OCR
Oxford Cambridge and RSA

AS Level Biology B (Advancing Biology)
H022/02 Biology in depth

Tuesday 6 June 2017 – Afternoon
Time allowed: 1 hour 30 minutes

You must have:
• the Insert (Inserted)

You may use:
• a scientific or graphical calculator
• a ruler (cm/mm)

First name	
Last name	

Centre number						Candidate number				

INSTRUCTIONS
• The Insert will be found inside this document.
• 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. If additional space is required, use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
• Do **not** write in the barcodes.

INFORMATION
• The total mark for this paper is **70**.
• The marks for each question are shown in brackets **[ ]**.
• Quality of extended responses will be assessed in questions marked with an asterisk (*).
• This document consists of **20** pages.

OCR is an exempt Charity

Turn over

2

Answer **all** the questions.

1   Fig. 1.1 is a diagram of a cell found in the trachea. The structures labelled **A** to **G** are organelles found within the cell.
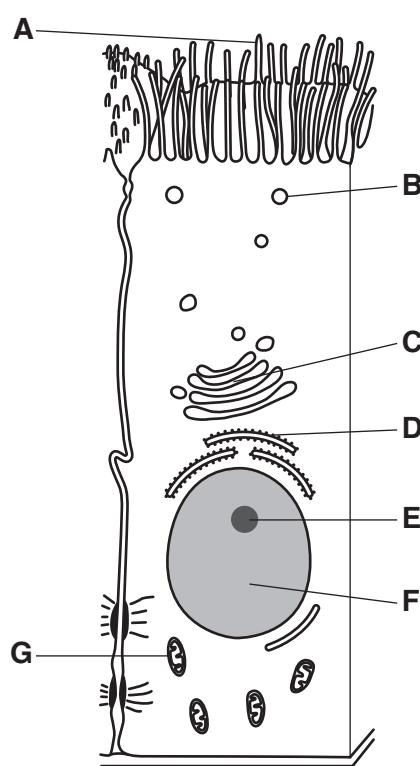
Fig. 1.1

(a) Using Fig. 1.1, complete the table below with the **letter** of the organelle that corresponds to the function being described.

Function	Letter
Provides ATP	
Modifies proteins	
Involved in protein synthesis	

[3]

(b) Tobacco smoke is a carcinogen. It can damage the DNA of the cells lining the trachea resulting in the development of a tumour.

Explain how damage to DNA can result in the development of a tumour.

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.... **[2]**

Question 1(c) begins on page 4

Turn over

(c) Research was carried out into the effect of smoking on the incidence of lung cancer.

Fig. 1.2 shows the results of this research.
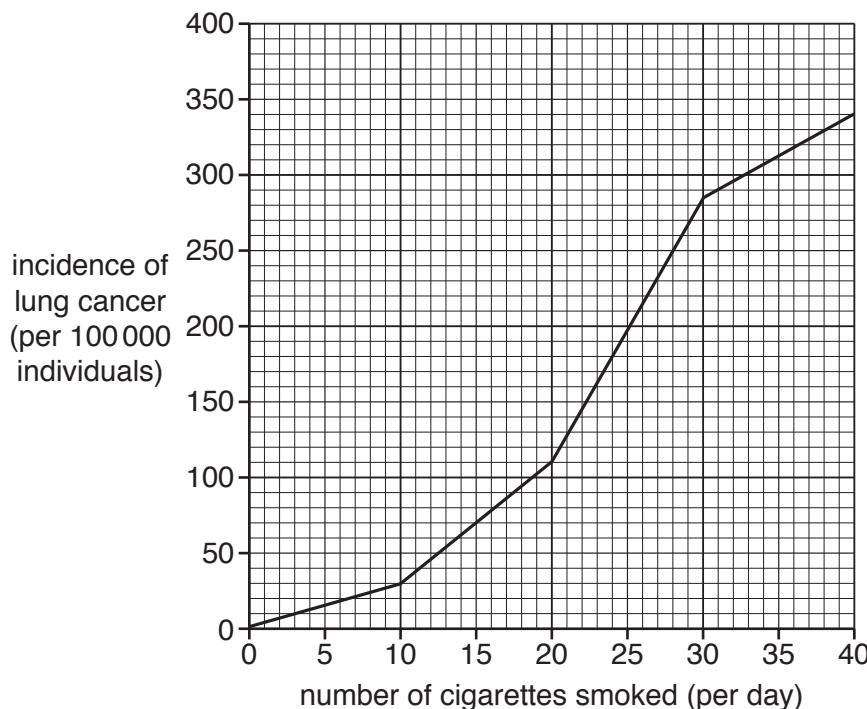
Fig. 1.2

(i) State **two** factors that should have been considered when selecting people to participate in this research.

Factor 1 ....

Factor 2 ....

[2]

(ii) Using Fig. 1.2, calculate the percentage increase in the incidence of lung cancer when the number of cigarettes smoked increases from 20 to 40 per day.

Give your answer to the **nearest whole number**.

Answer = ... **% [2]**

5

(d) (i) Lung cancer can be detected using a technique called endoscopic ultrasound.

When using this technique, instead of placing the ultrasound probe on the outside of the chest, it is inserted through the mouth and into the airways of the lungs.

Suggest why endoscopic ultrasound is used rather than standard ultrasound for detecting lung cancer.

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.... **[1]**

(ii) The number of people alive ten years after being diagnosed with a disease is called the ten year survival rate.

Lung cancer has one of the lowest ten year survival rates of all common cancers.

Suggest why the ten year survival rate for lung cancer is low.

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.... **[2]**

(e) Trastuzumad is an immunotherapy drug used in the treatment of breast cancer, but it has proved ineffective in treating lung cancer.

Using your knowledge of how **immunotherapy** drugs work, explain why trastuzumad can be used to treat breast cancer but **not** to treat lung cancer.

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.... **[1]**

(f) During chemotherapy treatment, the majority of body cells are not affected by the drugs used.

However, some cells, such as those in hair follicles and bone marrow, may be damaged by chemotherapy drugs.

Explain why.

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.... **[1]**

6

2 Technicians can use electrocardiograms (ECGs) to monitor the electrical activity of the heart.

Fig. 2 is an ECG trace of a person with a healthy heart.
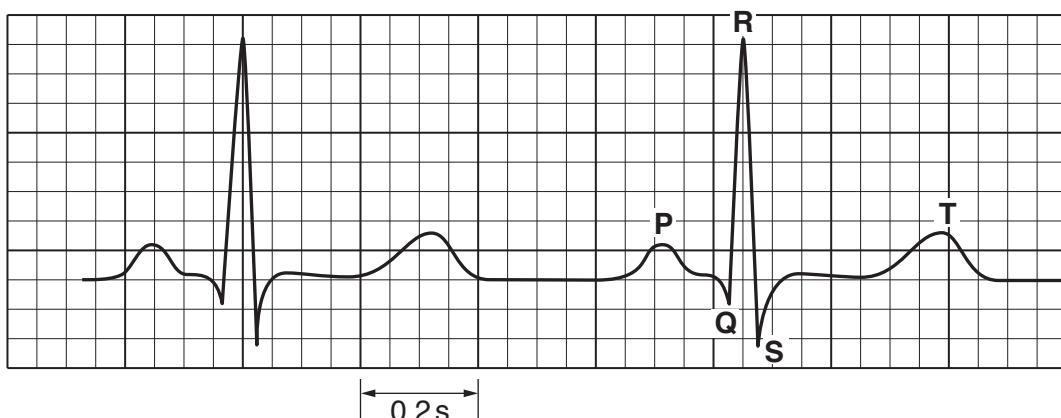
Fig. 2

(a) Using Fig. 2, calculate the heart rate to **two** significant figures.

Answer = ... bpm **[2]**

(b) Supraventricular tachycardia (SVT) is a medical condition affecting the heart resulting in an abnormal heart rhythm.

One of the signs of SVT is that the atria do not contract correctly.

Using this information, describe how the ECG trace of a patient with SVT would differ from the trace shown in Fig. 2.

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.... **[2]**

7

(c) Patients suffering from SVT for a prolonged period of time may suffer a heart attack and can go into cardiac arrest.

Describe the first aid procedure used to treat a patient suffering a heart attack **and** how the procedure would change if they later suffered a cardiac arrest.

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.... **[4]**

3   Hominids have been classified using taxonomic ranks.

   (a) Using the terms below, complete the sequence of taxonomic ranks in the hierarchy of classification.

   The last one has been done for you.

Genus	Phylum	Class	Family	Domain
	Species	Order	Kingdom	

Species

[1]

(b)* *Homo habilis* is a species of hominid that lived in central Africa between 2.8 and 1.5 million years ago.

Since the discovery of *Homo habilis* fossils in central Africa during the 1950s, scientists have debated whether this species should have been placed in the genus *Australopithecus*.

Discuss the usefulness of different types of evidence when classifying species such as *Homo habilis*.

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.... **[6]**

(c) Fig. 3.1, **on the insert,** shows tools used by *Homo habilis* and *Homo neanderthalensis.*

Explain how different tools, such as those shown in Fig. 3.1, can provide evidence of hominid evolution.

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.... **[2]**

Turn over

(d) Primate species are known to use physical grooming to maintain social groups. Studying this behaviour in primates has enabled scientists to hypothesise about how it developed into 'vocal grooming' and the evolution of language in hominids.

Table 3 shows results from a predictive model of how much time must be spent physically grooming for hominid species to maintain the size of their social groups.

Species	Size of social group (number of individuals per group)	Time that must be spent physically grooming to maintain group size (% of each day)
Australopithecus sp.	65	18
Homo habilis	90	25
Homo erectus	110	30
Homo neanderthalensis	120	35
Homo sapiens	150	40

Table 3

In extant primates, the maximum time that could be spent physically grooming has been recorded at 20%. This was observed in *Theropithecus gelada*, a species of baboon.

Discuss how this information and the predictive data in Table 3 support the idea for the development of 'vocal grooming' and evolution of language in hominids.

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.... **[3]**

4 Tuberculosis (TB) is caused by the bacterium *Mycobacterium tuberculosis*.

(a)* TB can be transmitted by droplet infection. It is also an opportunistic infection.

Outline the methods used to limit the transmission of TB and prevent opportunistic infection.

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(b) Isoniazid is one of the antibiotics used to treat TB.

Isoniazid works by inhibiting the production of mycolic acid, a fatty acid required for the synthesis of some bacterial cell walls.

(i) Explain how isoniazid causes the death of *M. tuberculosis* cells.

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.... **[3]**

Turn over

12

(ii) Isoniazid kills bacterial cells but has no effect on human cells.

Explain why.

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.... **[1]**

5 Blood is made up of different types of cells.

A haemocytometer can be used to determine the concentration of each type of cell in a blood sample.

Fig. 5.1 shows erythrocytes in one section of a haemocytometer chamber.

- The depth of the chamber is 0.1 mm.

- The blood sample was diluted by 1 in 200.
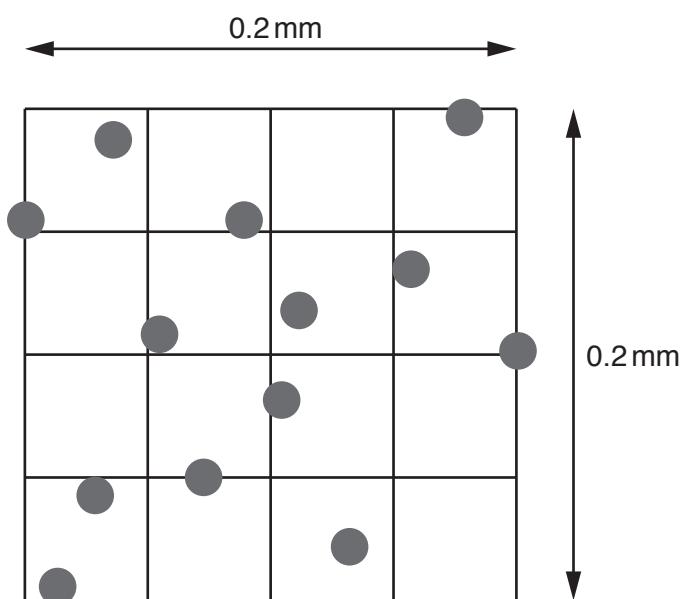
Fig. 5.1

(a) (i) Using Fig. 5.1, calculate the number of cells in 1 mm^3 of undiluted blood.

Answer = ... **[2]**

Turn over

(ii) When preparing blood samples for counting different types of cell using a haemocytometer, technicians follow a set procedure.

For each of the steps below, give **one** reason why it would be included in the procedure.

The haemocytometer slide is cleaned with ethanol.

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The blood sample is mixed thoroughly before and after dilution.

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A diluting fluid, such as Dacie's fluid, is used.

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A stain is added to the diluting fluid.

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[4]

Table 5 shows the standard cell count from a blood sample of a **healthy** person.

Cell type	Number of cells (dm^3)
Erythrocytes	4.5 to 6.5 × 10^{12}
Platelets	1.5 to 4.0 × 10^{11}
All Leucocytes	4.0 to 11.0 × 10^9
Neutrophils	2.0 to 7.5 × 10^9
Lymphocytes	1.0 to 4.5 × 10^9

Table 5

A haemocytometer was used by a technician to count the blood cells of a patient suspected of having a blood disorder.

Fig. 5.2 shows some of the notes taken by the technician.

Patient's results

Total number of white blood
cells : 60 000 / mm^3

Total number of red blood
cells : 5 × 10^6 / mm^3
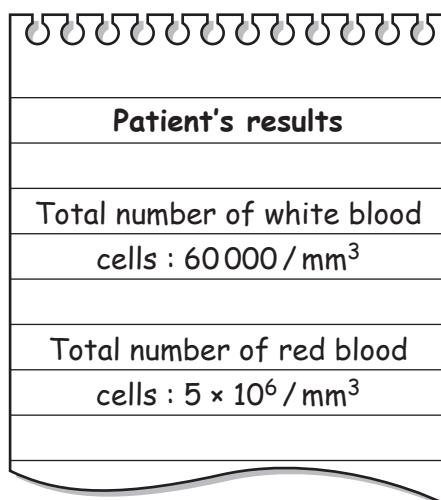
Fig. 5.2

(b) Using the information in Table 5 and Fig. 5.2, discuss any conclusions the technician could make about the health of this patient and whether a diagnosis could be made.

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.... **[4]**

6 A student was investigating the effect of sucrose concentration on plasmolysis in onion cells using the following procedure.

- Five Petri dishes were labelled **A** to **E**.

- Six drops of $0.2\,mol\,dm^{-3}$ sucrose solution and two drops of differential stain were added to Petri dish **A**.

- A sample of epithelial tissue from an onion was placed in Petri dish **A**.

- The tissue sample was then removed immediately, placed on a microscope slide and viewed using a light microscope.

- The numbers of plasmolysed **and** unplasmolysed cells were counted.

- This was repeated for Petri dishes **B** to **E** using different concentrations of sucrose solution as shown in Table 6.

(a) (i) What is the purpose of the differential stain in **this** investigation?

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.... **[1]**

(ii) The student made the following statement:

'The water potential of the onion cells changes when the cells are stained with the differential stain.'

Is this statement correct? Justify your answer.

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.... **[1]**

(iii) Identify **two** sources of error in the procedure used **and** suggest an improvement for each.

error ....

improvement ....

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error ....

improvement ....

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[4]

(b) The results of the student's investigation are shown in Table 6.

Petri dish	Sucrose concentration (mol dm^{-3})	Number of plasmolysed cells	Number of unplasmolysed cells	Percentage of plasmolysed cells (%)
A	0.2	30	168	18
B	0.3	46	162	28
C	0.5	62	148	42
D	0.7	73	124	59
E	0.8	68	104	65

Table 6

(i) Using the data in Table 6, complete an appropriate graph on the grid provided.
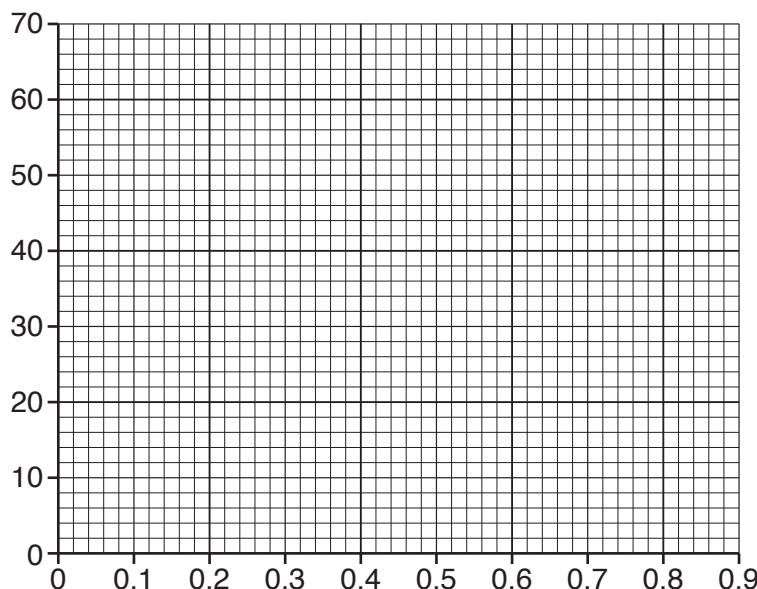
[3]

(ii) Using your graph plotted in **(b)(i)**, state the sucrose concentration at which 50% of the onion cells are plasmolysed.

.... [1]

18

(c) Water must enter plants via the roots and move through the tissues to enter the xylem vessels.

On Fig. 6, **draw** the **apoplast** pathway taken by water from point **X** in the soil to point **Y** in the xylem.

X soil
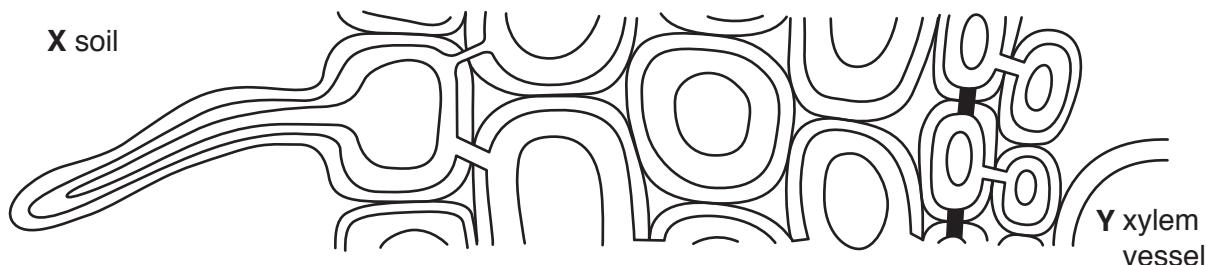
Y xylem vessel

Fig. 6

[2]

(d) Complete the sentences below about the movement of water through xylem vessels.

As water molecules move through xylem vessels they are attracted to each other by

.... forces. The water molecules are also attracted to the walls of

the xylem vessel by .... forces.

The walls of the xylem vessel are strengthened by .... which is

impermeable to water. The movement of water between xylem vessels can therefore only

occur through pores, known as ....

[4]

END OF QUESTION PAPER

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ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

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