Cambridge Assessment International Education

Cambridge IGCSE™

CO-ORDINATED SCIENCES **0654/23**

Paper 2 Multiple Choice (Extended) **May/June 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

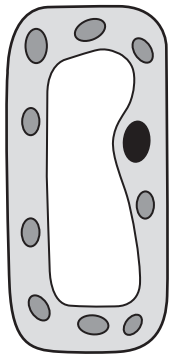
- There are **forty** questions on this paper. Answer **all** questions.
- For each question there are four possible answers **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in soft pencil on the multiple choice answer sheet.
- Follow the instructions on the 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 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 The diagram shows an incomplete plant cell.



Which structure is **not** shown?

A nucleus

B cell wall

C chloroplast

D vacuole

2 Which row describes the diffusion of molecules from P to Q?

	P	Q	movement
A	higher concentration	lower concentration	down a concentration gradient
B	higher concentration	lower concentration	up a concentration gradient
C	lower concentration	higher concentration	down a concentration gradient
D	lower concentration	higher concentration	up a concentration gradient

3 What is a characteristic of enzymes?

A act as catalysts

B made from fatty acids

C turn Benedict's solution red when heated

D physically digest food

4 Which row shows the parts of the alimentary canal where the enzymes amylase, lipase and protease are secreted?

	mouth	small intestine	stomach
A	amylase	protease	amylase
B	amylase	lipase	protease
C	protease	protease	lipase
D	protease	lipase	lipase

5 More stomata are found on the lower surfaces of leaves than on the upper surfaces of leaves.

A student puts petroleum jelly on the surfaces of four leaves.

- One leaf has petroleum jelly on the upper surface.
- One leaf has petroleum jelly on the lower surface.
- One leaf has petroleum jelly on both surfaces.
- One leaf has petroleum jelly on neither surface.

The leaves are weighed and left in the air for one week before being weighed again.

The percentage decrease in mass of each of the leaves is shown in the table.

leaf	percentage decrease in mass
W	45
X	12
Y	17
Z	42

Which leaf has petroleum jelly on its lower surface only?

A W **B** X **C** Y **D** Z

6 What reduces the risk of suffering from coronary heart disease?

1 exercise

2 low fat diet

3 high salt diet

4 smoking

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

7 What is the role of glucagon?

A decrease blood glucose

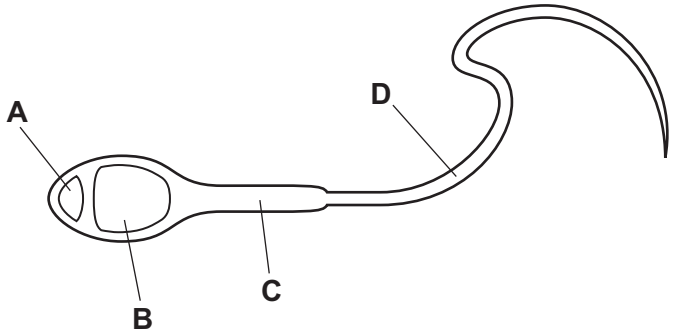
B decrease blood insulin

C increase blood glucose

D increase blood insulin

8 The diagram shows a sperm cell.

Which structure contains enzymes to digest the outer jelly layer of an egg cell?



9 Kangaroos have 16 chromosomes in their skin cells.

How many chromosomes are there in a kangaroo sperm cell?

A 4 **B** 8 **C** 16 **D** 32

10 Which characteristic is an example of discontinuous variation?

A body height

B body mass

C blood group

D hand span

11 A food chain is shown.

plant → insect → mouse → snake → eagle

Which statements are correct for this food chain?

1 The eagle is a tertiary consumer.

2 The insect is at trophic level 1.

3 The mouse is a secondary consumer.

4 The plant is a producer.

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

12 Which row shows a cause and an effect that results from deforestation?

	cause	effect
A	fewer tree roots	decrease in flooding
B	fewer tree leaves respire	increase in carbon dioxide
C	fewer tree roots	decrease in soil erosion
D	fewer habitats	increase in extinctions

13 During physical activity, the rate and depth of breathing increases.

This increase in breathing is caused by the detection of an increase in carbon dioxide concentration.

Which row describes this detection?

	location where increase is detected	organ that detects the increase
A	alveoli	brain
B	alveoli	lungs
C	blood	brain
D	blood	lungs

14 Atoms of element X have 11 nucleons and 6 neutrons.

What is element X?

A boron

B carbon

C chlorine

D sodium

15 Which statement explains why isotopes of the same element have the same properties?

A They have equal numbers of protons and electrons.

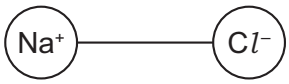
B They have the same number of electrons in their outer shell.

C They have the same number of protons.

D They have the same number of electron shells.

16 Which diagram represents the structure of sodium chloride, NaCl?

A



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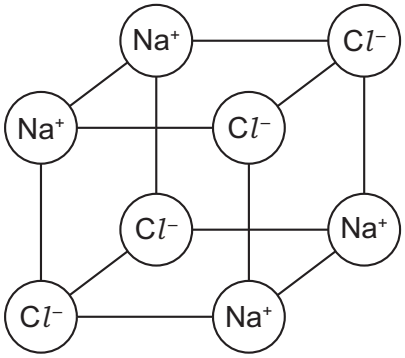

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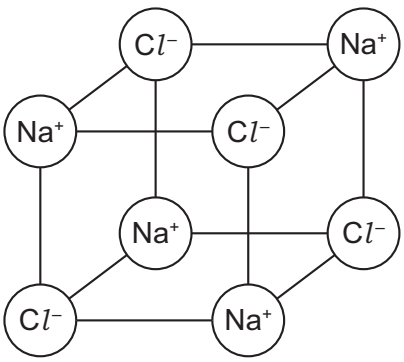

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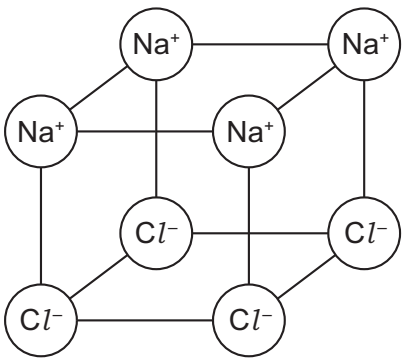


17 Limestone contains calcium carbonate, $CaCO_3$.

It is used to neutralise nitric acid, HNO_3.

What is the balanced ionic equation for the reaction between calcium carbonate and nitric acid?

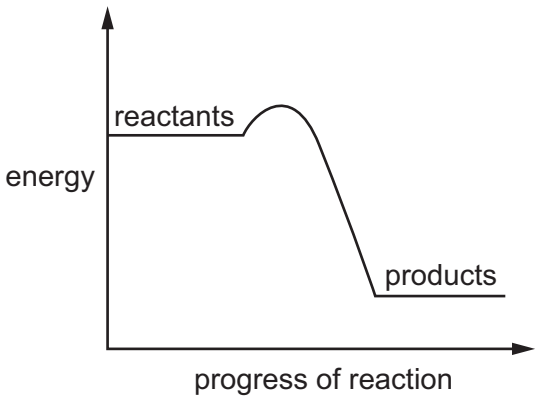
A $Ca^{2+} + CO_3^{2-} + H^+ + NO_3^- \rightarrow CaNO_3 + H_2O + CO_2$

B $Ca^{2+} + CO_3^{2-} + 2H^+ + 2NO_3^- \rightarrow Ca(NO_3)_2 + H_2O + CO_2$

C $CO_3^{2-} + 2H^+ \rightarrow H_2O + CO_2$

D $CaCO_3 + 2HNO_3 \rightarrow Ca(NO_3)_2 + H_2O + CO_2$

18 A reaction pathway diagram for a reaction is shown.



Which reactions have a reaction pathway diagram like the one shown?

1 $C + O_2 \rightarrow CO_2$

2 $CaCO_3 \rightarrow CaO + CO_2$

3 $2C_3H_6 + 9O_2 \rightarrow 6CO_2 + 6H_2O$

4 $H_2O(l) \rightarrow H_2O(g)$

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

19 Solid P reacts with dilute acid.

Which change in reaction conditions increases both the frequency of particle collisions and the number of colliding particles that have the minimum energy needed to react?

A Decrease the particle size of solid P.

B Increase the concentration of the acid.

C Increase the surface area of solid P.

D Increase the temperature of the reaction.

20 Zinc sulfate is made by adding zinc oxide to dilute sulfuric acid.

The steps used to obtain zinc sulfate crystals are listed.

1 Filter the solution to remove excess zinc oxide.

2 Warm the zinc sulfate solution.

3 Add excess zinc oxide and stir.

4 Filter and dry the crystals.

What is the correct order of the steps?

A $1 \rightarrow 3 \rightarrow 4 \rightarrow 2$

B $2 \rightarrow 1 \rightarrow 3 \rightarrow 4$

C $3 \rightarrow 1 \rightarrow 2 \rightarrow 4$

D $3 \rightarrow 2 \rightarrow 1 \rightarrow 4$

21 Which property of aluminium explains why it is used to manufacture parts for aircraft?

A high melting point

B ductile

C good electrical conductivity

D low density

22 Which element is used to extract some metals from their ores?

A carbon

B copper

C iron

D nitrogen

23 Which row shows the conditions that each turn a sample of white copper(II) sulfate blue?

	add water	heat
A	✗	✗
B	✗	✓
C	✓	✓
D	✓	✗

24 Which two processes are used to treat the domestic water supply?

A chlorination and evaporation

B chlorination and filtration

C crystallisation and evaporation

D crystallisation and filtration

25 Which processes add carbon dioxide to the air?

1 complete combustion of ethanol

2 displacement of copper from aqueous copper(II) sulfate

3 reaction of dilute hydrochloric acid with magnesium

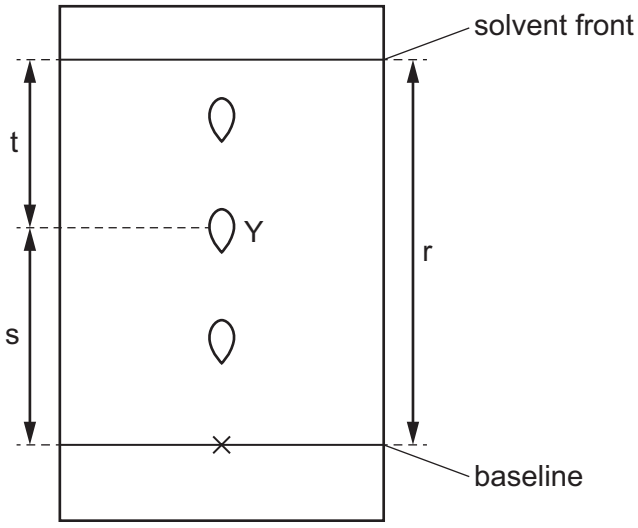
4 reaction of dilute sulfuric acid with copper carbonate

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

26 A chromatography experiment is performed on a coloured solution.

The solution contains substance Y.

The chromatogram is shown.



How is the R_f value of substance Y calculated?

A r ÷ s **B** s ÷ r **C** s ÷ t **D** t ÷ s

27 Three processes are listed.

1 cracking of hydrocarbons

2 combustion of methane

3 reaction of magnesium with steam

Which processes produce hydrogen?

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

28 An object of mass 2.0 kg is taken from planet W to Jupiter.

The gravitational field strength on planet W is 10 N / kg.

The gravitational field strength on Jupiter is 25 N / kg.

By which factor does the weight of the object change when the object is on planet W compared to when it is on Jupiter?

A ×0.040 **B** ×2.5 **C** ×5.0 **D** ×250

29 An object X with mass 2.0 kg is moving with a speed of 4.0 m / s.

Object Y has kinetic energy equal to that of object X.

Which row shows the mass and the speed of object Y?

	mass of object Y / kg	speed of object Y / m / s
A	0.50	16
B	1.0	8.0
C	8.0	2.0
D	16	1.0

30 Which material is a good thermal conductor?

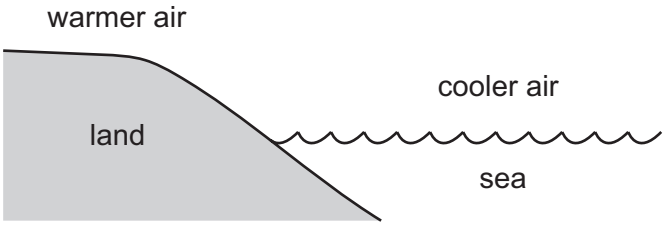
A aluminium

B cardboard

C rubber

D wool

31 At the coast on a hot day, the air above the land is warmer than the air above the sea. This causes a convection current. The convection current causes a gentle wind.



Which row describes the density of the air above the land and the direction of the wind?

	density of air above land	direction of wind
A	greater than above sea	from land to sea
B	greater than above sea	from sea to land
C	less than above sea	from land to sea
D	less than above sea	from sea to land

32 An image of an object is formed by a plane mirror. The image formed is virtual.

Which statement describes what is meant by a virtual image?

A The reflected rays do not meet where the image is formed.

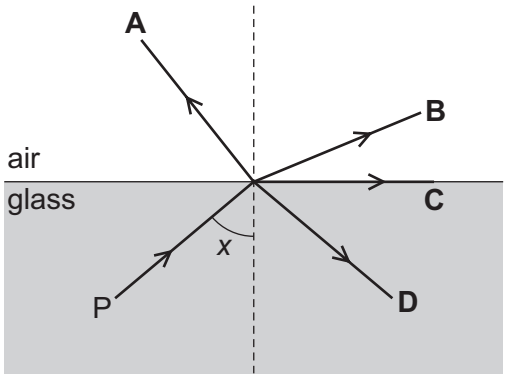
B The image is formed directly opposite the object.

C The image is the same distance from the mirror as the distance of the object from the mirror.

D The angle of incidence is equal to the angle of reflection.

33 The diagram shows a ray of light travelling in glass from point P towards a glass–air boundary. Angle *x* is greater than the critical angle.

In which labelled direction does the ray continue?



34 Which row describes all electromagnetic waves?

	type of wave	approximate speed in a vacuum / m/s
A	longitudinal	300
B	longitudinal	300 million
C	transverse	300
D	transverse	300 million

35 An iron bar is placed within the magnetic field of a permanent magnet.

What happens to the iron bar?

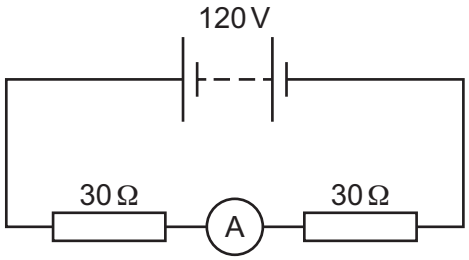
A It becomes an induced permanent magnet.

B It becomes an induced temporary magnet.

C It becomes negatively charged.

D It becomes positively charged.

36 The diagram shows two 30 Ω resistors and an ammeter connected to a 120 V battery.



What is the reading on the ammeter?

A 0.25 A **B** 0.50 A **C** 2.0 A **D** 4.0 A

37 There is a current of 0.50 A in a lamp when the potential difference (p.d.) across the lamp is 12 V.

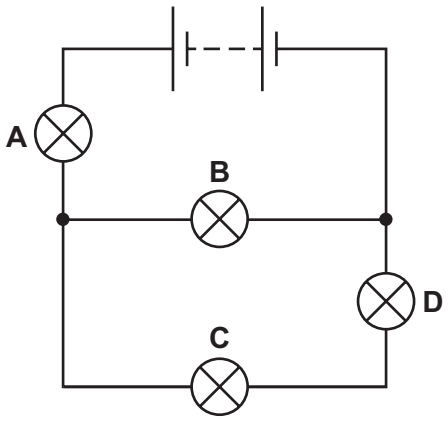
How much time does it take for the lamp to transfer 100 J of energy?

A 0.060 s **B** 4.2 s **C** 17 s **D** 600 s

38 The circuit shown includes a battery and four lamps. All the lamps are on.

One lamp fails and all the lamps go off.

Which lamp failed?



39 A radioisotope decays by the emission of an alpha (α)-particle.

What is lost by the nucleus as it decays?

A one proton and one neutron only

B one proton, one neutron and one electron

C two protons and two neutrons only

D two protons, two neutrons and two electrons

40 Which gases make up most of the Sun and in which regions of the electromagnetic spectrum does the Sun mostly radiate its energy?

	gases	electromagnetic regions
A	hydrogen and helium	infrared, visible, ultraviolet
B	hydrogen and helium	visible, ultraviolet, X-rays
C	methane and helium	infrared, visible, ultraviolet
D	methane and helium	visible, ultraviolet, X-rays

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The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	VIII
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
11 Na sodium 23	12 Mg magnesium 24											13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium –	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium –	85 At astatine –	86 Rn radon –
87 Fr francium –	88 Ra radium –	89–103 actinoids	104 Rf rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –	113 Nh nihonium –	114 Fl flerovium –	115 Mc moscovium –	116 Lv livermorium –	117 Ts tennessine –	118 Og oganesson –

Key

atomic number
atomic symbol
name
relative atomic mass

lanthanoids	57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium –	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
actinoids	89 Ac actinium –	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium –	94 Pu plutonium –	95 Am americium –	96 Cm curium –	97 Bk berkelium –	98 Cf californium –	99 Es einsteinium –	100 Fm fermium –	101 Md mendelevium –	102 No nobelium –	103 Lr lawrencium –

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).