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Friday 06 November 2020 ± Morning

GCSE (9–1) Combined Science (Biology) A (Gateway Science)

J250/01 Paper 1 (Foundation Tier)

Time allowed: 1 hour 10 minutes

8170581227

You must have:
- a ruler (cm/mm)

You can use:
- a scientific or graphical calculator
- an HB pencil

J250/01

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number | | | | | | Candidate number | | | | |

First name(s) _____

Last name _____

INSTRUCTIONS
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. If you need extra space use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- Answer **all** the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.

INFORMATION
- The total mark for this paper is **60**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of extended response will be assessed in questions marked with an asterisk (*).
- This document has **24** pages.

ADVICE
- Read each question carefully before you start your answer.

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SECTION A

Answer **all** the questions.

You should spend a maximum of 20 minutes on this section.

Write your answer to each question in the box provided.

1 A student uses a light microscope to look at cells.

The magnification of the eyepiece lens is ×10.

The magnification of the objective lens is ×20.

Calculate the magnification of the image they see.

A ×10

B ×20

C ×100

D ×200

Your answer ☐ **[1]**

2 Look at the table.

	Requires energy	Movement down a concentration gradient	Substance(s) moved
A	yes	no	water and glucose
B	no	no	water only
C	yes	yes	water and glucose
D	no	yes	water only

Which row in the table describes osmosis?

Your answer ☐ **[1]**

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3 Scars are formed when skin is damaged. Which word describes the type of cell division used when scar tissue forms?

A Differentiation

B Mitosis

C Replication

D Specialised

Your answer ☐ **[1]**

4 A person needs to have injections every day because they have **type 1** diabetes.

Which substance do these injections contain?

A Glucose

B Haemoglobin

C Insulin

D Testosterone

Your answer ☐ **[1]**

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5 The diagram shows cells from a plant.



Where in the plant would these cells be found?

A Leaf

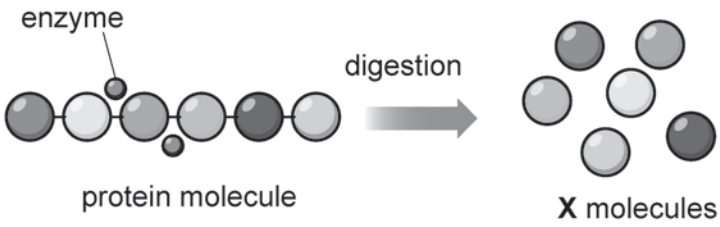
B Flower

C Root

D Stem

Your answer ☐ **[1]**

6 The diagram represents the digestion of protein by an enzyme.



What name describes the **X** molecules?

A Amino acids

B Fatty acids

C Glucose

D Glycerol

Your answer ☐ **[1]**

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7 Which substances are transported in the xylem vessels?

A Mineral ions only

B Sucrose only

C Water and mineral ions

D Water and sucrose

Your answer ☐ **[1]**

8 Which chamber of the heart receives blood directly from the pulmonary vein?

A Left atrium

B Left ventricle

C Right atrium

D Right ventricle

Your answer ☐ **[1]**

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9 **Table 9.1** shows the classification of non-diabetic, pre-diabetic and type 2 diabetes based on blood glucose levels.

Classification	Blood glucose levels 2 hours after food (mg/dl of blood)	Blood glucose levels 12 hours after food (mg/dl of blood)
non-diabetic	70–99	<140
pre-diabetic	100–125	140–199
type 2 diabetes	>126	>200

Table 9.1

Table 9.2 shows measurements of blood glucose levels taken from 4 people.

	Blood glucose levels 2 hours after food (mg/dl of blood)	Blood glucose levels 12 hours after food (mg/dl of blood)
A	73	140
B	100	125
C	105	148
D	129	206

Table 9.2

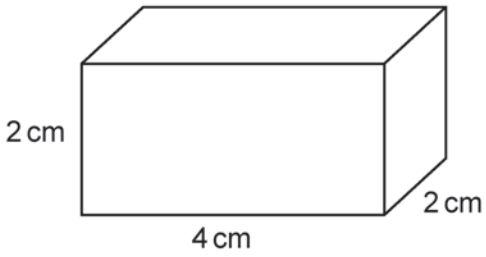
Which row in **Table 9.2** shows a person who is a **pre-diabetic**?

Your answer ☐ **[1]**

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10 A student investigates the rate of diffusion using blocks of agar.

The diagram shows one of the blocks of agar they use.



The block has a surface area of 40 cm^2.

What is the surface area to volume ratio of this block of agar?

A 1 : 2

B 1 : 2.5

C 2 : 1

D 2.5 : 1

Your answer ☐ **[1]**

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SECTION B

Answer **all** the questions.

11 (a) **Fig. 11.1** shows a red blood cell.

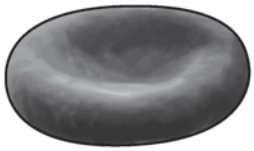


Fig. 11.1

Complete these sentences about this red blood cell.

Choose words from the list.
You may use each word once, more than once or not at all.

biconcave **cytoplasm** **nucleus** **plasma**

round **square** **vacuole** **water**

The red blood cell has a ..... shape to increase its surface area.

There is more room to transport oxygen because the cell does **not** have a

..... .

The red blood cell is transported in a liquid called ..... .

[3]

(b) **Fig. 11.2** shows two different blood vessels, **X** and **Y**, from the human body.

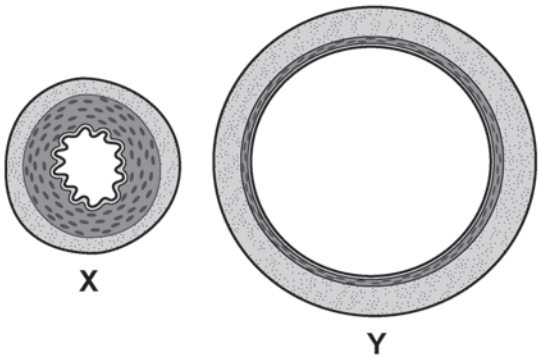


Fig. 11.2

Which blood vessel, **X** or **Y**, is an **artery**? .....

Write down **two** pieces of evidence seen in **Fig. 11.2** to support your answer.

1 .....

2 .....

[2]

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(c) **Fig. 11.3** shows the structure of a human heart.

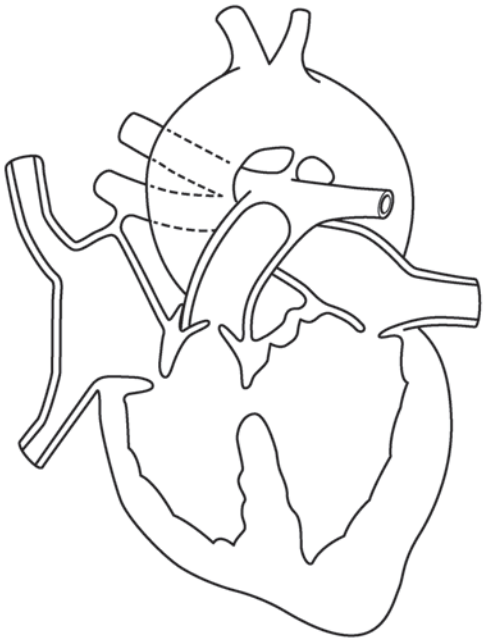


Fig. 11.3

The heart has a defect.

(i) Draw the letter **X** on the diagram to show the position of the defect. **[1]**

(ii) Explain how this defect might affect the transport of oxygen around the body.

.....

.....

.....

..... **[2]**

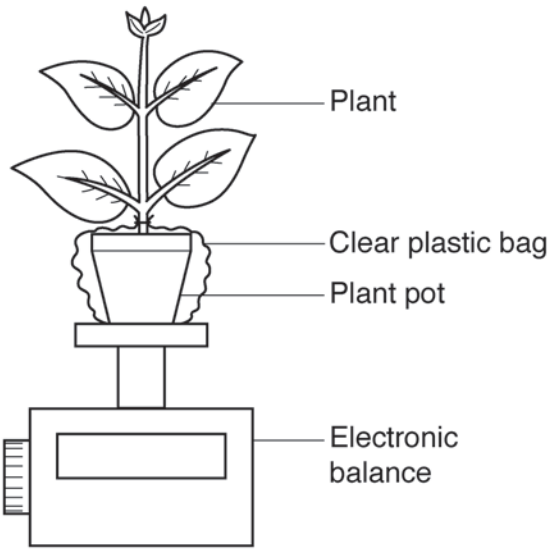
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12 A student investigates transpiration rate in six plants.

The plants are the same size, age and type.

The student adds the same volume of water to the soil in the plant pots and covers each pot with a clear plastic bag. They then measure the mass of each plant.

The diagram shows the apparatus they use.



Three plants are placed in the light and three in the dark. After 24 hours the student measures the mass again.

(a) Write down **two** variables that were controlled in the investigation.

1 .....

2 .....

[2]

(b) What should the student do to reduce the effect of **random errors**?

.....

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

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(c) The table shows the results of the student's investigation.

Plant	Light or dark	Mass at start (g)	Mass after 24 hours (g)	Change in mass (g)
A	light	148	124	24
B	light	146	114	32
C	light	147	111	36
D	dark	150	139	11
E	dark	147	135	12
F	dark	149	138	11

(i) Which set of results are more **precise**, light or dark? .....

Explain your answer.

.....

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

(ii) The mean change in mass for plants in the dark is 11.3 g.

Calculate the mean change in mass for the plants in the **light** (plants **A** to **C**).

Give your answer to **1** decimal place.

Mean change in mass for **light** = ... g **[3]**

(iii) Write down **one** conclusion about the effect light has on the transpiration rate seen in the table.

.....

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

(d) The student has investigated the effect of light on transpiration rate.

The student decides to develop their investigation to find the effect of **air movement** on transpiration rate.

Suggest **one** piece of apparatus they could use to change the movement of the air.

.....

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

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13 (a) **Fig. 13.1** shows a single-celled organism called an alga.

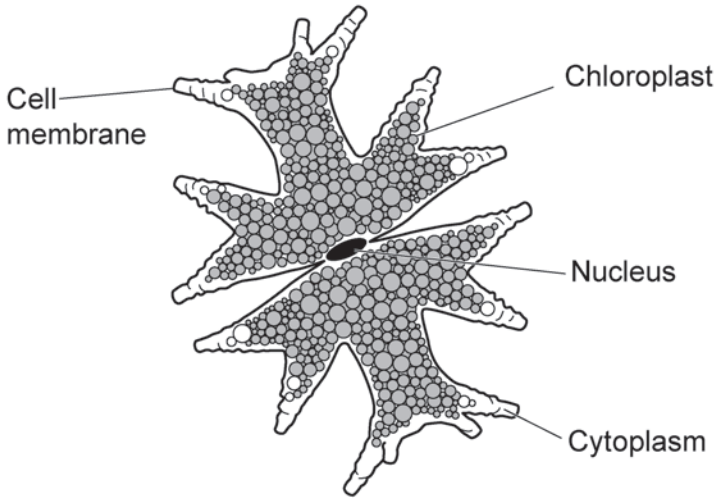


Fig. 13.1

(i) The cell in **Fig. 13.1** is a eukaryotic cell.

Use the diagram in **Fig. 13.1** to explain why the cell is a eukaryotic cell.

.....

..... **[2]**

(ii) Chlorophyll is used in photosynthesis.

What are the **two** raw materials needed for photosynthesis?

1 .....

2 .....

[2]

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(b) **Fig. 13.2** shows algae growing on the surface of a lake.



Fig. 13.2

In summer the area covered by algae increases.

Explain why more algae grow in the summer than in the winter.

.....

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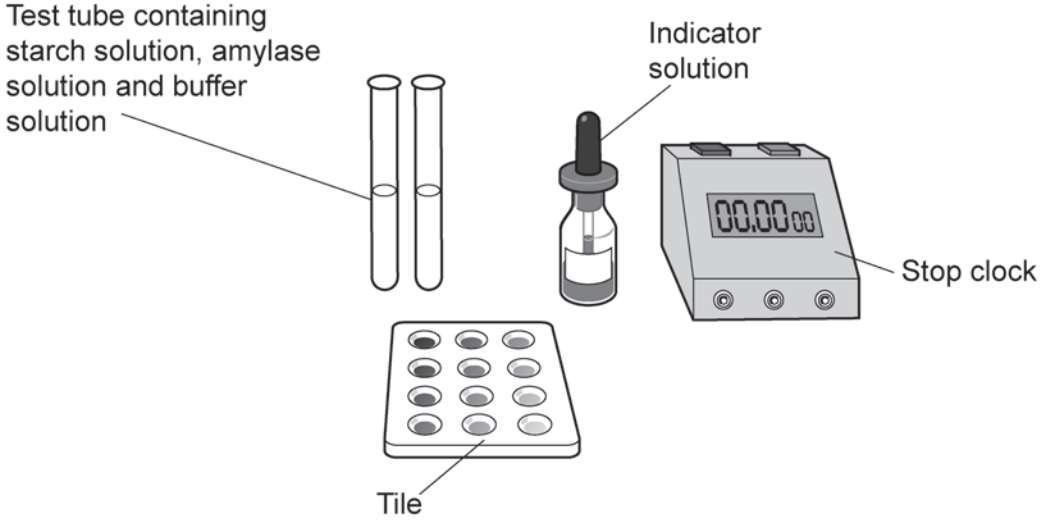
..... **[3]**

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14 A student investigates the effect of pH on the activity of the enzyme amylase on starch.

To change the pH of the amylase, the student uses a chemical called a buffer.

The diagram shows equipment used in their investigation.



This is the method the student uses:

1. Add a single drop of indicator solution to each compartment in the tile.
2. Use **one** syringe to add 2 cm^3 amylase solution, 1 cm^3 pH 3 buffer solution and 2 cm^3 starch solution to the test tube.
3. Start the stop clock.
4. Every **20 seconds** transfer a drop of the mixture in the test tube to the indicator in the tile and record the colour change of the indicator.
5. Stop the stop clock when the indicator in the tile stays orange.
6. Repeat the method using buffers of **different** pH.

(a) Identify the **independent** and **dependent** variable in this investigation.

Independent variable .....

.....

Dependent variable .....

.....

[2]

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(b) The indicator solution changes colour when starch is present.

(i) What is the name of this indicator solution?

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

(ii) What colour will the indicator solution change to when starch is present?

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

(c) To improve their investigation the student could repeat each pH to identify anomalies.

Suggest **two other** improvements the student could make to their investigation.

For each improvement write down **one** reason why it is needed.

Improvement 1 .....

Reason .....

.....

.....

Improvement 2 .....

Reason .....

.....

.....

[4]

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(d)* The table shows the student's results.

pH of buffer solution	Time when indicator stays orange (seconds)
3	Indicator still changes colour after 600
5	360
7	60
9	340
11	Indicator still changes colour after 600

Explain the pattern in the results.

Include ideas about the mechanism of enzymes in your answer.

.....

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..... **[6]**

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PLEASE DO NOT WRITE ON THIS PAGE

Turn over for the next question

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15 Stem cells are found in both animals and plants.

(a) (i) **Fig. 15.1** shows the area where stem cells can be found in a plant.

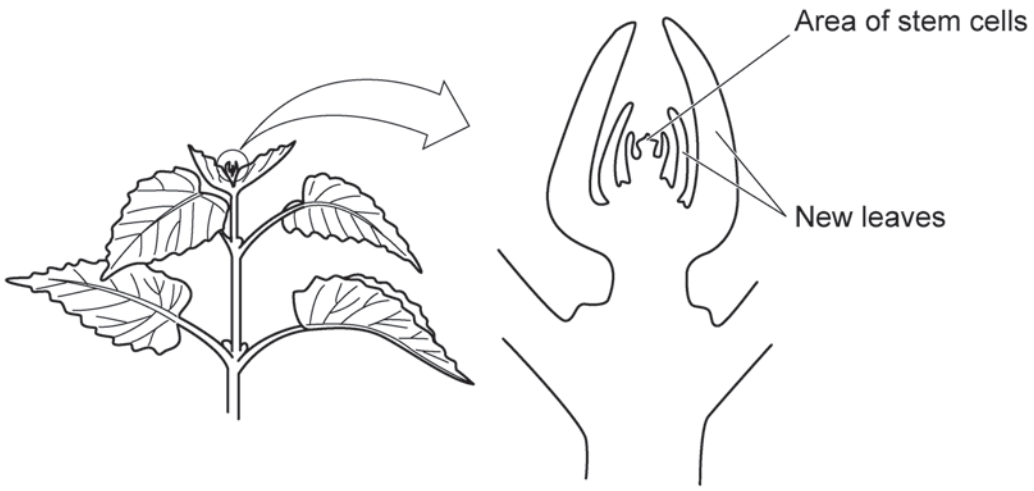


Fig. 15.1

What is the name of the area where stem cells are found?

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

(ii) Describe the difference between embryonic and adult stem cells in animals.

.....

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

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(b) A group of people were asked if they were in favour of using embryonic stem cells for medical research.

The pie chart in **Fig. 15.2** shows the results.

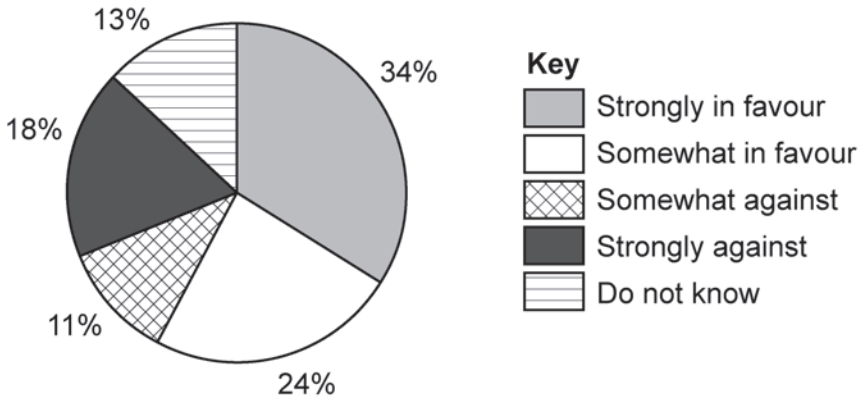


Fig. 15.2

(i) There were **254** people in the survey.

Calculate the **total** number of people who were **against** the use of embryonic stem cells.

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

Number of people against = ... **[3]**

(ii) Suggest **two** reasons why some people may object to the use of embryonic stem cells.

1 .....

.....

2 .....

.....

[2]

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16 **(a)** Hormones are used for coordination within the human body.

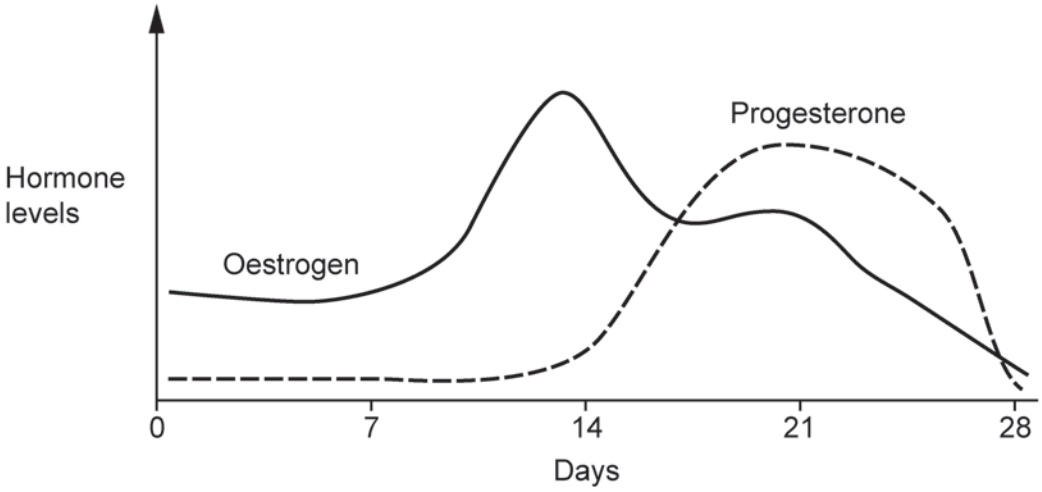
Complete these sentences about hormones.

Hormones are chemical ..... .

Hormones are made in ..... glands.

[2]

(b) **(i)** The diagram shows how the levels of the hormones oestrogen and progesterone change during the menstrual cycle.



Describe how changes in the levels of these hormones affect the thickness of the uterus wall.

Use data from the graph in your answer.

.....

.....

.....

.....

..... **[2]**

(ii) What is the role of FSH in the menstrual cycle?

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

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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