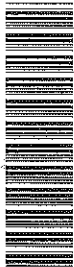# OCR
Oxford Cambridge and RSA

AS Level Biology A
H020/01 Breadth in biology
Practice Question Paper

Date – Morning/Afternoon
Time allowed: 1 hour 30 minutes

You must have:
- Insert (inserted)
- Ruler (cm/mm)

You may use:
- a scientific calculator

First name	
Last name	

Centre number						Candidate number				

INSTRUCTIONS
- Use black ink. You may use an HB pencil for graphs and diagrams.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Write your answer to each question in the space provided.
- Additional paper may be used if required but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION
- The total mark for this paper is **70**.
- The marks for each question are shown in brackets **[ ]**.
- This document consists of **24** pages.

SECTION A

You should spend a maximum of 25 minutes on this section.

You should put the letter of the correct answer in the box provided.

Answer **all** the questions.

1   Which inorganic ion can act as a cofactor for amylase?

A OH^-

B PO_4^{3-}

C Cl^-

D HCO_3^-

Your answer [ ]   **[1]**

2   Translocation occurs through the sieve elements by ....1.......... . Sucrose is loaded

into the phloem at regions of the plant known as ....2.......... . This mechanism is

..........3.......... . The addition of sucrose ....4.......... the water potential of the

sieve element sap. This causes water to enter from surrounding tissues by ....5.......... which

in turn increases the ....6.......... of the sap.

Which words correctly complete the numbered gaps 1-6?

	1	2	3	4	5	6
A	active transport	sources	active	raises	osmosis	concentration
B	mass flow	sources	active	lowers	active transport	pressure
C	mass flow	sinks	passive	raises	diffusion	concentration
D	mass flow	sources	active	lowers	osmosis	pressure

Your answer [ ]   **[1]**

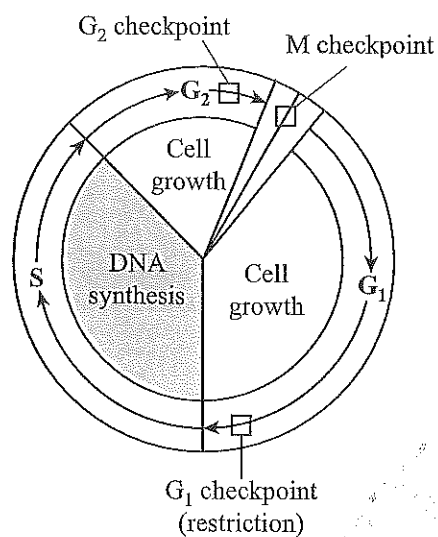9   Fig. 9.1 shows some of the checkpoints of the cell cycle.

Fig. 9.1

Which statement correctly describes the events that happen if DNA damage is discovered at the G_2 checkpoint?

A   The cell cycle continues to mitosis and the DNA will be replicated during metaphase.

B   The cell cycle is halted and the cell tries to repair the DNA.

C   The cell cycle returns to the G_1 phase to try to correct the damage.

D   The cell cycle stops and the cell dies.

Your answer [ ]   [1]

10   Which of the following is **not** a role of an intracellular membrane?

A   cell to cell signalling

B   partially permeable barrier

C   site of chemical reactions

D   transport of substances across the membrane

Your answer [ ]   [1]

H020/01

Turn over

11 The mitotic cell cycle is divided into a number of stages.

In which of the following stages will the chromosomes line up at the equator of the cell?

A anaphase

B interphase

C metaphase

D telophase

Your answer [ ] [1]

12 Which of the following factors does **not** affect the shape of the active site of an enzyme?

A a drop in temperature

B non-competitive inhibitor

C a change in pH

D binding of substrate

Your answer [ ] [1]

13 Which of the following statements is a step in meiosis that can lead to variation within a species?

A Mutations occurring during DNA replication.

B Random fusion of gametes.

C Independent assortment of homologous chromosomes.

D Chromosomes forming homologous pairs called bivalents.

Your answer [ ] [1]

14 A student tested a range of solutions of known concentrations of reducing sugar using Benedict's solution and colorimetry. Fig. 14.1 shows the calibration curve drawn by the student.
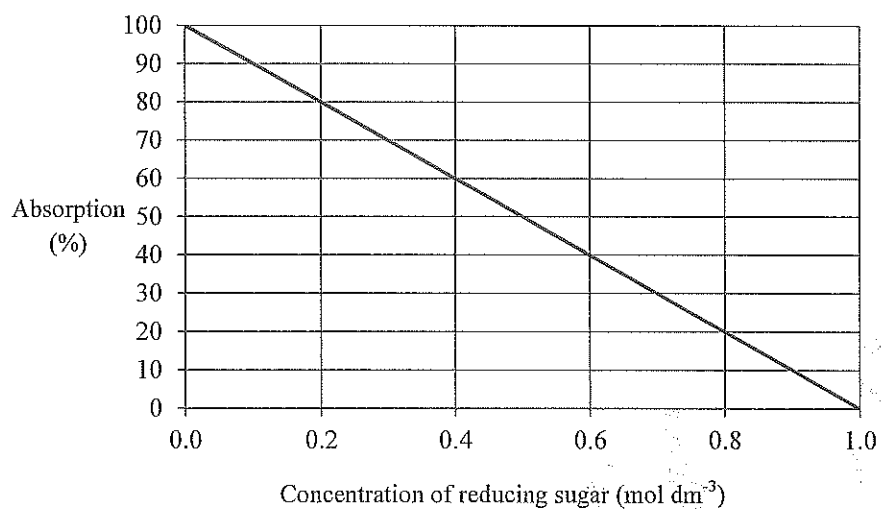
Fig. 14.1

The student then tested four solutions of **unknown** concentrations of reducing sugar. Table 14.1 shows the results:

Solution	P	Q	R	S
Absorption (%)	60	40	70	100

Table 14.1

Select the option that gives the correct sequence of reducing sugar concentrations from **highest** to **lowest**.

A S, R, P, Q

B Q, R, P, S

C S, P, R, Q

D Q, P, R, S

Your answer [ ]   [1]

15 Enzymes are capable of affecting the metabolism and structure of whole organisms. Which of the following enzymes will have the greatest effect on the **development** of an organism as a whole?

    A   Methyltransferase: adds methyl groups to DNA allowing genes to be switched on or off.

    B   Reverse transcriptase: generates complementary DNA from an RNA template.

    C   Deoxyribonuclease: digests free DNA molecules outside of the nucleus.

    D   Telomerase: lengthens ends of chromosomes by adding DNA sequences, preventing them from being degraded.

Your answer ☐ [1]

16 Fig. 16.1 shows the results of an osmosis experiment on sections of potato and beetroot. The original mass of each potato section was 4.6 g.
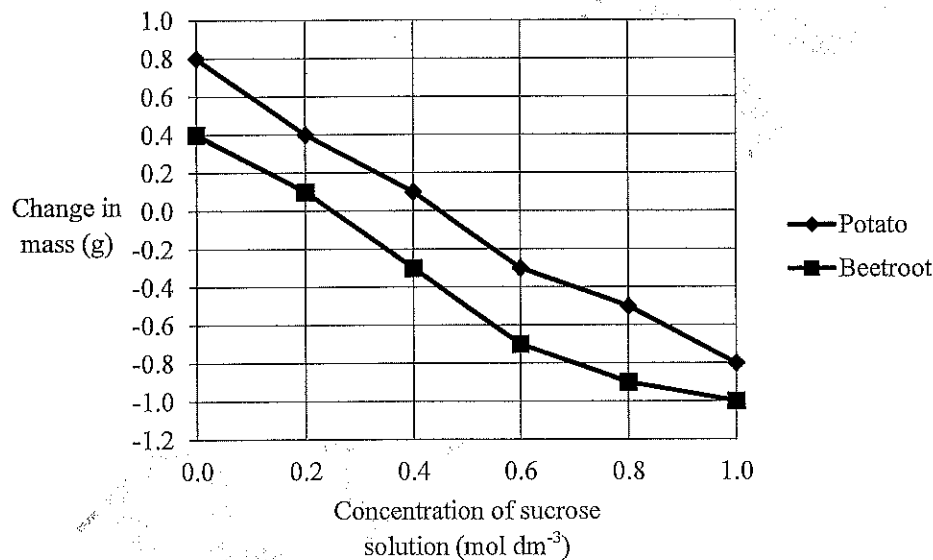
Fig. 16.1

Which option shows the correct percentage change in mass when a potato section was placed in the solution with the highest water potential?

    A   -17.4%

    B   10.8%

    C   -27.0%

    D   17.4%

Your answer ☐ [1]

17 A student observed mitosis in a prepared slide of a root tip.
The student recorded a description for each of four cells (**A-D**) and then tried to identify which stage of mitosis had been observed.

Which of the mitotic stages has been identified correctly?

	Description	Mitotic stage identified
A	Spindle fibres clearly visible	Telophase
B	Chromosomes aligned at equator	Anaphase
C	Sister chromatids pulled to poles of cell	Metaphase
D	Dark bodies visible within nucleus	Prophase

Your answer ☐ [1]

18 The **second division** of meiosis is different from mitosis because...

A ...individual chromosomes line up randomly on the equator.

B ...each chromosome replicates during metaphase.

C ...chiasmata form between the chromatids of a bivalent.

D ...the separating chromatids of a pair are not the same.

Your answer ☐ [1]

Turn over

19   Tuberculosis is an infectious disease that affects humans. It is caused by a pathogen.

Pathogens can also cause diseases in plants.

Which of the following plant diseases is caused by the same **type** of pathogen that causes tuberculosis in humans?

A   black sigatoka in bananas

B   'mosaic' leaf discolouration in tobacco plants

C   ring rot in tomatoes

D   late blight in potatoes

Your answer [ ]   [1]

20   Which of the following **best** describes the term *biodiversity*?

A   the variety of species

B   the number of individuals of each species

C   the variety of genes, species and habitats

D   the variety of genes within a species

Your answer [ ]   [1]

SECTION B

Answer **all** the questions.

21 Fig. 21.1 shows the cross sectional structure of a large artery and a large vein.
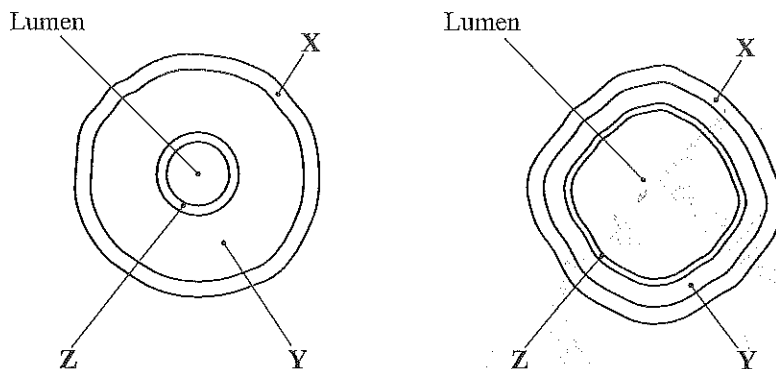
Fig. 21.1

(a) Name the structure labelled **Z**.

.... **[1]**

(b) Use Fig. 21.1 to calculate the cross sectional area of the artery's lumen as a proportion of that of the vein. (Assume that the artery is circular and the vein is a square in cross-section).
Show the steps in your calculation.

Answer... **[3]**

Turn over

(c) Outline how the difference in **lumen size** between arteries and veins is related to their function.

....

....

....

....

....

.... **[3]**

(d) The walls of blood vessels contain a polymer called collagen.

Name the type of monomer from which collagen is made and explain how two such monomers are joined together.

Name ....

Joined together by ....

....

....

[3]

22 Biological processes can be investigated using models.

The effect of cell size on diffusion can be investigated using cubes of agar jelly to represent cells of different sizes.

A student used cubes of agar jelly containing universal indicator, which changes colour at different pH.

* Five different sizes of cubes were cut from a larger block using a scalpel.
* Cubes were placed in a beaker containing hydrochloric acid (enough to cover the cubes) and a stopwatch was started.
* After 2 minutes the cubes were removed, rinsed with distilled water and blotted dry.
* Acid absorbed at the outside continued diffusing towards the centre of the blocks.
* The time taken for the blocks to turn entirely red was recorded.

The results are shown in **Table 22.1 on the insert.**

(a) What was the role of the universal indicator in this experiment?

.... [1]

(b) (i) In the space provided **on page 16**, plot a graph of mean time taken to turn red against surface area to volume ratio. [4]

(ii) Describe the pattern shown by your graph.

....

....

.... **[1]**

(iii) An identical procedure was carried out on a cube of unknown size. This cube turned red after 21.5 min.

Use your graph to estimate the surface area to volume ratio of this unknown cube.

Answer........................... **[1]**

(iv) Suggest how the original procedure could be modified in order to improve the accuracy of your answer to part **(iii)**.

....

....

.... **[1]**

(c) Use the data in **Table 22.1, on the insert**, to calculate the **rate** of diffusion of acid in **Cube C** from the outer surface to the centre of the cube.

Answer........................ **[3]**

(d) **(i)** Explain which of the mean values, **A - E**, is likely to be the least accurate. You should process data from the table to support your answer.

....

....

....

.... **[2]**

(ii) Identify one limitation in the practical procedure that may have caused the results to be inaccurate **and** explain which cube's results are most likely to have been affected by this limitation.

Limitation ....

....

....

Is more likely to affect cube ..... because ....

....

....

....

[3]

(e) The procedure described above involved the use of model cells. Hydrogen ions from the acid were able to travel freely to the centre of the agar jelly cubes.

The rate of movement of molecules from the plasma membrane towards the centre of **living** cells is often **greater** than that seen in the procedure the student carried out even if the cells are kept at the same temperature.

Suggest a reason for this observation.

....

....

....

[1]

23   Xylem vessel elements are produced from non-xylem cells in meristematic tissue.
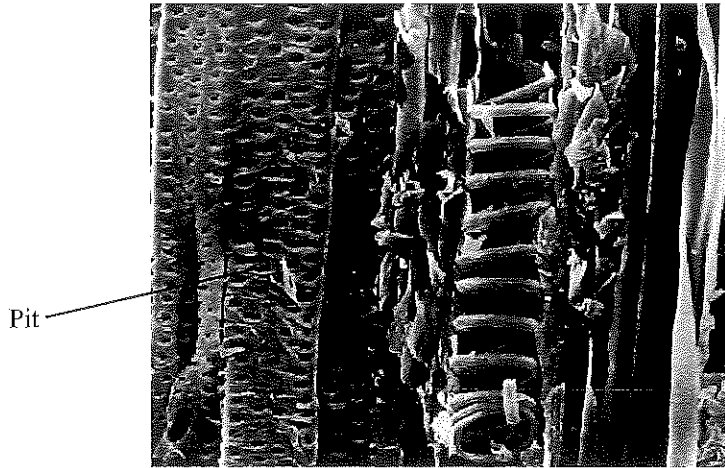
Fig. 23.1 shows an electronmicrograph of xylem tissue.

Pit

Fig. 23.1

(a)   State the function of the pits in xylem tissue.

....   [1]

(b)   Name the type of cell present in meristematic tissue and describe how xylem vessel elements are
produced from this type of cell.

Type of cell ....

Description ....

....

....

....

....

....

....
    [4]

Turn over

(c) Xylem forms part of a plant's transport system.

Explain why large multicellular plants need a transport system.

....

....

....

.... **[3]**

(d) Fig. 23.2 shows a cross section of a plant stem. The vascular bundles containing xylem found in most other flowering plants are absent. There are many air spaces in the stem.

Air space
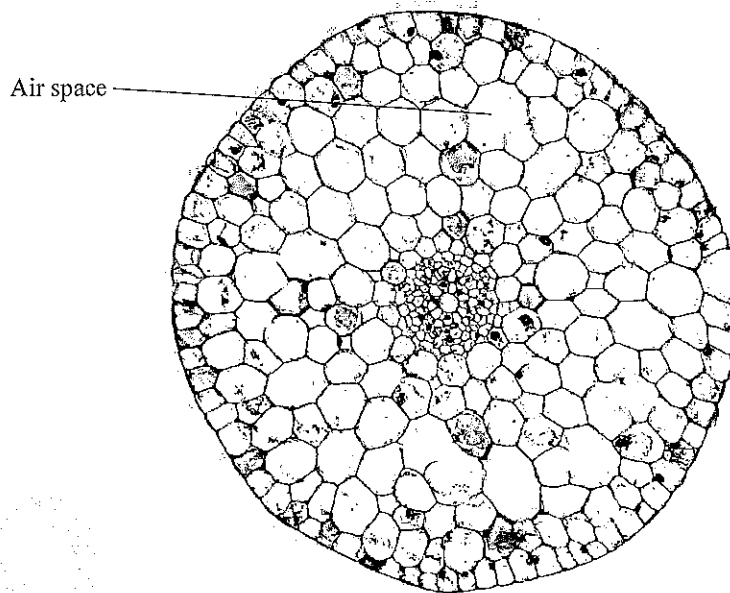
Fig. 23.2

Suggest and explain **two** likely adaptations of the **leaves** of the plant in Fig. 23.2.

1 ....

....

2 ....

.... **[2]**

24 A thin-layer chromatography procedure was carried out on an extract of leaf cells that contained chlorophyll and other pigments.

Liquid extract from the leaf cells was dried thoroughly.

The extract was then mixed with an organic solvent and placed onto a thin-layer chromatography plate suspended in organic solvent.

Fig. 24.1, on the insert, shows the results of the procedure.

Table 24.1 shows the typical Rf values for various pigments present in plants.

Pigment	Colour	Rf value
Carotene	yellow-orange	0.91
Pheophytin a	grey	0.75
Chlorophyll a	blue green	0.63
Chlorophyll b	green	0.58

Table 24.1

(a) (i) Name the organelle that is likely to have yielded most of the pigments present in the leaf extract.

.... **[1]**

(ii) Suggest why it was important that the leaf extract was dried thoroughly before mixing with the organic solvent.

....

....

.... **[1]**

(b) (i) Calculate the Rf value for pigment Y on Fig. 24.1.

Answer...................... **[1]**

(ii) The student concluded that in Fig. 24.1 pigment **Y** was probably chlorophyll a.

How well do the results support the student's conclusion? Support your answer with reference to Fig 24.1 and Table 24.1.

....

....

....

....

....

....

.... **[3]**

25 Fig. 25.1 shows the concentration of antibodies in a patient's bloodstream following a vaccination against a common pathogen and subsequent infection with the same pathogen.
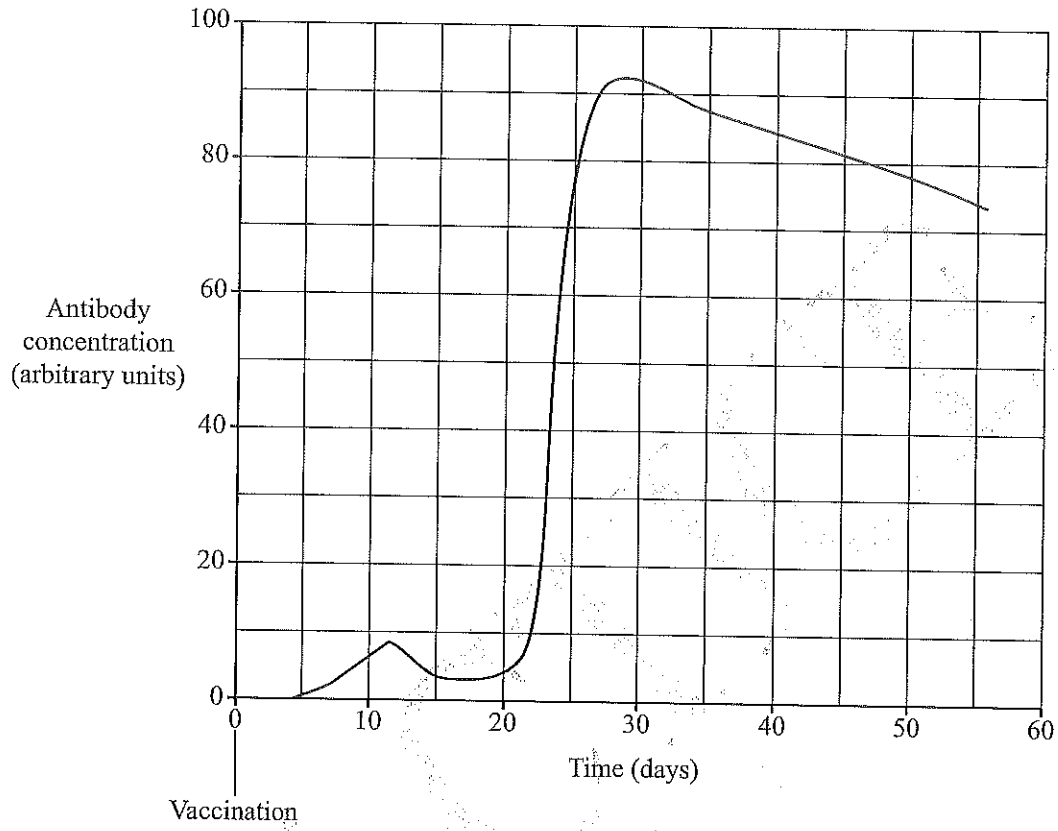
Fig. 25.1

(a) Calculate the rate of antibody production at day 10 in arbitrary units per day.

Answer........................ au day^{-1} **[2]**

H020/01

Turn over

(b) Explain why the response to the subsequent infection is much bigger than the response to vaccination, as shown in Fig. 25.1.

....

....

....

....

.... **[3]**

(c) Antibodies have a number of mechanisms of action. For example, agglutinins cause pathogens to be rendered inactive by clumping them together.

Outline the action of opsonins.

....

....

....

....

.... **[2]**

END OF QUESTION PAPER

OCR
Oxford Cambridge and RSA

AS Level Biology A
H020/01 Breadth in biology
Practice Paper Insert

Date – Morning/Afternoon
Time allowed: 1 hour 30 minutes
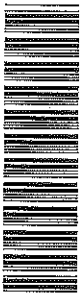
You must have:
- Question Paper
- Insert (inserted)
- Ruler (cm/mm)

INFORMATION

- This document consists of **2** pages.

Cube	Length of one side of agar cube (mm)	Surface area to volume ratio	Time taken to turn red (min)			
			Test 1	Test 2	Test 3	Mean
A	5	1.20	6.4	2.9	5.4	4.9
B	10	0.60	14.8	15.5	14.6	15.0
C	20	0.30	30.6	28.3	27.4	28.8
D	30	0.20	44.1	42.2	43.0	43.1
E	40	0.15	58.7	60.1	57.4	58.7

Table 22.1

Original position of sample

Solvent front

Y   X

Fig. 24.1