is the synthetic plant hormone 2,4-D used for?

- A** genetic engineering
- B** inhibiting phototropism
- C** killing weeds
- D** promoting germination

C

2.

With which kingdoms do bacteria share the same genetic code?

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

A

3.

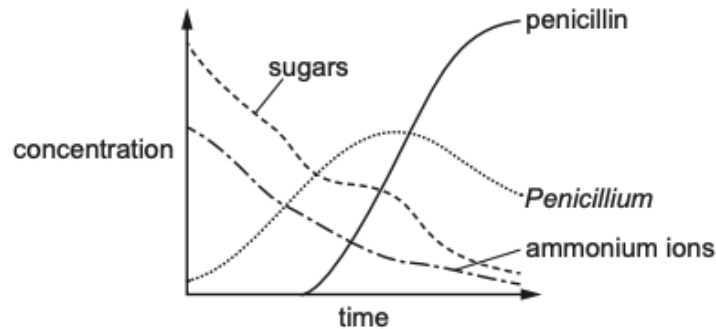
Which process makes use of a genetically engineered organism?

- A** using bacteria to produce insulin
- B** using enzymes in biological washing powders
- C** using pectinase in fruit juice production
- D** using yeast to produce ethanol

A

4.

The graph shows how much penicillin is produced by the fungus *Penicillium* in a fermenter. It also shows the concentrations of sugars, ammonium ions and *Penicillium*. *Penicillium* uses sugars as a food source and needs ammonium ions.



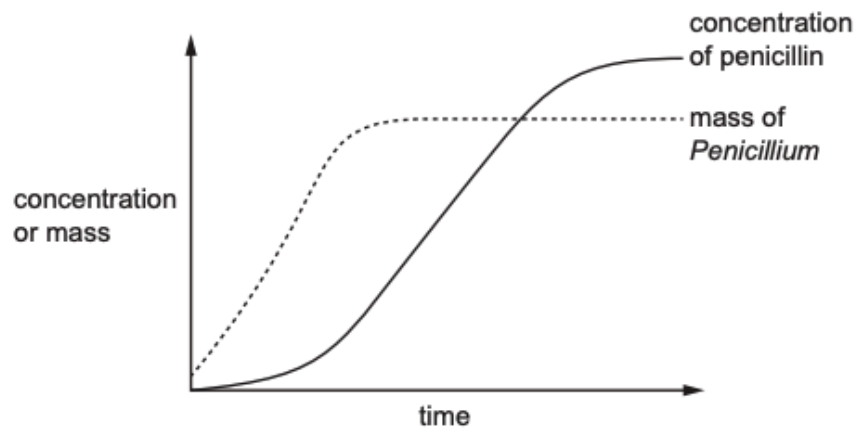
What does the graph show about the conditions needed for penicillin production?

- A A high concentration of ammonium ions must be maintained.
- B Most penicillin is produced when nutrient concentrations are low.
- C *Penicillium* cannot produce penicillin when its concentration decreases.
- D Sugars must be added constantly to the fermenter.

B

5.

The graph shows the growth of the fungus *Penicillium* and its production of the antibiotic penicillin in a fermenter.



Which stage of the *Penicillium* growth curve produces the highest concentration of penicillin?

- A lag phase
- B exponential phase
- C stationary phase
- D death phase

C

## Human influences on the ecosystem

1.

What is a consequence of deforestation?

- A** flooding due to reduced transpiration by trees
- B** increased carbon dioxide concentration in the atmosphere due to increased photosynthesis
- C** reduced carbon dioxide concentration in the atmosphere due to increased decomposition of dead trees
- D** reduced oxygen concentration in the atmosphere due to reduced respiration of trees

A