



Cambridge O Level

CANDIDATE NAME

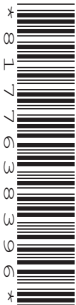


CENTRE NUMBER

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COMBINED SCIENCE

5129/22

Paper 2 Theory

October/November 2025

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [].
- The Periodic Table is printed in the question paper.

This document has **16** pages.





1 Table 1.1 contains sentences about nuclear division and reproduction.

Place a tick (✓) by **three** correct sentences.

Table 1.1

sentence	tick if correct
A gamete is a haploid cell.	
Most human cells contain 23 pairs of genes.	
Chromosomes contain DNA (deoxyribonucleic acid).	
Genes carry the codes for enzymes.	
All chromosomes carry the same number of genes.	
A gamete is produced by mitosis.	

[3]



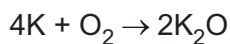
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2 (a) State the percentage of oxygen gas, O₂, in clean, dry air.

..... [1]

(b) Potassium metal, K, reacts with oxygen to form potassium oxide, K₂O.



The relative atomic masses, A_r, of potassium and oxygen are shown.

[A_r: K, 39; O, 16]

(i) Complete the following sentence.

7.8 g of potassium reacts with g of oxygen. [1]

(ii) Describe the electrical conductivity of oxygen and of potassium oxide.

oxygen

.....

potassium oxide

..... [2]

(iii) Potassium melts at 63.5 °C and boils at 759 °C.

Place a tick (✓) in the box next to the state of potassium at 810 °C.

Explain your choice.

solid liquid gas

explanation

..... [2]

[Total: 6]

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3 The mass of a toy rocket is 0.12 kg.

(a) Calculate the weight of the toy rocket.

Gravitational field strength $g = 10 \text{ N/kg}$.

weight = N [1]

(b) A student launches the rocket.

The rocket reaches a height of 100 m. It then falls back to the ground.

(i) State the acceleration of free fall.

acceleration of free fall = m/s^2 [1]

(ii) State the names of the **two** forces that act on the rocket as it falls.

..... and [2]

(iii) The force acting to slow the rocket is negligible at low speeds.

Calculate the speed of the rocket when it has fallen for 2 seconds from rest.

speed = m/s [1]

[Total: 5]

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4 Carbohydrates, fats and proteins are nutrients in food that are digested as the food passes along the digestive system from the mouth to the anus.

Fig. 4.1 shows the percentages of carbohydrates, fats and proteins which remain undigested in different parts of the digestive system.

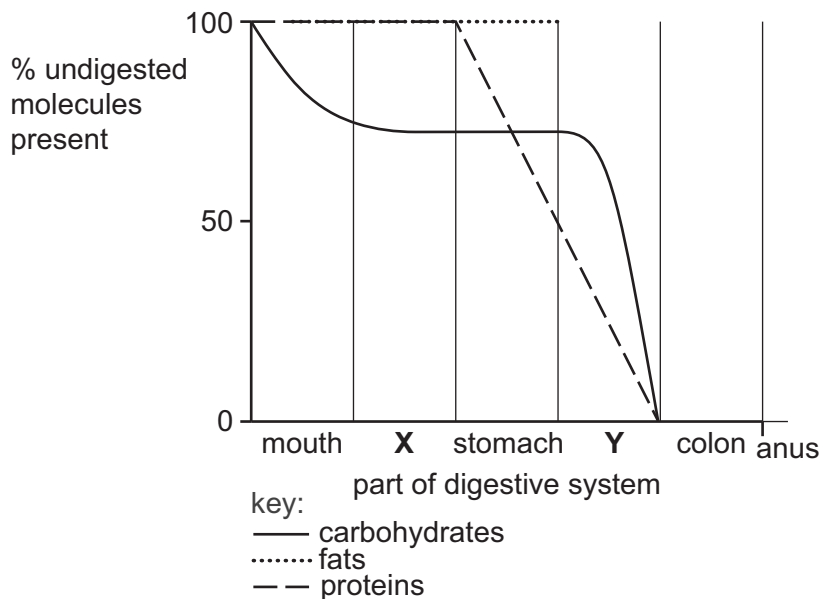


Fig. 4.1

(a) Name the parts of the digestive system labelled X and Y on Fig. 4.1.

X

Y

[2]

(b) (i) Use the information in Fig. 4.1 to name the nutrients that start being digested in the stomach.

..... [1]

(ii) Name the part of the digestive system where most of the digestion of carbohydrates takes place.

..... [1]

(iii) Explain why the digestion of carbohydrates is reduced in the stomach.

.....

..... [1]

(c) Describe what happens to the small nutrient molecules produced after the nutrients are digested.

.....

.....

..... [2]

[Total: 7]

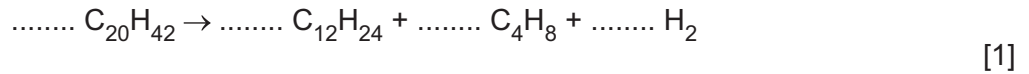


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5 (a) Hydrogen gas, H₂, can be produced by cracking icosane, C₂₀H₄₂.

(i) Balance the symbol equation for the reaction shown.



(ii) State two conditions for cracking.

condition 1
condition 2 [2]

(iii) State a use for hydrogen gas.

..... [1]

(b) Ethane and ethene can also be produced by the cracking of icosane.

Describe **one** similarity and **one** difference in the bonding in ethane and ethene.

similarity
.....
difference
..... [2]

[Total: 6]

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6 Fig. 6.1 shows apparatus used to determine the density of a liquid.

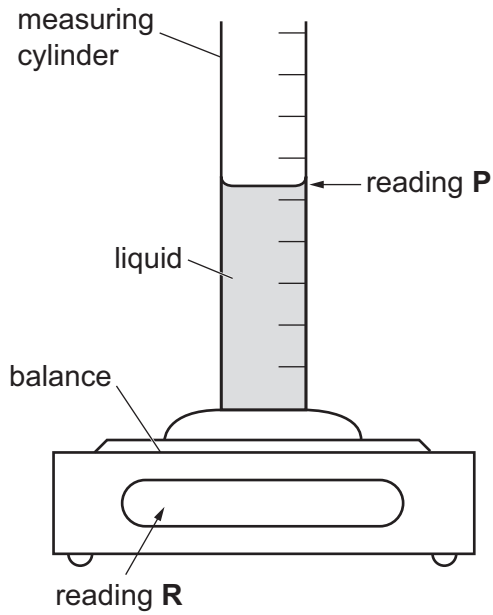


Fig. 6.1

(a) Reading P is 54 cm³.

Reading R is 49 g.

Calculate the density of the liquid.

Give your answer to 2 significant figures and state the unit.

density = unit [3]

(b) A small stone falls through the liquid in the measuring cylinder before coming to rest on the bottom.

Explain why work is done by the stone as it falls through the liquid.

.....

.....

..... [2]

[Total: 5]

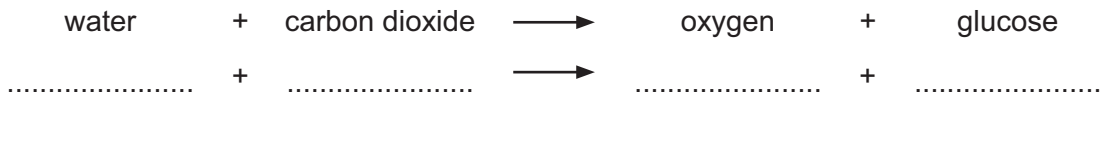


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7 Plants use photosynthesis to produce glucose.

(a) Write the balanced chemical equation for photosynthesis by completing the blanks under the word equation.



(b) Describe the role of chlorophyll in the process of photosynthesis.

.....

..... [2]

(c) Plants use some of the glucose made in photosynthesis as a source of energy and convert the rest of the glucose into other carbohydrates.

Complete Table 7.1 by stating the functions of these other carbohydrates.

Table 7.1

name of carbohydrate made from glucose	function of carbohydrate
cellulose
starch
sucrose

[3]

[Total: 7]



8 Table 8.1 shows five different chemical equations, labelled **V**, **W**, **X**, **Y** and **Z**.

Table 8.1

process	chemical equation
V	$2\text{NaI} + \text{Cl}_2 \rightarrow 2\text{NaCl} + \text{I}_2$
W	$2\text{CH}_4 + 3\text{O}_2 \rightarrow 2\text{CO} + 4\text{H}_2\text{O}$
X	$\text{KBr}(\text{aq}) + \text{AgNO}_3(\text{aq}) \rightarrow \text{AgBr}(\text{s}) + \text{KNO}_3(\text{aq})$
Y	$\text{CH}_4(\text{l}) \rightarrow \text{CH}_4(\text{s})$
Z	ethene \rightarrow poly(ethene)

State which equation, **V**, **W**, **X**, **Y** or **Z**, is an example of the type of change described in parts (a) to (e).

Each equation may be used once, more than once or not at all.

(a) a physical change

..... [1]

(b) a displacement reaction

..... [1]

(c) polymerisation

..... [1]

(d) a test for bromide ions

..... [1]

(e) incomplete combustion

..... [1]

[Total: 5]





9 (a) Describe how useful energy may be obtained from geothermal sources.

.....

.....

.....

..... [3]

(b) Describe **one** advantage of using geothermal sources to produce useful energy.

.....

..... [1]

[Total: 4]

10 The boxes on the left contain the names of components of blood.

The boxes on the right contain functions of components of blood.

Draw **one** straight line from each component to its function.

You must draw a total of **four** lines.

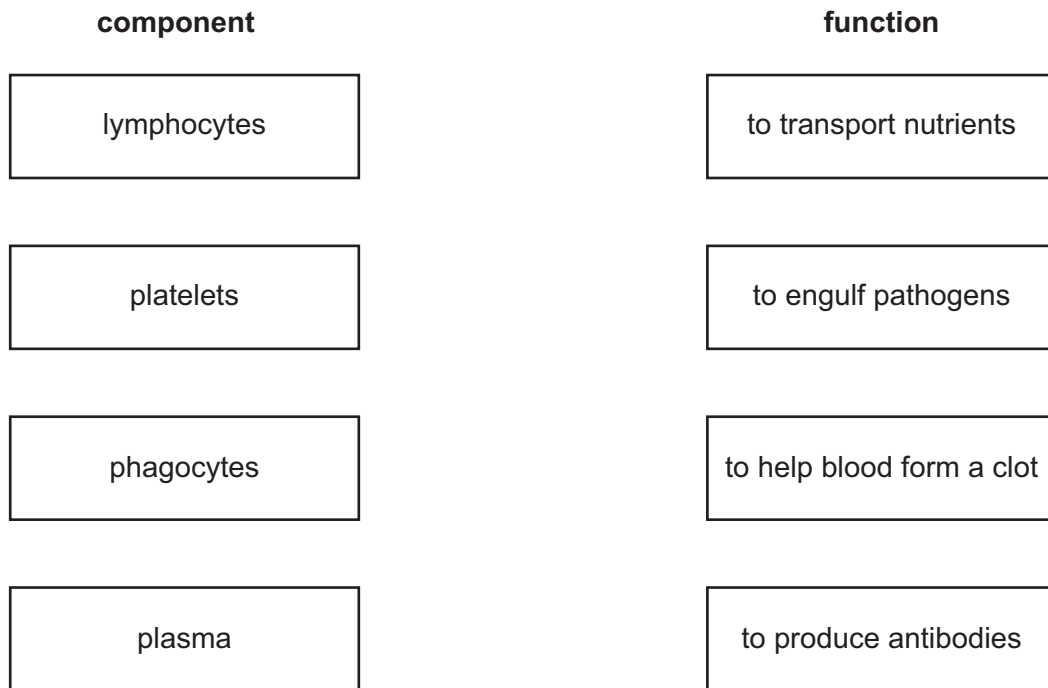


Fig. 10.1

[3]





11 Aluminium is a metal.

- (a) (i) Complete Fig. 11.1 by drawing the arrangement of **nine** atoms in solid aluminium in the box provided. One atom has been drawn for you.

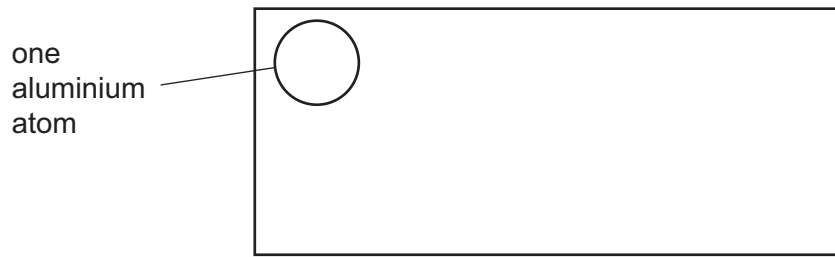


Fig. 11.1

[1]

- (ii) Describe the motion of aluminium atoms in solid aluminium.

.....

..... [1]

(b) Aluminium is used in electrical cables because it is a good conductor of electricity.

- (i) State **one** other use of aluminium.

..... [1]

- (ii) State **two** other general properties of metals.

property 1

property 2

[2]

[Total: 5]



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12 A small electric motor is connected in series with a resistor and a power supply as shown in Fig. 12.1.

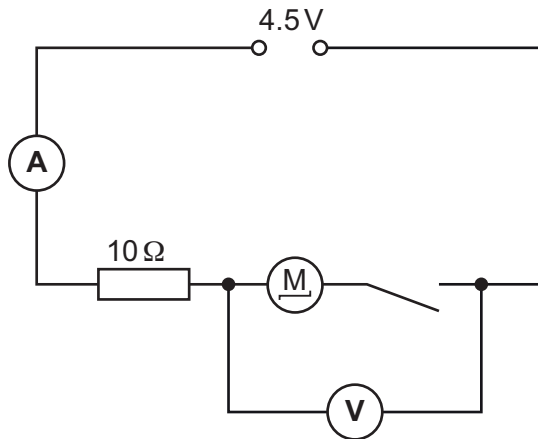


Fig. 12.1

(a) When the switch is closed, the reading on the voltmeter is 3.3V and the reading on the ammeter is 0.12A.

(i) Calculate the input power P to the motor.

$P = \dots\dots\dots$ W [1]

(ii) Show that the potential difference across the 10Ω resistor is 1.2V.

[1]

(iii) Show that the resistance in the motor and the resistance of the resistor have a combined total resistance of approximately 38Ω .

[3]

(b) An electric current that is too large will damage the motor.

State the name of a component that switches off the current in the circuit when it becomes too large.

..... [1]

[Total: 6]



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13 Fig. 13.1 shows a cross-section through a human heart.

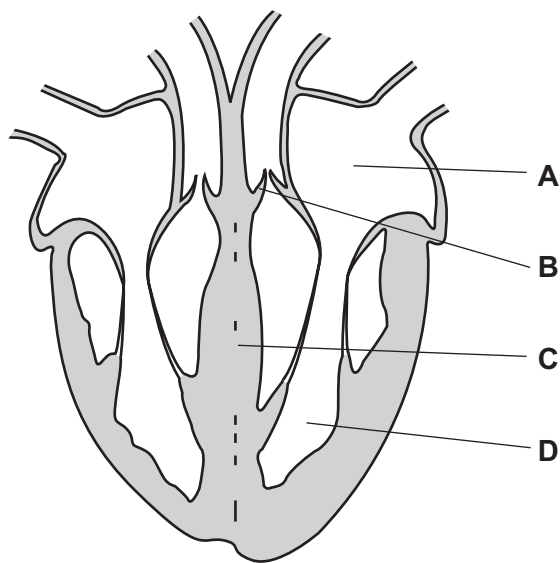


Fig. 13.1

(a) Complete Table 13.1 by inserting the names of the structures labelled **A**, **B**, **C** and **D** in Fig. 13.1.

Table 13.1

letter of structure in Fig. 13.1	name of structure
A
B
C
D

[4]

(b) By referring to the structures labelled **A**, **B**, and **D** on Fig 13.1, state **three** events which occur in the heart during one heartbeat.

1

.....

2

.....

3

.....

[3]

[Total: 7]

[Turn over



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14 A counter records the count rate of a radioactive source.

Fig. 14.1 shows the graph drawn from the results.

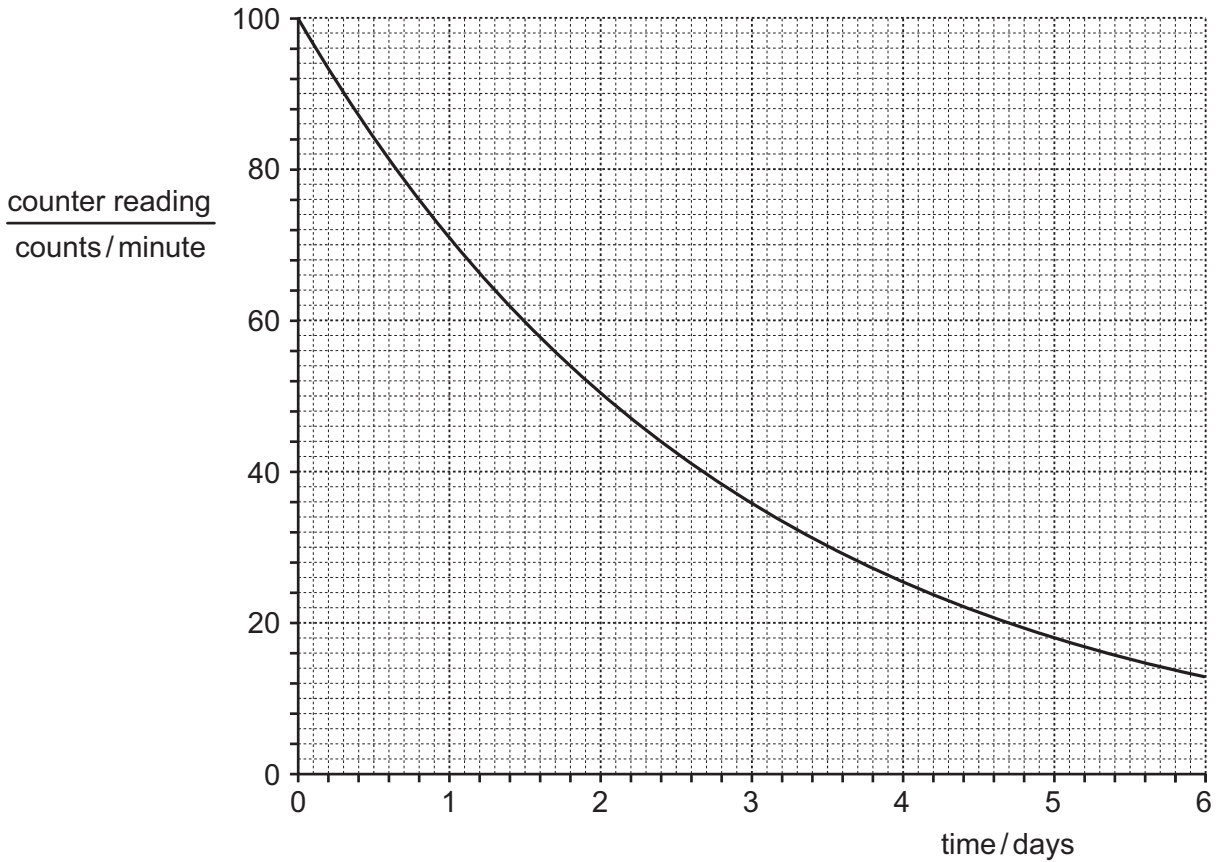


Fig. 14.1

(a) The time taken for the counter reading to halve is the half-life.

On Fig. 14.1, draw **one** horizontal line and **one** vertical line to show how the half-life of the radioactive source can be determined.

Record the value of the half-life determined using the lines that you have drawn.

half-life = days [2]

(b) Radioactive sources are used in smoke alarms.

State **two** other uses of radioactive sources.

- 1
 - 2
- [2]





(c) Describe **two** precautions for the safe handling of radioactive sources.

- 1
-
- 2
-

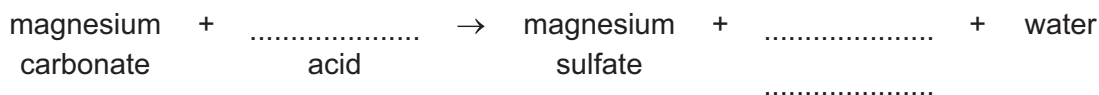
[2]

[Total: 6]

15 Magnesium carbonate is an insoluble solid.

A student reacts magnesium carbonate with an acid to form soluble magnesium sulfate.

(a) (i) Complete the word equation for the reaction.



[2]

(ii) The student uses an excess of magnesium carbonate to ensure that all the acid reacts.

Describe how the student makes a pure, dry sample of the magnesium sulfate from the reaction mixture.

-
-
- [2]

(b) State **one** way in which the rate of the reaction between magnesium carbonate and the acid can be decreased.

- [1]

[Total: 5]

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