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Tuesday 14 May 2019 – Afternoon

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

J250/01 Paper 1 (Foundation Tier)

Time allowed: 1 hour 10 minutes

7708633308

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

You may 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 may use an HB pencil for graphs and diagrams.
- Answer **all** the questions.
- Where appropriate, your answers should be supported with working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.

INFORMATION
- The total mark for this paper is **60**.
- 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 **24** pages.

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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 Which process supplies **ATP** in all living cells?

A Circulation

B Photosynthesis

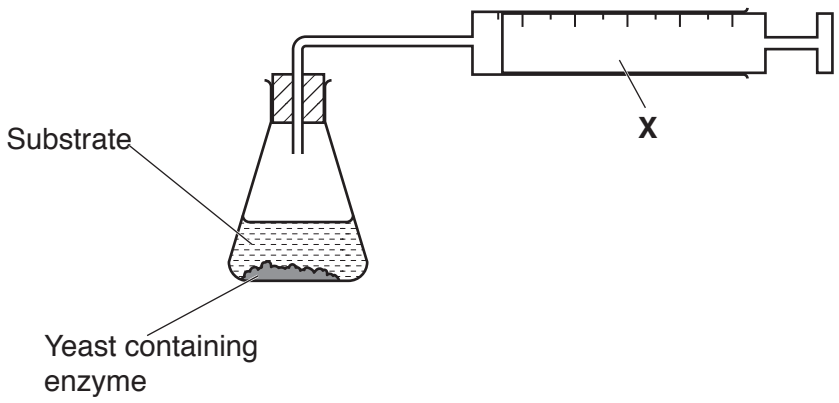
C Protein synthesis

D Respiration

Your answer ☐ **[1]**

2 A student investigates the effect of an enzyme found in yeast on a substrate.

They use the apparatus in the diagram.



What is apparatus **X** used to measure?

A Volume of enzyme

B Volume of product

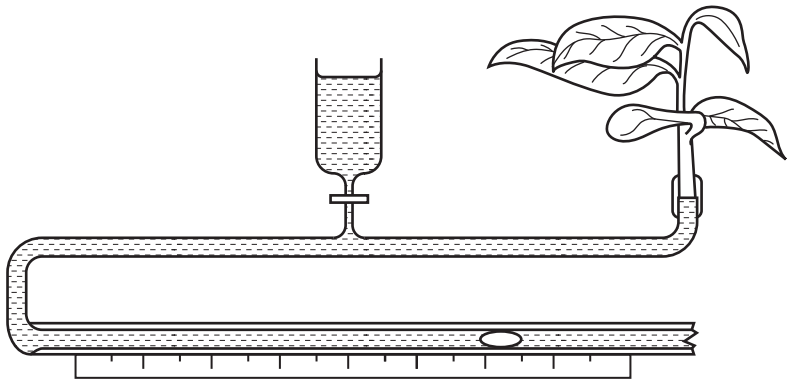
C Volume of substrate

D Volume of yeast

Your answer ☐ **[1]**

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3 Look at the apparatus in the diagram.



What is this apparatus used to measure?

A Rate of blood flow

B Rate of diffusion

C Rate of food uptake

D Rate of water uptake

Your answer ☐ **[1]**

4 Root hair cells have large numbers of mitochondria to provide lots of energy.

Why do root hair cells need lots of energy?

A For active transport of minerals.

B For active transport of water.

C For diffusion of minerals.

D For diffusion of water.

Your answer ☐ **[1]**

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5 A student investigates the rate of reaction for photosynthesis using pondweed.

The student records the time it takes pondweed to produce 30 bubbles of oxygen. The student repeats the investigation using different light intensities.

The table shows one of the student's results.

Relative light intensity	Time (s)
0.7	14

The student calculates the rate of reaction using the formula:

$$\text{rate} = \frac{1}{\text{time}}$$

Calculate the rate of reaction for a relative light intensity of 0.7.

A 0.07

B 0.7

C 7

D 14

Your answer ☐ **[1]**

6 The resolution of an electron microscope is 0.0001 μm.

The resolution of a light microscope is 0.2 μm.

How many times greater is the resolution of the electron microscope compared to the light microscope?

A 20

B 200

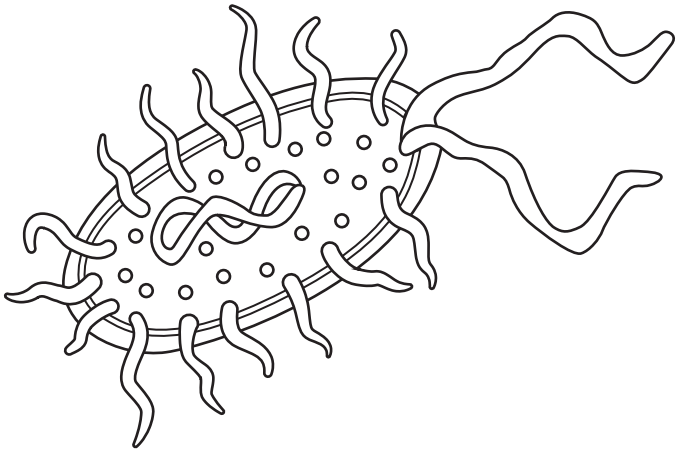
C 2000

D 20 000

Your answer ☐ **[1]**

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7 A student draws this image of a prokaryotic cell.



The cell image drawn by the student is 55 mm long.

The actual length of the prokaryotic cell is 0.001 mm.

What is the magnification of the student's drawing?

A 0.055×

B 0.550×

C 5500×

D 55 000×

Your answer ☐ **[1]**

8 Which of these statements describes **aerobic** respiration in fungi?

A An endothermic reaction that produces carbon dioxide and water.

B An endothermic reaction that produces carbon dioxide and ethanol.

C An exothermic reaction that produces carbon dioxide and water.

D An exothermic reaction that produces carbon dioxide and ethanol.

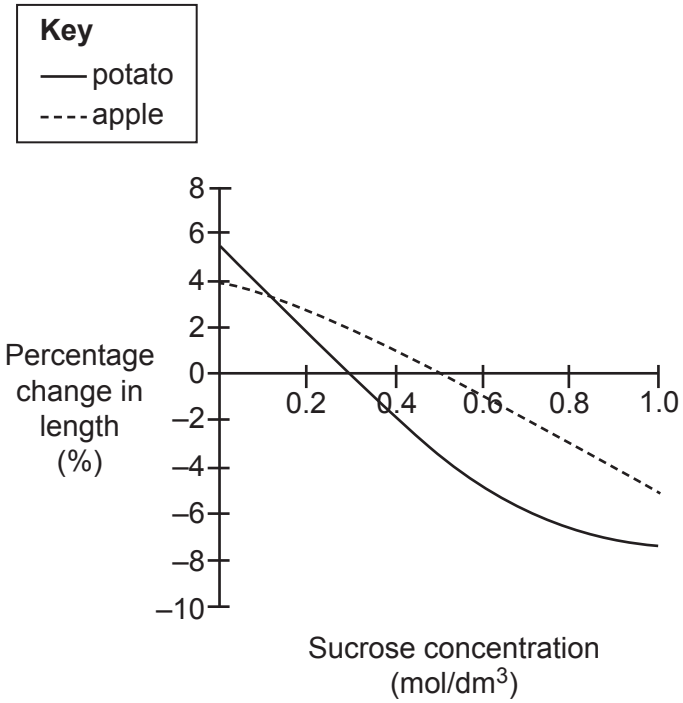
Your answer ☐ **[1]**

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9 A student investigates osmosis by placing chips of potato and apple into different concentrations of sucrose solution.

The student calculates the percentage change in length for each chip of potato and apple.

The graph shows the student's results.



Estimate the concentration of sucrose inside the cells of the **apple**.

A 0.06 mol/dm^3

B 0.3 mol/dm^3

C 0.5 mol/dm^3

D 1.0 mol/dm^3

Your answer ☐ **[1]**

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10 Which row shows the correct pathway of oxygen from the lungs to the body tissues?

A	artery	atrium	ventricle	vein
B	atrium	artery	vein	ventricle
C	vein	atrium	ventricle	artery
D	vein	ventricle	artery	atrium

Your answer ☐ **[1]**

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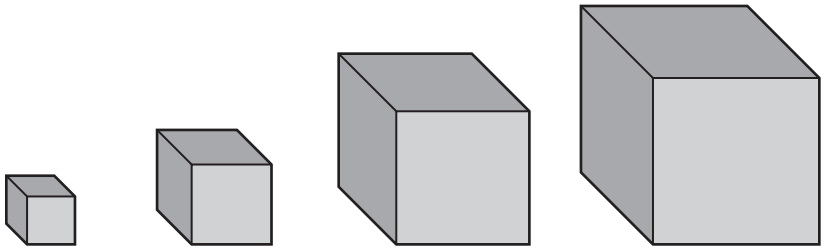
SECTION B

Answer **all** the questions.

11 Surface area is important for gas exchange in living organisms.

Scientists investigate the relationship between surface area and volume.

(a) The diagram shows four cubes.



A **B** **C** **D**

The table shows some data about the cubes.

Cube	Height of cube (cm)	Surface area (cm^2)	Volume (cm^3)	Surface area to volume ratio
A	2	24	8	3.0 : 1
B	4	96	64	1.5 : 1
C	6	216	216	1.0 : 1
D	8	.....	.....	0.8 : 1

Calculate the surface area and volume for cube **D**.
Write your answers in the table.

[2]

(b) Complete the sentences about the data in the table.
Use the words in the list. You may use the words once, more than once or not at all.

decreases **increases** **stays the same**

As the height of the cubes increases the surface area ..... .

As the height of the cubes increases the surface area to volume ratio ..... .

[1]

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(c) Look at the picture. It shows a salamander larva with external gills.



The salamander larva has skin that is a gas exchange surface. The external gills are also a gas exchange surface.

A salamander larva needs external gills to be able to grow larger.

Explain why developing external gills helps gas exchange.
Use ideas about how having gills changes the:

- surface area
- surface area to volume ratio
- distance needed for gases to diffuse.

.....

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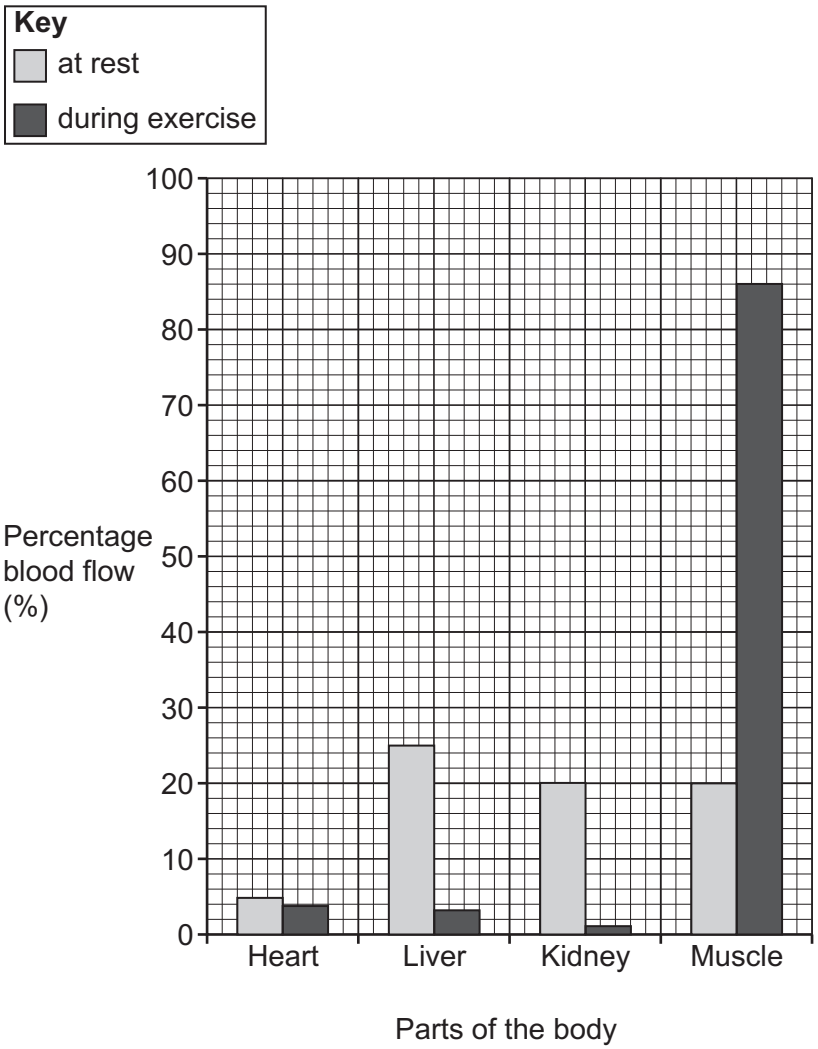
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..... **[3]**

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12 The bar chart shows percentage blood flow to different parts of the body at rest and during exercise.



(a) (i) Percentage blood flow to the **muscle** changes during exercise.

Calculate this change in percentage blood flow.

Change in percentage blood flow = ... % **[1]**

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(ii) Use ideas about aerobic respiration to explain the change in blood flow to muscle during exercise.

.....

.....

.....

.....

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

(b) The blood is transported to the muscles in arteries and capillaries.

(i) Give two differences between the **wall** structure of arteries and capillaries.

1 .....

.....

2 .....

.....

[2]

(ii) Write down **one** reason why there is a difference in wall structure between arteries and capillaries.

.....

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

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13 **Fig. 13.1** represents a cell dividing to form two new cells.

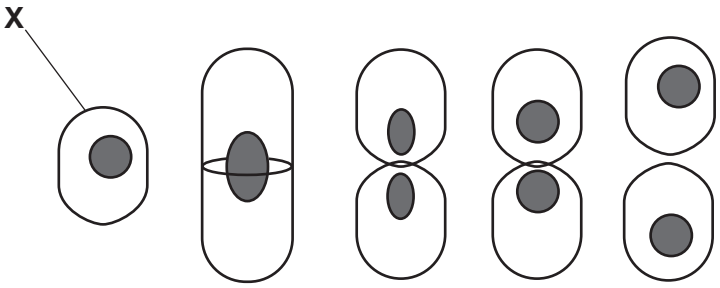


Fig. 13.1

(a) **(i)** What is the name of the part of the cell labelled **X** in **Fig. 13.1**?

Tick (✓) **one** box.

Chloroplast ☐

Cell membrane ☐

Mitochondria ☐

Nucleus ☐

[1]

(ii) Explain how the structure of part **X** is related to its functions.

.....

.....

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

(b) **(i)** Complete these sentences about the type of cell division shown in **Fig. 13.1**.

Use words from the list. Each word can be used once, more than once, or not at all.

cell cycle **mitosis** **multiplication** **replication** **repair**

This type of cell division is called ..... .

Before the cell divides, DNA ..... takes place in the nucleus. **[2]**

(ii) The dividing cell is a stem cell.

Describe the function of stem cells.

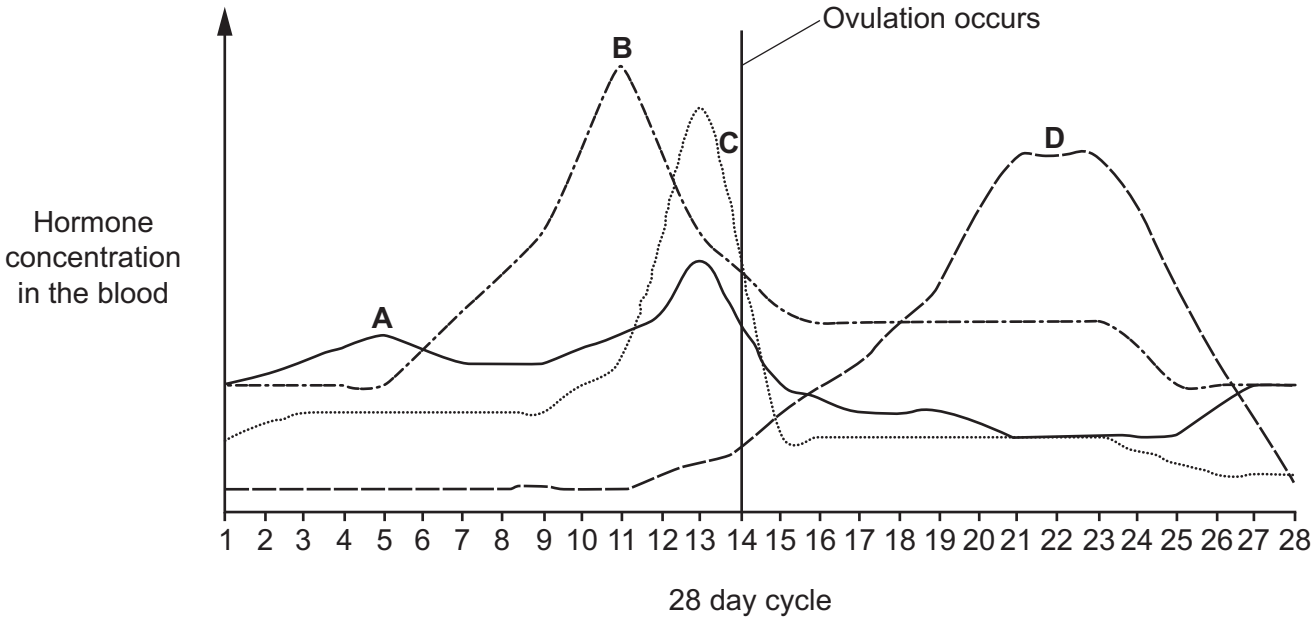
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14 The diagram shows the changes that occur to female hormone concentrations in the blood during the menstrual cycle.



(a) (i) Which line represents the hormone **progesterone**?

Choose from **A**, **B**, **C** or **D**

.....

[1]

(ii) Explain your answer to part **(a)(i)**.

.....

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

(iii) Describe the role of progesterone in the menstrual cycle.

.....

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

(b) Progesterone and a second hormone are used in the combined pill taken to prevent pregnancy.

Explain how the combined pill works.

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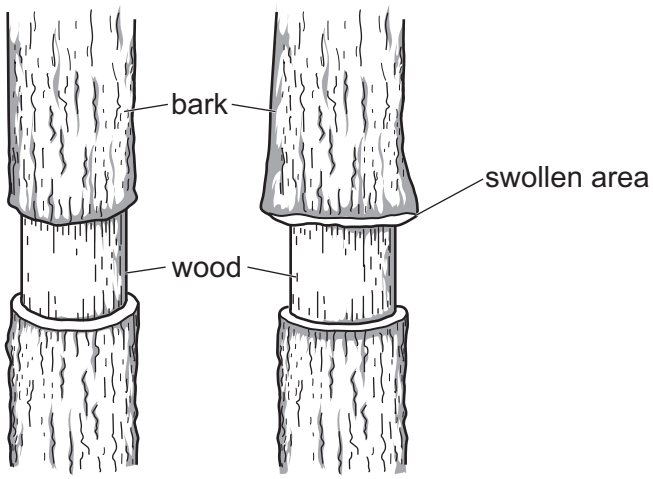
..... **[2]**

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15 Translocation involves movement of substances in plants. A scientist investigates translocation in a tree.

She cuts a ring of bark away from the stem of a tree. The tree is then left for one week.

The diagram shows the stem of the tree at the start and one week later.



(a) Removing the bark affects translocation but **not** transpiration.

(i) Which transport vessels have been removed along with the ring of bark?

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

(ii) Which transport vessels remain in the wood?

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

(b) (i) Write down **one** substance that is translocated.

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

(ii) What conclusion can be made about the direction of movement in the vessels that have been removed in the ring of bark?

Explain your answer using evidence from the diagram.

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

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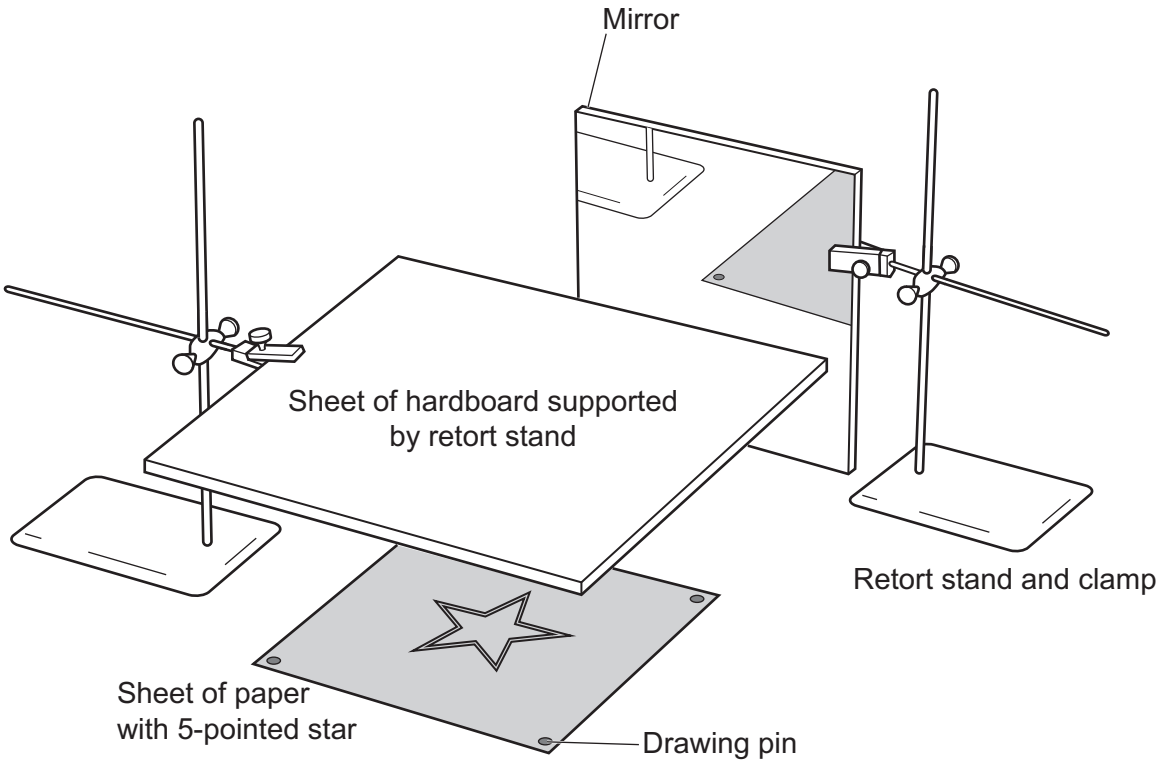
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16 A student investigates coordination.

The student sets up the apparatus in the diagram.



The student asks a friend to draw around the star, keeping between the two lines.

The friend can only see the star in the mirror.

The student measures how many seconds it takes the friend to draw around the star. He also counts the number of errors they make.

This is repeated five times.

(a) Sight is used by the friend to detect where to draw around the star.

What organ is used for detecting light?

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

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(b) The student records the results in a table.

Attempt	Time to draw around the star (s)	Number of errors
1	57	15
2	56	10
3	44	8
4	46	6
5	39	4

(i) Look at the results for **time** to draw around the star.

What is the **median** for these results?

Median = ... s **[1]**

(ii) At the start of the investigation the student made this statement.

Practising a task helps you to improve.

Write about how the results **support** this statement.

.....

.....

.....

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

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***(c)** Drawing around the star is a coordinated response.

Describe the parts of the nervous system **and** how they work together to coordinate this response.

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

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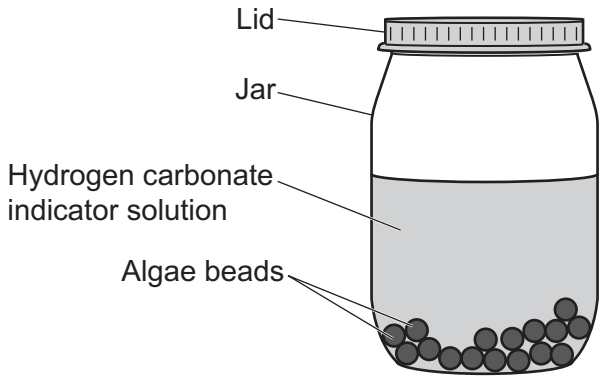
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17 A student investigates photosynthesis.

The student uses small organisms called algae, trapped inside beads.

The algae beads are put inside a jar containing hydrogen carbonate indicator solution.

A lid is placed on the jar to stop any air getting in.



At the start of the investigation the hydrogen carbonate indicator solution is red showing the presence of carbon dioxide. This changes to purple when there is no carbon dioxide present.

The student times how long it takes the indicator solution to turn purple.

She repeats the investigation using different numbers of algae beads.

The table shows her results.

Number of algae beads	**Time for indicator solution to turn purple (minutes)**			
	Trial 1	**Trial 2**	**Trial 3**	**Mean**
0	No change	No change	No change	No change
10	56	57	55	56
20	32	36	33	34
30	19	8	17	18
40	6	7	9	

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(a) (i) Calculate the mean for **40** beads.

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

Mean = ... **[1]**

(ii) Look at the mean for **30 beads**.

Explain why the student did **not** use the result for **trial 2** when calculating the mean.

.....

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

(b) Look at the results for 10, 20 and 40 beads.

Which set of data is the most **precise**?

Explain your answer.

.....

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

(c) Explain why the student sets up a bottle with **zero** algae beads in.

.....

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

(d) Use ideas about photosynthesis to explain the pattern in the results.

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

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(e) The student wants to investigate the effect of temperature on the rate of photosynthesis.

The student uses a stop watch and a bottle of hydrogen carbonate indicator solution containing 20 algae beads.

(i) The student also uses a large beaker and a kettle of hot water.

Explain why the student uses the beaker and kettle of hot water.

.....

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

(ii) Describe how the student could develop her method to find the best temperature for photosynthesis.

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

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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