Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/12**

Paper 1 Multiple Choice **October/November 2015**

1 hour

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

3152832431

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, 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.
DO **NOT** WRITE IN ANY BARCODES.

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.
Electronic calculators may be used.

This document consists of **15** printed pages and **1** blank page.

CAMBRIDGE International Examinations

1 Which size of ribosome is found in mitochondria?

A 60S **B** 70S **C** 80S **D** 90S

2 Different units are used when measuring biological specimens.

Which measurement in mm has **not** been correctly converted into **both** μm and nm?

	mm	μm	nm
A	1.0	1.0×10^3	1.0×10^6
B	2.5	2.5×10^3	2.5×10^6
C	5.0	5.0×10^4	5.0×10^7
D	25.0	2.5×10^4	2.5×10^7

3 Which features of microvilli and root hairs are correct?

	increase cell surface area	cannot be resolved with the light microscope	contain vacuoles	more than one present on a cell
A	microvilli	microvilli	root hairs	root hairs
B	microvilli	root hairs	microvilli	microvilli
C	root hairs	microvilli	root hairs	microvilli
D	root hairs	root hairs	microvilli	root hairs

4 Lysosomes have a variety of different shapes and sizes, making them difficult to identify.

What describes a lysosome?

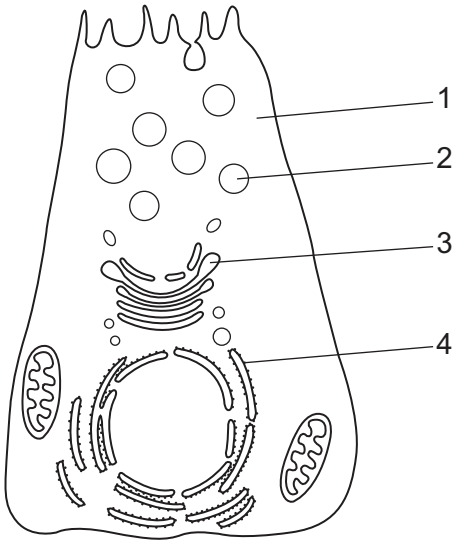
A a vesicle containing enzymes, enclosed by a double membrane, that is budded off the endoplasmic reticulum

B a vesicle containing hydrolytic enzymes and surrounded by a single membrane, found only in phagocytes

C a vesicle enclosed by a single membrane, containing several different hydrolytic enzymes that may act inside or outside the cell

D a vesicle surrounded by a double membrane, containing enzymes which can hydrolyse damaged organelles in a cell

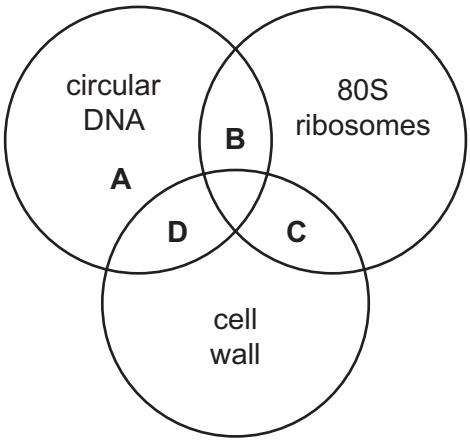
5 Radioactively-labelled amino acids were introduced into a tracheal cell that uses them to make mucus (a glycoprotein).



What route will the amino acids take?

	first → last			
A	1	2	3	4
B	1	4	3	2
C	4	1	2	3
D	4	3	2	1

6 Which structures are present in a *Vibrio cholerae* cell?



7 The colour of a positive Benedict's test is due to the formation of copper oxide. The mass of copper oxide is proportional to the mass of reducing sugar present.

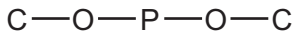
Samples of fruit juice were tested for the presence of reducing sugars and non-reducing sugars using the Benedict's test. The results show the mass of copper oxide after boiling with Benedict's solution and after acid hydrolysis and boiling with Benedict's solution.

Which sample contained the most **non-reducing** sugar?

	mass of precipitate / mg	
	after boiling with Benedict's solution	after acid hydrolysis and boiling with Benedict's solution
A	20	20
B	30	45
C	50	55
D	65	75

8 Which diagram shows the bond linking the individual units of both cellulose and glycogen?

A



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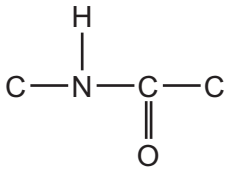

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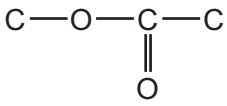

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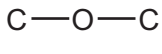


9 Which row describes a triglyceride?

	hydrophilic	soluble in alcohol
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

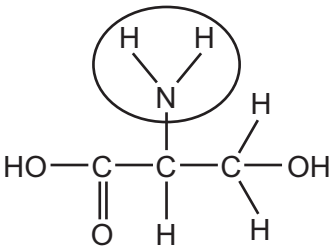
✓ correct

✗ not correct

10 The diagrams show the amino acid serine.

Which circled area is different in all other amino acids?

A



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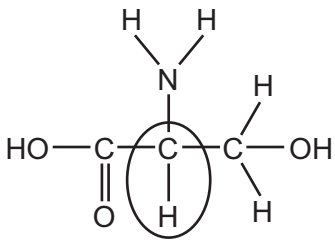

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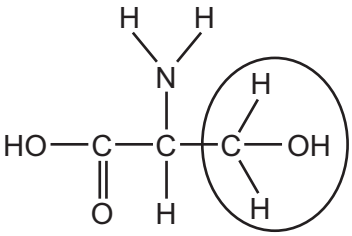

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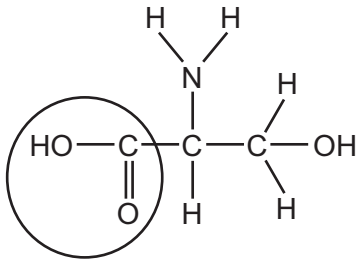


11 As a frozen lake warms after a cold winter, mineral nutrients are brought to the surface.

Which properties of water contribute to this process?

1 Its greatest density is at 4 °C.

2 It has high specific heat capacity.

3 It is a solvent.

4 Its molecules form hydrogen bonds.

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

12 Which statements describe some enzyme actions?

1 Enzymes hold reacting molecules in such a way that their reactive groups are brought close together.

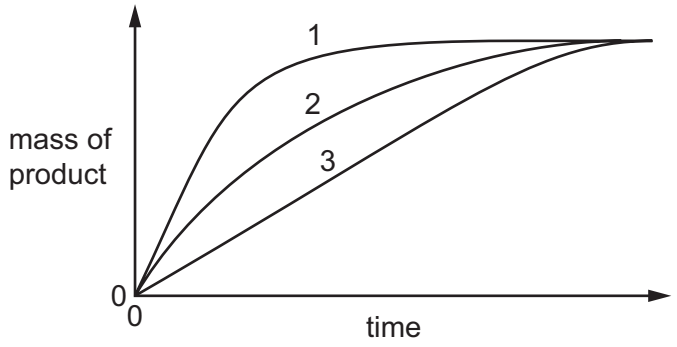
2 In an enzyme-catalysed reaction, more molecules have sufficient energy to react than in the absence of the enzyme.

3 Reactions catalysed by enzymes take place at a lower temperature than they would without the enzyme.

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

13 The diagram shows the mass of product formed over time in three reactions using the same substrate and enzyme.

The volumes of substrate, enzyme and temperature were kept constant in each reaction.



Which statement explains the difference in these reactions?

A The pH in reactions 2 and 3 has denatured the enzyme.

B There is a non-competitive inhibitor present in reaction 3.

C There is the highest concentration of enzyme in reaction 1.

D There is the highest concentration of substrate in reaction 1.

14 Tyrosinase is an enzyme that catalyses the conversion of the amino acid tyrosine into the black pigment melanin. It is responsible for the black fur colour of some rabbits.

A group of rabbits kept at 30 °C resulted in 90% of the rabbits with light fur colour. A second group of rabbits kept at 10 °C resulted in 90% of the rabbits with black fur colour.

Which hypothesis is supported by these results?

A An inhibitor is present in rabbit skin cells that can bind strongly to tyrosinase when the external temperature is 30 °C.

B At 10 °C external temperature there are fewer tyrosinase-tyrosine complexes formed and less melanin is produced.

C Tyrosinase is an enzyme that is coded for by a gene that is switched off when the external temperature is 10 °C.

D Tyrosinase is a temperature-sensitive molecule that is only activated when the external temperature is 30 °C.

15 Which descriptions are correct for transport across cell surface membranes?

	active processes	passive processes
A	active transport	exocytosis and osmosis
B	endocytosis and exocytosis	facilitated diffusion and osmosis
C	exocytosis and active transport	osmosis and endocytosis
D	facilitated diffusion and exocytosis	endocytosis and diffusion

16 The stages of an investigation using plant tissue are listed below.

- A freshly cut slice of plant tissue was rinsed in distilled water, dried and weighed.
- This slice was placed in a solution with a water potential of −4 arbitrary units for thirty minutes.
- The slice was removed from the solution, dried and reweighed.
- The mass of the slice was the same as its original mass.

Which conclusions can be drawn from this investigation?

1 The water potential of the cells of the plant tissue is −4 arbitrary units.

2 The cell sap of the plant tissue has a lower water potential than the surrounding solution.

3 There has been no net movement of water.

4 The cell wall of the plant tissue will not be in contact with the cell membrane.

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

17 What explains the effect on a red blood cell of being placed into pure water?

A Less water leaves the cell than enters it, so the cell shrinks.

B More water enters the cell than leaves it, so the cell swells and bursts.

C Water enters the cell and none leaves it, so the cell swells and bursts.

D Water enters the cell and more leaves it, so the cell shrinks.

18 Which statements about a diploid cell are correct?

1 can divide by mitosis to repair itself

2 has two complete sets of chromosomes

3 can undergo a reduction division to form haploid cells

4 can undergo mitotic division to allow growth to occur

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

19 Which metabolic processes will be very active in a cell that has just completed cytokinesis?

1 ATP formation

2 DNA replication

3 protein synthesis

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

20 What occurs during DNA replication and transcription and translation?

1 ATP provides energy.

2 Condensation reactions occur to form a polymer.

3 Hydrogen bonds form between purine and pyrimidine bases.

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

21 Ricin is a toxic protein which inactivates ribosomes.

Which effect will this have on protein synthesis?

A Amino acids will be unable to bind to the binding sites on specific tRNA molecules.

B Anticodons on mRNA molecules will not base pair to codons on tRNA molecules.

C Peptide bonds will not form between adjacent amino acids in the growing polypeptide.

D RNA nucleotides will be unable to join by condensation reactions to form rRNA.

22 Which row shows two pairs of nucleotide bases in a molecule of DNA?

	first base pair		second base pair	
	bases present	number of hydrogen bonds	bases present	number of hydrogen bonds
A	AT	2	CG	2
B	AT	2	CG	3
C	TA	3	GC	2
D	TA	3	GC	3

23 What is the role of the Casparian strip?

A to act as a site for active transport of ions into the xylem

B to increase root pressure, increasing transpiration

C to lower the water potential in the xylem

D to prevent water moving back into the cortex from the xylem

24 Sucrose is loaded into companion cells and phloem sieve tube elements by active transport and diffusion using transport proteins and plasmodesmata.

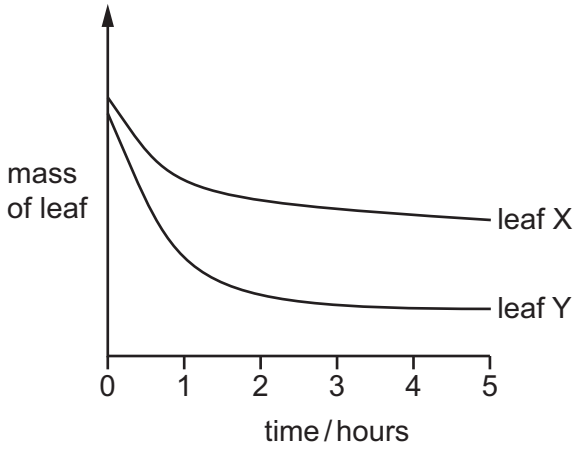
Which row shows how sucrose is loaded?

	active transport	diffusion	transport proteins	plasmodesmata
A	into companion cell	into phloem sieve tube element	into companion cell	into phloem sieve tube element
B	into companion cell	into phloem sieve tube element	into phloem sieve tube element	into companion cell
C	into phloem sieve tube element	into companion cell	into companion cell	into phloem sieve tube element
D	into phloem sieve tube element	into companion cell	into phloem sieve tube element	into companion cell

25 Which changes to the water potential and the volume of liquid in the phloem occur when sucrose is transferred from leaves into phloem sieve tubes to be transported to a sink?

	water potential in phloem sieve tubes becomes	volume of liquid in phloem sieve tubes
A	less negative	decreased
B	less negative	increased
C	more negative	decreased
D	more negative	increased

26 The diagram shows the results of an experiment using leaves with the same surface area from two different species. Each leaf was left on a balance in daylight in a closed room and their mass recorded at 1 hour intervals.



Which features of leaf X could explain these results?

1 thinner cuticle

2 sunken stomata

3 ability to roll the leaf

4 no trichomes on the leaf

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

27 Which components of blood are found in tissue fluid?

	glucose	proteins	white blood cells
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✓

key
✓ = present
✗ = absent

28 Which reactions take place in a capillary in an active tissue?

1 carbon dioxide and water are formed from hydrogencarbonate ions and hydrogen ions

2 carbonic acid is formed from carbon dioxide and water

3 carbaminohaemoglobin is formed from carbon dioxide and haemoglobin

4 haemoglobin and hydrogen ions are formed from haemoglobinic acid

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

29 What happens to the atrioventricular valves and to the semilunar valves during atrial systole and ventricular systole?

	atrial systole		ventricular systole	
	atrioventricular valves	semilunar valves	atrioventricular valves	semilunar valves
A	open	closed	closed	open
B	open	closed	open	open
C	closed	open	closed	closed
D	closed	open	open	closed

[Turn over

30 Red blood cells may contain a molecule known as 2,3-bisphophoglycerate (2,3BPG). When 2,3BPG binds to haemoglobin a higher partial pressure of oxygen is needed to bring about 50% saturation of haemoglobin with oxygen.

Which statements about the effect of 2,3BPG are correct?

1 2,3BPG in red blood cells causes the oxygen dissociation curve to shift to the right.

2 The binding of 2,3BPG to haemoglobin reduces the Bohr effect.

3 The binding of 2,3BPG to haemoglobin lowers the affinity of the haemoglobin for oxygen.

4 When 2,3BPG is absent, oxyhaemoglobin is less likely to unload oxygen.

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

31 Which row about the human gas exchange system is correct?

		trachea	bronchus	alveolus
A	cartilage	present	present	absent
B	ciliated epithelium	absent	present	absent
C	goblet cells	present	absent	absent
D	smooth muscle	present	present	present

32 Which of the effects are caused by breathing in **both** carbon monoxide **and** nicotine from cigarette smoke?

1 increased heart rate

2 increased risk of cardiovascular disease

3 increased risk of emphysema

4 increased risk of lung cancer

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

33 Which statements about chronic obstructive pulmonary disease (COPD) are correct?

1 The disease can often be reversed by treatment.

2 The patient's symptoms normally do not change.

3 The patient is normally over 30 years old.

4 The patient coughs a lot, bringing up mucus.

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

34 Why is it necessary for a person with a bacterial infection 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 a 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

35 Which statement is correct for a neutrophil?

A They are found in tissues and secrete cytokines in response to infection.

B They can leave the blood and accumulate at sites of inflammation.

C They can leave the blood and secrete cytotoxins when exposed to damaged cells.

D They circulate in the blood and present antigens in response to infection.

36 What describes artificial passive immunity?

A protection against a pathogen by an injection of antibodies

B protection against a pathogen by drinking colostrum containing antibodies

C stimulation of lymphocytes by antigens contained in a vaccine

D stimulation of lymphocytes by antigens on the surface of invading pathogens

37 Which statements correctly describe lymphocytes?

1 Each B-lymphocyte has the ability to make several types of antibody molecules.

2 Some B-lymphocytes and T-lymphocytes become memory cells.

3 Plasma cells secrete antibodies into the blood plasma.

4 Some T-lymphocytes stimulate macrophages to kill infected cells.

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 2, 3 and 4 only

D 1 and 4 only

38 Which group could be a population?

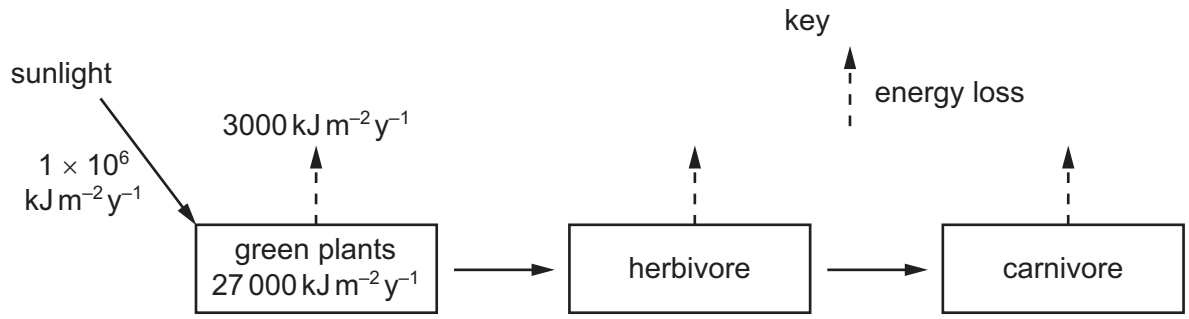
A all the animals and plants on an isolated island

B all the birds counted in one day in a garden

C all the bacteria in a colony of *Bacillus subtilis*

D all the insects occupying three hectares of farmland

39 The diagram shows the flow of energy through a food chain.



What percentage of the energy is used by the green plants for photosynthesis?

A 0.03% **B** 0.30% **C** 2.70% **D** 3.00%

40 Anaerobic bacteria are found in large numbers in waterlogged soils.

Which effect does this have on soil fertility and why?

	soil fertility	reason
A	decreased	bacteria convert nitrate to ammonia
B	decreased	bacteria convert nitrate to nitrogen gas
C	increased	bacteria cause decomposition
D	increased	bacteria cause nitrogen fixation

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