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Cambridge Assessment International Education

Cambridge O Level

BIOLOGY **5090/12**

Paper 1 Multiple Choice **October/November 2023**

1 hour

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- There are **forty** questions on this paper. Answer **all** questions.
- For each question there are four possible answers **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in soft pencil on the multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.

This document has **20** pages. Any blank pages are indicated.

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1 Which structures have both cytoplasm and cell walls?

A liver cells

B red blood cells

C root hair cells

D xylem vessels

2 Which statement defines a species?

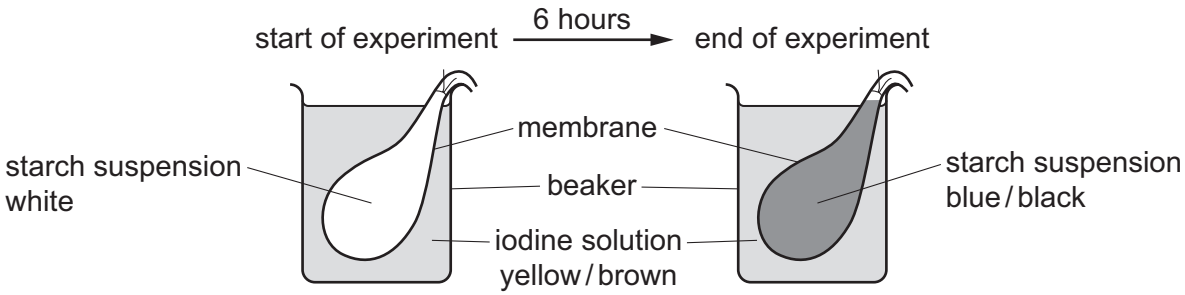
A a group of organisms that feed on the same food sources

B a group of organisms that have many body features in common

C a group of organisms that interbreed and produce fertile offspring

D a group of organisms that share a common habitat

3 The diagram shows an experiment.



Why has the starch suspension changed colour?

A Iodine has diffused in through the membrane.

B Iodine has diffused out through the membrane.

C Starch has diffused in through the membrane.

D Starch has diffused out through the membrane.

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4 The table shows the relative concentrations of two mineral ions in a root cell and in the water in the soil around the plant root.

	concentration of magnesium ions / arbitrary units	concentration of nitrate ions / arbitrary units
water around root	23	19
inside root cell	2475	1306

What is needed for the plant root to increase the concentration of the mineral ions in its cells?

A energy for active transport

B energy for osmosis

C water for active transport

D water for osmosis

5 Some health problems can be detected using chemical tests for protein and glucose in the urine.

Which row shows the results for a person with protein and glucose in their urine?

	Benedict's solution	biuret reagent	ethanol	iodine solution
A	blue colour	pale blue colour	milky colour	yellow / brown colour
B	red colour	mauve (purple) colour	colourless	yellow / brown colour
C	blue colour	mauve (purple) colour	milky colour	blue / black colour
D	red colour	pale blue colour	colourless	blue / black colour

6 Which statement describes enzyme-catalysed reactions?

A All enzymes work best at the same pH.

B As an enzyme-catalysed reaction progresses, the concentration of reactants increases.

C As the temperature of an enzyme-catalysed reaction increases from 0 °C to 20 °C, the frequency of effective collisions increases.

D Enzymes are denatured as the temperature of an enzyme-catalysed reaction is lowered from 20 °C to 0 °C.

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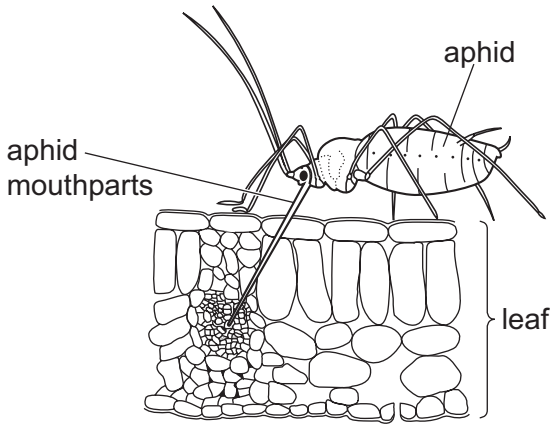
7 The diagram shows an aphid feeding on sugar in a leaf.



When the aphid feeds, in which order do its mouthparts pass through the tissues of the leaf?

A palisade cells → phloem → upper epidermis

B upper epidermis → palisade cells → phloem

C palisade cells → upper epidermis → xylem

D upper epidermis → xylem → palisade cells

8 For which processes do plants need either nitrate ions or magnesium ions?

	synthesis of cellulose	synthesis of chlorophyll	synthesis of proteins
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✗
D	✗	✓	✓

key

✓ = nitrate ions or magnesium ions needed

✗ = nitrate ions or magnesium ions not needed

9 Which row shows the processes involved when nitrate ions and water, from soil, enter a root hair cell?

	nitrate ions	water
A	active transport	osmosis
B	diffusion	osmosis
C	diffusion	active transport
D	osmosis	diffusion

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10 Which change in conditions will decrease the rate of transpiration?

A a decrease in air currents around the leaf

B a decrease in the humidity of the atmosphere

C an increase in light intensity around the leaf

D an increase in the temperature of the atmosphere

11 What are the correct definitions of digestion and assimilation?

1 the intake of food into the body through the mouth

2 the breakdown of large insoluble food molecules into small soluble ones

3 the uptake and use of food molecules in the cells of the body

4 the movement of food molecules through the wall of the intestine into the blood and lymph

	digestion	assimilation
A	1	3
B	2	3
C	1	4
D	2	4

12 Which organ produces an acid that kills the bacteria in ingested food?

A liver

B pancreas

C salivary gland

D stomach

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13 The table shows the rates of absorption of two different sugars, arabinose and glucose, in living and dead intestines. The concentrations of the sugars inside the intestines were the same in each case.

	rate of absorption / arbitrary units	
	arabinose	glucose
living intestine	31	102
dead intestine	31	34

What are the main methods of absorption of arabinose and glucose in living intestine?

	arabinose	glucose
A	active transport	active transport
B	active transport	diffusion
C	diffusion	active transport
D	diffusion	diffusion

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14 Which table shows muscle movement during inspiration?

A

	contract	relax
diaphragm	✗	✓
external intercostal muscles	✓	✗
internal intercostal muscles	✗	✓

B

	contract	relax
diaphragm	✓	✗
external intercostal muscles	✓	✗
internal intercostal muscles	✗	✓

C

	contract	relax
diaphragm	✓	✗
external intercostal muscles	✗	✓
internal intercostal muscles	✓	✗

D

	contract	relax
diaphragm	✗	✓
external intercostal muscles	✗	✓
internal intercostal muscles	✓	✗

key

✓ = yes

✗ = no

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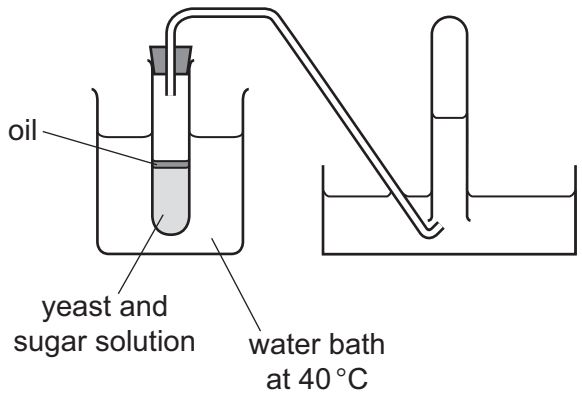
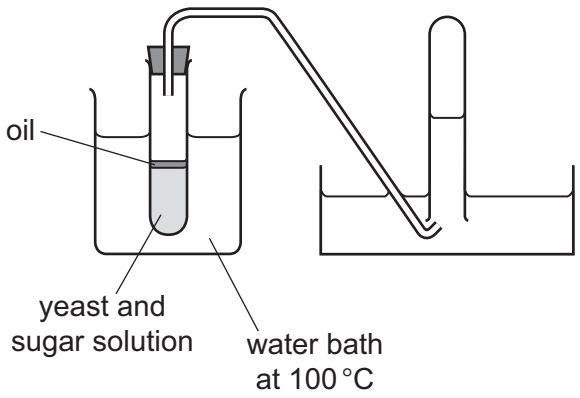
15 Which apparatus can be used to investigate the production of carbon dioxide by anaerobic respiration of yeast?

A



B



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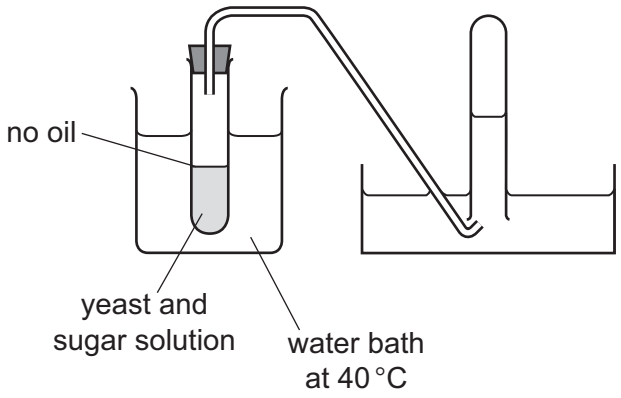

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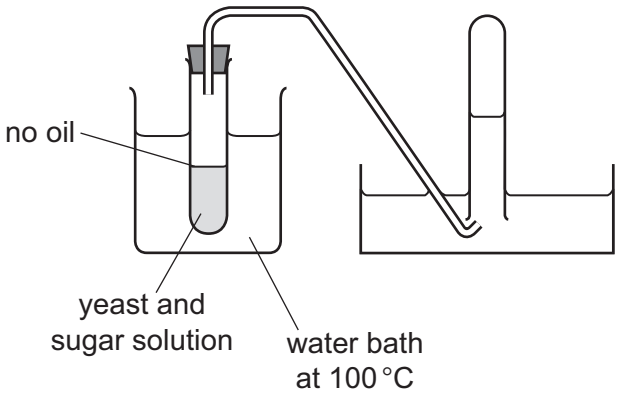

16 The diagram represents the equation for aerobic respiration.

.....1..... + ...2..... → .....3..... + ...4…...

Which words correctly complete gaps 1–4?

	1	2	3	4
A	carbon dioxide	water	glucose	oxygen
B	glucose	carbon dioxide	oxygen	water
C	glucose	oxygen	carbon dioxide	water
D	oxygen	water	carbon dioxide	glucose

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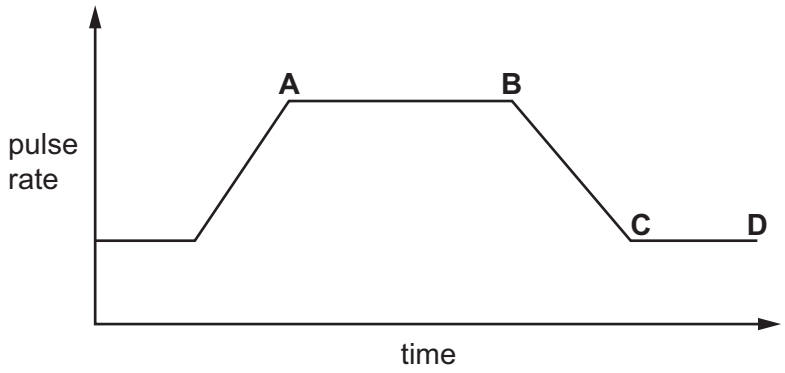
17 The graph shows a person's pulse rate over a period of time during which they rest, pedal an exercise bike and then rest again.

At which point did the person stop pedalling?



18 Which row shows the names of blood vessels that transport blood to and from the liver and the kidney?

	to the liver	from the liver	to the kidney	from the kidney
A	hepatic portal vein	hepatic vein	renal vein	renal artery
B	hepatic vein	hepatic portal vein	renal vein	renal artery
C	hepatic portal vein	hepatic vein	renal artery	renal vein
D	hepatic artery	hepatic portal vein	renal artery	renal vein

19 What is a pathogen?

A a disease-causing organism

B a disease

C a disease-carrying organism

D a cure for a disease

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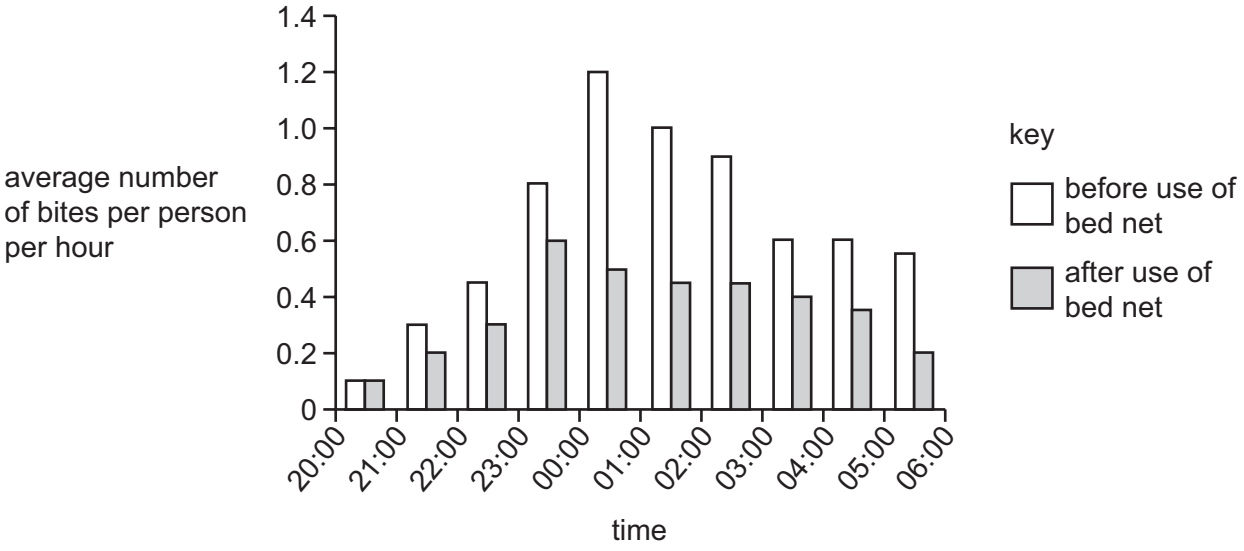
20 Malaria can be controlled by the use of mosquito nets treated with insecticide, placed over beds. The use of these bed nets reduces the number of bites by infected mosquitoes.

The graph shows the impact of the use of bed nets on the average number of mosquito bites in a group of people.



Which conclusion can be drawn from this data?

A Mosquitoes bite more during the evening than after midnight (00:00).

B Use of bed nets prevented mosquito bites.

C Use of bed nets had a greater impact after midnight (00:00) than before midnight.

D The maximum number of mosquito bites occur between 01:00 and 02:00.

21 Against which type of infection or disease are antibiotics effective?

A bacterial infection

B cancer

C heart disease

D viral infection

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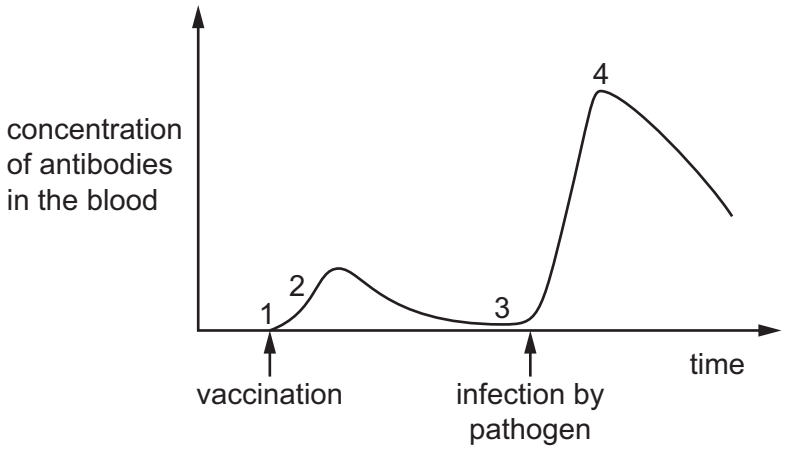
22 The graph shows the antibody concentration in a child's blood over a period of time. It shows what happens to the antibody concentration after a child is vaccinated against a particular disease and after the child is infected by the pathogen for that disease.



Based on the graph, which statement is correct?

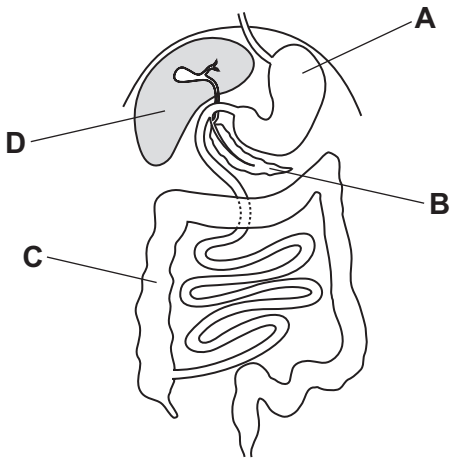
A Memory cells have disappeared from the child's blood by 3.

B Memory cells were in the child's blood at 2.

C Memory cells were in the child's blood before 1.

D Passive immunity was attained at 4.

23 Which label shows the location for the production of urea?



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24 A student was asked to compare a typical spinal reflex action with a voluntary action.

He has made one mistake in his comparison.

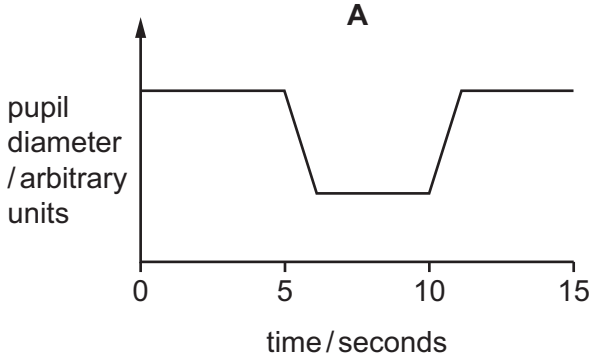
Which row shows the **incorrect** statement?

	reflex action	voluntary action
A	rapid response to a stimulus	response may be slow
B	initiated by the response of a receptor to a stimulus	initiated from the brain by conscious thought
C	the nervous impulse takes the longest pathway	the nervous impulse takes the shortest pathway
D	effectors are muscles or glands	effectors are muscles only

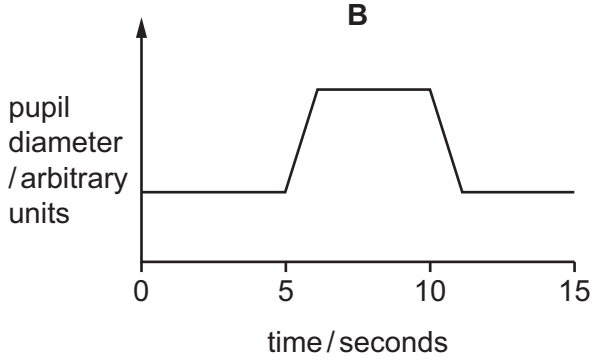
25 A person is sitting in a darkened room. After five seconds, a light is turned on. Five seconds after that, the light is turned off again.

Which graph shows the changes in the diameters of their pupils?

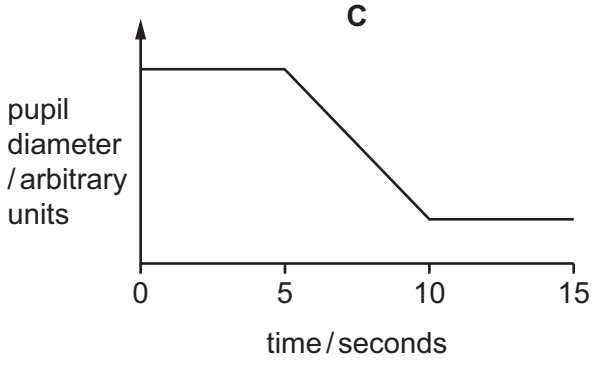
A



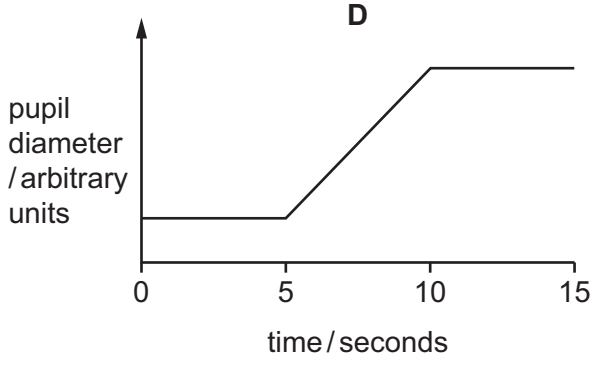
B



C



D



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26 Descriptions of the body's response to changes in temperature are listed.

1 Arterioles in the skin surface constrict.

2 Arterioles in the skin surface dilate.

3 Hair erector muscles contract.

4 Hair erector muscles relax.

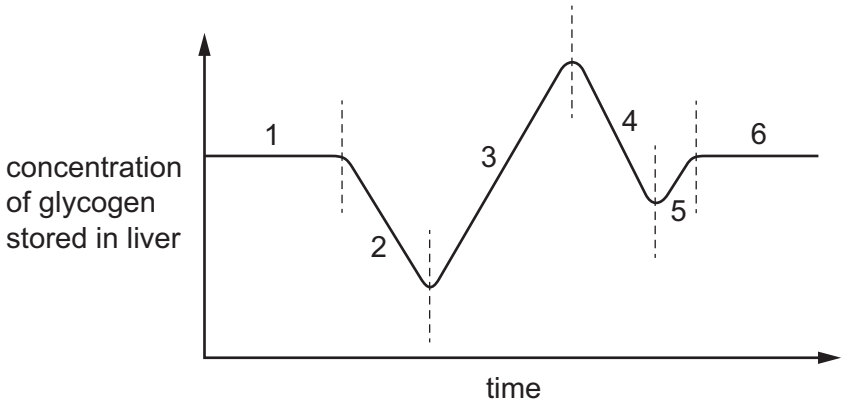
5 Sweat evaporates from the skin.

6 Muscles contract spontaneously.

Which descriptions apply to the body's response to hot weather?

A 1, 3 and 6 **B** 1, 4 and 5 **C** 2, 3 and 5 **D** 2, 4 and 5

27 The diagram shows how the concentration of glycogen stored in the liver of a human changes over time. The changes help to maintain a constant concentration of glucose in the blood.



During which periods is the concentration of **glucose** in the blood above average?

A 1 and 6 **B** 2 and 5 **C** 3 and 4 **D** 3 and 5

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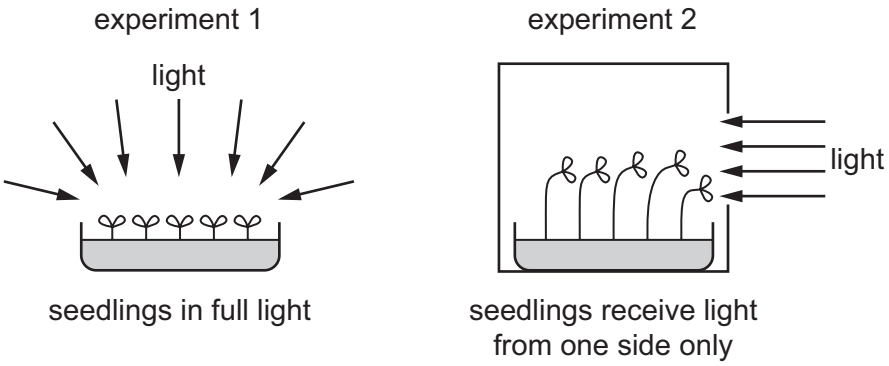
28 The diagram shows some seedlings grown in the light.



Which statement describes the distribution of auxin in the seedlings?

A Auxin is equally distributed in experiments 1 and 2.

B Auxin is equally distributed in experiment 1 only.

C Auxin is equally distributed in experiment 2 only.

D Auxin is **not** distributed equally in experiments 1 and 2.

29 A plant has 20 chromosomes in its leaf cells. The plant reproduces both sexually and asexually.

What is the correct number of chromosomes in the gametes and in cells used for asexual reproduction?

	gametes	cells used for asexual reproduction
A	10	10
B	10	20
C	20	10
D	20	20

30 What are features of sexual reproduction?

1 fusion of diploid nuclei

2 fusion of haploid nuclei

3 production of clones

4 production of genetically different offspring

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

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31 Which flower structure produces pollen?

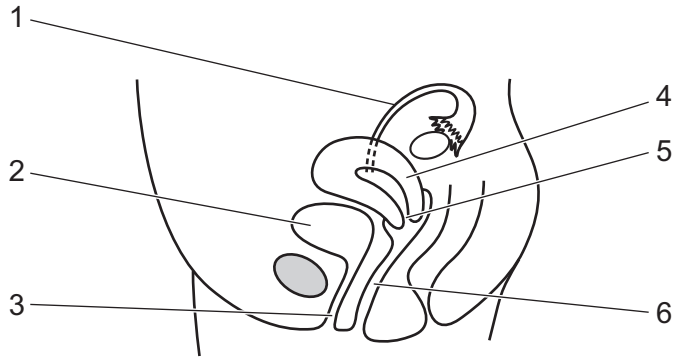
A anther

B filament

C stigma

D style

32 The diagram shows the female reproductive system.



Which row correctly labels the diagram?

	1	2	3	4	5	6
A	bladder	urethra	ureter	oviduct	uterus	cervix
B	oviduct	bladder	urethra	uterus	cervix	vagina
C	urethra	bladder	ureter	uterus	cervix	vagina
D	oviduct	bladder	urethra	ureter	uterus	cervix

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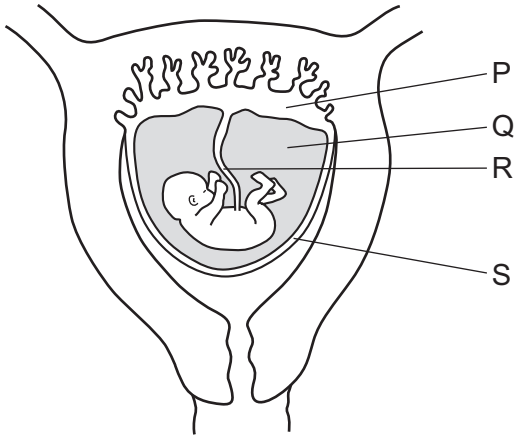
33 The diagram shows a fetus in the uterus.



Which structures are essential for feeding the fetus, and which structures are essential for supporting it and protecting it from mechanical shocks?

	feeding	supporting and protecting
A	P and Q	R and S
B	P and R	Q and S
C	Q and S	P and R
D	R and S	P and Q

34 Which statements are correct?

1 Each chromosome contains one molecule of DNA.

2 A gene is a section of DNA on a chromosome.

3 A gene contains smaller regions called alleles.

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

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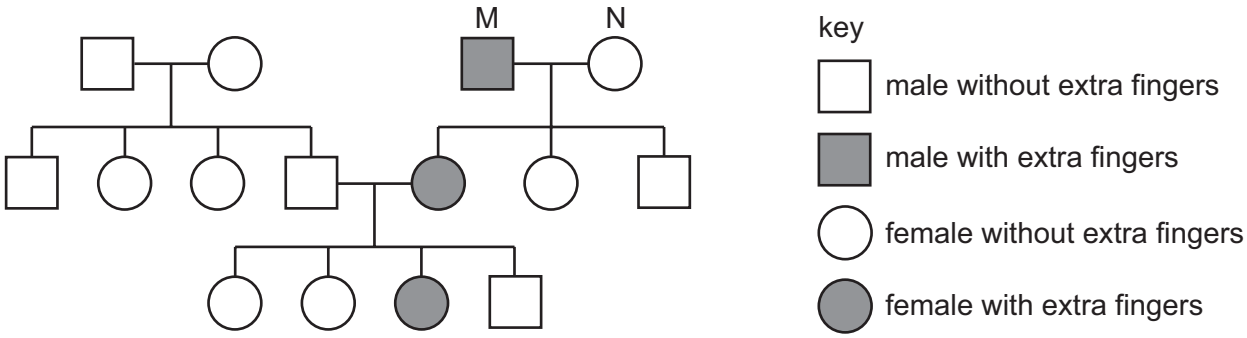
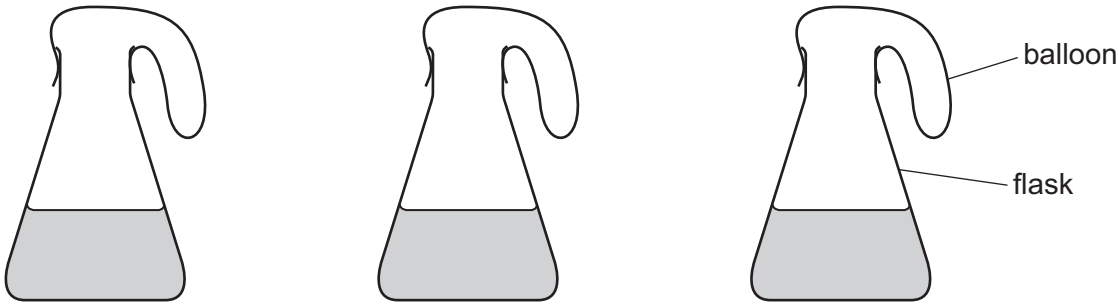
35 The diagram shows the inheritance of the allele, E, for polydactyly (having extra fingers) which is dominant over the allele for no extra fingers, e.



What are the genotypes of persons M and N?

	M	N
A	EE	ee
B	Ee	Ee
C	Ee	ee
D	ee	ee

36 Three flasks were set up as shown at 35 °C. Each flask had a balloon attached to the top.



1
contains water, yeast and sugar

2
contains water and sugar

3
contains water and yeast

The amount of inflation of each balloon was recorded after one hour.

What is the correct order for the balloons from most to least inflated?

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

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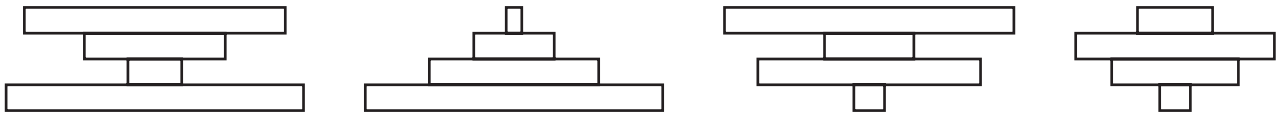
37 A tree has insect larvae burrowing in its leaves. The emerging insects are eaten by birds and the birds have parasitic fleas living amongst their feathers.



Which pyramid is a pyramid of biomass and which pyramid is a pyramid of numbers for this food chain?

	pyramid of biomass	pyramid of numbers
A	1	3
B	1	4
C	2	3
D	2	4

38 The fossil fuels used as energy sources today developed from animal and plant remains buried millions of years ago.

What was the initial source of the energy in these fossil fuels?

A heat rising from the centre of the Earth trapped by the fuels

B heat released by decomposers feeding on dead animals and plants

C metabolic activity of the animals and plants in the oceans

D sunlight absorbed by producers

39 Which term describes the number of different species that live in an area?

A biodiversity

B community

C ecosystem

D population

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40 If high levels of nitrates are washed into rivers, the following changes may occur, causing fish to die.

1 Water plants die and fall to the bottom.

2 Bacteria multiply rapidly.

3 Concentration of oxygen in the water decreases.

4 Increased growth of single-celled water plants makes the water green.

In which order do these changes take place?

A $1 \rightarrow 4 \rightarrow 3 \rightarrow 2$

B $2 \rightarrow 3 \rightarrow 1 \rightarrow 4$

C $3 \rightarrow 2 \rightarrow 4 \rightarrow 1$

D $4 \rightarrow 1 \rightarrow 2 \rightarrow 3$

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