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Tuesday 14 May 2019 – Afternoon

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

J250/07 Paper 7 (Higher Tier)

Time allowed: 1 hour 10 minutes

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

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

J250074

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.

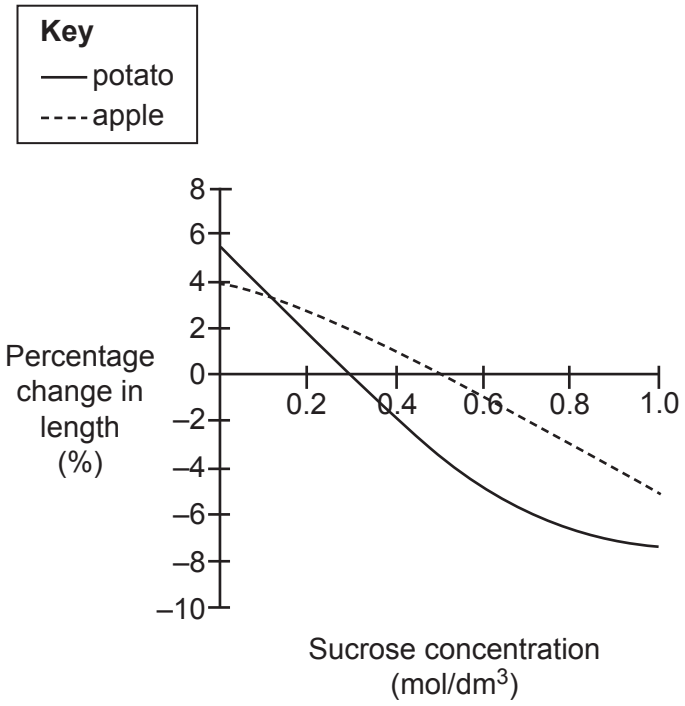
You should spend a maximum of 20 minutes on this section.

Write your answer to each question in the box provided.

1 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 0.0 mol/dm^3

B 0.3 mol/dm^3

C 0.5 mol/dm^3

D 1.0 mol/dm^3

Your answer [ ] **[1]**

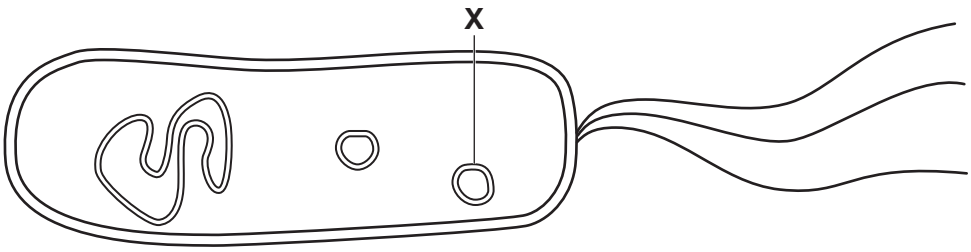
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2 Which row shows the correct pathway of oxygen from the lungs to the body tissues?

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

Your answer ☐ **[1]**

3 Look at the diagram of a bacterial cell.



What is the name of the structure labelled **X**?

A Mitochondrion

B Nucleus

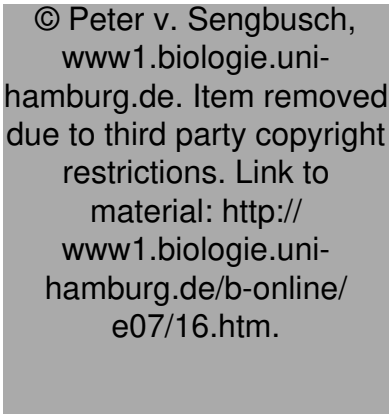
C Plasmid

D Receptor molecule

Your answer ☐ **[1]**

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4 The photograph shows the structure of specialised plant tissue.



Which statement **best** describes the plant tissue in the photograph?

A Phloem used to transport mineral ions

B Phloem used to transport sugars

C Xylem used to transport mineral ions

D Xylem used to transport sugars

Your answer ☐ **[1]**

5 Which statement about **both** Type 1 and Type 2 diabetes is correct?

A Insulin injections are always needed.

B Regulating diet and exercise will help to control the symptoms.

C The body becomes intolerant to insulin.

D The pancreas stops producing insulin.

Your answer ☐ **[1]**

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6 What is the correct definition of water potential?

A The ability of dissolved glucose molecules to move to different areas.

B The ability of dissolved water molecules to move to different areas.

C The ability of free glucose molecules to move to different areas.

D The ability of free water molecules to move to different areas.

Your answer ☐ **[1]**

7 The resolution of an electron microscope is 1×10^{-10} m.

The resolution of a light microscope is 2×10^{-7} m.

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

A 5×10^{-4}

B 2×10^{-3}

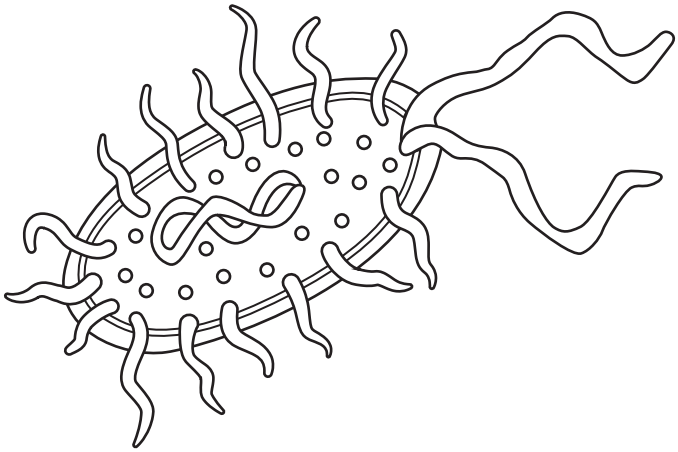
C 5×10^{2}

D 2×10^{3}

Your answer ☐ **[1]**

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8 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 1 μm.

What is the magnification of the student's drawing?

A 55×

B 550×

C 5500×

D 55 000×

Your answer ☐ **[1]**

9 Which statement describes how water is lost from the leaf?

A Diffusion of water from cells followed by diffusion through the stomata.

B Diffusion of water from cells followed by evaporation through the stomata.

C Evaporation of water from cells followed by diffusion through the stomata.

D Evaporation of water from cells followed by evaporation through the stomata.

Your answer ☐ **[1]**

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10 The rate of photosynthesis is affected by light intensity.

When you increase distance between a light source and a plant, light intensity decreases.

The relative light intensity can be calculated using the inverse square law:

$$\text{relative light intensity} = \frac{1}{\text{distance from light source}^2\text{(m)}}$$

The relative light intensity is 6.25.

Calculate the distance from the light source.

A 0.08 m

B 0.16 m

C 0.32 m

D 0.40 m

Your answer ☐ **[1]**

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SECTION B

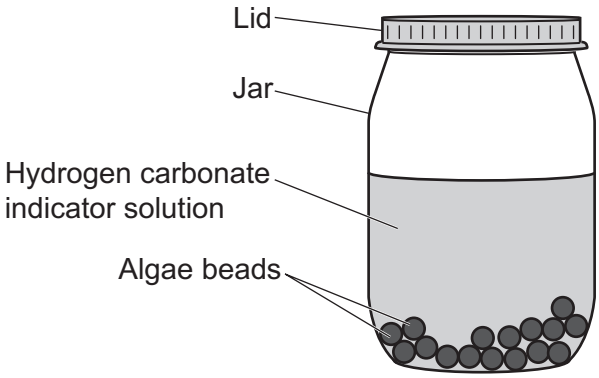
Answer **all** the questions.

11 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.

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

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

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..... **[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.

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

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

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

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12 Surface area is important for transport in plants.

Scientists investigate the relationship between surface area and volume.

(a) The diagram in **Fig. 12.1** shows four cubes.

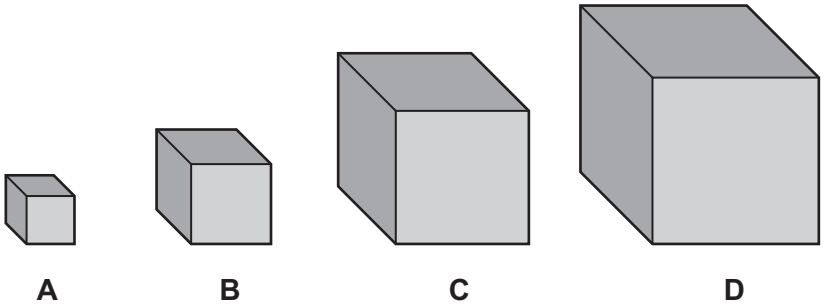


Fig. 12.1

The table shows some data about the cubes in **Fig. 12.1**.

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			

Calculate the surface area to volume ratio for cube **D**.

Give your answer to **1** significant figure.

Surface area to volume ratio = ... **[3]**

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(b) Roots are important for transport in plants.

The diagram in **Fig. 12.2** shows a root tip, with a root hair cell labelled.

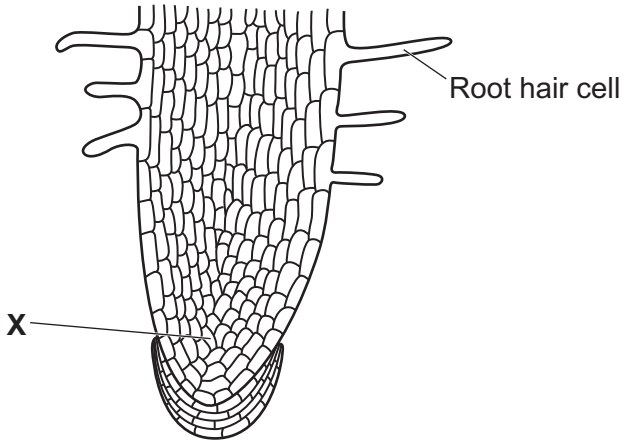


Fig. 12.2

(i) The root hair cell is adapted for its function.

Explain why the adaptation is needed.

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

(ii) Look at the area of the root tip labelled **X** in **Fig. 12.2**.

Describe the type and function of the cells found in area **X**.

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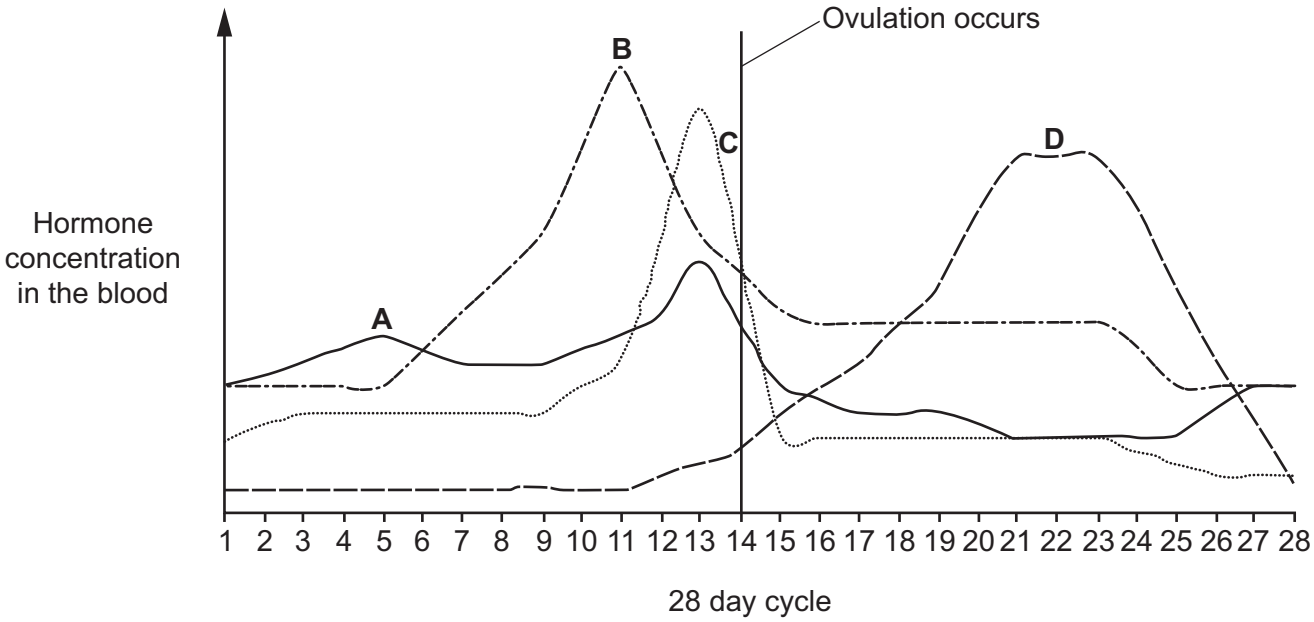
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..... **[2]**

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



(a) (i) Draw lines to the correct name for hormones **A**, **B**, **C** and **D** labelled in the diagram.

A	**Oestrogen**
B	**FSH**
C	**LH**
D	**Progesterone**

[4]

(ii) Explain how the hormones **FSH** and **LH** work to help control the menstrual cycle.

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

(b) Hormones can be used in the contraceptive pill to prevent pregnancy.

Explain how hormones in the contraceptive pill prevent pregnancy.

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

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14 A student investigates coordination.

They set up the apparatus shown in diagram **Fig. 14.1**.

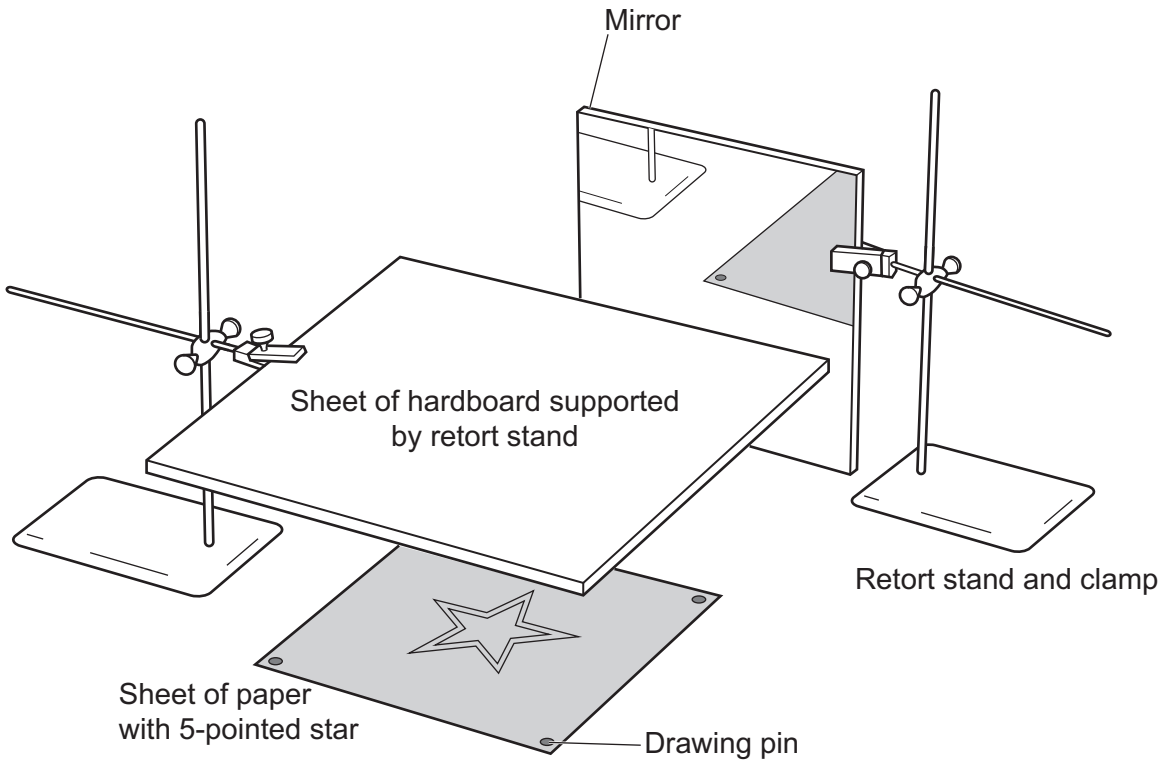


Fig. 14.1

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) The student records the results in **Table 14.1**.

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

Table 14.1

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(i) The student investigates how the number of attempts affects the accuracy of drawing the star.

What are the **independent** variable and **dependent** variables for this investigation?

independent variable .....

dependent variables ..... **and** .....
[2]

(ii) The friend has improved their time and the number of errors they make.

Calculate percentage change in the number of errors in **Table 14.1**.

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

Percentage change = ...%
[3]

(b) The student makes this conclusion about their results.

My results show that practising a task will always help you improve.

Explain why this conclusion may **not** be valid.

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

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***(c)** The diagram in **Fig. 14.1** and **Table 14.1** are repeated below.

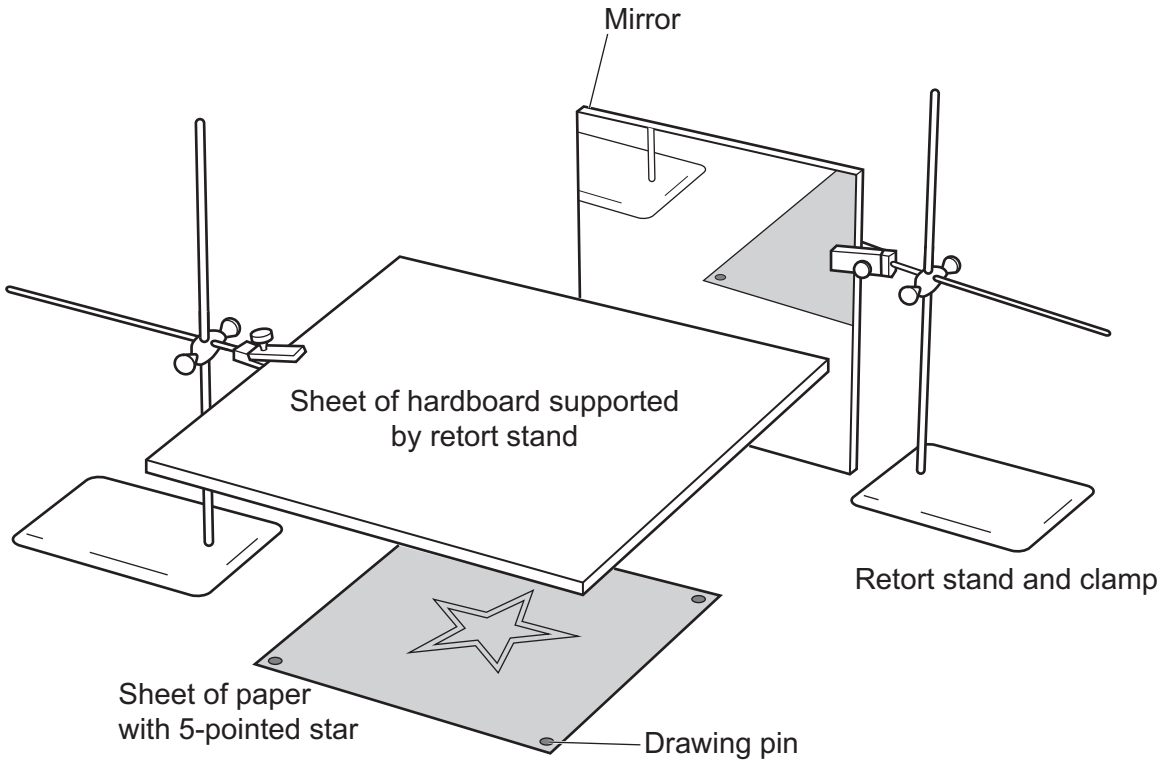


Fig. 14.1

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

Table 14.1

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Drawing around the star is a coordinated response.

Explain how the body coordinates the response **and** suggest an explanation for the pattern in the results in **Table 14.1**.

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

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15 Look at the diagram. It shows the breakdown of a lipid by the enzyme lipase.



Molecule P **Molecule Q** **Molecule R**

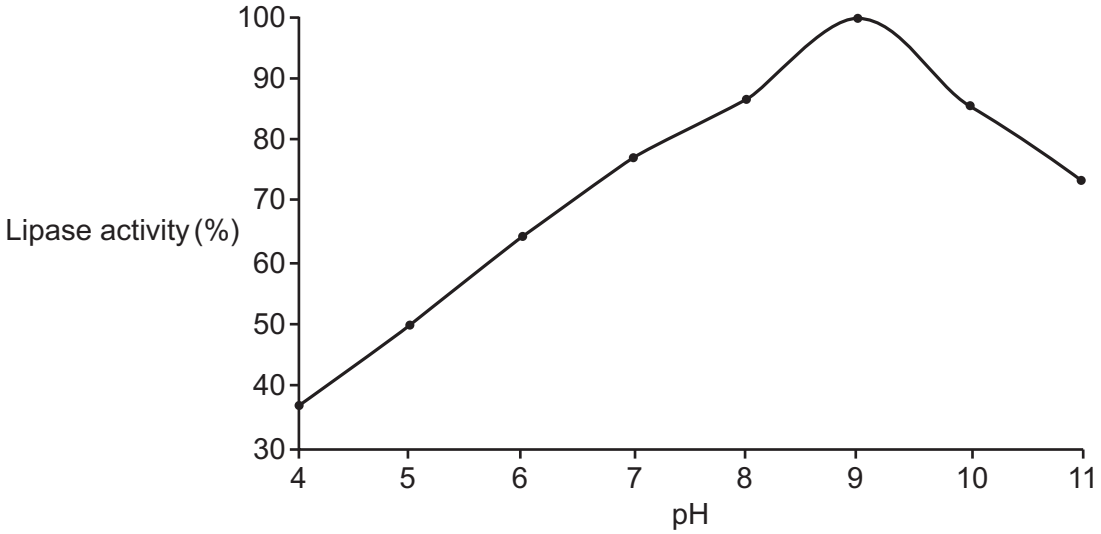
(a) What type of molecules are **Q** and **R**?

Molecule **Q** .....

Molecule **R** .....

[1]

(b) Look at the graph. It shows the effect of pH on the activity of lipase enzyme.



(i) Human lipase is **most** active in the small intestine.

The pH of the small intestine is pH7.5.

The lipase used to produce the results in the graph is **not** human lipase.

How can you tell this from the graph?

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

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(ii) The lock and key hypothesis can explain the pattern in the graph.

Explain the lock and key hypothesis for enzyme specificity.

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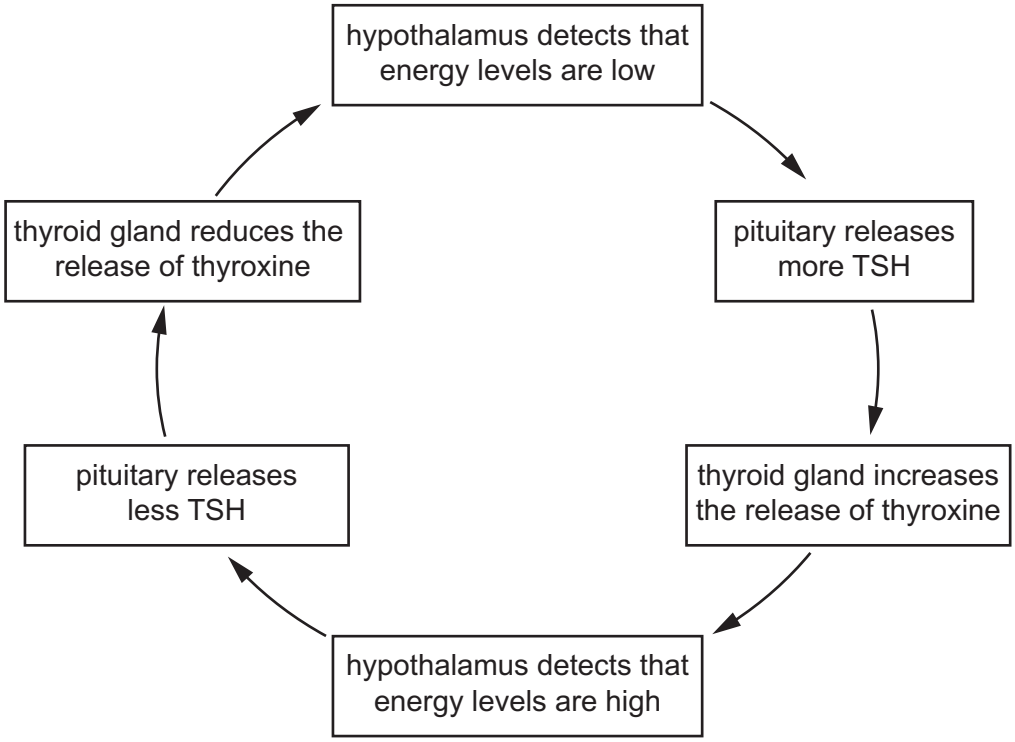
..... **[2]**

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16 This question is about hormones.

(a) The hormone thyroxine helps to control the amount of energy available to cells.

Look at the diagram. It shows how energy levels in the body are controlled.



Explain why controlling energy levels is an example of negative feedback.

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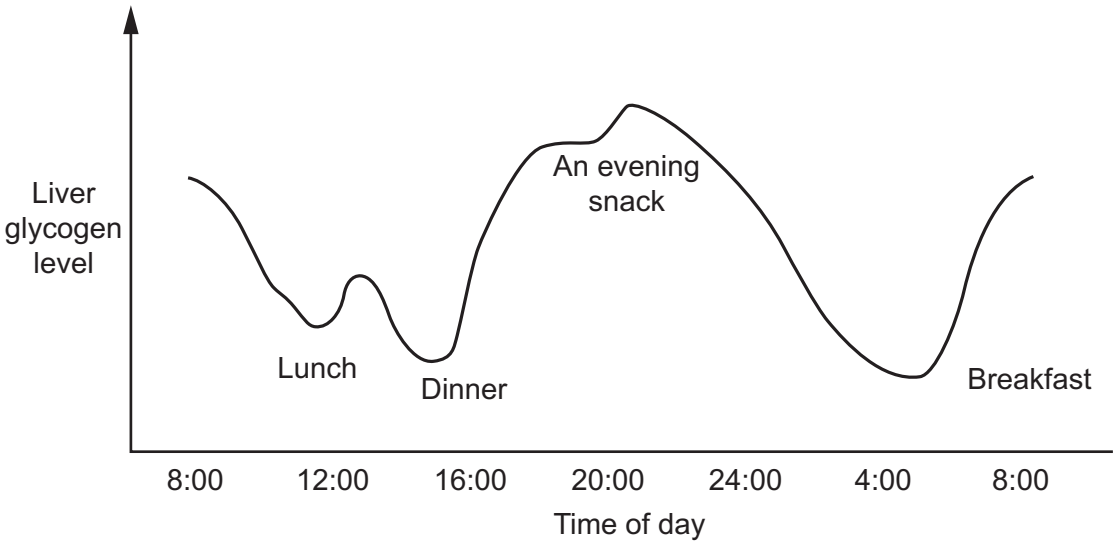
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..... **[2]**

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(b) Look at the graph.

It shows how the levels of glycogen stored in the liver changes during the day.



Explain the changes seen in the graph between **12:00** and **16:00**.

Include **named** hormones in your answer.

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..... **[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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