

Friday 06 November 2020 – Afternoon

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

J250/07 Paper 7 (Higher Tier)

Time allowed: 1 hour 10 minutes



You must have:

- a ruler (cm/mm)

You can use:

- a scientific or graphical calculator
- an HB pencil



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

Centre number

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Candidate number

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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 **20** pages.

ADVICE

- Read each question carefully before you start your answer.

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 **Table 1.1** shows the classification of non-diabetic, pre-diabetic and type 2 diabetes based on their 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 1.1

Table 1.2 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 1.2

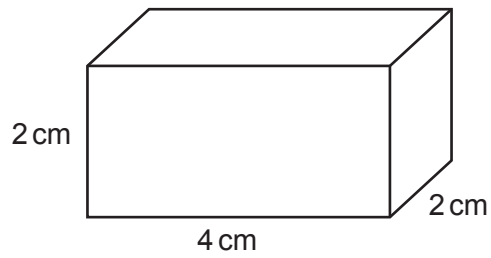
Which row in **Table 1.2** shows a person who is a **pre-diabetic**?

Your answer

[1]

- 2 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

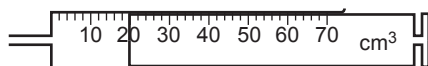
[1]

- 3 A student investigates the rate of photosynthesis.

They collect the gas produced during the reaction in a gas syringe.

The diagrams show the volume of gas in the syringe at the **start** and after **30 minutes**.

Volume of gas at start



Volume of gas after 30 minutes



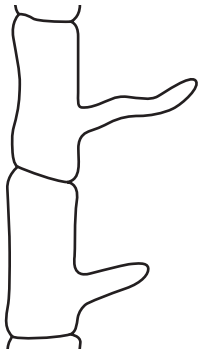
What is the rate of reaction?

- A 0.7 cm³/min
- B 0.9 cm³/min
- C 1.4 cm³/min
- D 2.1 cm³/min

Your answer

[1]

- 4 The diagram shows cells from a plant.



What is the function of these cells?

- A Produce sucrose
- B Take in water from the soil
- C Transport sucrose to the roots
- D Transport water up the stem

Your answer

☐

[1]

- 5 Which of these statements about proteins is correct?

- A Proteins are monomers made from polymers called amino acids.
- B Proteins are polymers made from monomers called amino acids.
- C Proteins are monomers made from polymers called fatty acids.
- D Proteins are polymers made from monomers called fatty acids.

Your answer

☐

[1]

6 What are the product(s) of anaerobic respiration in animals?

- A Alcohol
- B Alcohol and carbon dioxide
- C Lactic acid
- D Lactic acid and carbon dioxide

Your answer

[1]

7 The diagram shows a sensory neurone.



What is the part labelled **X**?

- A Axon
- B Dendrite
- C Cell body
- D Nucleus

Your answer

[1]

8 Look at the table.

	Glucagon released	Insulin released	Action of liver
A	yes	no	glucose converted to glycogen
B	no	yes	glycogen converted to glucose
C	yes	no	glycogen converted to glucose
D	no	yes	glucose converted to glycogen

Which row describes the body's response to a **decrease** in blood sugar levels?

Your answer

[1]

9 Which term describes the ability to see two points as separate points and not merged into one?

- A Depth of field
- B Magnification
- C Power
- D Resolution

Your answer

[1]

10 Look at the table.

	Respiration rate	Heart rate	Blood flow to digestive system
A	decrease	decrease	decrease
B	decrease	increase	increase
C	increase	decrease	increase
D	increase	increase	decrease

The body releases adrenaline when we are stressed.

Which row describes the body's response to stress?

Your answer

[1]

SECTION B

Answer **all** the questions.

11 Stem cells are found in both animals and plants.

(a) (i) **Fig. 11.1** shows the area where stem cells can be found in a plant.

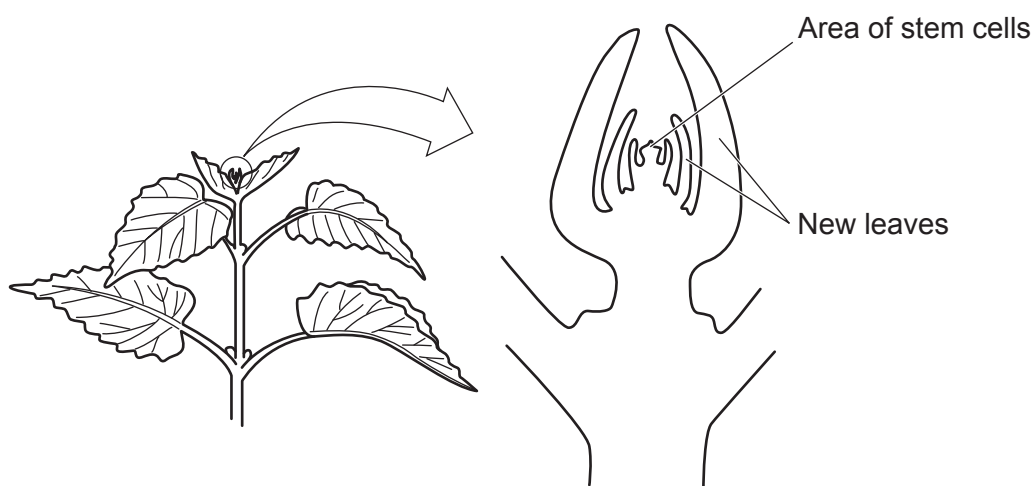


Fig. 11.1

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]

- (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. 11.2** shows the results.

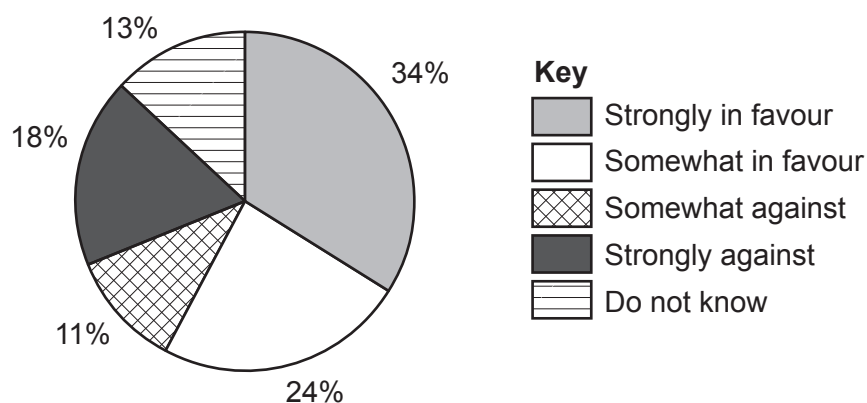


Fig. 11.2

- (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]

- 12 (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.

© A S Vink, S Clur, A A M Wilde, N A Blom, 'Effect of age and gender on the QTc-interval in healthy individuals and patients with Long-QT syndrome', Fig. 2, Trends in Cardiovascular Medicine, 28.1, 12 July 2017. Item removed due to third party copyright restrictions. Link to material: https://www.researchgate.net/figure/Estrogen-and-progesterone-levels-over-a-single-menstrual-cycle-in-females_fig2_318896767

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]**

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Turn over for the next question

13 (a) Fig. 13.1 shows a red blood cell.

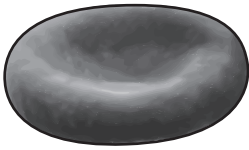


Fig. 13.1

(i) Explain **one** way red blood cells are adapted to transport oxygen around the body.

.....

 [2]

(ii) Which gas diffuses out of blood and into the lungs?

..... [1]

(b) (i) Complete these sentences about the human heart.

The wall of the human heart is made of a type of muscle called

..... muscle.

The muscle wall of the ventricle to pump blood to the body.

[2]

- (ii) Fig. 13.2 shows two different blood vessels, **X** and **Y**, that are connected to the heart.

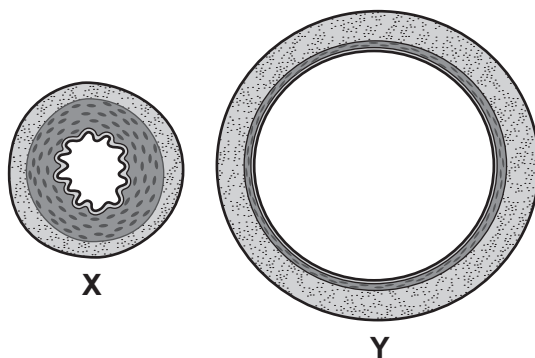


Fig. 13.2

Which blood vessel, **X** or **Y**, is most likely to be the vena cava?

Use **Fig. 13.2** to explain your answer.

.....

.....

.....

..... [2]

14 A student investigates transpiration rate in three plants.

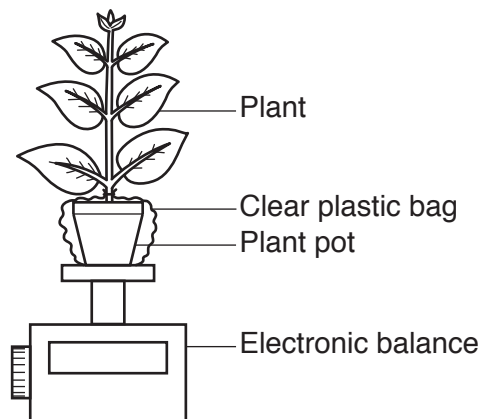
The plants are the same size, age and type.

The student removes leaves from two of the plants so that:

- plant **A** has 6 leaves
- plant **B** has 4 leaves
- plant **C** has 2 leaves.

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.



The plants are all left in the same place with plenty of light.

After 24 hours the student measures the mass of each plant again.

(a) (i) Why was each pot covered with a clear plastic bag?

.....
 [1]

(ii) What would be the effect on the results if the pots were not covered?

.....
 [1]

(b) The student has **not** tried to reduce the effects of random error.

Suggest how they should have done this.

.....
 [1]

Dependent variable

(ii) Plant **C** has 2 leaves. It had a starting mass of 138 g. After 24 hours the mass of plant **C** was 131 g.

Give your answer to **2** significant figures.

Percentage decrease in mass for plant **C** = % **[3]**

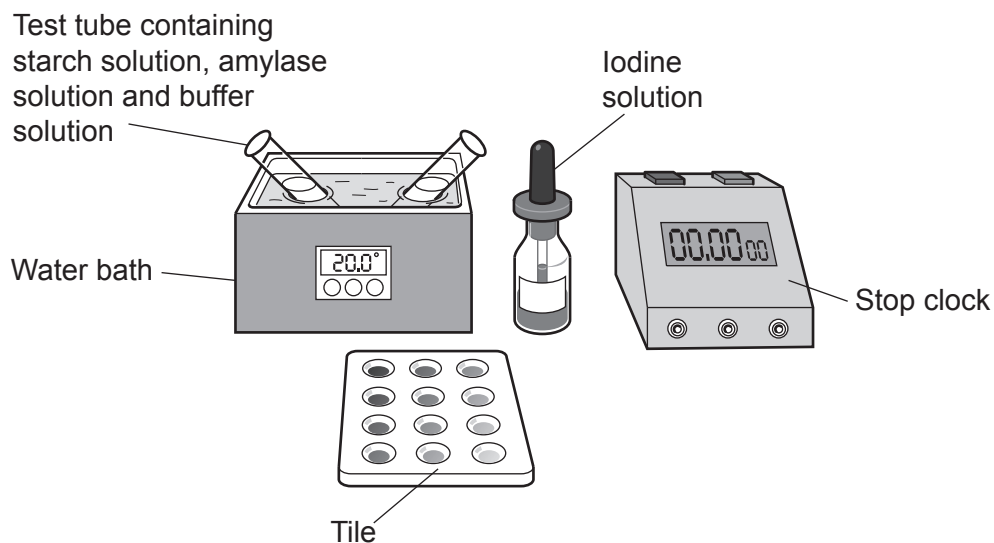
- plant **A** (6 leaves) is 16.2%
- plant **B** (4 leaves) is 8.9%.

Use ideas about transpiration in your answer.

..... [6]

- 15 A student investigates the effect of temperature on the activity of the enzyme amylase on starch.

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 and 1 cm^3 pH 7 buffer solution in a test tube.
3. Add 2 cm^3 starch solution to a second test tube.
4. Put both test tubes in a water bath set at 20°C , for 5 minutes.
5. Mix the contents of the two test tubes together and start the stop clock.
6. Every **20 seconds** transfer a drop of the mixture to the indicator in the tile.
7. Stop the stop clock when the indicator in the tile stays orange.
8. Repeat the method using the water bath set at **different** temperatures.

- (a) Explain why the student leaves the test tubes in the water bath for 5 minutes before mixing them.

.....
 [1]

(b) The table shows the student's results.

Temperature of water bath (°C)	Time when indicator stays orange (seconds)
20	568
30	360
40	60
50	340
60	Indicator still changes colour after 600

(i) Explain the result for 20 °C.

.....

.....

.....

..... [2]

(ii) Explain why amylase works slowly at 50 °C but no longer works at 60 °C.

.....

.....

.....

..... [2]

(c) The student has investigated the effect of temperature on the activity of amylase.

Describe how they could develop their investigation to find the effect of **pH** on the activity of amylase.

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.....

..... [4]

16 (a) Fig. 16.1 shows a single-celled organism called an alga.

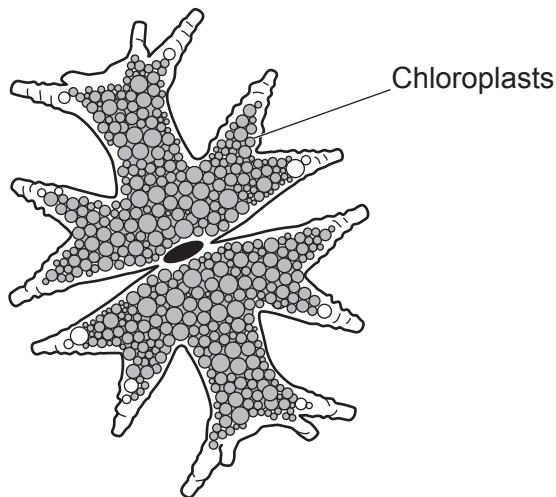


Fig. 16.1

(i) The alga cell is a eukaryotic cell.

Describe **two** differences in structure between eukaryotic and prokaryotic cells.

1

.....

2

.....

[2]

(ii) Explain why chloroplasts are needed for photosynthesis.

.....

..... [1]

- (b) Fig. 16.2 shows algae growing on the surface of a lake.



Fig. 16.2

In the summer the area covered by the algae increases.

Other plants growing at the bottom of the lake receive less light.

Explain how this could affect the growth of the plants at the bottom of the lake.

.....

.....

..... [2]

- (c) Compare the process of photosynthesis with the process of aerobic respiration.

.....

.....

.....

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.....

.....

..... [3]

END OF QUESTION PAPER

This image shows a blank sheet of white paper designed for writing. It features a series of evenly spaced horizontal blue lines across its entire width. A single vertical red line runs down the left side, creating a narrow margin. The paper is otherwise completely empty, with no text or markings.

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