CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

**BIOLOGY** **9700/01**

Paper 1 Multiple Choice

May/June 2003

**1 hour**

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name, Centre number and candidate 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 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 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.

This document consists of **16** printed pages.


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Local Examinations Syndicate
**[Turn over**

**1** An actively growing cell is supplied with radioactive amino acids.

Which cell component would first show an increase in radioactivity?

**A** Golgi body

**B** mitochondrion

**C** nucleus

**D** rough endoplasmic reticulum

**2** Which pair of organelles has internal membranes?

**A** chloroplasts and mitochondria

**B** chloroplasts and nuclei

**C** mitochondria and ribosomes

**D** nuclei and ribosomes

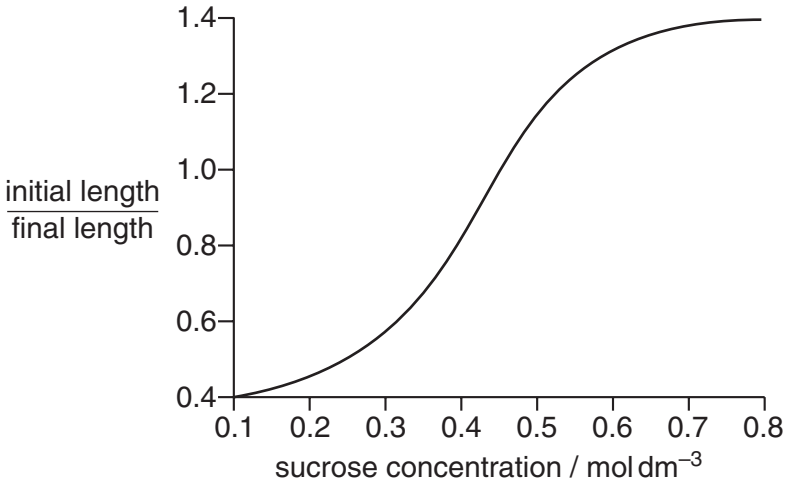
**3** Which combination is found in a prokaryotic cell?

| | endoplasmic reticulum | DNA | RNA | nucleus |
|---|---|---|---|---|
| **A** | ✓ | ✓ | ✗ | ✗ |
| **B** | ✓ | ✗ | ✗ | ✓ |
| **C** | ✗ | ✓ | ✓ | ✗ |
| **D** | ✗ | ✗ | ✓ | ✓ |

key
✓ present
✗ absent

**4** Strips of plant tissue were immersed in a range of sucrose solutions of different concentrations. Their lengths were measured before immersion and after 30 minutes in the different solutions.

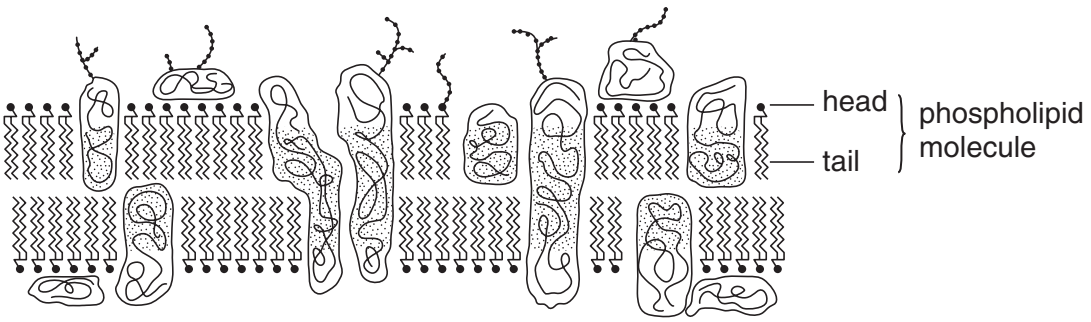
The graph shows the ratio of initial length to final length.




Which concentration of sucrose solution, in mol $dm^{-3}$, has the same water potential as the cell sap before immersion?

**A** 0.1 **B** 0.25 **C** 0.45 **D** 0.8

**5** The diagram shows a section of a cell surface membrane.




What causes the phospholipid molecules to be arranged as shown?

**A** The heads are hydrophilic and point towards water molecules.

**B** The heads are hydrophobic and point away from water molecules.

**C** The tails are hydrophilic and point away from water molecules.

**D** The tails are hydrophobic and point towards water molecules.

**6** Many fresh water animals possess vacuoles which contract regularly, expelling excess water.

Why do plants living in fresh water **not** require such vacuoles?

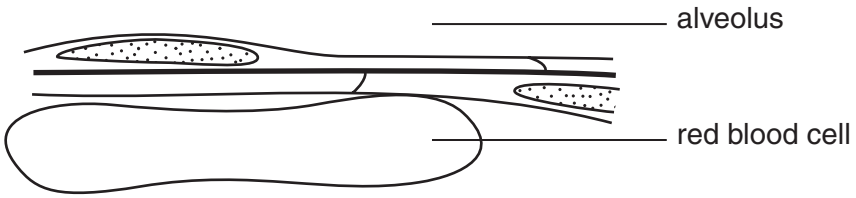
**A** Plant cell sap has a much lower concentration of dissolved solutes than animal cytoplasm.

**B** Plant cell walls are impermeable to water.

**C** The water potential is the same inside and outside the plant cells.

**D** Water movement into plants is controlled by their roots.

**7** The drawing has been made from a section showing part of an alveolus and a red blood cell in a capillary. The magnification of the drawing is × 5000




What is the minimum distance that oxygen must diffuse from air in an alveolus into a red blood cell?

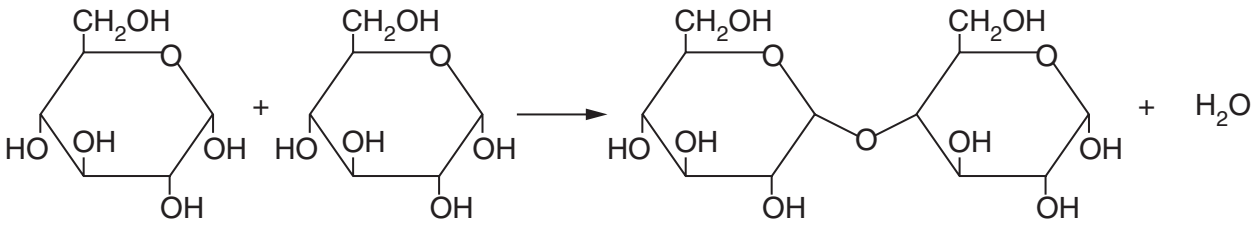
**A** 0.1 nm

**B** 1.0 nm

**C** 0.1 µm

**D** 1.0 µm

**8** The diagram shows a reaction resulting in the formation of a bond between two molecules.




Which bond is formed and what is the type of reaction?

| | bond formed | type of reaction |
|---|---|---|
| **A** | glycosidic | condensation |
| **B** | glycosidic | hydrolysis |
| **C** | peptide | condensation |
| **D** | peptide | hydrolysis |

**9** What is the general formula for a monosaccharide?

**A** $C(H_2O)_n$

**B** $(CH_2O)_n$

**C** $C_2(H_2O)_n$

**D** $C_n(H_2O)$

**10** Four sugar solutions were tested with a standard Benedict's solution. The table shows the colour of the solutions after testing.

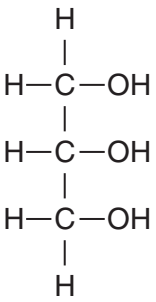
| solution | colour |
|---|---|
| **1** | green |
| **2** | blue |
| **3** | brick-red |
| **4** | yellow |

What is the best interpretation of the results?

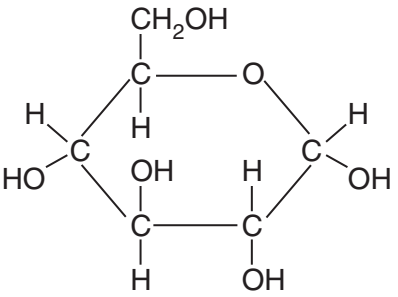
| | solution **1** | solution **2** | solution **3** | solution **4** |
|---|---|---|---|---|
| **A** | 0.05% reducing sugar | 0.5% non-reducing sugar | 1.0% reducing sugar | 0.1% reducing sugar |
| **B** | 0.5% non-reducing sugar | 0.05% reducing sugar | 0.1% reducing sugar | 1.0% reducing sugar |
| **C** | 1.0% reducing sugar | 1.0% non-reducing sugar | 1.5% reducing sugar | 0.5% reducing sugar |
| **D** | 1.0% non-reducing sugar | 0.5% reducing sugar | 0.5% non-reducing sugar | 0.1% non-reducing sugar |

**11** Which molecule is found in glycogen?

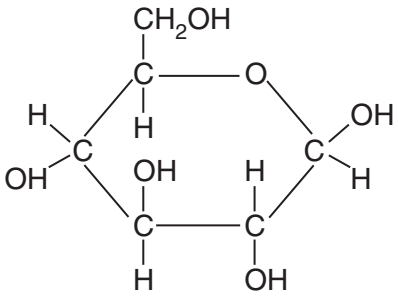
**A**



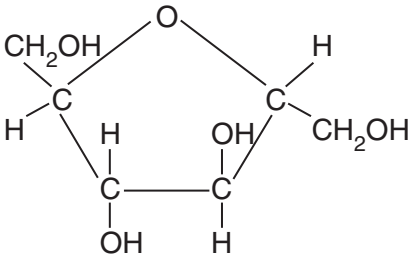
**B**



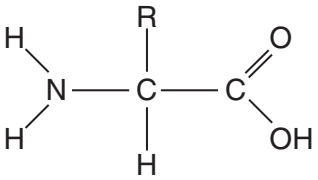
**C**



**D**



**12** The diagram shows a molecule which is an important component of living organisms.



A forensic sample is tested for the presence of a polymer of this molecule.

Which polymer is tested for?

**A** DNA

**B** lipid

**C** protein

**D** starch

**13** How many fatty acid residues are normally present in a phospholipid molecule?

**A** 1

**B** 2

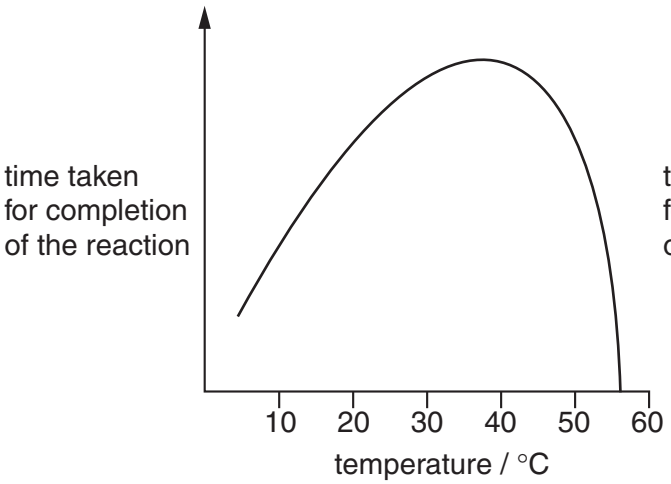
**C** 3

**D** 4

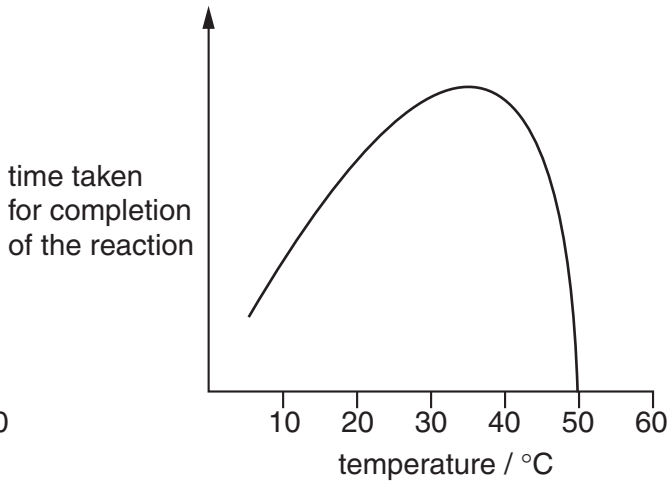
**14** An enzyme is completely denatured at 50 °C. A fixed concentration of this enzyme is added to a fixed concentration of its substrate. The time taken for completion of the reaction is measured at different temperatures.

Which graph shows the results?

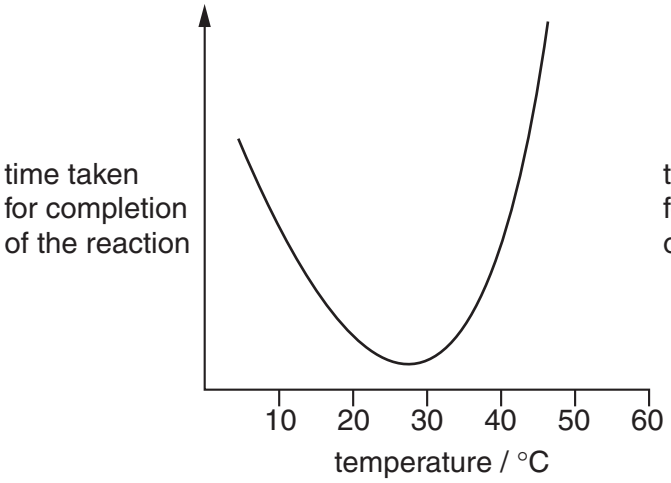
**A**



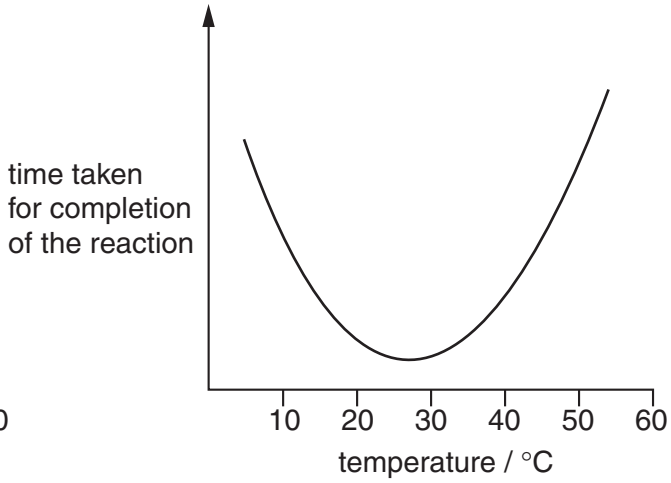

**B**




**C**




**D**






**[Turn over**

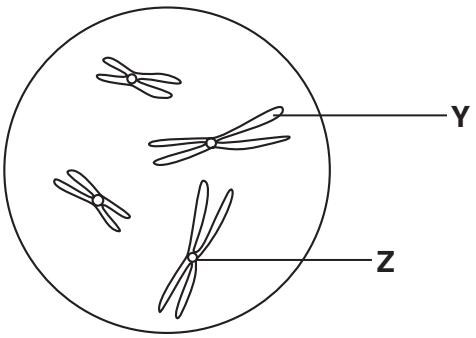
**15** Which properties are characteristic of a non-competitive inhibitor of an enzyme?

| | binding | effect of adding more substrate |
|---|---|---|
| **A** | at active site | reduces inhibition |
| **B** | at active site | does not reduce inhibition |
| **C** | not at active site | reduces inhibition |
| **D** | not at active site | does not reduce inhibition |

**16** What occurs in mitosis?

| | homologous chromosomes pair | chromosome number remains the same |
|---|---|---|
| **A** | ✗ | ✓ |
| **B** | ✓ | ✗ |
| **C** | ✗ | ✗ |
| **D** | ✓ | ✓ |

**17** The diagram shows chromosomes in a nucleus.




What are **Y** and **Z**?

| | **Y** | **Z** |
|---|---|---|
| **A** | centromere | centriole |
| **B** | centromere | chromatid |
| **C** | chromatid | centriole |
| **D** | chromatid | centromere |

**18** A peptide consists of ten amino acids of four different kinds.

What is the theoretical minimum number of tRNA molecules required to translate the mRNA for this peptide?

**A** 4

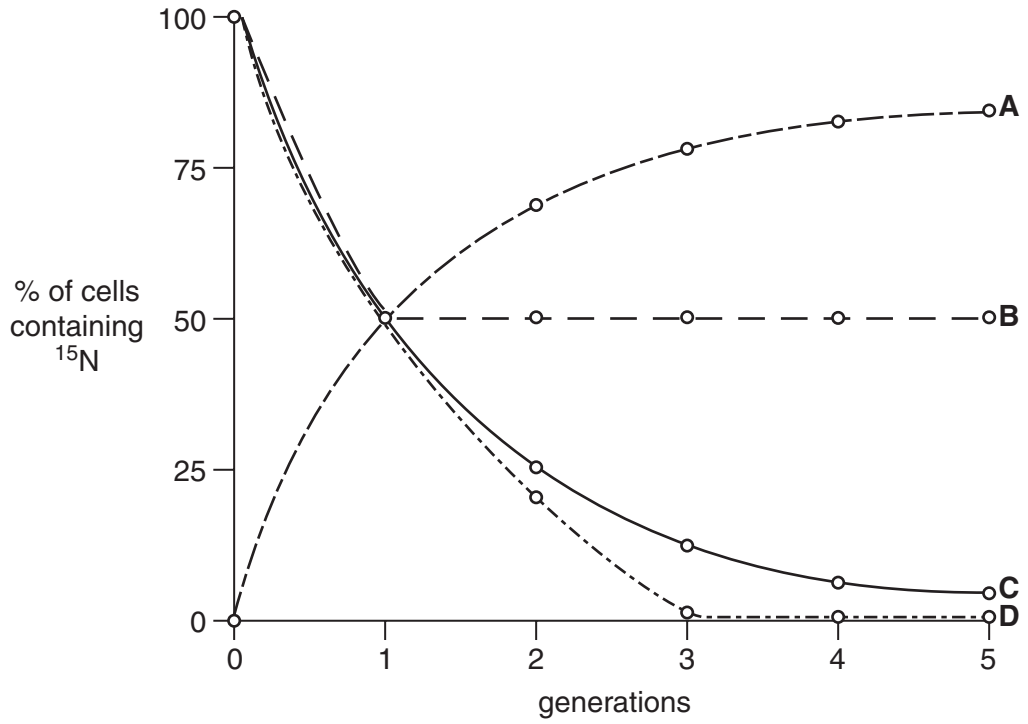
**B** 10

**C** 12

**D** 30

**19** Bacteria were cultured in a medium containing heavy nitrogen ($^{15}N$) until all the DNA was labelled. These bacteria were then grown in a medium containing only normal nitrogen ($^{14}N$) for five generations. The percentage of cells containing $^{15}N$ in each generation was estimated.

Which curve provides evidence that DNA replication is semi-conservative?




**20** RNA is extracted from β cells in the pancreas. It is used to make DNA coding for human insulin.

Which enzyme is used to make the DNA?

**A** DNA ligase

**B** restriction enzyme

**C** reverse transcriptase

**D** RNA polymerase



**[Turn over**

**21** Which type of molecule is the end product of translation?

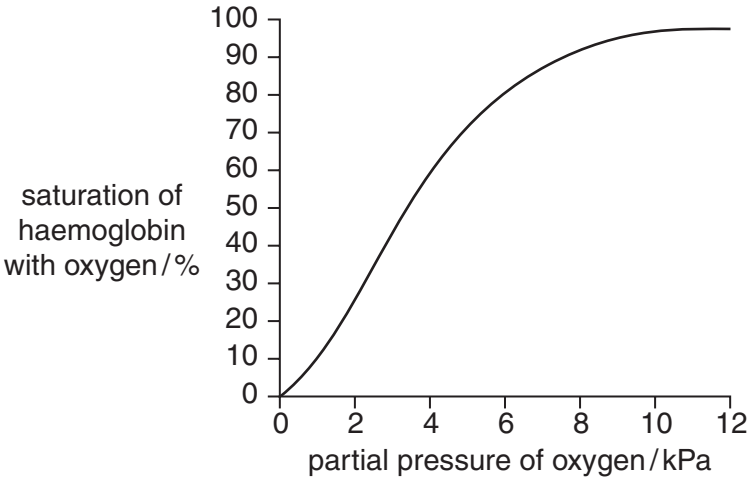
**A** amino acid

**B** DNA

**C** mRNA

**D** polypeptide

**22** The graph shows the human haemoglobin dissociation curve.




Which range of partial pressures of oxygen would be found in pulmonary arteries?

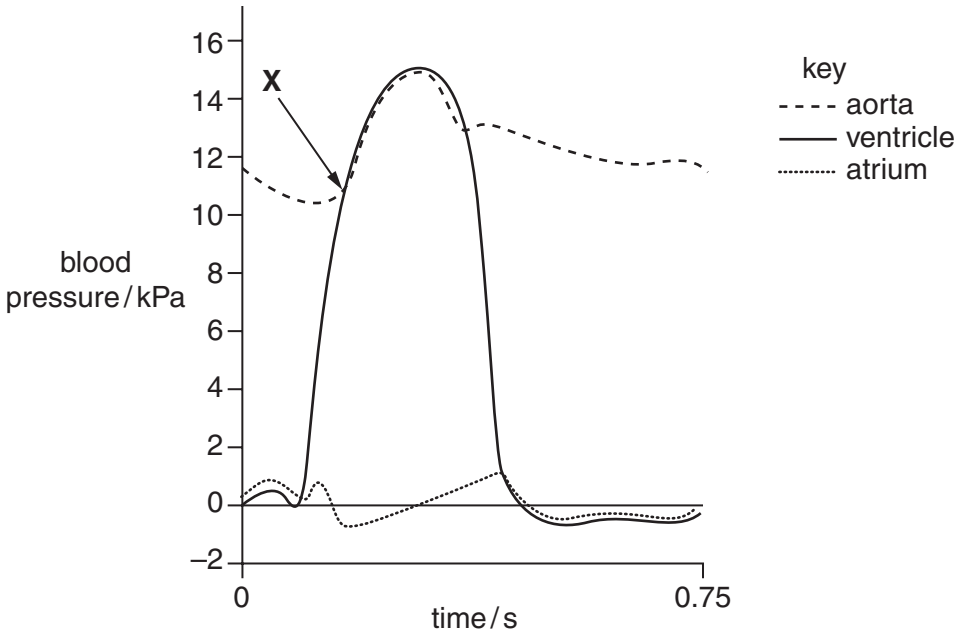
**A** between 0 and 2 kPa

**B** between 2 and 6 kPa

**C** between 6 and 8 kPa

**D** between 8 and 12 kPa

**23** The graph shows changes in blood pressure during one cardiac cycle.




What is happening to the ventricle and aortic semilunar valve at **X**?

| | ventricle | aortic semilunar valve |
|---|---|---|
| **A** | contracting | closing |
| **B** | contracting | opening |
| **C** | relaxing | closing |
| **D** | relaxing | opening |

**24** The movement of water through xylem vessels is affected by external factors.

A decrease in which external factor would result in an increase in water movement?

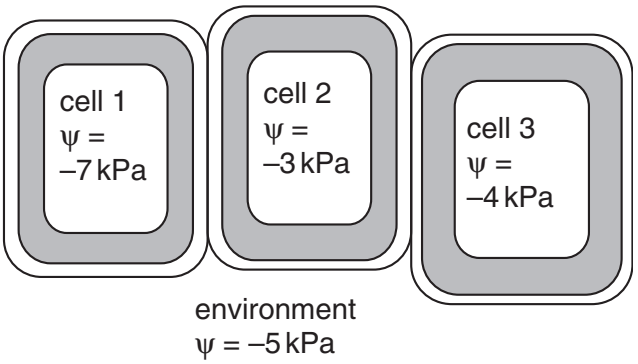
**A** atmospheric humidity

**B** external temperature

**C** light intensity

**D** wind velocity

**25** The diagram shows the water potential (ψ) in some plant cells and in their environment.




Which statement describes the movement of water between these cells and between them and their environment?

**A** All three cells are turgid, so no water moves.

**B** Water moves from cell 1, cell 3 and the environment into cell 2.

**C** Water moves from cell 3 to the environment, and from the environment to cell 1.

**D** Water moves from the environment into cells 1, 2 and 3.

**26** Which condition is caused by a deficiency of vitamin A?

**A** anaemia

**B** anorexia nervosa

**C** night blindness

**D** rickets

**27** What is a role of essential fatty acids in the body?

**A** as part of glycoproteins in cell membranes

**B** as part of phospholipids in cell membranes

**C** to use for enzyme formation

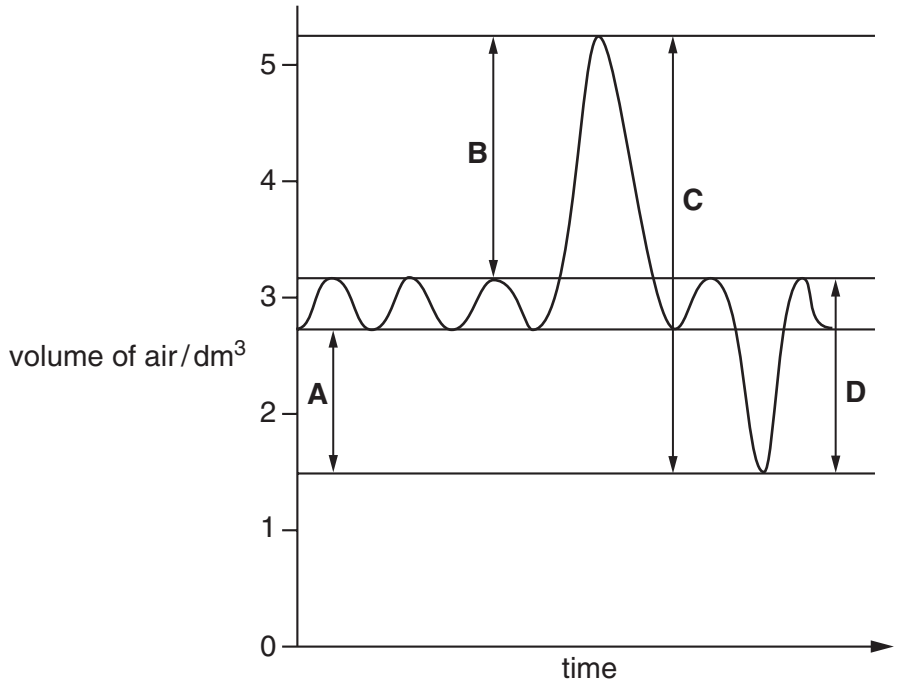
**D** to use for RNA formation

**28** Which tissues are present in the walls of a trachea and an alveolus?

| | | tissue | | |
|---|---|---|---|---|
| | | cartilage | epithelium with goblet cells | smooth muscle |
| **A** | trachea | ✓ | ✓ | ✓ |
| | alveolus | ✓ | ✓ | ✗ |
| **B** | trachea | ✓ | ✓ | ✓ |
| | alveolus | ✗ | ✗ | ✗ |
| **C** | trachea | ✓ | ✓ | ✗ |
| | alveolus | ✗ | ✓ | ✓ |
| **D** | trachea | ✓ | ✓ | ✓ |
| | alveolus | ✗ | ✗ | ✓ |

**29** The diagram shows the changes in human lung volume obtained using a spirometer.

Which part of the trace represents the vital capacity?




**30** What is the main limiting factor on the amount of work that muscles can perform during aerobic exercise?

**A** the percentage saturation of haemoglobin with oxygen in the lungs

**B** the speed of dissociation of oxygen from haemoglobin in the muscles

**C** the volume of blood flow through the lungs

**D** the volume of blood flow through the muscles



**[Turn over**

**31** Why is aerobic respiration of a molecule of glucose considered more efficient than anaerobic respiration?

**A** More ATP is produced.

**B** More carbon dioxide is produced.

**C** More water is produced.

**D** More oxygen is used.

**32** Which component of tobacco smoke affects blood pressure?

**A** carbon dioxide

**B** carbon monoxide

**C** nicotine

**D** tar

**33** Drinking excess alcohol can lead to long-term damage to the liver.

In which sequence would the effects occur?

| | first → last | | |
|---|---|---|---|
| **A** | cirrhosis | fatty liver | jaundice |
| **B** | cirrhosis | jaundice | liver cancer |
| **C** | fatty liver | cirrhosis | jaundice |
| **D** | jaundice | liver cancer | cirrhosis |

**34** In parts of London, there was an increase in the number of cases of TB in the 1990s.

Which factor is **most** likely to have contributed to this?

**A** global warming increasing mean temperature

**B** increase in air pollution

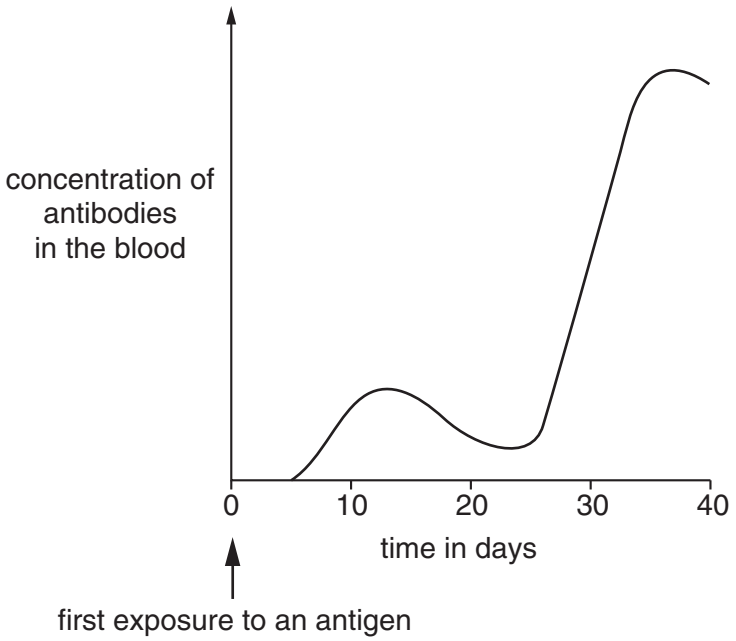
**C** increased pathogen mutation rate

**D** overcrowded accommodation

**35** What are the causative agent and method of transmission of cholera?

| | causative agent | method of transmission |
|---|---|---|
| **A** | bacterium | airborne droplets |
| **B** | bacterium | water-borne |
| **C** | virus | airborne droplets |
| **D** | virus | water-borne |

**36** The graph shows the amount of antibody produced in response to an antigen.




From the graph, which statement is correct?

**A** It takes 25 days to achieve active immunity.

**B** Memory cells for this antigen are present in the body within 20 days.

**C** A second exposure to the antigen occurred on day 20.

**D** T helper cells are activated on day 12.

**37** For a period after its birth, a human baby is immune to most of the diseases to which its mother is immune.

Which form of immunity does this represent?

**A** artificial active

**B** artificial passive

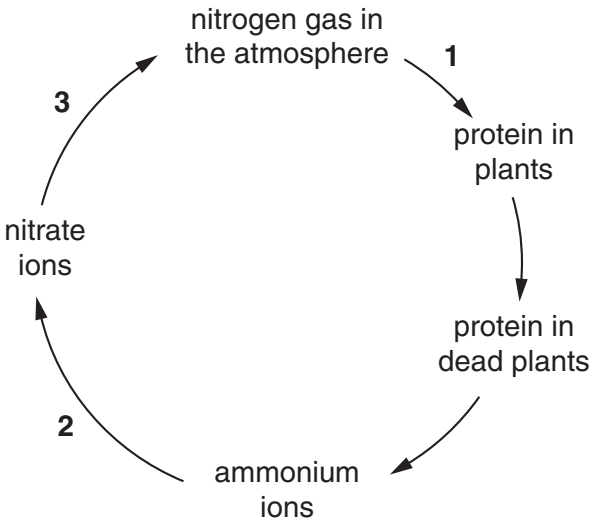
**C** natural active

**D** natural passive



**[Turn over**

**38** The diagram shows part of the nitrogen cycle.




Which kind of bacteria are involved in steps **1**, **2** and **3**?

| | nitrifying bacteria | denitrifying bacteria | nitrogen-fixing bacteria |
|---|---|---|---|
| **A** | 1 | 2 | 3 |
| **B** | 2 | 3 | 1 |
| **C** | 3 | 1 | 2 |
| **D** | 3 | 2 | 1 |

**39** What name is given to all the organisms in an area and their interactions with their environment?

**A** community

**B** ecosystem

**C** niche

**D** population

**40** Which statement explains why two species **cannot** permanently occupy the same ecological niche?

**A** The two species could not interbreed.

**B** The two species may be part of separate food webs.

**C** The two species would compete for the same resources.

**D** The two species would have different nutritional requirements.