Cambridge Assessment International Education

Cambridge IGCSE™

COMBINED SCIENCE **0653/22**

Paper 2 Multiple Choice (Extended) **May/June 2024**

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.

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.

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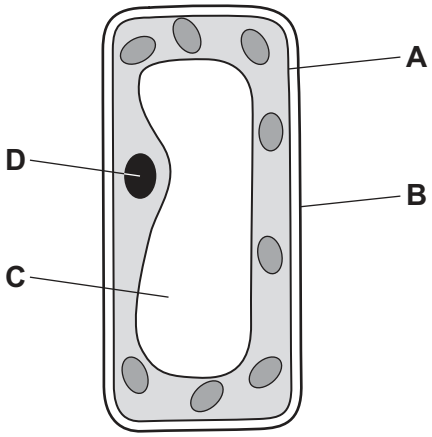
1 The diagram shows a typical plant cell.

Which part of the cell controls the movement of materials into and out of the cell?



2 Molecules can move from one area to another by diffusion.

Which statement applies to diffusion?

A A partially permeable membrane is needed for diffusion to happen.

B Diffusion can only happen when a substance is in solution in water.

C Molecules can only enter or leave living cells by diffusion.

D Molecules move by diffusion down a concentration gradient.

3 Biological catalysts speed up reactions.

What is another name for biological catalysts?

A antibodies

B enzymes

C fatty acids

D hormones

4 Which row is correct for photosynthesis in a leaf?

	substrates	products	cells where photosynthesis occurs
A	$C_6H_{12}O_6 + 6O_2$	$6H_2O + 6CO_2$	palisade mesophyll
B	$C_6H_{12}O_6 + 6O_2$	$6H_2O + 6CO_2$	upper epidermis
C	$6H_2O + 6CO_2$	$C_6H_{12}O_6 + 6O_2$	palisade mesophyll
D	$6H_2O + 6CO_2$	$C_6H_{12}O_6 + 6O_2$	upper epidermis

5 Which type of molecule is starch?

A carbohydrate

B fat

C protein

D vitamin

6 Chemical digestion starts in the mouth and continues throughout the length of the alimentary canal.

What is a sequence of three organs in the alimentary canal where chemical digestion occurs?

A oesophagus → gall bladder → liver

B oesophagus → stomach → small intestine

C small intestine → gall bladder → large intestine

D small intestine → stomach → oesophagus

7 How are mineral ions transported around the human body?

A attached to antibodies

B attached to haemoglobin

C dissolved in blood plasma

D inside blood platelets

8 Which row correctly lists the features of a gas exchange surface in animals?

	large surface area	thin surface	good blood supply	good ventilation with air
A	✓	✓	✗	✗
B	✓	✗	✓	✗
C	✗	✓	✓	✗
D	✓	✓	✓	✓

key

✓ = present

✗ = absent

9 When the hormone adrenaline is released in humans it causes changes in breathing rate and pupil size.

What are the correct changes?

	breathing rate	pupil size
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

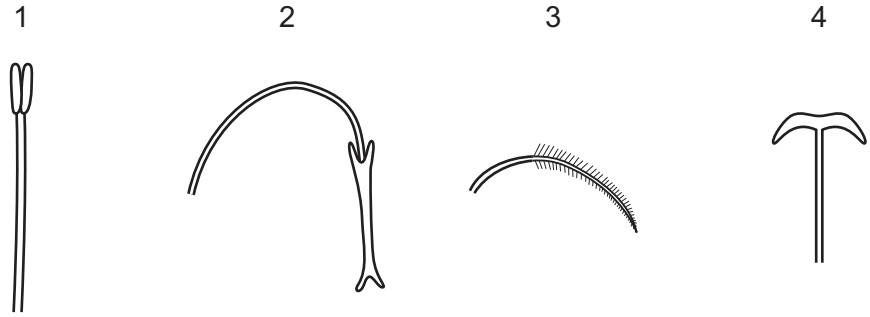
10 The table shows some possible tropic responses in a plant.

	part of plant	direction of growth response to	
		gravity	light (from one direction)
1	root	away	towards
2	root	towards	away
3	shoot	away	towards
4	shoot	towards	away

What are the correct tropic responses for gravitropism and phototropism?

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

11 Which row shows the anther and stigma of an insect-pollinated flower?



	insect-pollinated anther	insect-pollinated stigma
A	1	2
B	1	4
C	4	1
D	4	3

12 What gives the human embryo protection from mechanical shock?

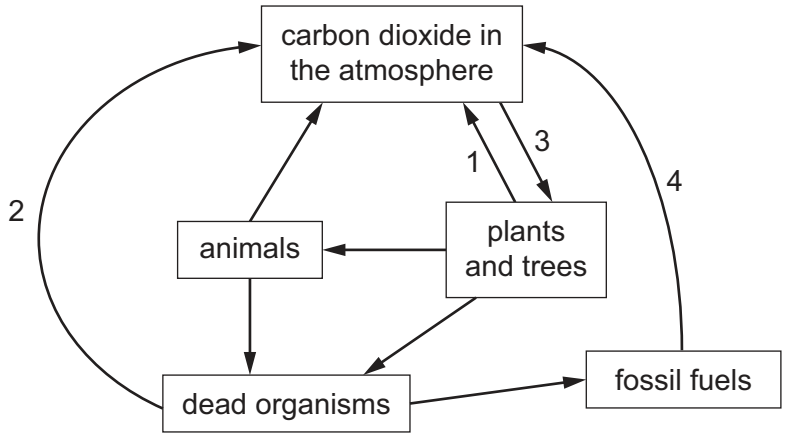
A amniotic fluid

B cervix

C placenta

D umbilical cord

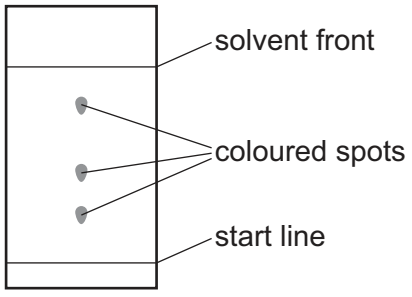
13 The diagram shows part of the carbon cycle.



Which arrows represent decomposition and combustion?

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

14 The diagram shows a chromatogram of an ink sample after separation by paper chromatography.



Which calculation is used to determine the R_f value of a coloured spot on the chromatogram?

A $$\frac{\text{distance travelled by the solvent from the start line}}{\text{distance travelled by the spot from the start line}}$$

B $$\frac{\text{distance travelled by the spot from the start line}}{\text{distance travelled by the solvent from the start line}}$$

C $$\frac{\text{distance from the bottom of the chromatography paper to the spot}}{\text{distance from the bottom to the top of the chromatography paper}}$$

D $$\frac{\text{distance from the bottom to the top of the chromatography paper}}{\text{distance from the bottom of the chromatography paper to the spot}}$$

15 White solid X is formed when magnesium reacts with oxygen.

What is X?

A a compound

B a mixture

C an alloy

D an element

16 Which statement describes the formation of ions when two different atoms combine?

A The two atoms share a pair of electrons.

B Both atoms lose electrons.

C Both atoms gain electrons.

D One atom gains electrons and one loses electrons.

17 A solution of barium chloride reacts with dilute sulfuric acid to form a precipitate.

What is the ionic equation for this reaction?

A $Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(aq)$

B $Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(s)$

C $BaCl_2(s) + H_2SO_4(aq) \rightarrow BaSO_4(aq) + 2HCl(aq)$

D $Ba^{2+}(aq) + 2Cl^{-}(aq) + 2H^{+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(s) + 2HCl(aq)$

18 Dilute sulfuric acid is electrolysed using platinum electrodes.

Which statements about this electrolysis are correct?

1 Water is broken down to give hydrogen and oxygen.

2 Water is covalent but the solution conducts electricity because it contains equal concentrations of H^+ ions and OH^- ions.

3 The equation for the reaction at the anode is $4OH^- \rightarrow 2H_2O + O_2 + 4e^-$.

4 The equation for the reaction at the cathode is $2H^+ \rightarrow H_2 + 2e^-$.

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

19 Which row about an endothermic reaction is correct?

	energy	temperature change in the reaction mixture
A	given out	decreases
B	taken in	increases
C	given out	increases
D	taken in	decreases

20 Hydrogen peroxide decomposes to form water and oxygen.

Which changes in temperature and in concentration **both** reduce the rate of this reaction?

	temperature of hydrogen peroxide	concentration of hydrogen peroxide
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

21 Which equation represents a redox reaction?

A $AgNO_3 + NaCl \rightarrow NaNO_3 + AgCl$

B $CaCO_3 \rightarrow CaO + CO_2$

C $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

D $HCl + NaOH \rightarrow NaCl + H_2O$

22 Copper sulfate is a soluble salt which is prepared by reacting insoluble copper oxide with dilute sulfuric acid.

Which statement about the preparation of copper sulfate crystals is **not** correct?

A After the reaction, the mixture is filtered and copper sulfate solution is collected.

B Excess copper oxide is used to ensure that all the acid is used up.

C The final solution is heated so that all the water boils off.

D The mixture of copper oxide and dilute sulfuric acid is heated to speed up the reaction.

23 Magnesium carbonate reacts with dilute sulfuric acid.

A gas is produced.

What is the test for this gas?

A It bleaches damp litmus paper.

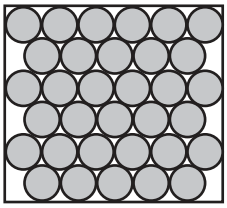
B It 'pops' with a lighted splint.

C It relights a glowing splint.

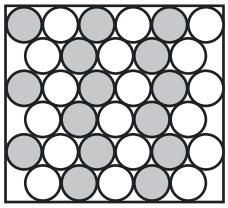
D It turns limewater milky.

24 Which diagram represents the particles in an alloy?

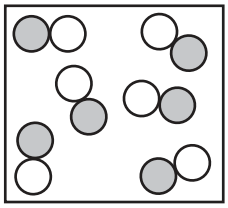
A



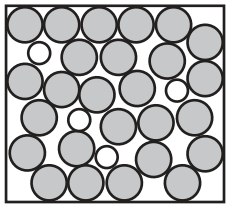
B



C



D



25 What causes an enhanced greenhouse effect?

A decreased concentration of methane in the atmosphere

B decreased concentration of nitrogen in the atmosphere

C increased concentration of carbon dioxide in the atmosphere

D increased concentration of oxygen in the atmosphere

26 Which statement about alkenes is correct?

A They are saturated hydrocarbons.

B They have the general formula C_nH_{2n+2}.

C They have similar chemical properties.

D They are all gases at room temperature.

27 A hydrocarbon with the formula C_9H_{20} is cracked to form one molecule of ethene and two other hydrocarbon molecules.

What are the two other molecules?

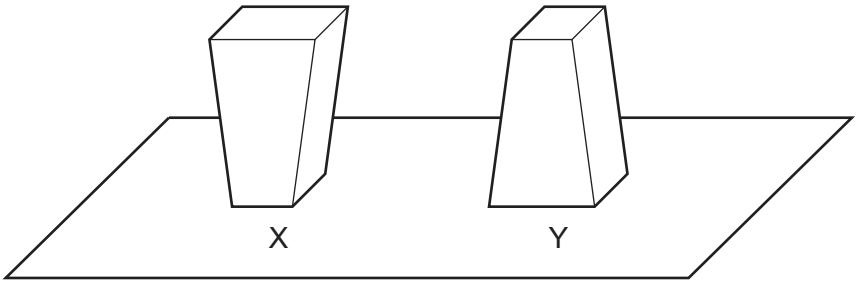
A C_4H_{10} and C_3H_8

B C_4H_8 and C_3H_8

C C_4H_8 and C_3H_6

D C_7H_{14} and H_2

28 Two identical solid objects X and Y are placed on a bench.



How do the forces and the pressures on the bench due to X and Y compare?

	forces	pressures
A	different	different
B	different	equal
C	equal	different
D	equal	equal

29 An object has mass and is in a gravitational field.

Which property does the object possess because it is in a gravitational field?

A density

B resistance

C volume

D weight

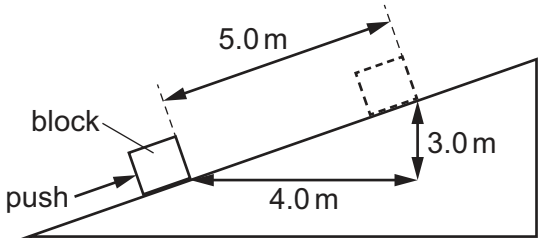
30 A spring obeys Hooke's law.

In which unit is its spring constant measured?

A m/N **B** N **C** N/m **D** Nm

31 A block has a mass of 5.0 kg.

A student pushes the block 5.0 m up a slope. The gravitational field strength is 10 N / kg.



How much gravitational potential energy does the block gain?

A 25 J **B** 150 J **C** 200 J **D** 250 J

32 An automatic coffee maker has a power rating of 900 W and takes 3.0 minutes to make a cup of coffee.

How much energy is transferred by the coffee maker when it makes a cup of coffee?

A 5.0 J **B** 300 J **C** 2700 J **D** 162 000 J

33 In which list are all the energy resources renewable?

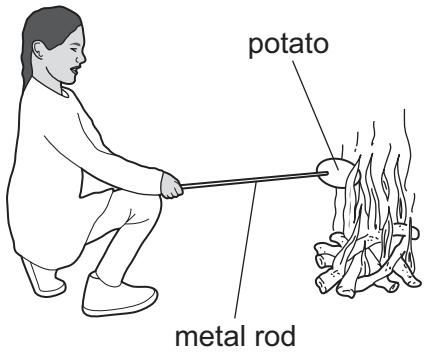
A geothermal, hydroelectric, nuclear

B geothermal, tides, hydroelectric

C tides, nuclear, coal

D solar, wind, coal

34 A student cooks a potato over a fire. The student holds the potato using a metal rod.



Which transfer of thermal energy is caused mainly by radiation?

A from the fire to the air above the fire

B from the fire to the student's face

C from the inside of the potato to the student's hand

D from the outside of the potato to the inside of the potato

35 A student uses a thin converging lens of focal length 5.0 cm as a magnifying glass.

What is a possible position of the object?

A 4.0 cm from the lens, on the same side of the lens as the student

B 4.0 cm from the lens, on the side of the lens away from the student

C 6.0 cm from the lens, on the same side of the lens as the student

D 6.0 cm from the lens, on the side of the lens away from the student

36 What is **not** able to transmit sound waves?

A a gas

B a liquid

C a solid

D a vacuum

37 There is a potential difference (p.d.) of 6.0 V across a resistor of resistance 1.5 kΩ.

How much charge passes through the resistor in 5.0 minutes?

A 1.2 C **B** 20 C **C** 30 C **D** 1200 C

38 Wire X and wire Y are made from the same material. Each wire has a circular cross-section.

The resistance of wire X is R, its length is l and its diameter is d.

The length of wire Y is $2l$ and its diameter is $2d$.

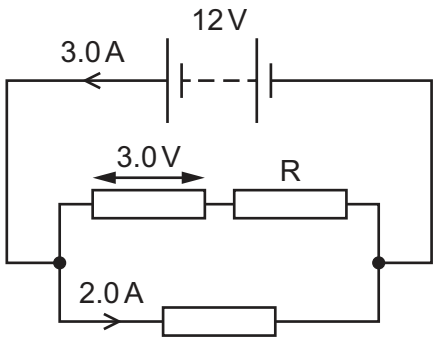
What is the resistance of wire Y?

A $\frac{R}{2}$ **B** R **C** $4R$ **D** $8R$

39 The diagram shows three resistors connected to a 12 V battery.

The current at two points in the circuit and the potential difference (p.d.) across one resistor are shown.

Another resistor is labelled R.



What is the current in resistor R and what is the p.d. across resistor R?

	current in resistor R / A	p.d. across resistor R / V
A	1.0	3.0
B	1.0	9.0
C	2.0	3.0
D	2.0	9.0

40 A fault develops in an electric circuit and the current in the circuit becomes too large.

A component in the circuit protects the wires from overheating.

Which component protects the wires?

A ammeter

B fuse

C lamp

D voltmeter

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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.).