

## BIOLOGY

Paper 1 Multiple Choice

9700/13 May/June 2011

1 hour

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

## READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

67607

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.

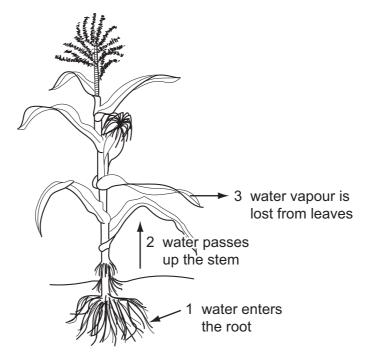
## Read the instructions on the Answer Sheet very carefully.

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 15 printed pages and 1 blank page.



1 The diagram represents the movement of water through a plant.

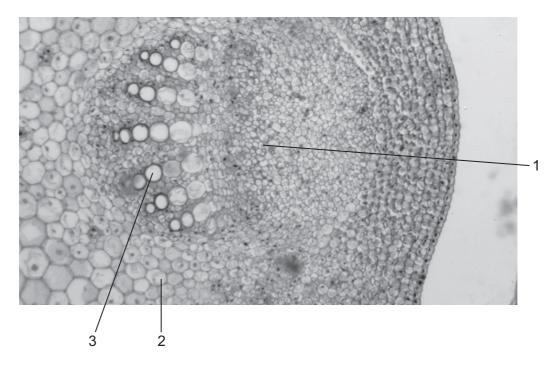


Which row identifies the processes involved during the stages of water movement shown?

	cohesion and adhesion	transpiration	osmosis
Α	1	2	3
в	1	3	2
С	2	1	3
D	2	3	1

- 2 Which xerophytic adaptations reduce the water potential gradient?
  - 1 rolled leaves
  - 2 hairy leaves
  - 3 sunken stomata
  - 4 fewer stomata
  - 5 fleshy leaves
  - **A** 1, 2, 3, 4 and 5
  - **B** 1, 2 and 3 only
  - **C** 1, 3 and 4 only
  - **D** 2, 4 and 5 only

**3** The photomicrograph shows a vascular bundle.



Which describes the relationship of water potential in the labelled cells?

- A cell 3 less negative than cell 1
- B cell 2 less negative than cell 3
- C cell 3 more negative than cells 1 and 2
- **D** cells 1, 2 and 3 have the same water potential
- **4** Which row correctly identifies the structure of an artery compared with a vein seen in transverse section under a light microscope?

	outer wall of artery	layer of muscles and elastic fibres	diameter of the lumen (hollow space)
Α	thicker	thicker	narrower
в	thicker	thinner	wider
С	thinner	thicker	narrower
D	thinner	thinner	wider

	nerve impulses from atrio-ventricular node (AVN) to	nerve impulses from Purkyne tissue (PT) to	nerve impulses from sino-atrial node (SAN) to
Α	SAN	the ventricles	AVN
в	PT	the atria	PT
С	PT	the ventricles	AVN
D	SAN	the atria	PT

5 Which row correctly describes the events during the cardiac cycle?

- 6 What happens during ventricular diastole?
  - A All semilunar valves open.
  - **B** The atrio-ventricular valves open.
  - **C** The pressure in the atria rises above the pressure in the ventricles.
  - **D** The pressure in the left atrium rises more than the pressure in the right atrium.
- 7 What is correct for tissue fluid?

	phagocytes	platelets	protein concentration compared to blood plasma	
Α	1	$\checkmark$	higher	key
в	x	x	higher	✓ = present
С	$\checkmark$	x	lower	<b>x</b> = absent
D	x	$\checkmark$	lower	

8 Which structures are present in a typical plant cell?

	centrioles	cilia	mitochondria	vacuole	
Α	1	$\checkmark$	x	x	key
в	1	x	x	1	✓ = present
С	x	$\checkmark$	1	x	<b>x</b> = absent
D	X	x	✓	~	

**9** A cell organelle measures  $4 \times 10^{-1}$  mm in diameter.

What is the diameter in  $\mu m?$ 

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\label{eq:alpha} \textbf{A} \quad 4\times 10^1\,\mu m \qquad \textbf{B} \quad 4\times 10^2\,\mu m \qquad \textbf{C} \quad 4\times 10^3\,\mu m \qquad \textbf{D} \quad 4\times 10^4\,\mu m
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**10** Plant cells are stained and then viewed through a light microscope.

Which structures would be clearly visible at a magnification of ×400?

- A chloroplast grana
- **B** lysosomes
- C nucleoli
- D ribosomes

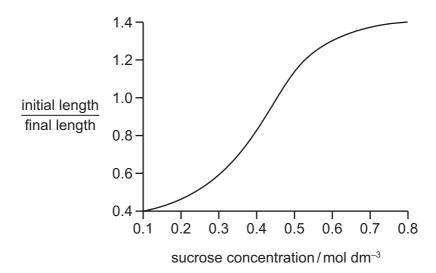
11 In the following table, which is the correct comparison between light and electron microscopes?

	light mic	roscope	electron microscope		
	resolution	magnification	resolution magnificat		
Α	high high low		low	low	
в	high	low	low	high	
С	low	high	high	low	
D	low	low	high	high	

- 12 What supports the view that a membrane protein is involved in active transport?
  - A It allows movement of molecules across a membrane if concentration differences exist.
  - **B** It can only function if mitochondria are supplied with sufficient oxygen.
  - **C** It has a tertiary structure with a binding site with a specific shape.
  - **D** It is found in the cell surface membranes and the mitochondrial membranes.
- 13 What is correct for the cell surface membrane and membranes within cells?
  - **A** Both allow intracellular transport.
  - **B** Both are stabilised by glycoproteins.
  - **C** Both have sites for enzyme attachment.
  - **D** Both protect cells from the contents of lysosomes.

**14** 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.

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



What is a correct description of the change in the cells and in their water potential as the sucrose concentration increases?

	change in the cells	change in the water potential	
Α	less turgid	more negative	
в	less turgid	less negative	
С	more turgid	less negative	
D	more turgid	more negative	

- 15 Which type of cell will contain the highest proportion of single membrane-bound structures?
  - A ciliated epithelial cell
  - **B** goblet cell
  - C red blood cell
  - D smooth muscle cell
- **16** A person suffering from mild emphysema stopped smoking cigarettes.

Why would this person's health improve?

- A goblet cells secrete more mucus, allowing a greater number of pathogens to be trapped
- B increased numbers of phagocytic macrophages arrive in the lungs
- C less atheroma build-up on the inner lining of arteries, increasing lumen diameter
- D less carboxyhaemoglobin produced, increasing oxygen transport by haemoglobin

- **17** A student was asked to describe the differences between four microscope slides of sections taken from different parts of the gas exchange system.
  - slide 1 not present: cartilage, glands present: few goblet cells, ciliated epithelial cells, smooth muscle
  - slide 2 present: incomplete cartilage rings, glands, goblet cells, ciliated epithelial cells, smooth muscle
  - slide 3 not present: cartilage, glands, goblet cells, smooth muscle present: squamous epithelial cells
  - slide 4 present: plates of cartilage, glands, goblet cells, ciliated epithelial cells, smooth muscle

Which is the correct identification of the parts of the gas exchange system?

	slide 1	slide 2	slide 3	slide 4
Α	alveolus	bronchiole	bronchus	trachea
в	bronchiole	bronchus	alveolus	trachea
С	bronchiole	trachea	alveolus	bronchus
D	bronchus	trachea	bronchiole	alveolus

**18** In the lungs, oxygen and carbon dioxide pass through cell membranes by diffusion.

Which row is correct?

	number of cell membranes diffused through by				
	oxygen from air carbon dioxide to air				
Α	3	2			
в	3	2 or 3			
С	5 4				
D	5 4 or 5				

- **19** Which process does **not** involve making nitrogen available to plants?
  - A ammonification
  - B denitrification
  - **C** nitrification
  - **D** nitrogen fixation

20 A square metre of grassland receives about 1 047 000 kJ of solar light energy each year.The table shows what happens to this energy.

	kJ
used in evaporation of water	523 500
transmitted to the ground	335 000
reflected by the leaves	165 000
used for growth	21 500
used for other life processes	1 500
respiratory heat losses	500

How much energy is used by the grass in photosynthesis?

Α	2000 kJ	В	19 500 kJ	С	21 500 kJ	D	23 500 kJ
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- 21 During transpiration, what is the site of evaporation of water in the leaves?
  - A air spaces
  - B guard cell walls
  - C mesophyll cell walls
  - **D** stomata
- 22 Some inhibitors of enzyme reactions bind to the enzyme/substrate complex.

Which statements about this type of inhibition are correct?

- 1 The active site changes shape.
- 2 The inhibitor is non-competitive.
- 3 The initial rate of reaction is reduced.
- 4 The maximum rate of reaction  $(V_{max})$  is increased.
- **A** 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 2, 3 and 4 only

- 23 Which levels of protein structure can determine the specificity of an enzyme?
  - 1 primary
  - 2 secondary
  - 3 tertiary
  - 4 quaternary
  - **A** 1, 2, 3 and 4
  - **B** 1, 2 and 3 only
  - **C** 1, 2 and 4 only
  - **D** 3 and 4 only
- 24 The breakdown of hydrogen peroxide to water and oxygen is catalysed by the enzyme catalase.

In an investigation into the effect of pH on the rate of reaction of catalase, potato cubes were added to hydrogen peroxide.

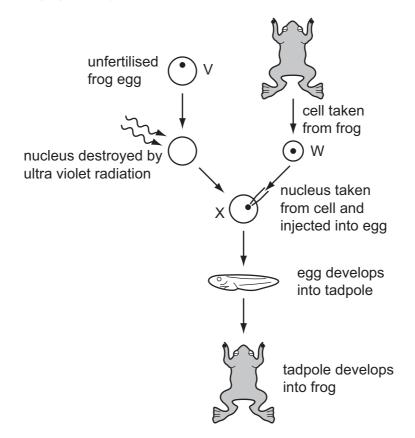
Which dependent variable should be recorded?

- A the change in mass of the potato after a given time
- **B** the pH of the solution at regular time intervals
- **C** the number of potato cubes added at the start
- **D** the volume of oxygen given off at regular time intervals
- 25 Which type of sugar and types of bonds are found in a DNA molecule?

	type of sugar	types of bonds	
Α	non-reducing	hydrogen and ionic	
В	non-reducing	hydrogen and peptide	
С	reducing	covalent and hydrogen	
D	reducing	hydrogen and peptide	

- 26 Which process occurs during prophase of the mitotic cell cycle in an animal cell?
  - **A** division of centromeres
  - **B** formation of chromosomes
  - C replication of DNA
  - **D** separation of centrioles

- 27 Which is always true of cytokinesis?
  - 1 Cell organelles replicate.
  - 2 Cell organelles are divided between two cells.
  - 3 Nuclear envelope reforms.
  - **A** 1, 2 and 3 **B** 1 and 3 only **C** 2 only **D** 3 only
- **28** The diagram shows how genetically identical frogs can be developed from unfertilised frog eggs. The diploid number (2n) for frogs is 26.



Which combination of numbers correctly identifies the number of chromosomes in each of the types of cell in the diagram?

	V	W	Х
Α	13	13	26
в	13	26	13
С	13	26	26
D	26	26	13

- **29** The following events occur during transcription.
  - 1 Bonds break between complementary bases.
  - 2 Bonds form between complementary bases.
  - 3 Sugar-phosphate bonds form.
  - 4 Free nucleotides pair with complementary nucleotides.

Before the mRNA leaves the nucleus, which events will have occurred twice?

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

- **30** The mechanism of action of four drugs that inhibit DNA replication is stated below.
  - Aphidicholine inhibits DNA polymerase.
  - Cytarabine is converted into a molecule that can substitute for a DNA nucleotide and also inhibits DNA repair mechanisms.
  - Epirubicin inhibits an enzyme involved in the unwinding of DNA and separation of strands.
  - Hydroxycarbamide inhibits an enzyme involved in the production of deoxyribonucleotides.

Which row correctly matches a drug to an explanation of the mechanism of action?

	explanation of mechanism of action				
	decreased pool of available nucleotides inhibits chain elongation	DNA strands not available as templates for transcription	DNA damaged during replication and cell death occurs	exposed DNA template strands unable to be copied	
Α	aphidicholine epirubicin		cytarabine	hydroxycarbamide	
в	epirubicin cytarabine		hydroxycarbamide	aphidicholine	
С	hydroxycarbamide aphidicholine		epirubicin	cytarabine	
D	hydroxycarbamide	epirubicin	cytarabine	aphidicholine	

**31** Four different fruit juices, **A**, **B**, **C** and **D**, were tested with Benedict's solution. A second sample of each juice was hydrolysed and tested with Benedict's solution. The table shows the masses of the precipitates formed.

Which juice contains the greatest mass of non-reducing sugar?

	mass of precipitate before hydrolysis /mg	mass of precipitate after hydrolysis /mg
Α	30	55
в	55	55
С	65	85
D	70	80

32 Which rows show the chemical groups present in the biological molecules listed?

		biological molecule	presence of carboxyl (COOH) groups	presence of two or more hydroxyl (OH) groups		
	1	amino acid	yes	no		
	2	β-glucose	no	yes		
	3	glycerol	no	no		
	4 fatty acid		yes	no		
Α	<b>A</b> 1, 2 and 3 <b>B</b> 1, 2 and 4 <b>C</b> 1, 3 and 4 <b>D</b> 2, 3 and 4					

33 Some foods contain 'hydrogenated vegetable oils'. These are unsaturated fats that have been

Which property of the fats will have changed?

- **A** Their hydrocarbon chains will fit together more closely.
- **B** Their solubility in water will increase.

converted to saturated fats.

- **C** They will have more double bonds in their molecules.
- **D** They will remain liquid at room temperature.

**34** Which molecular bonds will be broken by hydrolysis when a molecule of glycogen is converted to glucose?

	bonds			
	1,2	1,4	1,6	
Α	$\checkmark$	x	x	key
в	X	1	1	✓ = broken
С	$\checkmark$	x	1	<b>x</b> = unbroken
D	x	1	x	

**35** Which correctly matches the functional and structural features of cellulose, collagen, glycogen or triglyceride?

			structure		
		function	fibrous	molecule held together by hydrogen bonds	branched chains
Α	cellulose	support	√	√	x
	triglyceride	energy source	×	X	x
В	collagen cellulose	strengthening support	$\checkmark$	√ X	X ✓
С	collagen	strengthening	√	√	✓
	glycogen	storage	×	X	✓
D	glycogen	storage	x	√	√
	triglyceride	energy source	x	√	x

key  $\checkmark$  = true X = false

- at 50% saturation. Α four polypeptide iron ions can in each chain. associate with hydrophobic R chains, each two oxygen groups of amino molecules are containing a oxygen forming oxyhaemoglobin acids point towards transported by the prosthetic group the centre of the molecule molecule В polypeptide chains each chain contains two identical alpha each chain can interact to produce a a prosthetic group of chains and two transport an oxygen globular chain amino acids identical beta chains molecule surrounding an iron ion С polypeptide chains an iron ion is each molecule can quaternary structure interact to produce present within each of two alpha chains transport a total of an almost spherical and two beta chains haem group four oxygen atoms molecule D polypeptide chains iron ions in the in each chain, each molecule can produce a loose molecule can bind hydrophobic R transport a total of helical shape, which reversibly with groups of amino eight oxygen atoms curls to form a acids surround the oxygen spherical molecule iron ion
- 36 Which set of statements correctly describes haemoglobin?

37 Smallpox has been eradicated, but not malaria or cholera.

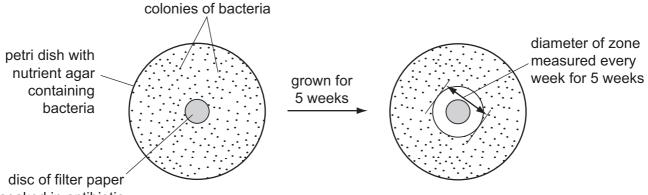
Which statements correctly explain this?

- 1 Cholera bacteria in the intestines are not destroyed by antibiotics.
- 2 Plasmodium antigens change during the life cycle.
- 3 Smallpox antigens remain stable.
- 4 Vaccines only work against viruses.

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

- 38 Which disease is not likely to be passed directly from parents to child?
  - A cholera
  - **B** malaria
  - C sickle cell anaemia
  - D tuberculosis

**39** The diagram shows one way of testing the effect of an antibiotic on bacteria.



soaked in antibiotic

The table shows the results of testing five different types of bacteria. Zones of less than 13 mm show the presence of resistant bacteria.

type of bacteria	diameter of zone/mm					
	week 1	week 2	week 3	week 4	week 5	
1	24.10	21.90	19.00	17.60	14.30	
2	18.60	15.40	12.20	9.00	0.00	
3	17.90	12.80	12.40	11.10	10.90	
4	19.40	15.30	13.20	8.10	0.00	
5	22.00	21.00	20.50	20.40	20.40	

Which statement can be supported by this data?

- Bacteria become more resistant to antibiotics over time. Α
- В Only types 2, 3 and 4 of the bacteria show resistance to the antibiotic.
- С The antibiotic can be used to treat all the types of bacteria.
- D Type 5 of the bacteria can never become resistant to the antibiotic.
- 40 In an animal cell, which process is dependent upon cell surface area and which process is dependent upon cell volume?

	cell surface area	cell volume
Α	carbon dioxide produced	oxygen used
В	glucose absorbed	hormones detected
С	hormones detected	carbon dioxide produced
D	oxygen used	glucose absorbed

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