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

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

Paper 1 Multiple Choice **May/June 2009**

**1 hour**

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

*0696094544*

**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 **13** printed pages and **3** blank pages.

**1** What are the appropriate units for measuring diameters of alveoli, diameters of white blood cells and the width of cell walls?

| | diameters of alveoli | diameters of white blood cells | width of cell walls |
|---|---|---|---|
| **A** | mm | μm | μm |
| **B** | μm | mm | μm |
| **C** | μm | μm | nm |
| **D** | mm | mm | nm |

**2** Cells which do not have nucleoli die because they do not have

**A** centrioles and cannot divide.

**B** mitochondria and cannot release energy.

**C** mRNA and cannot transcribe DNA.

**D** ribosomes and cannot synthesise protein.

**3** What describes the features of an electron microscope?

| | maximum magnification | resolution / nm | specimen |
|---|---|---|---|
| **A** | $2.5 \times 10^{3}$ | $2.5 \times 10^{2}$ | dead |
| **B** | $2.5 \times 10^{4}$ | $5.0 \times 10^{-1}$ | living |
| **C** | $2.5 \times 10^{5}$ | $5.0 \times 10^{-1}$ | dead |
| **D** | $5.0 \times 10^{5}$ | $2.5 \times 10^{2}$ | living |

**4** A plan diagram is made of a transverse section of a leaf.

Which features should be seen in the diagram?

1 the overall distribution of tissues

2 the relative thicknesses of the tissue layers

3 those cells which contain chloroplasts

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

**5** The table shows some of the structural features present or absent in four different cell types.

Which identifies the cell type for each column of features?

key
✓ = feature present
✗ = feature absent

| | | | | |
|---|---|---|---|---|
| cell wall | ✓ | ✓ | ✗ | ✓ |
| centrioles | ✗ | ✗ | ✓ | ✗ |
| chloroplast | ✓ | ✗ | ✗ | ✗ |
| Golgi apparatus | ✓ | ✓ | ✓ | ✗ |
| large vacuole | ✓ | ✓ | ✗ | ✗ |
| **A** | ciliated epithelial cell | prokaryotic cell | root cortex cell | spongy mesophyll cell |
| **B** | root cortex cell | spongy mesophyll cell | prokaryotic cell | ciliated epithelial cell |
| **C** | prokaryotic cell | ciliated epithelial cell | spongy mesophyll cell | root cortex cell |
| **D** | spongy mesophyll cell | root cortex cell | ciliated epithelial cell | prokaryotic cell |

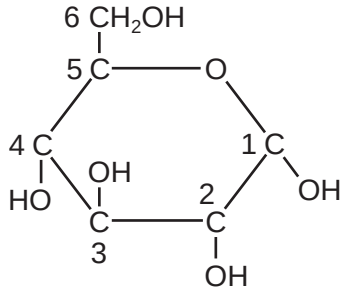
**6** Which types of bonds maintain the tertiary structure of a protein molecule?

| | disulfide | hydrogen | ionic | peptide |
|---|---|---|---|---|
| **A** | ✓ | ✓ | ✓ | ✗ |
| **B** | ✗ | ✓ | ✓ | ✗ |
| **C** | ✗ | ✓ | ✗ | ✓ |
| **D** | ✓ | ✗ | ✗ | ✓ |

**7** What is the general formula for starch?

**A** $(C_5H_{10}O_5)_n$ **B** $(C_5H_{10}O_6)_n$ **C** $(C_6H_{10}O_5)_n$ **D** $(C_6H_{12}O_6)_n$

**8** The hexose sugar molecule in the diagram has its six carbon atoms numbered.




Which carbon atoms join by glycosidic bonds to form amylose and amylopectin?

| | amylose | amylopectin |
|---|---|---|
| **A** | 1 to 4 | 1 to 4 and 1 to 6 |
| **B** | 1 to 6 | 1 to 4 and 1 to 6 |
| **C** | 1 to 4 and 1 to 6 | 1 to 4 |
| **D** | 1 to 4 and 1 to 6 | 1 to 6 |

**9** Which statement about triglycerides is correct?

**A** They are made up of three fatty acids combined with glycogen.

**B** They are more saturated with hydrogen compared with phospholipids.

**C** They form a bilayer in the membranes of cells.

**D** They have a lower ratio of oxygen to carbon compared with carbohydrates.

**10** When a peptide bond is formed, which statement is correct?

**A** One amino acid loses a hydroxyl group from its amine group.

**B** One amino acid loses a hydroxyl group from its carboxyl group.

**C** Both amino acids lose a hydrogen atom from their amine group.

**D** Both amino acids lose a hydrogen atom from their carboxyl group.

**11** Which sequence correctly identifies the change in colours during the Benedict's test?

**A** blue → brown → red → green → yellow

**B** blue → green → yellow → brown → red

**C** blue → red → green → yellow → brown

**D** blue → yellow → brown → red → green

**12** Lactose is a disaccharide present in the milk of mammals.

How will a baby mammal benefit from having this sugar, instead of a monosaccharide, in the milk?

**A** Condensation of disaccharides enables rapid production of glycogen.

**B** Disaccharides can be transported across membranes for more rapid absorption.

**C** Disaccharides have a higher energy value than triglycerides.

**D** Hydrolysis of the glycosidic bond gives a gradual release of monosaccharide.

**13** When investigating the rate of reaction of the enzyme lipase on the hydrolysis of triglycerides, the pH must be maintained at an optimum to prevent the lipase denaturing.

What is the reason for this?

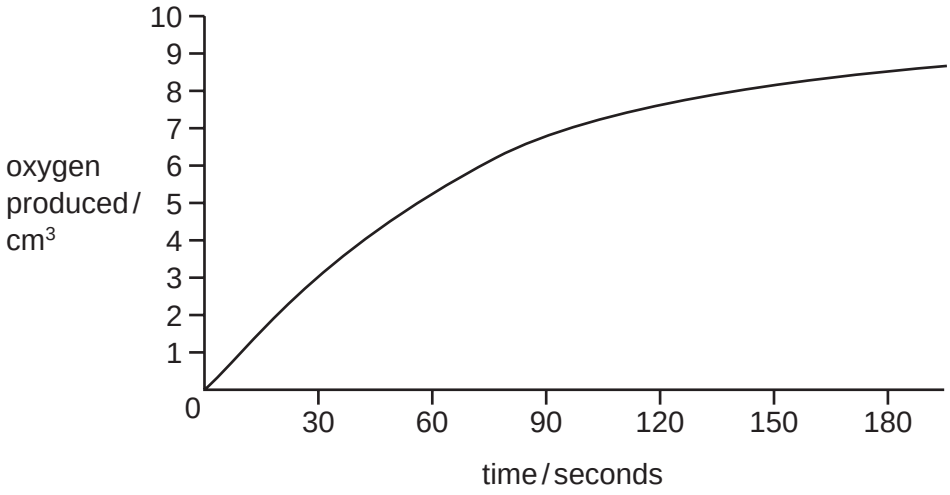
**A** The addition of water molecules produced by hydrolysis increases pH.

**B** The products of hydrolysis decrease the pH.

**C** The products of hydrolysis increase the pH.

**D** The removal of water molecules used in hydrolysis decreases pH.

**14** Catalase was added to hydrogen peroxide solution. The volume of oxygen produced was measured at intervals. The results are shown on the graph.




What was the initial rate of reaction?

**A** $0.05\,cm^3\,s^{-1}$ **B** $0.10\,cm^3\,s^{-1}$ **C** $1.00\,cm^3\,s^{-1}$ **D** $10.0\,cm^3\,s^{-1}$



[Turn over

**15** Some viruses are able to bind to the cell surface membrane before entering the host cell.

Which sequence of events will lead to a virus invading a cell?

**A** binding to a cholesterol molecule, followed by endocytosis

**B** binding to a glycoprotein receptor, followed by exocytosis

**C** binding to a protein receptor, followed by endocytosis

**D** binding to the hydrophilic portion of a phospholipid, followed by exocytosis

**16** Which statement about the fluid mosaic model of membrane structure is correct?

**A** The less unsaturated the fatty acid tails of the phospholipid, the more fluid the membrane.

**B** The more unsaturated the fatty acid tails of the phospholipid, the more fluid the membrane.

**C** The higher the temperature, the less fluid the membrane.

**D** The lower the temperature, the more fluid the membrane.

**17** Which pair of factors is inversely proportional to the rate of diffusion?

**A** concentration gradient and surface area over which diffusion occurs

**B** distance over which diffusion occurs and size of diffusing molecule

**C** size of diffusing molecule and concentration gradient

**D** surface area over which diffusion occurs and distance over which diffusion occurs

**18** For organisms undergoing sexual reproduction, a reduction division occurs before fertilisation.

Which reasons explain why this is necessary?

1 increase genetic variation

2 prevent doubling of the chromosome number

3 reduce the chances of mutation

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

**19** Colchicine is a chemical that stops chromatids from separating during mitosis.

Which phase will the cell reach and then stop dividing?

**A** anaphase

**B** metaphase

**C** prophase

**D** telophase

**20** In the DNA sequence for sickle cell anaemia, adenine replaces thymine in a CTT triplet, forming the triplet CAT. During synthesis of the sickle cell haemoglobin molecule, the amino acid valine is incorporated instead of glutamic acid.

What is the anticodon in the transfer RNA molecule carrying this valine?

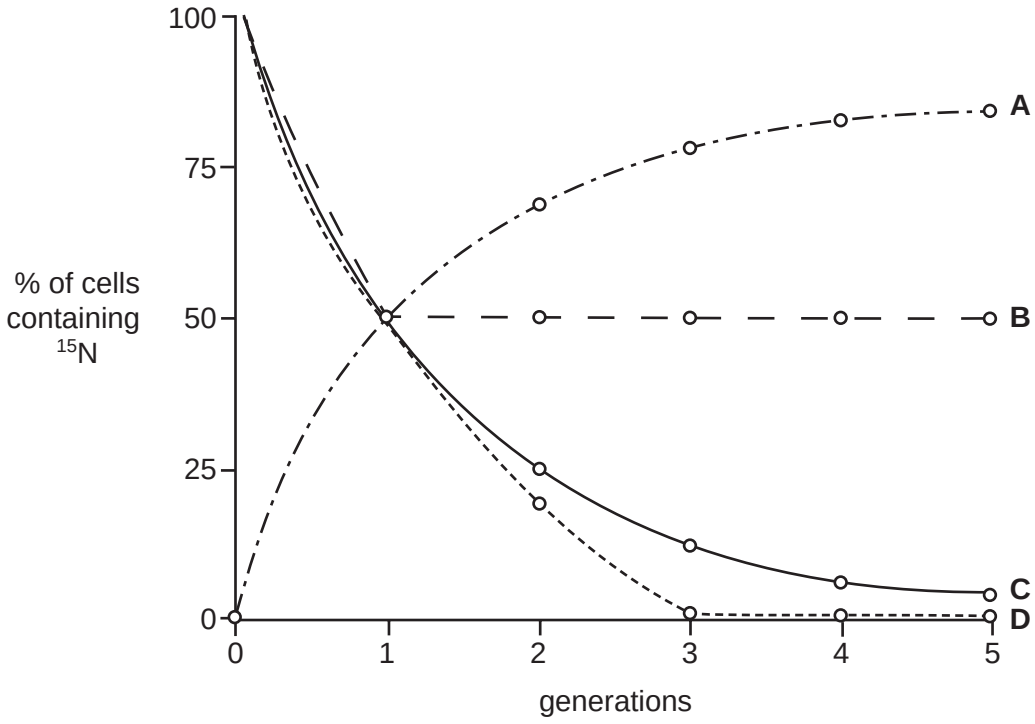
**A** CAU **B** CUA **C** GAU **D** GUA

**21** Which statements are correct about DNA transcription and translation?

| | transcription | translation |
|---|---|---|
| **A** | is semi-conservative | produces mRNA |
| **B** | produces mRNA | is semi-conservative |
| **C** | occurs at the surface of ribosomes | produces mRNA |
| **D** | produces mRNA | occurs at the surface of ribosomes |

**22** 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?



**23** The table shows the sugars and some bases found in RNA and DNA.

Which is correct?

| | RNA | DNA |
|---|---|---|
| **A** | ribose | thymine |
| **B** | ribose | uracil |
| **C** | thymine | deoxyribose |
| **D** | uracil | ribose |

**24** What is transpiration and which advantage does it give to the plant?

| | transpiration | advantage to the plant |
|---|---|---|
| **A** | evaporation of water from leaf surfaces | maintains the water potential |
| **B** | evaporation of water from leaf surfaces | stomata are open for gas exchange |
| **C** | loss of water vapour from leaves | maintains the water potential |
| **D** | loss of water vapour from leaves | stomata are open for gas exchange |

**25** Which statement explains why the circumference (girth) of a tree is less at midday and increases at night?

**A** Mineral uptake by the root hair cells decreases during the night because root pressure has decreased.

**B** Stomata close during the night and there is a build-up of water in the vascular tissue within the stem.

**C** The phloem sieve tubes fill with dissolved solutes because the translocation rate reduces during the night.

**D** There is less tension in the xylem vessels during the night because the rate of transpiration is at a minimum.

**26** Different substances, such as sucrose and amino acids, can move in different directions in the phloem sieve tubes.

Which statement explains this?

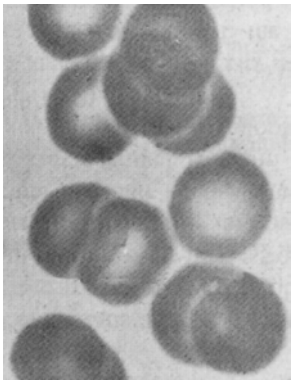
**A** Active transport occurs in some phloem sieve tubes and mass flow in other phloem sieve tubes.

**B** Both active transport and mass flow occur in each individual phloem sieve tube.

**C** Mass flow occurs in both directions at once in each individual phloem sieve tube.

**D** Mass flow occurs in different directions in different phloem sieve tubes at the same time.

**27** The photograph shows a type of blood cell.



Which statements about these cells are correct?

1 Oxygen diffuses through the phospholipid bilayer.

2 Sodium ions diffuse through the phospholipid bilayer.

3 Water passes in and out of these cells by osmosis.

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

**28** When one molecule of oxygen combines with haemoglobin it makes it easier for the next oxygen molecule to bind, which makes it easier for the next molecule of oxygen to bind.

Which orders of protein structure change to allow this to happen?

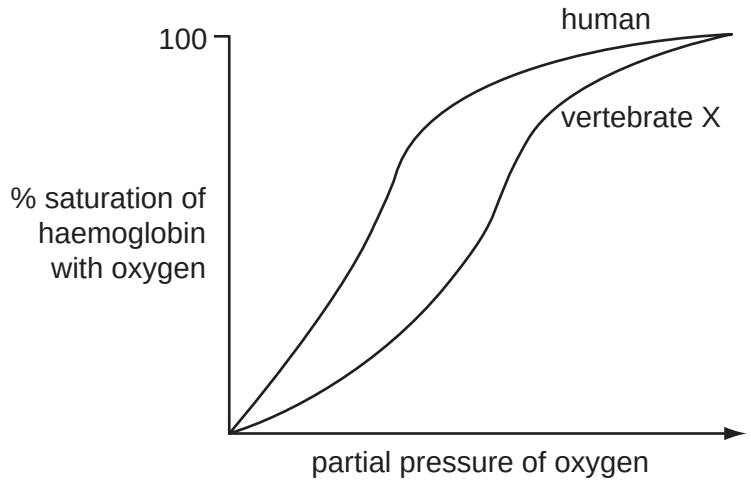
**A** primary and quaternary

**B** primary and secondary

**C** secondary and tertiary

**D** tertiary and quaternary

**29** The graphs show changes in the percentage saturation of haemoglobin in the blood of humans and of another vertebrate animal. The partial pressure of $CO_2$ remains constant at 1.0 kPa and the temperature is constant at 25 °C.




Which conclusion is justified from the graph?

**A** At the temperature of 25 °C the affinity of haemoglobin for oxygen increases more in humans than in vertebrate X.

**B** Haemoglobin does not become fully saturated in the lungs of vertebrate X.

**C** Oxygen is more easily released from haemoglobin in the muscle of vertebrate X than in human muscle.

**D** The Bohr effect in the haemoglobin of vertebrate X is greater than in human haemoglobin.

**30** Which component of cigarette smoke makes blood platelets more sticky and therefore increases the risk of blood clot formation?

**A** carbon monoxide

**B** carcinogens

**C** nicotine

**D** tar

**31** When a person suffers an asthma attack, the tubes of the gas exchange system narrow and extra mucus is produced.

Which of these changes occur during an asthma attack?

1 Activity of ciliated epithelium increases.

2 Endocytosis in goblet cells increases.

3 Smooth muscles respire faster.

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

**32** A person inhales minute particles from a very dusty environment.

Which effect will this have on B-lymphocytes and goblet cells?

| | B-lymphocytes | goblet cells |
|---|---|---|
| **A** | less active | less active |
| **B** | less active | more active |
| **C** | more active | less active |
| **D** | more active | more active |

**33** Four ways of being immune are

1 having memory cells after an infection

2 having memory cells after being injected with dead bacteria

3 being injected with antibodies

4 receiving antibodies from breast milk

Which row in the table correctly shows the types of immunity?

| | natural active | artificial active | natural passive | artificial passive |
|---|---|---|---|---|
| **A** | 1 | 2 | 3 | 4 |
| **B** | 1 | 2 | 4 | 3 |
| **C** | 2 | 1 | 3 | 4 |
| **D** | 2 | 1 | 4 | 3 |

**34** A graft of tissue, such as skin, from a different person is usually rejected by the body.

Which statement about graft rejection is correct?

**A** The graft is rejected by T-lymphocytes because they circulate in the blood and can gather at the graft site.

**B** The graft is rejected by B-lymphocytes because they make and release antibodies which react with the surface antigens on the graft cells.

**C** The graft is rejected by B-lymphocytes because T-lymphocytes are not stimulated to produce antibodies.

**D** The graft is rejected by T-lymphocytes because the graft tissue causes T-lymphocytes to release antibodies.

**35** Which statement about both B- and T-lymphocytes is correct?

**A** They become active only when a specific antibody binds to their surface receptor.

**B** They divide to form clones when meeting an antitoxin in a cell.

**C** They produce memory cells to respond to an antigen when exposed in the future.

**D** They release hormone-like cytokines which stimulate release of antibodies.

**36** Why is it necessary for a person with a bacterial infection to be told to take antibiotics at evenly spaced time intervals?

**A** to increase the concentration of antibiotic slowly to a level which is lethal to the bacteria

**B** to maintain concentration of antibiotic in the body which is lethal to the bacteria

**C** to prevent the development of resistant strains of bacteria

**D** to select and kill the resistant strains of bacteria

**37** How are the diseases cholera, malaria and HIV / AIDS transmitted?

| | cholera | malaria | HIV / AIDS |
|---|---|---|---|
| **A** | air | body fluid | insect |
| **B** | body fluid | water | air |
| **C** | insect | air | water |
| **D** | water | insect | body fluid |

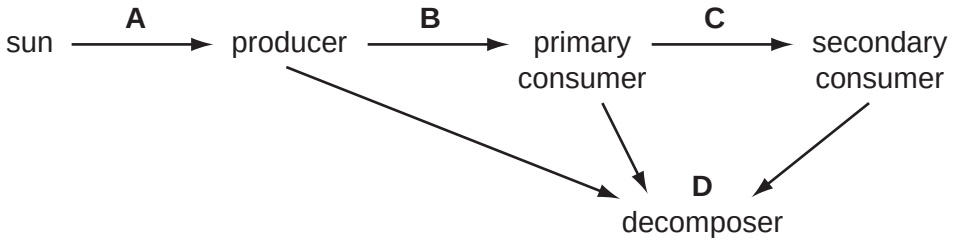
**38** A farmer grows a different crop in a field each year for three years.

In the fourth year he grows a leguminous crop, such as clover, and then ploughs this into the soil. The next year he starts the rotation again.

How does the fourth year crop add mineral ions to the soil?

| | decomposition | nitrification | nitrogen fixation |
|---|---|---|---|
| **A** | no | yes | yes |
| **B** | yes | no | yes |
| **C** | yes | yes | no |
| **D** | yes | yes | yes |

**39** At which stage of a food chain of tropical grassland is the energy transfer least efficient?




**40** Which soil would have the smallest number of denitrifying bacteria?

**A** compressed agricultural soil

**B** poorly drained forest soil

**C** water-logged clay soil

**D** well-aerated garden soil

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