



# Cambridge IGCSE™

## COMBINED SCIENCE

Paper 2 Multiple Choice (Extended)

0653/22

February/March 2025

45 minutes

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet  
Soft clean eraser  
Soft pencil (type B or HB is recommended)

### INSTRUCTIONS

- There are **forty** questions on this paper. Answer **all** questions.
- For each question there are four possible answers **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in soft pencil on the multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- Take the weight of 1.0 kg to be 9.8 N (acceleration of free fall =  $9.8 \text{ m/s}^2$ ).

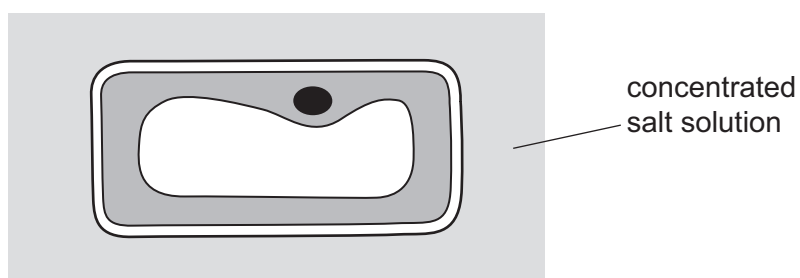
### INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages. Any blank pages are indicated.



- 1 Which characteristic of living organisms describes the taking in of materials for energy, growth and development?
- A excretion  
B nutrition  
C photosynthesis  
D respiration
- 2 Which structures are found in bacterial cells but **not** in animal cells?
- A cell membrane and plasmids  
B nucleus and cytoplasm  
C nucleus and ribosomes  
D plasmids and cell wall
- 3 The diagram shows a plant cell in a concentrated salt solution.

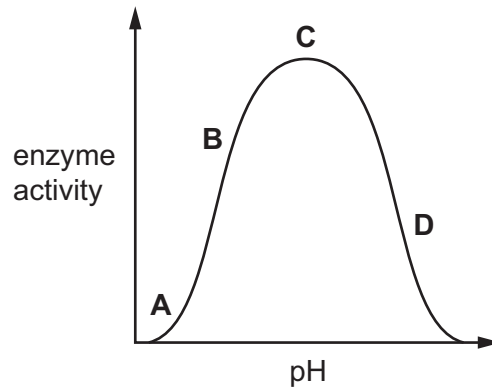


Which row shows the net movement of water molecules and the effect on the plant cell?

	net movement of water molecules	effect on the plant cell
A	out of cell	becomes turgid
B	out of cell	becomes flaccid
C	into cell	becomes turgid
D	into cell	becomes flaccid

- 4 The graph shows the effect of pH on the activity of an enzyme.

Which label shows where collisions between enzyme and substrate are the most effective?

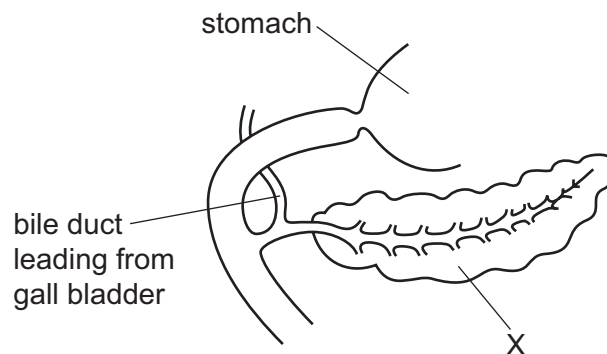


- 5 Carbon dioxide is needed for photosynthesis.

How many molecules of carbon dioxide are needed to make five molecules of glucose?

- A** 6                      **B** 12                      **C** 30                      **D** 36

- 6 The diagram shows part of the human digestive system.



Which row identifies structure X, an enzyme secreted by structure X and the action of this enzyme?

	structure X	enzyme	action of enzyme
<b>A</b>	liver	amylase	converts proteins to amino acids
<b>B</b>	pancreas	amylase	converts starch to simple sugars
<b>C</b>	liver	protease	converts proteins to amino acids
<b>D</b>	pancreas	protease	converts starch to simple sugars

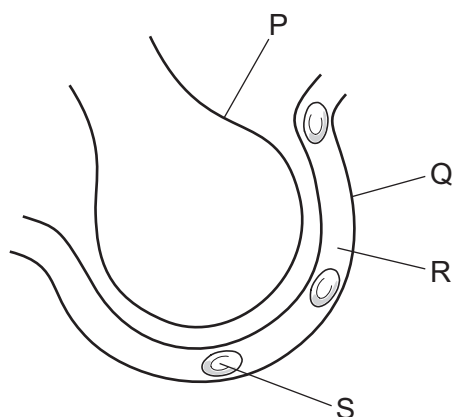
7 What is a function of the large surface area of root hair cells?

- A** to increase the uptake of mineral ions by active transport
- B** to increase the uptake of water by active transport
- C** to decrease the rate of transpiration by diffusion
- D** to decrease the uptake of oxygen by diffusion

8 Which row shows how blood is pumped out of the heart to the lungs?

	atria	ventricles
<b>A</b>	left atrium contracts	left ventricle relaxes
<b>B</b>	left atrium relaxes	left ventricle contracts
<b>C</b>	right atrium contracts	right ventricle relaxes
<b>D</b>	right atrium relaxes	right ventricle contracts

9 The diagram shows part of the breathing system.



Which row identifies structures P, Q, R and S?

	alveolus	capillary	plasma	red blood cell
<b>A</b>	P	Q	R	S
<b>B</b>	Q	R	S	P
<b>C</b>	R	S	P	Q
<b>D</b>	S	P	Q	R

10 Which molecule is broken down in aerobic respiration?

- A starch
- B glucose
- C glycogen
- D water

11 Which row describes structural adaptations of insect-pollinated and wind-pollinated flowers?

	insect-pollinated flowers	wind-pollinated flowers
<b>A</b>	the flowers have large, colourful petals	the anthers hang on long filaments outside the flower
<b>B</b>	the flowers have large, colourful sepals	the stigma is feathery and hangs outside the flower
<b>C</b>	the flowers have large, colourful petals	the anthers are on short filaments inside the flower
<b>D</b>	the flowers have large, colourful sepals	the stigma is sticky and is inside the flower

12 Which statement about consumers is correct?

- A They feed on other organisms to get their energy.
- B They make their own organic nutrients.
- C They only get their energy by feeding on producers.
- D They use energy from sunlight for photosynthesis.

13 Which methods can be used to conserve an endangered species?

- 1 captive breeding programmes
- 2 introducing a new species
- 3 monitoring species
- 4 protecting habitats

- A** 1, 2 and 3      **B** 1, 2 and 4      **C** 1, 3 and 4      **D** 2, 3 and 4

- 14 When a substance is heated, it absorbs energy and changes from a solid to a liquid.

Which statement explains how the absorbed energy causes the change from a solid to a liquid?

- A The energy decreases the average kinetic energy of the particles.
- B The energy increases the temperature of the substance.
- C The energy makes the particles move closer together.
- D The energy overcomes attractive forces between the particles.

- 15 Elements X and Y are among the first 20 elements in the Periodic Table.

Element Y has 9 more protons than X.

Which statement about these two elements **must** be correct?

- A They are both metallic elements.
- B They are in the same group of the Periodic Table.
- C They are in different periods of the Periodic Table.
- D The number of electrons in their outer shell differs by 9.

- 16 Which statement about sodium ions and chloride ions in sodium chloride is **not** correct?

- A They are strongly attracted to each other.
- B They both have noble gas electronic configurations.
- C They are arranged in a regular lattice.
- D They share pairs of electrons.

- 17 Which dot-and-cross diagram shows the outer-shell electrons in a molecule of carbon dioxide?

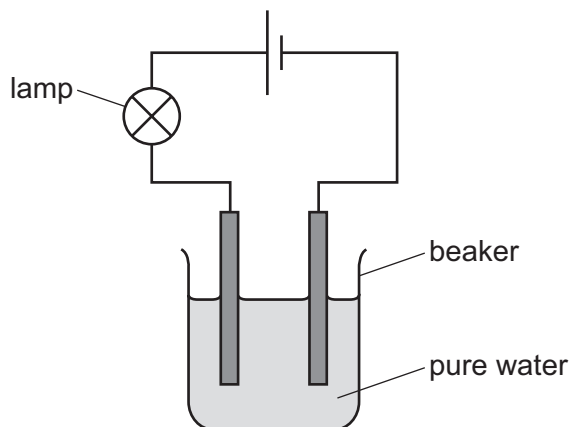


- 18 Calcium carbonate reacts with dilute hydrochloric acid to make calcium chloride, carbon dioxide and water.

What is the balanced symbol equation and correct state symbols for this reaction?

- A  $\text{CaCO}_3(\text{s}) + \text{HCl}(\text{aq}) \rightarrow \text{CaCl}_2(\text{aq}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$
- B  $\text{CaCO}_3(\text{s}) + \text{HCl}(\text{l}) \rightarrow \text{CaCl}_2(\text{s}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{aq})$
- C  $\text{CaCO}_3(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow \text{CaCl}_2(\text{aq}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$
- D  $\text{CaCO}_3(\text{s}) + 2\text{HCl}(\text{l}) \rightarrow \text{CaCl}_2(\text{s}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{aq})$

- 19 The apparatus shown is used to test a property of compound R.



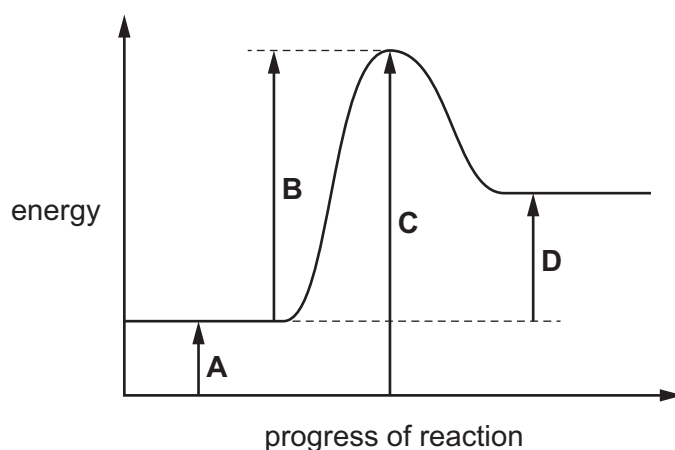
The lamp does **not** light when the beaker contains pure water.

When compound R is dissolved in the water, the lamp lights.

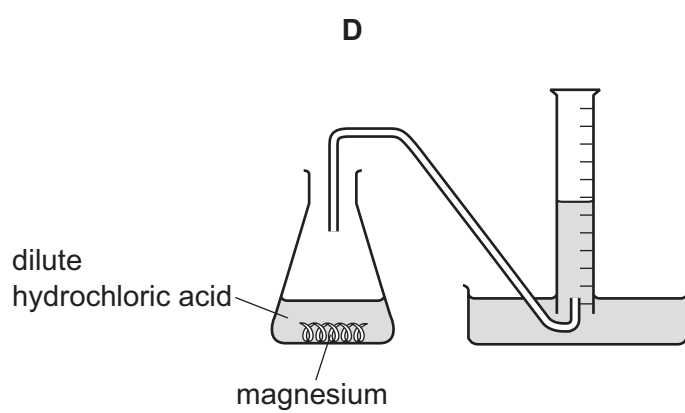
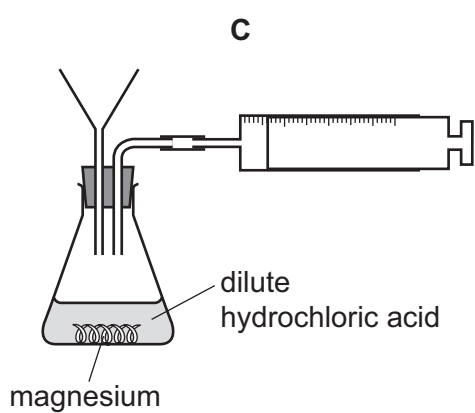
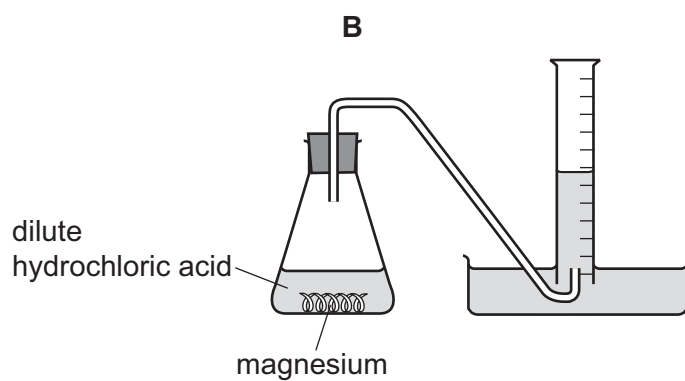
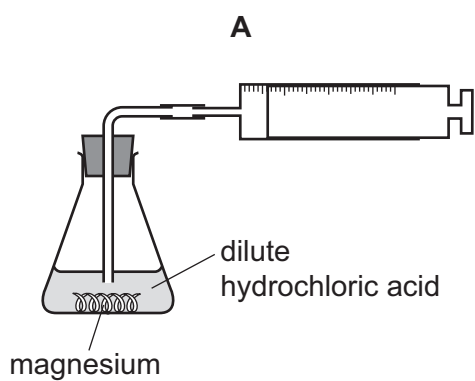
Which row describes compound R?

	type of bonding	elements of compound R
<b>A</b>	covalent	a metal and a non-metal
<b>B</b>	covalent	non-metals only
<b>C</b>	ionic	non-metals only
<b>D</b>	ionic	a metal and a non-metal

- 20 Which label represents the activation energy for an endothermic reaction?



- 21 Which diagram shows apparatus correctly assembled to determine the rate of reaction between magnesium and dilute hydrochloric acid?





- 22** Information about some elements in Group I, Group II and Group VII of the Periodic Table is shown.

Group I element melting point /°C	Group II element melting point /°C	Group VII element boiling point /°C
lithium = 181 potassium = 63	beryllium = 1278 calcium = 839	fluorine = -188 bromine = 59

A metal halide is formed when a metal in either Group I or Group II reacts with a Group VII element.

The metal has a melting point of 769 °C.

The Group VII element has a boiling point of -35 °C.

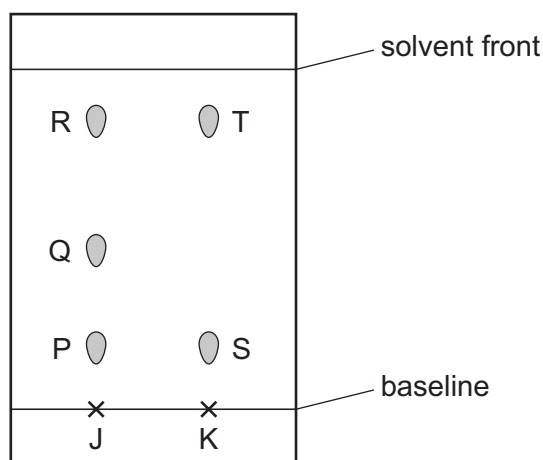
What is the metal halide?

- A** sodium chloride
  - B** sodium iodide
  - C** strontium chloride
  - D** strontium iodide
- 23** Which statement describes a chemical test for water?
- A** Water boils at 100 °C.
  - B** Water turns blue cobalt(II) chloride pink.
  - C** Water turns blue copper(II) sulfate white.
  - D** Water turns red litmus paper blue.

**24** Dyes J and K are analysed using chromatography.

Dye J contains coloured substances, P, Q and R.

Dye K contains coloured substances, S and T.



Which conclusions can be made using the chromatogram?

- 1 Dye K does **not** contain substance Q.
- 2 Dye J contains at least three substances.
- 3 The  $R_f$  of Q is less than the  $R_f$  of S.
- 4 R and T are different substances.

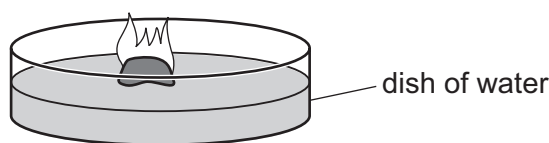
**A** 1 and 2      **B** 1 and 3      **C** 2 and 4      **D** 3 and 4

**25** Which tests are used to identify the ions in aqueous iron(II) sulfate?

- 1 add acidified aqueous silver nitrate
- 2 add acidified aqueous barium nitrate
- 3 add aqueous sodium hydroxide

**A** 1, 2 and 3      **B** 1 and 2 only      **C** 1 and 3 only      **D** 2 and 3 only

- 26 The diagram shows a solid element dropped into a dish of water. The element catches fire and burns with a lilac flame.



What is the element?

- A copper
- B lithium
- C potassium
- D sodium

- 27 Carbon dioxide is a greenhouse gas.

Which statements describe why carbon dioxide leads to increased global warming?

- 1 Carbon dioxide absorbs thermal energy from the Earth's surface.
- 2 Carbon dioxide reduces the loss of thermal energy into space.
- 3 Carbon dioxide dissolves in water to produce acid rain.

- A 1 and 2      B 1 and 3      C 1 only      D 3 only

- 28 On Earth, the acceleration of free fall is  $9.8 \text{ m/s}^2$ .

On Mars, the acceleration of free fall is  $3.7 \text{ m/s}^2$ .

The weight of a robot on Earth is 784 N.

The robot is taken to Mars.

What is the weight of the robot on Mars?

- A 21.6 N      B 212 N      C 296 N      D 784 N

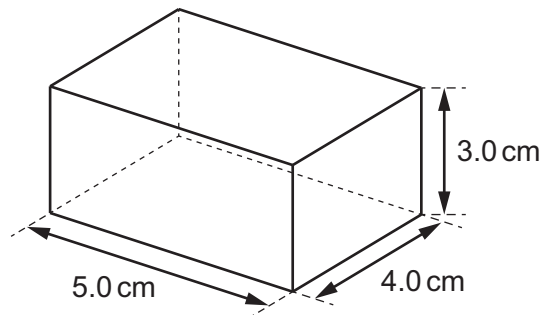
- 29 Four objects, P, Q, R and S, are moving.

The table shows the mass and speed of each object.

	mass / kg	speed m/s
P	1.0	4.0
Q	2.0	1.0
R	1.0	2.0
S	4.0	1.0

Which two objects have equal kinetic energies?

- A** P and R      **B** P and S      **C** Q and R      **D** R and S
- 30 The solid block shown is made of a metal with density  $7.0 \text{ g/cm}^3$ .



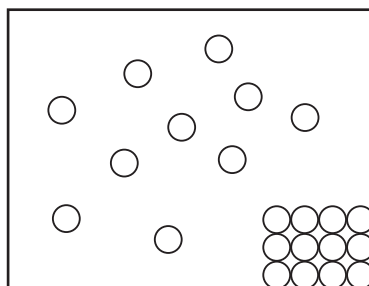
What is the mass of the block?

- A** 4.7 g      **B** 8.6 g      **C** 84 g      **D** 420 g
- 31 A liquid evaporates.
- Which particles leave the surface of the liquid and what happens to the temperature of the remaining liquid?
- A** The less energetic particles leave and the temperature increases.  
**B** The less energetic particles leave and the temperature decreases.  
**C** The more energetic particles leave and the temperature decreases.  
**D** The more energetic particles leave and the temperature increases.

32 Which statement explains why metals are good thermal conductors?

- A Metals contain delocalised electrons that are free to move.
- B Metal surfaces are shiny.
- C The distance between metal atoms increases when the metal is heated.
- D The nuclei of metal atoms are positively charged.

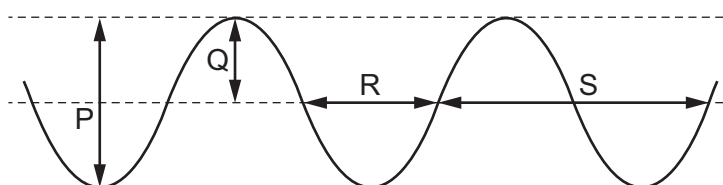
33 A student draws the diagram shown. The circles represent particles.



Which states of matter are represented in the diagram?

- A gas and liquid only
- B gas and solid only
- C liquid and solid only
- D gas, liquid and solid

34 The diagram represents a wave at one moment.



Which labelled arrows represent the amplitude and the wavelength of the wave?

	amplitude	wavelength
A	P	R
B	P	S
C	Q	R
D	Q	S

- 35** Which statement about longitudinal waves and transverse waves is correct?
- A** Longitudinal waves cannot travel in a vacuum, but some transverse waves can.
  - B** Transverse waves cannot travel in a vacuum, but some longitudinal waves can.
  - C** Particles in a transverse wave oscillate parallel to the direction of travel of the wave.
  - D** Particles in a longitudinal wave oscillate perpendicular to the direction of travel of the wave.
- 36** Which terms are used to describe the nature of sound waves in air?
- A** compressions and crests
  - B** compressions and rarefactions
  - C** crests and rarefactions
  - D** crests and troughs
- 37** What are the two types of electric charge?
- A** left and right
  - B** north and south
  - C** positive and negative
  - D** up and down
- 38** A charge of 12 C flows through a resistor in 5.0 minutes.
- What is the current in the resistor?
- A** 0.040 A      **B** 2.4 A      **C** 25 A      **D** 3600 A
- 39** A  $6.0\ \Omega$  resistor is connected in parallel with a  $12\ \Omega$  resistor.
- What is the combined resistance of the two resistors in parallel?
- A**  $0.25\ \Omega$       **B**  $4.0\ \Omega$       **C**  $18\ \Omega$       **D**  $72\ \Omega$
- 40** Which reaction releases energy in a stable star?
- A** combustion of hydrogen
  - B** combustion of methane
  - C** nuclear fission of helium
  - D** nuclear fusion of hydrogen

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