Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/13**

Paper 1 Multiple Choice **May/June 2016**

1 hour

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

7827360565

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 **14** printed pages and **2** blank pages.

© UCLES 2016

1 An eyepiece graticule can be calibrated using a stage micrometer.

What is the correct reason why an eyepiece graticule is calibrated?

A An eyepiece graticule can be used to make measurements.

B An eyepiece graticule is magnified by the objective lens.

C An eyepiece graticule magnifies the specimen.

D An eyepiece graticule makes comparisons.

2 For which cell component would nanometres be the most appropriate unit of measurement?

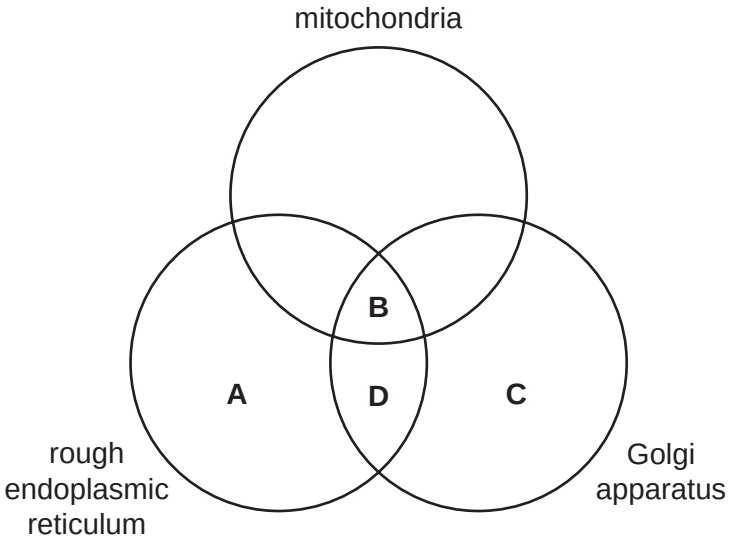
A a cell surface membrane

B a chloroplast

C a mitochondrion

D a nucleolus

3 Which organelles are required for the formation of lysosomes containing hydrolytic enzymes?



4 What are found in **both** chloroplasts and mitochondria?

A 70S ribosomes only

B 70S ribosomes and circular DNA

C 80S ribosomes and circular DNA

D circular DNA only

© UCLES 2016

5 Which types of RNA are found in **both** prokaryotic and eukaryotic cells?

	mRNA	rRNA	tRNA
A	✓	✓	✓
B	✓	✓	✗
C	✗	✓	✓
D	✗	✓	✗

key

✓ = present

✗ = absent

6 A sample of milk was tested with Benedict's solution and a yellow colour was observed.

Which conclusion is correct?

A No non-reducing sugars are present.

B Reducing sugars are present.

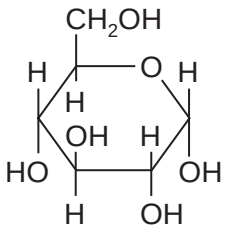
C There is a high concentration of glucose.

D There is a high concentration of sucrose.

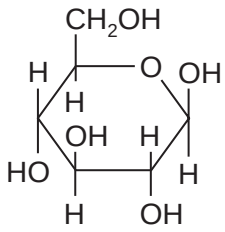
7 The diagrams show four monosaccharides with the formula $C_6H_{12}O_6$.

Which diagram shows β-glucose?

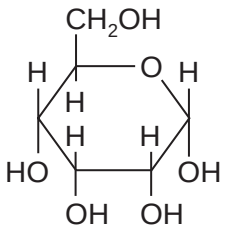
A



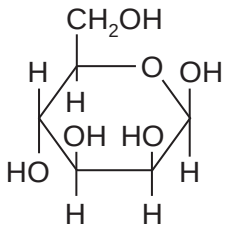
B



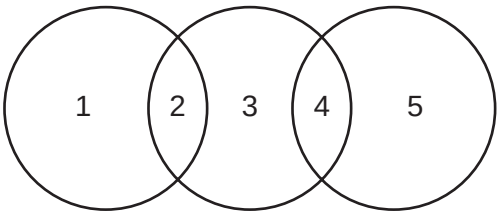
C



D



8 The diagram shows the relationship between different polysaccharides and the glycosidic bonds formed between the monomers.



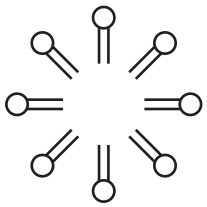
Which row is correct?

	1	2	3	4	5
A	amylopectin	α-1,-6	glycogen	α-1,-4	amylopectin
B	amylose	α-1,-4	cellulose	β-1,-4	glycogen
C	cellulose	α-1,-4	amylose	α-1,-4	glycogen
D	glycogen	β-1,-6	amylopectin	α-1,-4	amylose

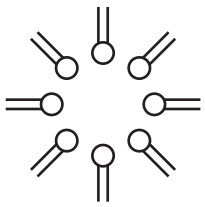
9 When a small quantity of phospholipid is added to a test-tube of water and then shaken vigorously, an emulsion is formed by small droplets called liposomes.

Which diagram shows the arrangement of phospholipid molecules in a cross-section of a liposome?

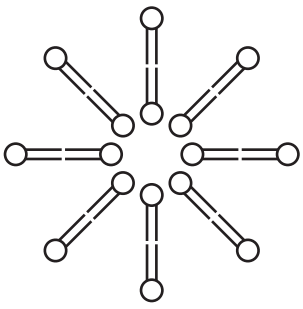
A



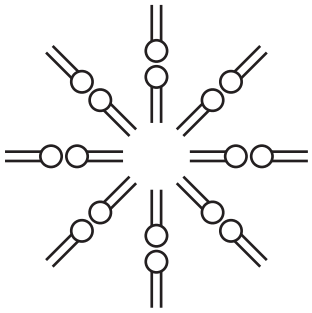
B



C



D



10 Which of the bonds will be last to break as the temperature of an enzyme is increased?

A hydrogen

B hydrophobic interactions

C ionic

D peptide

© UCLES 2016

11 Which statement is **only** true for the induced fit theory of enzyme action?

A A few amino acids give the active site a specific shape.

B An enzyme has a substrate with a specific shape.

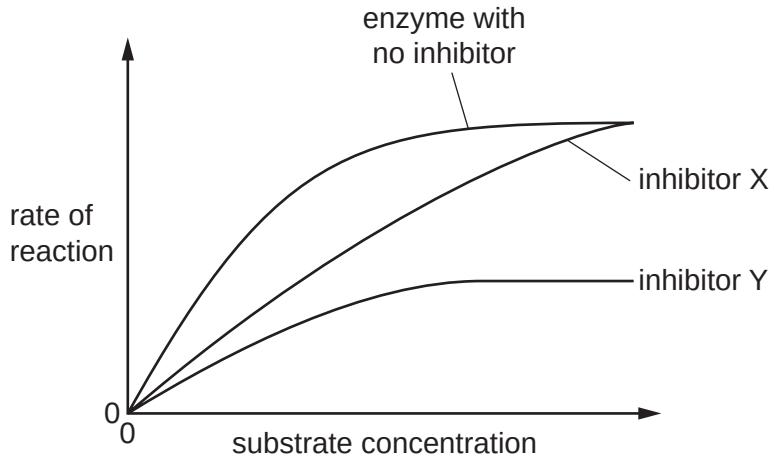
C The enzyme changes shape in the presence of the substrate.

D The substrate molecules are complementary to the active site.

12 The effect of substrate concentration on an enzyme-catalysed reaction was measured in three different conditions:

- with no inhibitor
- with inhibitor X
- with inhibitor Y.

The graph shows the results.



Which statement is correct?

A X is a competitive inhibitor which binds away from the active site of the enzyme.

B X is a non-competitive inhibitor which has a similar shape to the substrate.

C Y is a competitive inhibitor which has a similar shape to the substrate.

D Y is a non-competitive inhibitor which binds away from the active site of the enzyme.

© UCLES 2016

[Turn over

13 The list includes some of the molecules found in a cell surface membrane.

1 glycolipid

2 surface protein

3 glycoprotein

4 trans-membrane protein

Which molecules are involved in cell signalling?

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

14 Which statements about fatty acids are correct?

1 form part of cell membranes

2 form storage droplets

3 are synthesised by the Golgi body

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

15 Which substances can pass directly through cell surface membranes **without** using a carrier protein or channel protein?

1 Ca^{2+} and Na^{+}

2 O_2

3 $C_6H_{12}O_6$

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

16 Which statements about endocytosis are correct?

1 It is a process requiring energy in the form of ATP.

2 Phagocytosis is a form of endocytosis.

3 Substances brought into a cell by endocytosis are enclosed in a small vacuole.

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

17 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

© UCLES 2016

18 Which processes occur in bone marrow cells that are in a mitotic cell cycle?

1 phosphate groups bind to ADP molecules to form ATP

2 bonds form between nucleotides in a DNA strand

3 tRNA anticodons hydrogen bond with codons on mRNA

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

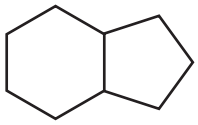
19 Which diagram shows a correct ring structure and named nucleic acid base?

A



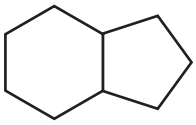
adenine

B



cytosine

C



thymine

D



uracil

20 Which statements are correct?

1 Adenine and cytosine are both purines.

2 The DNA nucleotide containing adenine is different from the RNA nucleotide containing adenine.

3 Purines only form base pairs with pyrimidines.

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

21 A short piece of DNA 18 base pairs long was analysed to find the number of nucleotide bases in each of the polynucleotide strands. Some of the results are shown below.

	number of nucleotide bases			
	adenine	cytosine	guanine	thymine
strand 1		4		7
strand 2		5		

How many nucleotides containing thymine were present in strand 2?

A 2 **B** 4 **C** 5 **D** 7

© UCLES 2016

22 The diagram shows the nucleotide sequence of a small section of a gene which is transcribed.

CGGGCCCCGCGG

The table shows the amino acids coded for by 10 mRNA codons.

mRNA codon	amino acid
AAG	Lys
ACG	Thr
CGG CGC CGU	Arg
CCG	Pro
GCC GCG	Ala
GGC	Gly
UGC	Cys

What is the order of the four amino acids in the polypeptide translated from this small section of a gene?

A Ala-Ala-Cys-Ala

B Ala-Arg-Gly-Ala

C Arg-Ala-Pro-Arg

D Arg-Arg-Thr-Arg

23 During transpiration, what is the site of evaporation of water in the leaves?

A air spaces

B guard cell walls

C mesophyll cell walls

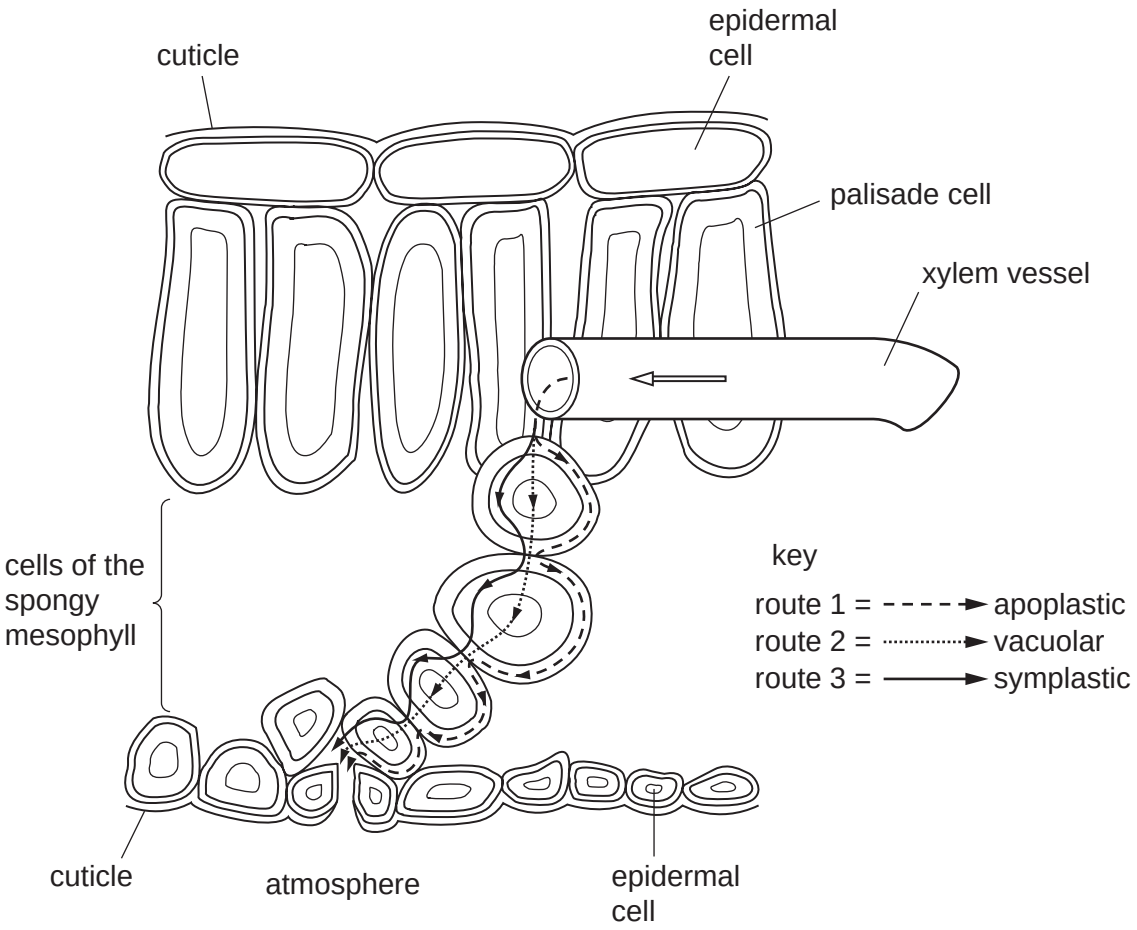
D stomata

© UCLES 2016

24 Water passes across leaf tissues by different routes as a result of:

- differences in water potential
- the pull transmitted by cohesive forces between water molecules.

The diagram shows three routes by which water can travel.



Which row correctly identifies why water passes across leaf tissues by the different routes?

	differences in water potential	pull transmitted by cohesive forces
A	route 1	routes 2 and 3
B	routes 1 and 3	route 2
C	route 2	routes 1 and 3
D	routes 2 and 3	route 1

25 Which factors contribute to the increase in transpiration rate when the temperature rises?

1 concentration of water molecules increases in air spaces due to evaporation

2 increased rate of diffusion as water molecules have more kinetic energy

3 increased hydrogen bonding between water molecules in air spaces

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

26 ATP is used in companion cells to provide the energy for loading a sieve tube element with sucrose.

How does the co-transporter mechanism use this energy?

A to pump protons into the sieve tube element

B to pump protons out of the companion cell

C to pump sucrose into the sieve tube element

D to pump sucrose out of the companion cell

27 Which changes to the water potential and the volume of liquid in the phloem sieve tube element occur when sucrose is moved from the phloem sieve tube element to an actively dividing shoot tip?

	water potential in phloem sieve tube element	volume of liquid in phloem sieve tube element
A	higher	decreases
B	higher	increases
C	lower	decreases
D	lower	increases

28 Which events occur during ventricular systole?

1 atrioventricular valves close

2 muscle in ventricle walls relaxes

3 semilunar valves open

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

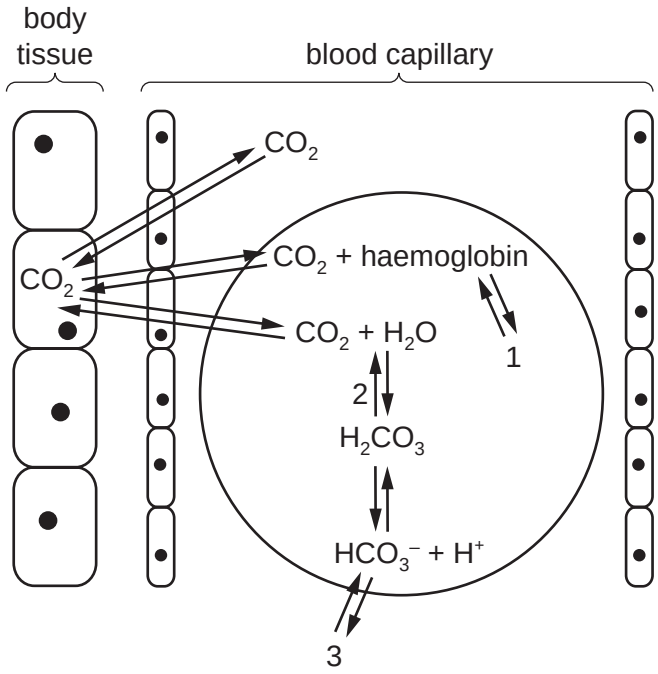
© UCLES 2016

29 Which components of blood are present in lymph?

	white blood cells	proteins	sodium ions
A	✓	✓	✓
B	✓	✗	✓
C	✗	✓	✓
D	✗	✓	✗

key
✓ = present
✗ = absent

30 Which row gives the correct labels for the diagram shown?



	1	2	3
A	carbaminohaemoglobin	carbonic anhydrase	hydrogencarbonate
B	carbonic anhydrase	carbaminohaemoglobin	carbon dioxide
C	carbonic anhydrase	carbaminohaemoglobin	hydrogencarbonate
D	hydrogencarbonate	carbon dioxide	carbonic anhydrase

© UCLES 2016

[Turn over

31 An increase in carbon dioxide in human blood shifts the oxyhaemoglobin dissociation curve to the right.

What is the explanation for this effect?

A An increase in carbon dioxide concentration increases the breathing rate.

B Carbon dioxide is more soluble than oxygen and displaces it.

C Diffusion of carbon dioxide between the alveoli and the blood is more rapid.

D Increasing the H^+ concentration decreases haemoglobin affinity for oxygen.

32 A person has two blood tests one month apart. The number of each type of cell in a fixed sample size is counted.

type of cell	first test	after one month
red blood cells	normal	higher
lymphocytes	normal	higher

What could this suggest about the person based on the results after one month?

	body temperature higher	moved to higher altitude	ATP synthesis in cells is higher
A	no	no	yes
B	no	yes	no
C	yes	no	no
D	yes	yes	yes

33 Goblet cells are found in the trachea.

Which organelles would be found in large numbers in a goblet cell?

	Golgi body	mitochondria	ribosomes
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✓

key

✓ = present in large numbers

✗ = not present in large numbers

34 What is the minimum number of layers of phospholipids that a molecule of oxygen passes through when diffusing from the alveoli, through cells, to haemoglobin in the red blood cells?

A 4 **B** 6 **C** 8 **D** 10

© UCLES 2016

35 Which symptoms may be seen in a person affected by chronic obstructive pulmonary disease (COPD)?

1 persistent cough

2 less elastic alveoli

3 increased risk of lung infection

4 shortness of breath

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 2, 3 and 4 only

D 1 and 4 only

36 More people are exposed to the risk of contracting malaria due to an increase in the distribution of *Anopheles* mosquitoes.

What could be the cause of this increase?

A drug resistance in *Plasmodium*

B global warming

C insecticide resistance

D no effective vaccine

37 An antibiotic inhibits the formation of cross-links between the molecules that form cell walls in bacteria.

Which statements explain why bacteria are killed by the antibiotic?

1 The bacterial cell is destroyed by osmotic lysis.

2 Cellulose molecules cannot form hydrogen bonds.

3 The cell wall is no longer selectively permeable.

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

38 Which of these pathogens can be transmitted by air?

1 *Plasmodium*

2 *Morbillivirus*

3 *Mycobacterium*

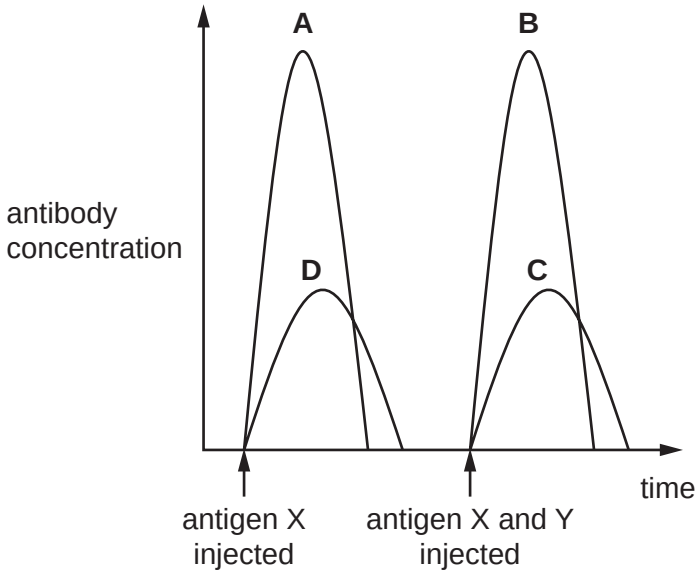
4 *Vibrio*

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

© UCLES 2016

39 The graph shows the antibody response when a person is injected first with antigen X and later with antigens X and Y.

Which curve shows the primary response to antigen Y?



40 Which row describes passive immunity?

	triggered by an antigen	involves an immune response	memory cells produced	permanent protection
A	✓	✓	✓	✓
B	✓	✓	✗	✗
C	✗	✗	✓	✓
D	✗	✗	✗	✗

key
✓ = true
✗ = false

© UCLES 2016

BLANK PAGE

© UCLES 2016

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.