

# DUNMAN SECONDARY SCHOOL

CANDIDATE  
NAME

CLASS

INDEX  
NUMBER

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## PRELIMINARY EXAMINATION 2025 SECONDARY 4 EXPRESS

**BIOLOGY**

Paper 1

**6093/01**

**2 September 2025**

**1 hour**

Additional Materials: Multiple Choice Answer Sheet

### READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, glue or correction fluid.

Write your name, class and index number on the Answer Sheet in the spaces provided unless this has been done for you.

There are **forty** questions on this paper. Answer **all** questions. For each questions 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 separate Answer Sheet.

**Read the instructions on the Answer Sheet very carefully.**

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

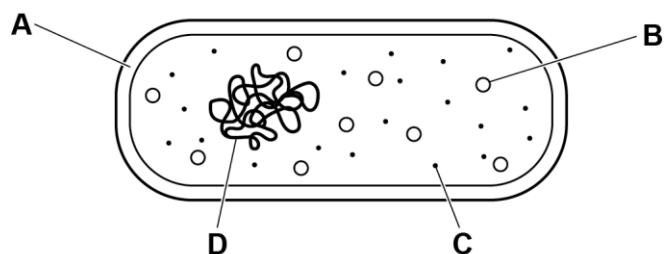
Any rough working should be done in this booklet.

The use of an approved scientific calculator is expected, where appropriate.

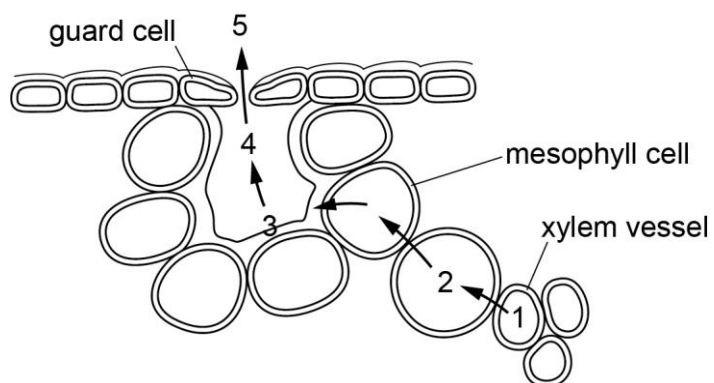
- 1 Which organelle is **not** correctly paired with its cellular function?

|          | organelle             | function                              |
|----------|-----------------------|---------------------------------------|
| <b>A</b> | endoplasmic reticulum | transports proteins to the Golgi body |
| <b>B</b> | Golgi body            | stores proteins and carbohydrates     |
| <b>C</b> | mitochondrion         | releases energy                       |
| <b>D</b> | ribosome              | joins amino acids together            |

- 2 The diagram shows a bacterial cell.  
Which cell structure makes bacteria useful in genetic modification?



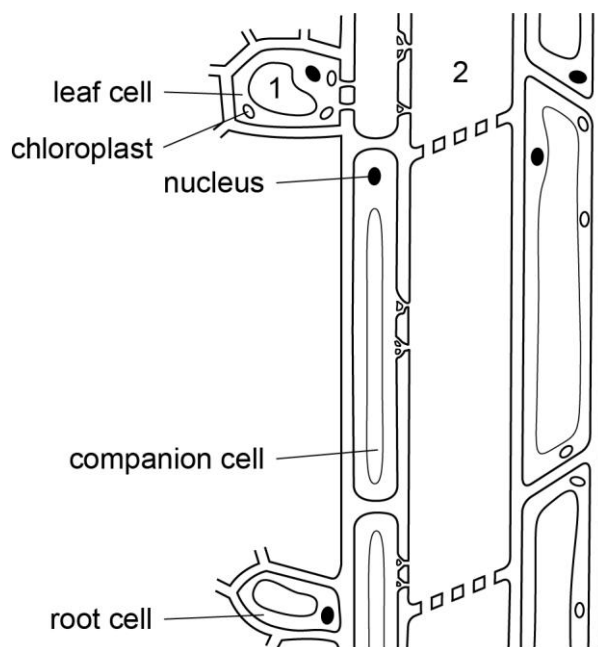
- 3 The diagram shows the movement of water through part of a leaf.



What processes are involved in the movement of water at these stages?

|          | 1–2         | 3–4         | 4–5         |
|----------|-------------|-------------|-------------|
| <b>A</b> | diffusion   | evaporation | osmosis     |
| <b>B</b> | evaporation | diffusion   | osmosis     |
| <b>C</b> | osmosis     | diffusion   | evaporation |
| <b>D</b> | osmosis     | evaporation | diffusion   |

- 4 The diagram represents the phloem pathway, with adjacent cells, from leaf to root in a plant.



Which process is occurring between 1 to 2 and what is the effect on the water potential at 2?

|          | process from 1 to 2         | water potential at 2  |
|----------|-----------------------------|-----------------------|
| <b>A</b> | active transport of sucrose | becomes more negative |
| <b>B</b> | active transport of sucrose | becomes less negative |
| <b>C</b> | diffusion of sucrose        | becomes more negative |
| <b>D</b> | diffusion of sucrose        | becomes less negative |

- 5 Which row correctly identifies the chemical elements found in insulin?

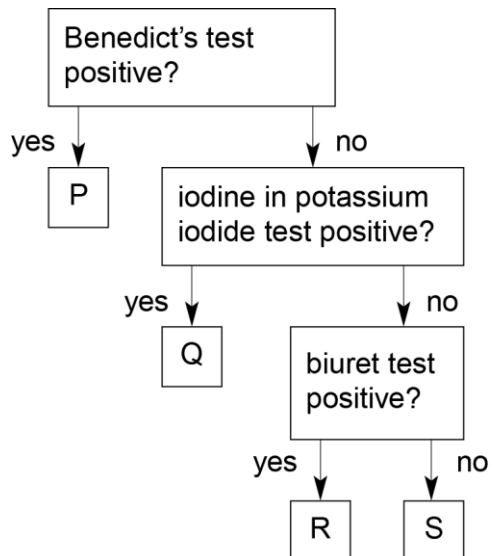
|          | carbon | hydrogen | oxygen | nitrogen |
|----------|--------|----------|--------|----------|
| <b>A</b> | ✓      | ✓        | ✓      | ✓        |
| <b>B</b> | ✓      | ✓        | ✓      | X        |
| <b>C</b> | ✓      | X        | ✓      | X        |
| <b>D</b> | X      | ✓        | X      | ✓        |

key

✓ = present

X = not present

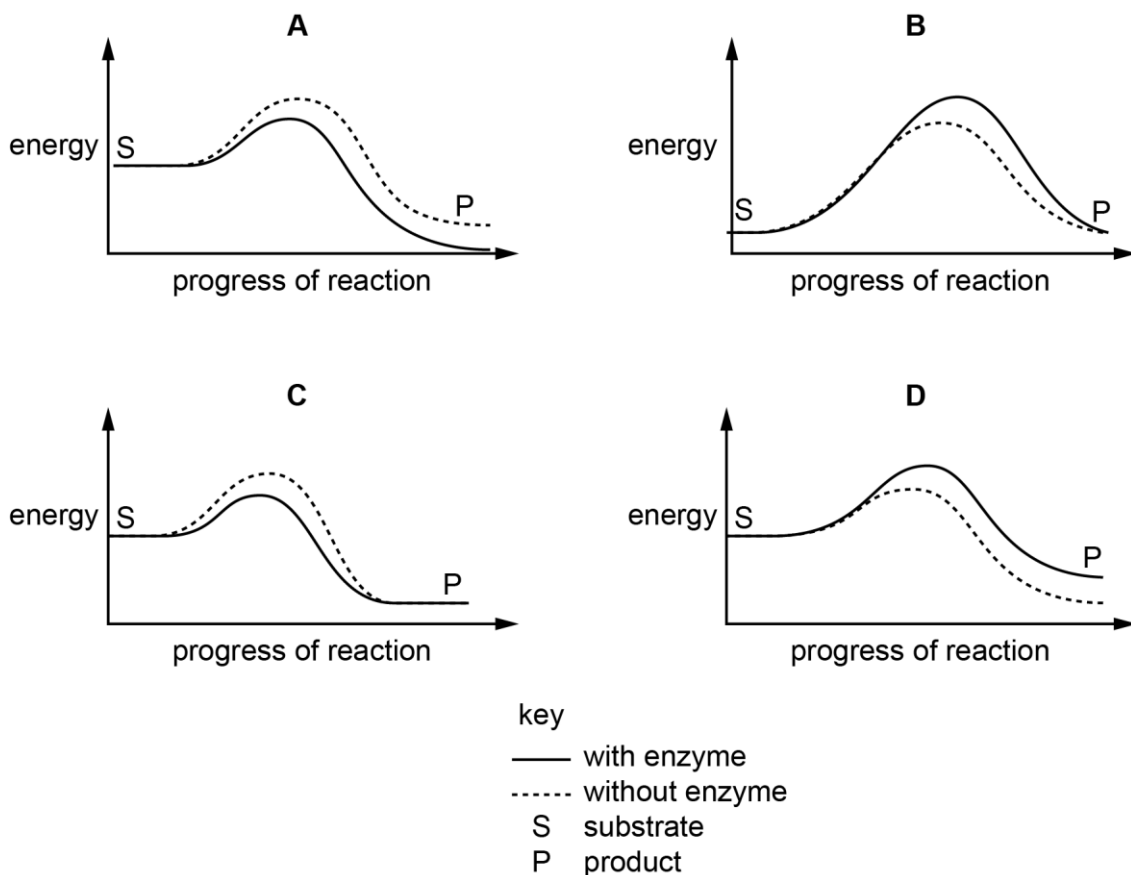
- 6 Various substances are identified using the following procedures.



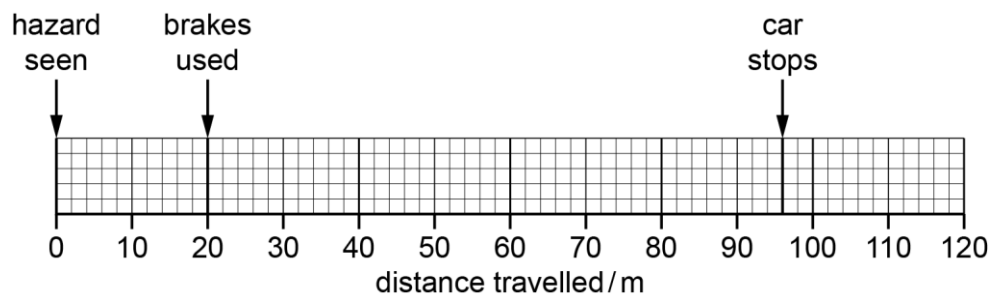
What could the four substances be?

|          | P       | Q       | R       | S       |
|----------|---------|---------|---------|---------|
| <b>A</b> | glucose | starch  | protein | lipid   |
| <b>B</b> | glucose | sucrose | starch  | protein |
| <b>C</b> | sucrose | protein | lipid   | starch  |
| <b>D</b> | sucrose | starch  | lipid   | protein |

- 7 Which graph correctly shows possible changes in energy levels as a chemical reaction progresses with and without an enzyme?



- 8 The chart gives information about a car being driven at 110 km/h by someone who has **not** consumed alcohol. It shows how far the car travels from the time the driver sees a hazard and reacts by using the brakes and how far the car will then travel before finally stopping.

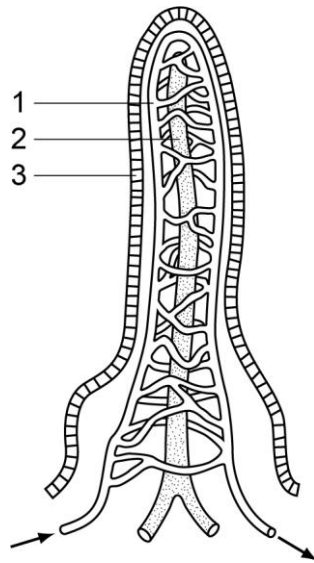


If the same driver consumes alcohol before driving, the distance travelled before reacting to the hazard increase by 20%.

What is the total distance travelled by the car before stopping?

- A** 96 m                      **B** 100 m                      **C** 111.2 m                      **D** 115.2 m

9 The diagram represents a villus.



Which row correctly describes the functions of the numbered parts?

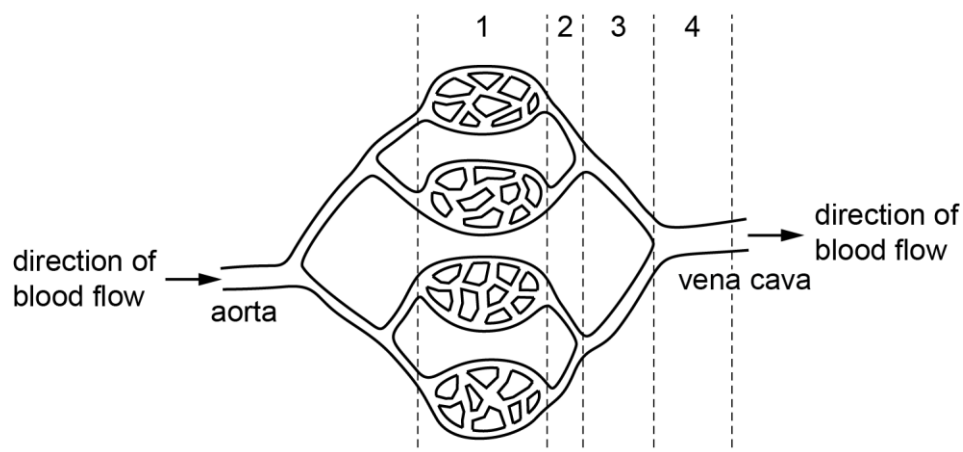
|          | 1                  | 2                  | 3                     |
|----------|--------------------|--------------------|-----------------------|
| <b>A</b> | transports fats    | transports glucose | absorbs digested food |
| <b>B</b> | transports fats    | transports glucose | produces mucus        |
| <b>C</b> | transports glucose | transports fats    | absorbs digested food |
| <b>D</b> | transports glucose | transports fats    | produces mucus        |

10 Which of the following statements is/are correct?

- 1 Bile breaks down fats to produce glycerol as one of the products.
- 2 Chemical digestion of fats only begins in the small intestine.
- 3 The liver is part of the alimentary canal.

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

11 The diagram shows part of the human circulatory system.



Where is the blood pressure and the speed of flow the lowest?

|          | lowest blood pressure | lowest speed of flow |
|----------|-----------------------|----------------------|
| <b>A</b> | 1                     | 4                    |
| <b>B</b> | 2                     | 3                    |
| <b>C</b> | 3                     | 2                    |
| <b>D</b> | 4                     | 1                    |

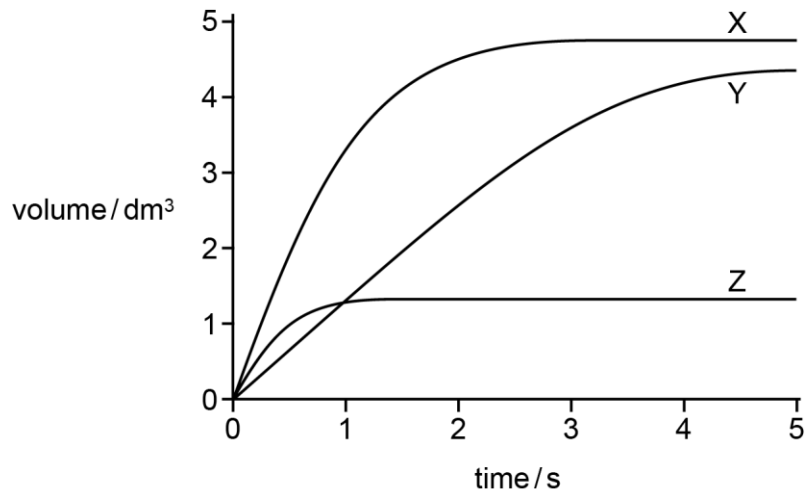
12 Tobacco smoke contains substances that affect the functioning of the human body.

| substance         | effect                                 |
|-------------------|----------------------------------------|
| W nicotine        | 1 decreases oxygenation of haemoglobin |
| X carbon monoxide | 2 increases risk of cancer             |
| Y tar             | 3 increases risk of blood clotting     |

Which row shows the substances matched with their correct effects?

- A** W-1, X-2, Y-3
- B** W-1, X-3, Y-2
- C** W-2, X-1, Y-3
- D** W-3, X-1, Y-2

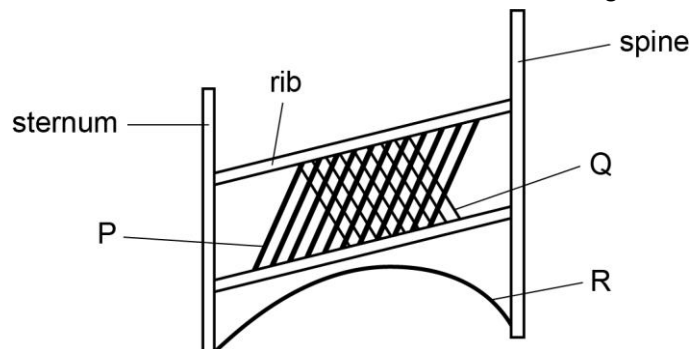
- 13** The graph shows the volume of air breathed out quickly and with force, following a deep breath in, for three different people, X, Y and Z.



What is an explanation for the differences shown?

|          | chronic bronchitis | emphysema | healthy lung function |
|----------|--------------------|-----------|-----------------------|
| <b>A</b> | X                  | Y         | Z                     |
| <b>B</b> | X                  | Z         | Y                     |
| <b>C</b> | Y                  | Z         | X                     |
| <b>D</b> | Z                  | Y         | X                     |

- 14** The diagram represents some of the muscles involved with breathing.



Which muscles are contracting during breathing in?

- A** P and Q      **B** P and R      **C** Q and R      **D** P, Q and R

**15** How many molecules of carbon dioxide will be produced from the breakdown of two molecules of glucose in aerobic respiration?

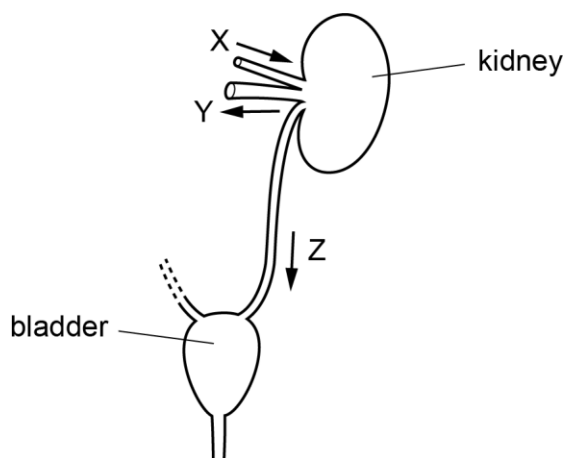
**A** 2

**B** 4

**C** 6

**D** 12

**16** The diagram shows structures in a human which form and store urine. Liquids pass through tubes X, Y and Z in the directions shown by the arrows.



Which statement about the volume of liquid passing through Y in one day is correct?

**A** It is greater than that passing through X.

**B** It is less than that passing through Z.

**C** It is much less than that passing through X but slightly greater than that passing through Z.

**D** It is slightly less than that passing through X but much greater than that passing through Z.

**17** Hormones are involved in the co-ordination of the body.

Which option correctly describes the nature of hormones?

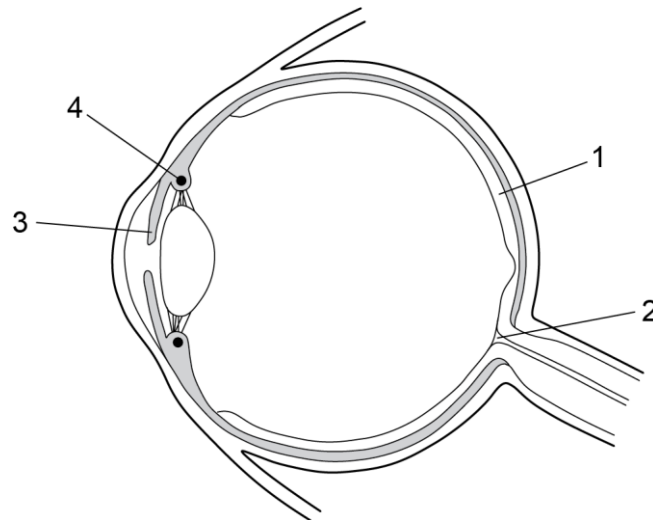
|          | transported by  | destroyed by |
|----------|-----------------|--------------|
| <b>A</b> | plasma          | kidney       |
| <b>B</b> | plasma          | liver        |
| <b>C</b> | red blood cells | kidney       |
| <b>D</b> | red blood cells | liver        |

- 18** The trigeminal nerve in humans connects the brain with the teeth and the skin on the face. When the dentist administers a local anaesthesia by injection, you can no longer feel pain and you cannot smile properly.

Which statement correctly explains the effects of the local anaesthesia?

- A** The trigeminal nerve carries impulses from the brain to the teeth and back.
- B** The trigeminal nerve contains motor neurones.
- C** The trigeminal nerve contains motor and sensory neurones.
- D** The trigeminal nerve contains sensory neurones.

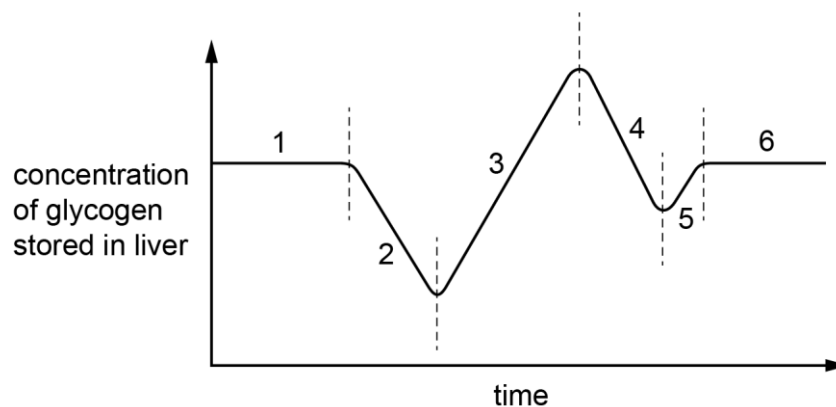
- 19** The diagram shows a section through the eye.



In the pupil reflex, which row shows the sites of the effectors and receptors involved?

|          | effectors | receptors |
|----------|-----------|-----------|
| <b>A</b> | 3         | 1         |
| <b>B</b> | 3         | 2         |
| <b>C</b> | 4         | 1         |
| <b>D</b> | 4         | 2         |

- 20** 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.

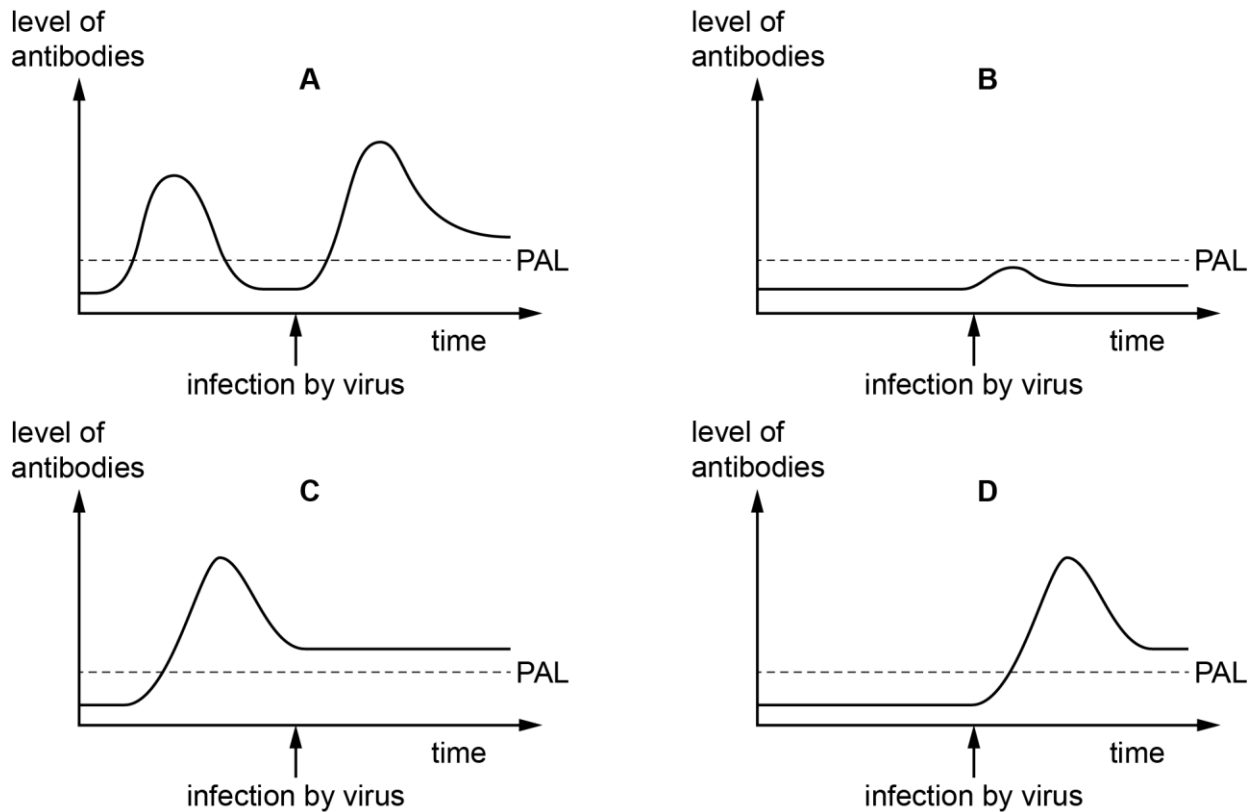


During which periods is the concentration of glucose in the blood above average?

- A** 1 and 6                      **B** 2 and 5                      **C** 3 and 4                      **D** 3 and 5
- 21** Which is a common symptom of both influenza and pneumococcal disease?
- A** cough  
**B** running nose  
**C** skin rash  
**D** vomitting

- 22** Four groups of people (A, B, C and D) were exposed to infection by a pathogenic virus. Researchers measured the level of antibodies in their blood before and after they were infected. The results are summarised in the graphs. PAL is the Protective Antibody Level – the level required to give protection from the virus.

Which group of people would have suffered the effects of the viral infection?

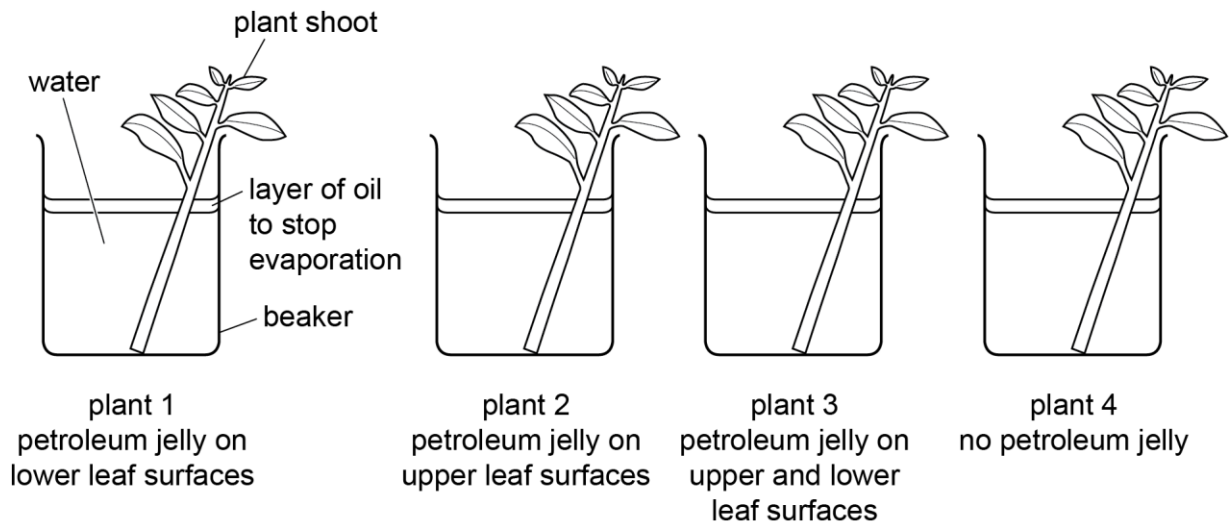


- 23** In 2022, many countries required travellers to be fully vaccinated against the COVID-19 virus. New Zealand's requirements stated: 'You need to have had the last COVID-19 vaccination at least 14 days before you arrive.'

Why did New Zealand require a period of 14 days after vaccination before entry was allowed?

- A** to allow time for the production of antibodies
- B** to allow time for the production of antigens
- C** to make sure the person did not have COVID-19
- D** to make sure there were no bad side effects from the vaccination

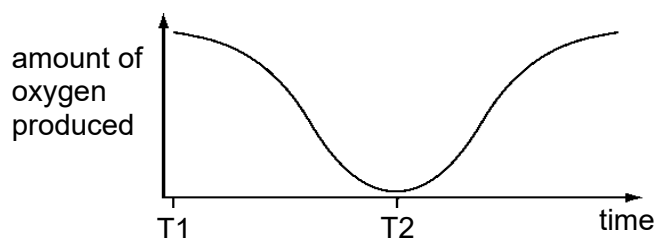
- 24** Four plant shoots were set up as shown in the diagram, in the same environmental conditions. Waterproof petroleum jelly was applied to the plant leaf surfaces, as shown. Each beaker, with its plant shoot and water, was weighed at the start of the experiment and after 24 hours. After 24 hours the percentage loss in mass was calculated for each plant shoot.



Which row shows the percentage loss in mass of plants after 24 hours?

|          | plant 1 | plant 2 | plant 3 | plant 4 |
|----------|---------|---------|---------|---------|
| <b>A</b> | 15      | 5       | 12      | 3       |
| <b>B</b> | 5       | 12      | 3       | 15      |
| <b>C</b> | 3       | 5       | 13      | 15      |
| <b>D</b> | 3       | 15      | 5       | 12      |

- 25** The graph shows the amount of oxygen produced by a green plant, growing outdoors, during a 24-hour period.



Which processes are occurring at time T1 and T2?

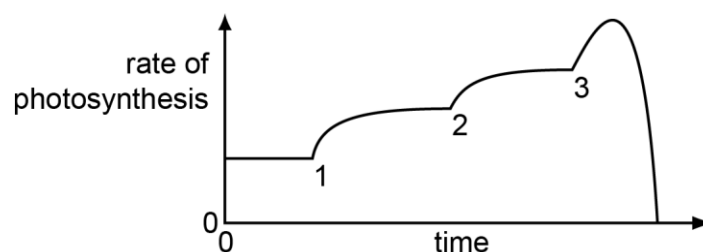
|          | T1             |             | T2             |             |
|----------|----------------|-------------|----------------|-------------|
|          | photosynthesis | respiration | photosynthesis | respiration |
| <b>A</b> | ✓              | X           | X              | ✓           |
| <b>B</b> | ✓              | ✓           | X              | ✓           |
| <b>C</b> | X              | ✓           | X              | ✓           |
| <b>D</b> | X              | ✓           | ✓              | X           |

key

✓ = occurring

X = not occurring

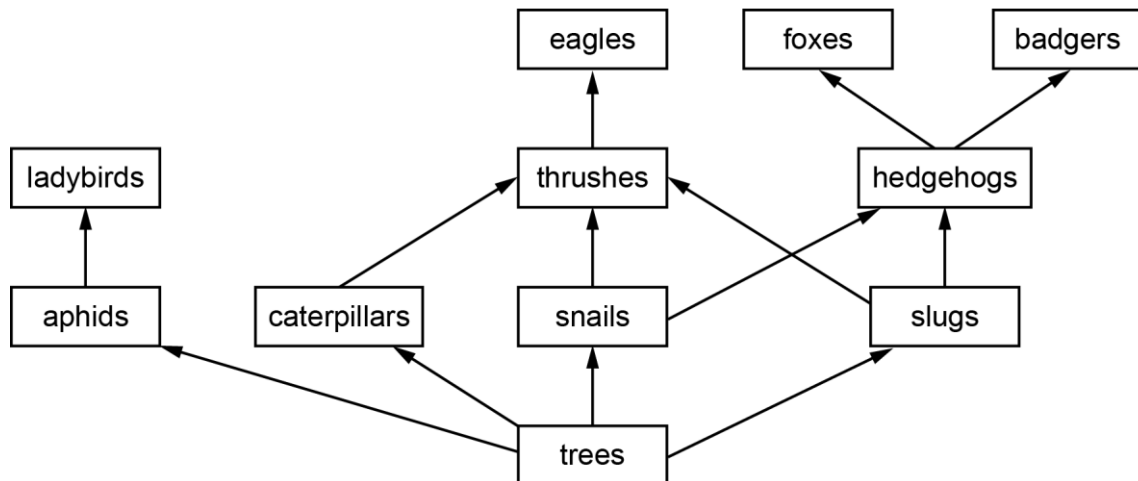
- 26** Temperature, light intensity and carbon dioxide concentration are three limiting factors in photosynthesis. In an experiment, each factor is increased in turn. The graph shows the results.



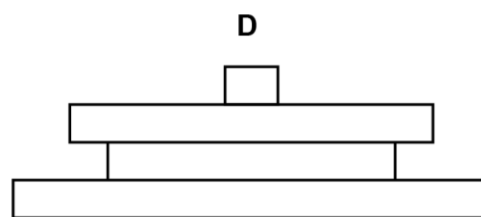
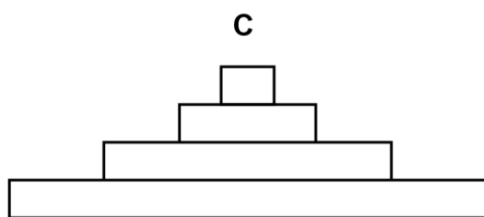
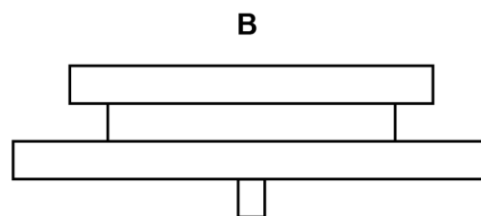
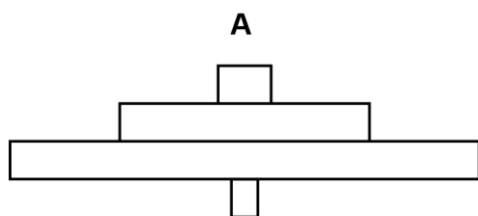
Which numbered points represent when each factor was increased?

|          | carbon dioxide concentration | light intensity | temperature |
|----------|------------------------------|-----------------|-------------|
| <b>A</b> | 1                            | 2               | 3           |
| <b>B</b> | 2                            | 3               | 1           |
| <b>C</b> | 3                            | 1               | 2           |
| <b>D</b> | 3                            | 2               | 1           |

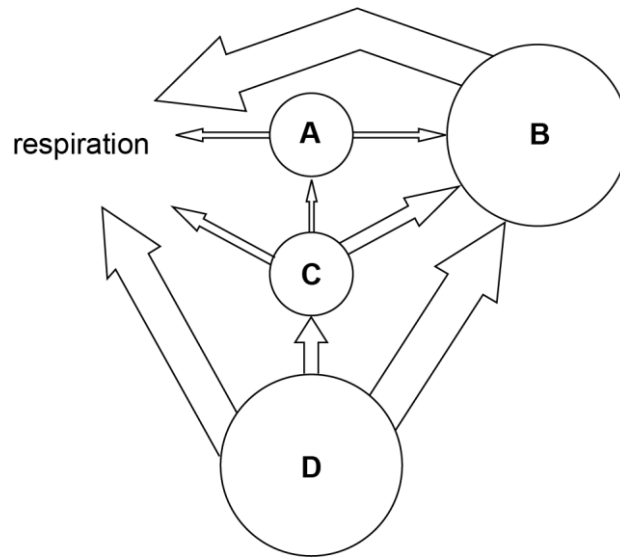
27 The diagram shows part of a food web.



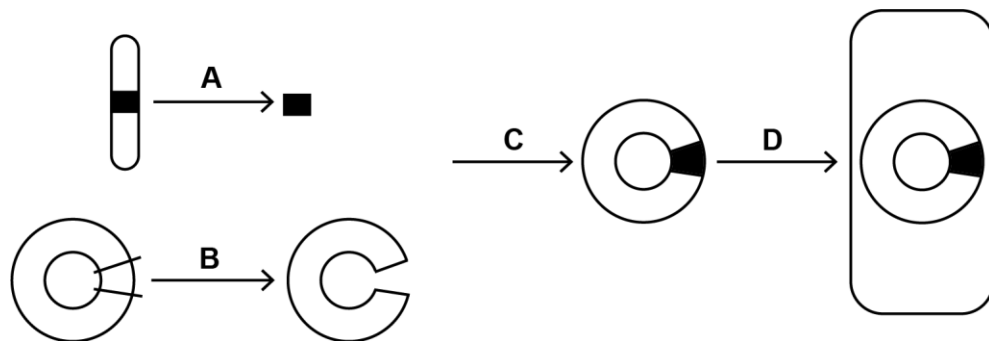
Which pyramid of numbers is based on this food web?



- 28** The diagram shows the energy flow model for all the species in a forest. The width of the arrows is proportional to the amount of energy transferred.
- Which circle represents the decomposers?



- 29** The diagram shows the stages in transferring a gene from a donor organism to a recipient bacterium.
- At which stage is DNA ligase used?



- 30** Which statement identifies a possible benefit of genetically modified crop plants?
- A** Cross-pollination of genetically modified crop plants with weeds could produce new varieties of weeds.
  - B** Some crop plants can be genetically modified to be resistant to diseases.
  - C** The use of genetically modified crops may increase in food allergies in children.
  - D** There is more research needed on the long-term effects of genetically modified crops on the environment.

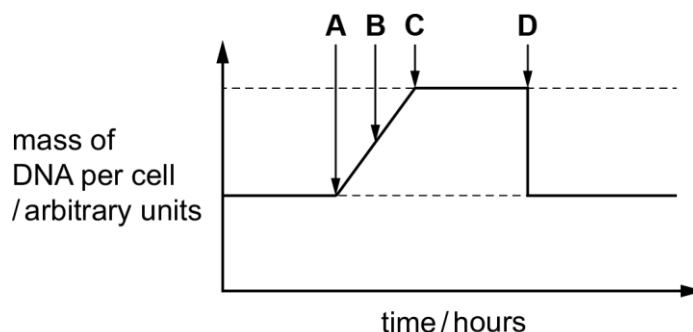
- 31 Two polynucleotide strands make up a DNA molecule.

What is a correct description?

- A The percentage of cytosine is 50% of that of guanine in the whole molecule.
- B The percentage of cytosine is the same as that of guanine in each strand.
- C The percentage of cytosine is the same as that of guanine in the whole molecule.
- D The percentage of cytosine is the same in each strand of the molecule.

- 32 The graph shows how the mass of DNA changes during a mitotic cell division.

Where on the graph are **two** cells formed?

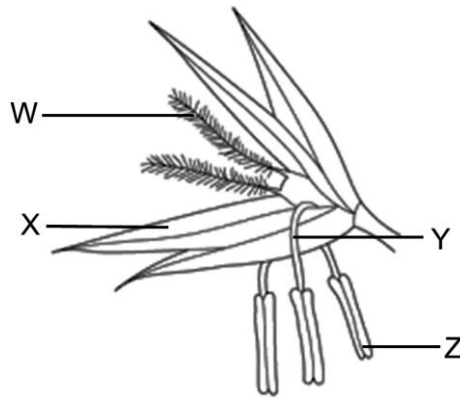


- 33 A scientist counted 22 chromosomes in each of the root cells of a plant.

What is the diploid and haploid number of chromosomes for this species?

|   | diploid number | haploid number |
|---|----------------|----------------|
| A | 11             | 22             |
| B | 22             | 11             |
| C | 22             | 44             |
| D | 44             | 22             |

**34** The diagram shows the side view of a flower.



A student made the following observations:

- 1 Structure X has a large surface area.
- 2 Structure W is small and inconspicuous.
- 3 Structures Y and Z are hung out of structure X.

Which of the above observation(s) show(s) that the flower is wind-pollinated?

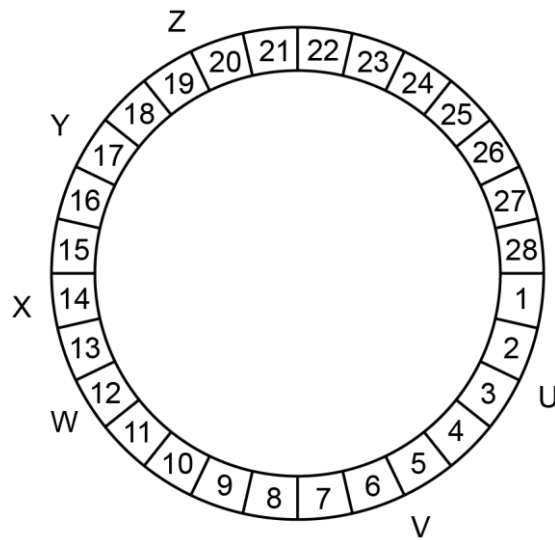
- A** 1 and 2  
**B** 1 and 3  
**C** 2 only  
**D** 3 only

**35** A plant P is pollinated. A seed from this plant develops into plant Q. The cells of plant Q contain 14 chromosomes.

How many of these chromosomes are identical to chromosomes from plant P?

|          | if P was self pollinated | if P was cross pollinated |
|----------|--------------------------|---------------------------|
| <b>A</b> | 7                        | 7                         |
| <b>B</b> | 7                        | 14                        |
| <b>C</b> | 14                       | 7                         |
| <b>D</b> | 14                       | 14                        |

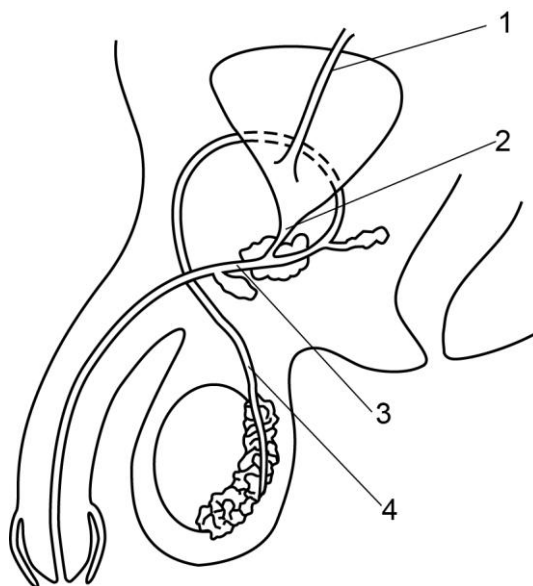
- 36** The diagram shows the 28 days of a typical menstrual cycle. The letters around the outside indicate different points in the cycle.



Which row correctly shows the points in the cycle?

|          | stage of cycle                        |              |           |
|----------|---------------------------------------|--------------|-----------|
|          | maximum thickness<br>of uterus lining | menstruation | ovulation |
| <b>A</b> | V                                     | X            | Z         |
| <b>B</b> | X                                     | U            | Y         |
| <b>C</b> | Z                                     | U            | X         |
| <b>D</b> | Z                                     | W            | X         |

- 37 The diagram shows part of the male urinary and reproductive systems in side view.



What is transported in the tubes labelled 1, 2, 3 and 4?

|          | 1               | 2               | 3               | 4          |
|----------|-----------------|-----------------|-----------------|------------|
| <b>A</b> | sperm only      | sperm and urine | urine only      | urine only |
| <b>B</b> | sperm and urine | urine only      | sperm and urine | sperm only |
| <b>C</b> | urine only      | sperm and urine | sperm only      | urine only |
| <b>D</b> | urine only      | urine only      | sperm and urine | sperm only |

- 38 A variety of snail has an inherited condition that affects the thickness of the shell.

$S^t S^t$  have thick shells.

$S^t S^n$  have thin shells.

$S^n S^n$  do not survive.

Two heterozygous snails are mated.

What is the probability that a surviving snail of the next generation is a heterozygote?

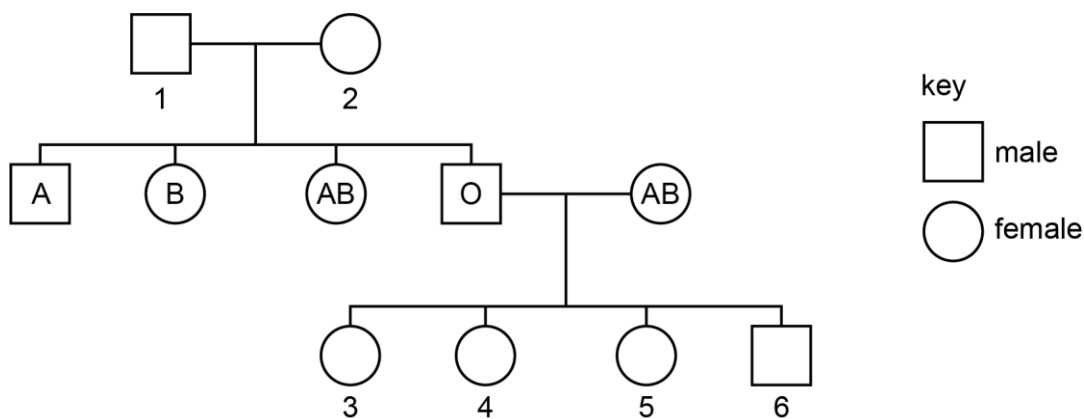
- A** 0.00                      **B** 0.25                      **C** 0.50                      **D** 0.67

- 39** Over time, a species of bird develops a more pointed beak. The more pointed shape of the beak helps the birds to catch small insects that may be hiding in cracks in the rocks.

What is a reason for the change in the shape of the birds' beaks?

- A** Birds develop more pointed beaks as they search for insects in cracks in the rocks.
- B** Individuals with less pointed beaks are better fitted to their environment and more likely to survive.
- C** Individuals with more pointed beaks are better able to compete for food.
- D** When reproducing, birds are more likely to seek out mates with less pointed beaks because these are better adapted.

- 40** The diagram shows a family tree with the blood groups of some individuals labelled.



What are possible blood groups for the numbered individuals?

|          | 1  | 2 | 3 | 4 | 5  | 6 |
|----------|----|---|---|---|----|---|
| <b>A</b> | A  | B | A | A | B  | B |
| <b>B</b> | A  | B | A | B | AB | O |
| <b>C</b> | AB | O | A | A | B  | B |
| <b>D</b> | AB | O | A | B | AB | O |