Oxford Cambridge and RSA

Tuesday 13 May 2025 – Afternoon

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

J250/07 Biology (Higher Tier)

Time allowed: 1 hour 10 minutes

H

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 | | | | | | 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 **20** pages.

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

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Section A

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

Write your answer to each question in the box provided.

1 What is the main source of **testosterone** in the human body?

A Adrenal glands

B Pancreas

C Pituitary gland

D Testes

Your answer ☐ **[1]**

2 Which substance has a net outward movement from plants during the day?

A Nitrates

B Nitrogen

C Oxygen

D Urea

Your answer ☐ **[1]**

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3 What is the definition of **resolution**?

A How large an image is compared to the object.

B The shortest distance apart that two objects can be and still be seen as separate objects.

C The magnification of an eyepiece and an objective lens multiplied together.

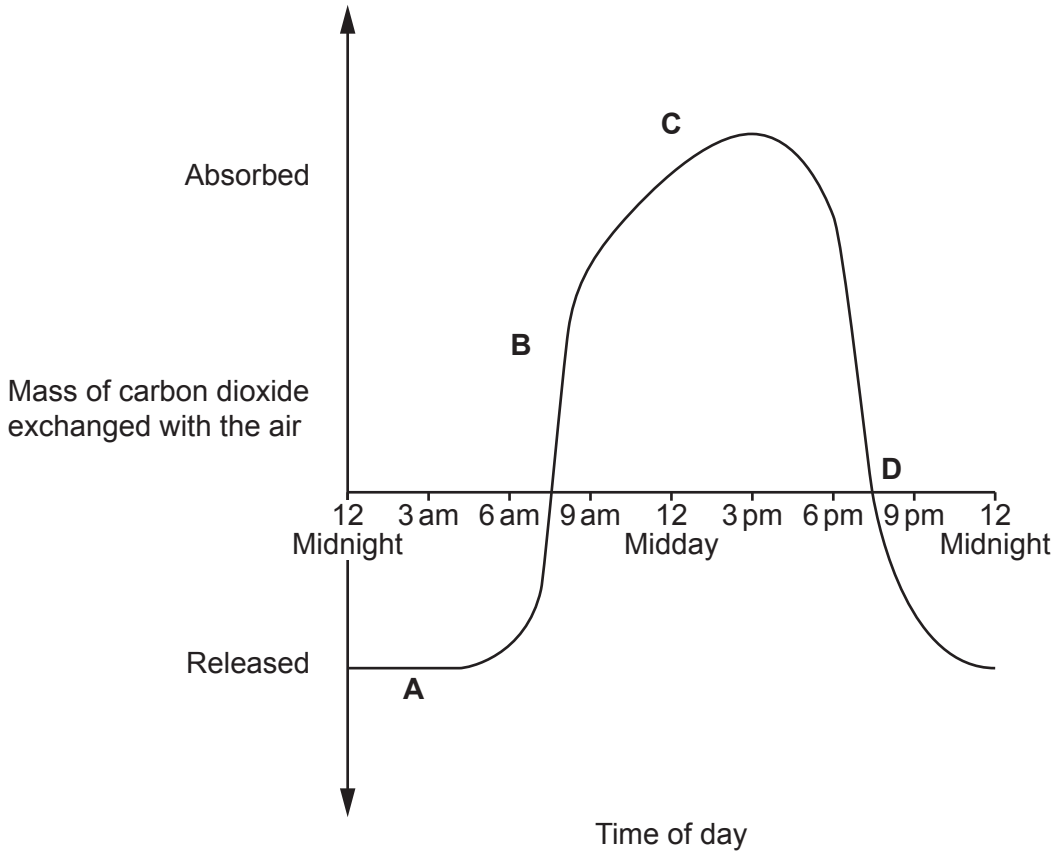
D The wavelength of light used to view an object.

Your answer ☐

[1]

4 The graph shows the mass of carbon dioxide exchanged by a plant with the air during 24 hours.

Which letter shows when the plant is respiring but **not** photosynthesising?



Your answer ☐

[1]

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5 Which statement describes the structure of DNA?

A A monomer made of one strand

B A monomer made of two strands

C A polymer made of one strand

D A polymer made of two strands

Your answer ☐ **[1]**

6 Which process do cells go through when they specialise?

A Differentiation

B Meiosis

C Mitosis

D Osmosis

Your answer ☐ **[1]**

7 A scientist is investigating the action of amylase enzymes on the digestion of starch into maltose.

What would **increase** the rate of reaction?

A Decreasing the enzyme concentration

B Decreasing the pH to 2

C Increasing the pH to 7

D Increasing the temperature to 70 °C

Your answer ☐ **[1]**

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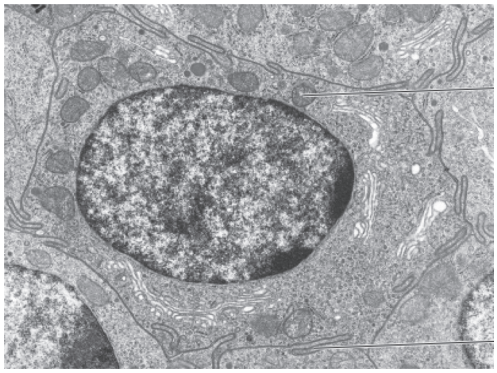
8 How is this image of a cell generated?



A Electron microscope

B Hand lens

C Light microscope

D X-ray machine

Your answer ☐

[1]

9 Which row correctly shows the role of glucagon?

	Effect on blood glucose concentration	**Effect on the liver**
A	decreases	increases breakdown of glycogen
B	decreases	increases take up of glucose
C	increases	increases breakdown of glycogen
D	increases	increases take up of glucose

Your answer ☐

[1]

10 Which sub-cellular structure is **not** found in eukaryotic cells?

A Chloroplast

B Nucleus

C Plasmid

D Ribosome

Your answer ☐

[1]

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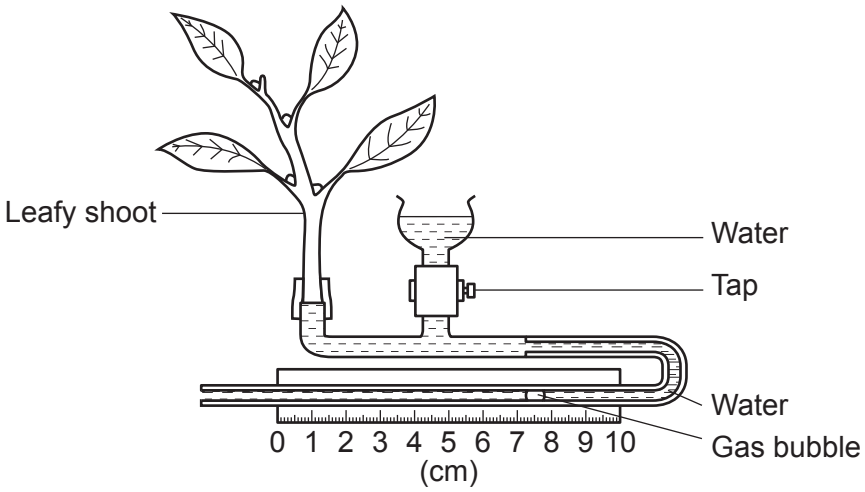
Section B

11 Plants need to move water and other molecules through their stems.

(a) A student uses this apparatus to estimate water uptake by a leafy shoot.



(i) State the name of this apparatus.

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

(ii) Describe how the student can use this apparatus to find the rate that the gas bubble moves in cm/minute.

.....

.....

.....

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

(iii) To find this estimate of water uptake in 10 minutes, the student took measurements for 60 minutes and divided their answer by 6.

Suggest why they did this.

.....

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

(iv) The student wanted to check the **reproducibility** of their results.

State **one** way that they could do this.

.....

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

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(v) The student wants to extend their experiment to investigate the effect of leaf area on the rate of water uptake.

Suggest how the student could measure the area of a leaf.

.....

.....

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

(b) The student then investigates the number of stomata on the upper and the lower surfaces of one of the leaves from the shoot.

The table shows their results.

	Number of stomata per mm^2 of leaf surface		
Leaf surface	**1st result**	**2nd result**	**3rd result**
Upper	28	26	33
Lower	47	48	52

Calculate the mean number of stomata on the **upper** surface.

Mean number of stomata = ... per mm^2 **[2]**

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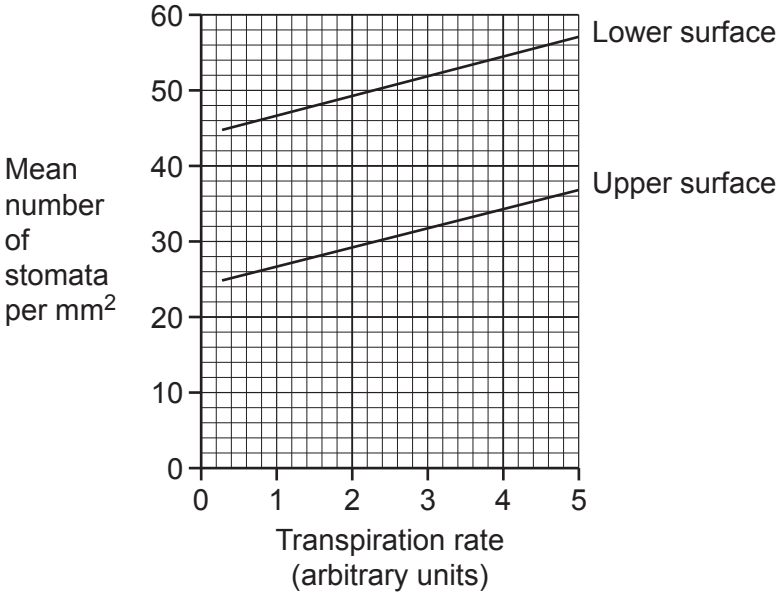
(c) The student then finds this graph as part of their investigation.

It shows the relationship between transpiration rate of plants and the mean number of stomata on the two surfaces of the leaves.



(i) The mean number of stomata on the lower surface of the student's leaf is 49 per mm^2.

Use this value and the graph to find the transpiration rate for this plant.

Transpiration rate = ... arbitrary units **[1]**

(ii) Suggest **two** conclusions that can be made from the trends shown in this graph.

1 .....

.....

2 .....

.....

[2]

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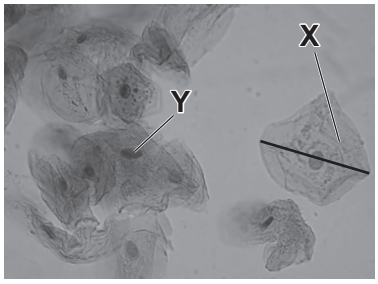
12 The image shows cheek cells magnified at 550×.

(a) Calculate the actual length of the cell marked **X**.

Use the line on the image.



Actual length = ... mm **[2]**

(b) State the function of the sub-cellular structure labelled **Y**.

.....

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

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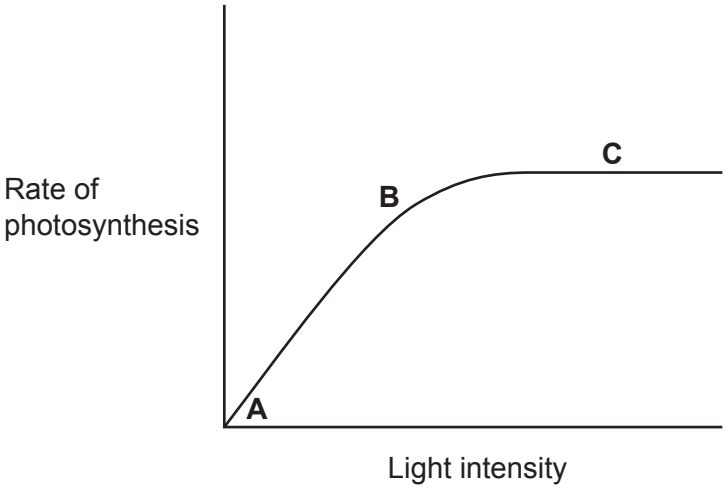
13

(a) Photosynthesis is affected by many factors.
The graph shows how the rate of photosynthesis in a plant is affected by varying light intensity.



Describe how light intensity affects the rate of photosynthesis.

Include how the graph changes from **A–B**, and **B–C**.

.....

.....

.....

.....

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

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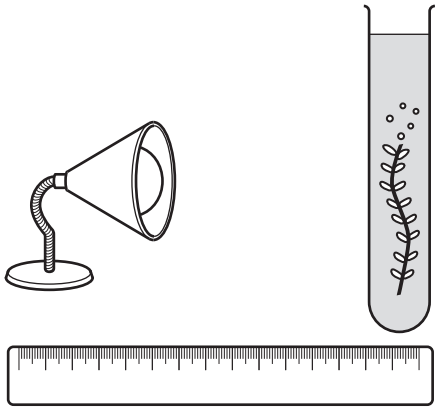
(b) A student set up the apparatus below to measure how light intensity affects the rate of photosynthesis in a pond plant.

Suggest **two** variables they should have controlled in their investigation.

Describe how they could have done this.



Variable 1 .....

This is controlled by .....

Variable 2 .....

This is controlled by .....

[2]

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14 Many biological processes involve enzymes.

(a) Explain how enzymes increase the rate of biological processes.

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

(b) Explain how temperature affects the progress of an enzyme-controlled reaction.

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

(c) Many lizards have a body temperature that matches the external temperature.

In the morning, these lizards often lie in the sun before they can become active and hunt.

Explain why they need to lie in the sun before they can hunt.

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

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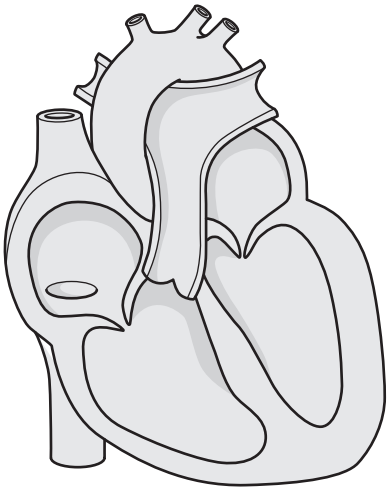
15 Many large multicellular organisms have a mass transport system to supply all cells with their requirements.

The diagram shows a mammal's heart.



(a) Explain how the **left ventricle** is adapted to carry out its function.

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.....

.....

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

(b) Explain why small organisms like amoeba do **not** need a transport system.

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.....

.....

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

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16 Animals produce coordinated responses when there are changes to their internal or external environments.

(a) An animal's nervous system is important in coordinating responses.

Put a tick (✓) next to any statements that correctly describe the functions of parts of an animal's nervous system.

Animal nervous system functions	
Effectors detect stimuli	
Motor neurones stimulate muscles	
Receptors stimulate sensory neurones	
Sensory neurones carry impulses away from the CNS	
Synapses physically connect neurones	

[2]

(b) Hormones are responsible for coordinating longer lasting responses.

Describe how low thyroxine levels would stimulate a response by the body.

Use the words in the list within your answer.

hypothalamus	**pituitary gland**	**TRH**	**TSH**

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

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(c)* IVF is a treatment some people use when they have difficulty getting pregnant.

This treatment involves the use of hormones involved in the menstrual cycle and eggs being fertilised by sperm in a laboratory.

Embryos are then transferred into a female's uterus.

This treatment has different results depending on age:

- females under 35 have a 32% success rate
- females aged 40–42 have an 11% success rate.

Name the hormones which are used in IVF treatment and explain their function.
Evaluate the effectiveness of using IVF treatment.

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

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17 Many substances move in and out of cells, maintaining the internal environment of the organism.

(a) State the name given to the type of transport where ions move against their concentration gradient.

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

(b) Water can move in and out of plant cells.

Potato chips can be used to demonstrate this type of transport.

The mass of three potato chips are measured at the start of the experiment and after 20 minutes in 3 different concentrations of sugar solution.

The table shows these results.

Concentration of solution (mol/cm^3)	**Starting mass (g)**	**Final mass (g)**	**Percentage change in mass (%)**
0.0	3.2	4.1	
0.2	3.4	3.8	11.8
0.5	3.3	2.8	–15.2

Calculate the percentage change in mass at $0.0\,mol/cm^3$.

Percentage change in mass = ... % **[2]**

(c) Explain the percentage change in mass shown by the potato chip in the $\mathbf{0.5\,mol/cm^3}$ solution.

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

END OF QUESTION PAPER

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EXTRA ANSWER SPACE

If you need extra space use these lined pages. You must write the question numbers clearly in the margin.

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