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Cambridge Assessment International Education

Cambridge IGCSE™

COMBINED SCIENCE **0653/22**

Paper 2 Multiple Choice (Extended) **February/March 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 A person moves their hand away from a hot object.

Which characteristic of living organisms is this?

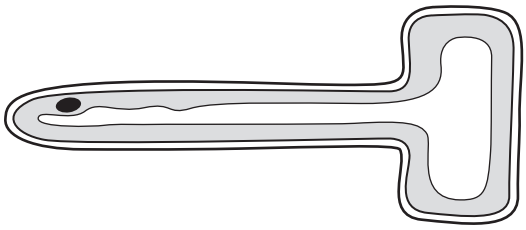
A growth

B nutrition

C reproduction

D sensitivity

2 The diagram shows a cross-section of a root hair cell.



Which row describes the root hair cell and its function?

	animal cell or plant cell	function
A	animal cell	water and glucose absorption
B	animal cell	water and ion absorption
C	plant cell	water and glucose absorption
D	plant cell	water and ion absorption

3 Which small biological molecules are used to make proteins?

A amino acids

B fatty acids

C glucose

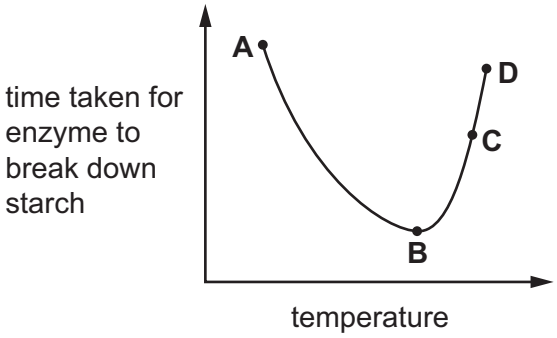
D glycerol

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4 The graph shows the effect of changing the temperature of an enzyme-controlled reaction.

At which temperature does the enzyme work best?



5 Which substance, when deficient in the diet, causes a lack of haemoglobin?

A calcium

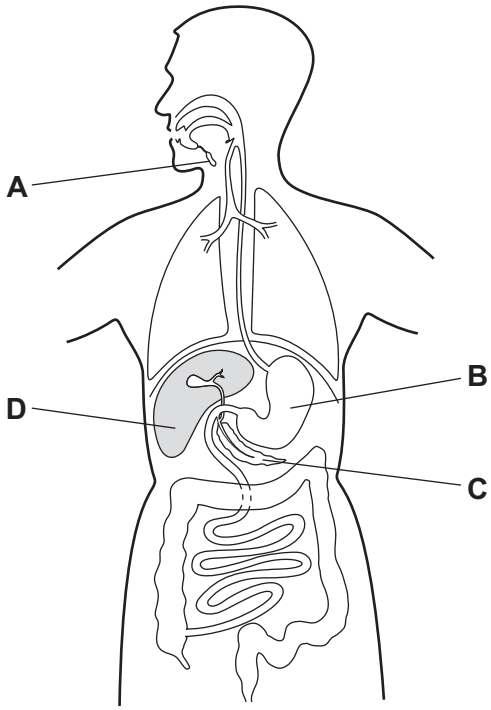
B fats

C iron

D glucose

6 The diagram shows the human alimentary canal and associated organs.

Which organ can produce amylase, protease and lipase?



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7 Which statement is an advantage of a double circulation?

A It allows blood to be pumped to the body and the lungs at different pressures.

B It allows blood to pass through the heart only once on each complete circuit of the body.

C It ensures that the blood leaving the heart is always oxygenated.

D It ensures that deoxygenated blood reaches the liver faster.

8 What is the correct balanced equation for aerobic respiration?

A $C_6H_{12}O_6 + 2O_2 \rightarrow 4CO_2 + 6H_2O$

B $C_6H_{12}O_6 + 4O_2 \rightarrow 6CO_2 + 4H_2O$

C $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 2H_2O$

D $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

9 Which statements correctly describe tropic responses?

1 Gravitropism is the growth of a shoot toward the light.

2 Gravitropism is the growth of a root downwards.

3 Phototropism is the growth of a shoot toward the light.

4 Phototropism is the growth of a root downwards.

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

10 Some plants have separate male and female flowers.

Which features are present in a male flower?

	anthers	ovules	petals	stigma
A	✓	✓	✓	✗
B	✓	✗	✓	✗
C	✓	✗	✗	✗
D	✗	✓	✓	✓

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11 Which row correctly describes features of human egg cells and sperm cells?

	egg cells	sperm cells
A	energy stores present	enzymes present
B	enzymes present	energy stores present
C	produced in large numbers	flagellum present
D	flagellum present	produced in large numbers

12 Which food chain is written correctly?

A cat → bird → snail → grass

B grass → snail → bird → cat

C grass ← snail ← bird ← cat

D grass ← bird ← snail ← cat

13 Which part of the carbon cycle removes carbon dioxide from the atmosphere?

A combustion

B decomposition

C photosynthesis

D respiration

14 Which statement describes the changes inside a closed container of a gas when the temperature increases?

A The gas particles slow down and the pressure decreases.

B The gas particles speed up and the pressure decreases.

C The gas particles speed up and the pressure increases.

D The gas particles turn to a liquid and the pressure increases.

15 Fluorine and chlorine are in Group VII of the Periodic Table.

Which number increases by eight from fluorine to chlorine?

A the number of atoms in one molecule

B the number of electrons in one atom

C the number of electrons in one molecule

D the number of nucleons in one atom

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16 Which statement about the structure of solid sodium chloride is correct?

A It contains chloride ions formed when chlorine atoms lose electrons.

B It contains metallic atoms sharing electrons with non-metallic atoms.

C Opposite electrical charges result in the formation of a giant ionic lattice.

D There is strong electrostatic attraction between sodium atoms and chlorine atoms.

17 An ionic compound contains the ions NH_4^+ and $S_2O_3^{2-}$.

What is the formula of this compound?

A $NH_4S_2O_3$ **B** $NH_4(S_2O_3)_2$ **C** $(NH_4)_2S_2O_3$ **D** $2NH_4S_2O_3$

18 Which statement about the electrolysis of a molten metal halide is correct?

A Cations move to the anode.

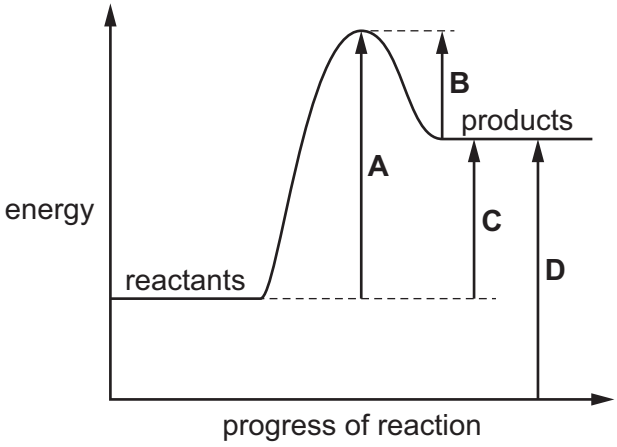
B Electrons flow through the electrolyte.

C Ions gain protons at the cathode.

D Ions lose electrons at the anode.

19 The energy level diagram for a reaction is shown.

Which energy change represents the activation energy?



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20 Hydrogen reacts with iodine to form hydrogen iodide.

The equation for the reaction is shown.

$$H_2(g) + I_2(g) \rightarrow 2HI(g)$$

Which statement explains why the rate of reaction is greater at a higher temperature?

A The molecules are closer together and collide more frequently.

B The molecules need less energy to react so more of the collisions result in reaction.

C The molecules move faster and the activation energy is increased.

D More of the molecules have enough energy to react so more of the collisions result in reaction.

21 The equation for the reaction between copper(II) oxide and hydrogen is shown.

$$CuO + H_2 \rightarrow Cu + H_2O$$

Which statement about this reaction is correct?

A Both copper(II) oxide and hydrogen are oxidised during the reaction.

B Copper(II) oxide is a reducing agent.

C Copper(II) oxide is reduced during the reaction.

D Hydrogen is an oxidising agent.

22 Which statement describes the elements in a period of the Periodic Table?

A Metals are on the left and non-metals are on the right of the period.

B Metals are on the left and right, non-metals are in the middle of the period.

C Non-metals are on the left and right, metals are in the middle of the period.

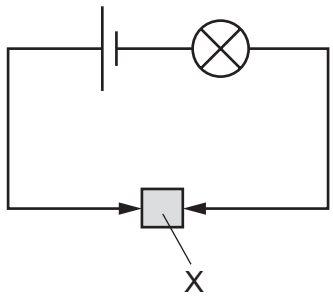
D Non-metals are on the left and metals are on the right of the period.

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23 Solid X is placed in the circuit shown.

The lamp lights.



What is X?

A a compound

B an alloy

C an electrolyte

D a salt

24 The extraction of iron from hematite in the blast furnace involves three main reactions.

Which substance is a product in one of these reactions and a reactant in one of the other reactions?

A carbon

B carbon dioxide

C iron(III) oxide

D oxygen

25 Which processes are used in the treatment of the water supply?

1 chlorination

2 crystallisation

3 filtration

4 precipitation

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

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26 Which two substances are required for iron to rust?

A nitrogen and oxygen

B nitrogen and water

C oxygen and salt

D oxygen and water

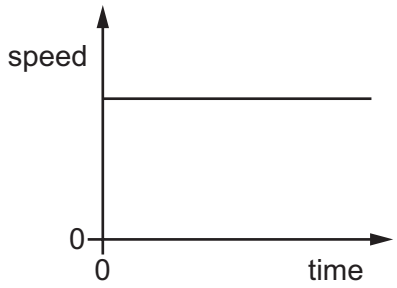
27 An equation representing the cracking of octacosane, $C_{28}H_{58}$, is shown.

$$C_{28}H_{58} \rightarrow C_{10}H_{22} + \text{.....1.....} + \text{.....2.....}$$

Which row identifies two other possible products of this reaction?

	1	2
A	C_4H_{10}	$C_{14}H_{28}$
B	C_6H_{14}	$C_{11}H_{22}$
C	$C_{10}H_{20}$	C_8H_{18}
D	$C_{12}H_{24}$	C_6H_{12}

28 The diagram shows a speed–time graph for a car.



What does the graph show about the car?

A It is accelerating.

B It is at rest.

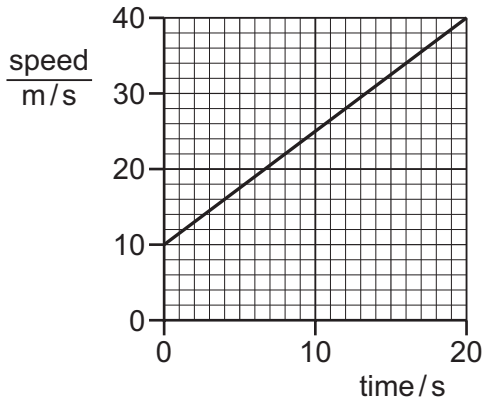
C It is decelerating.

D It is travelling at constant speed.

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29 The diagram shows a speed–time graph for an object.



What is the distance travelled by the object between 10 s and 20 s?

A 250 m **B** 325 m **C** 500 m **D** 650 m

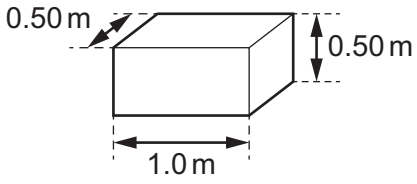
30 The diagrams show four rectangular solid blocks that each have a mass of 15 800 kg.

The dimensions of each block are shown.

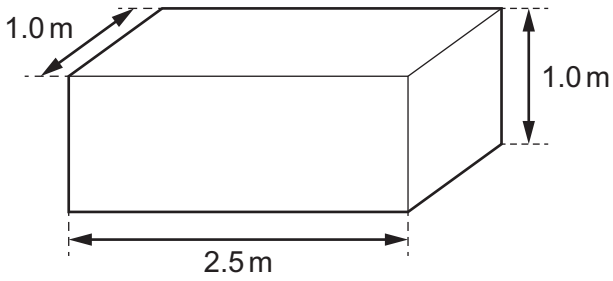
Iron has a density of 7900 kg / m^3.

Which block is made of iron?

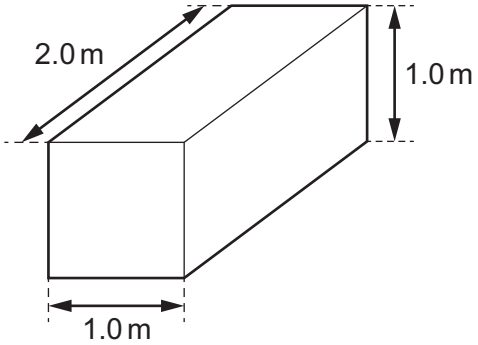
A



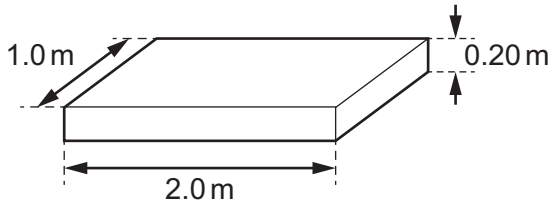
B



C



D



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31 A parachutist falls at a constant speed. Her kinetic energy does **not** change.

Which form of energy is increasing as she falls?

A chemical energy

B gravitational potential energy

C nuclear energy

D thermal energy

32 A car of mass 1200 kg travels at a speed of 15 m / s.

The speed of the car now increases to 25 m / s.

What is the increase in the kinetic energy of the car?

A 60 000 J **B** 135 000 J **C** 240 000 J **D** 375 000 J

33 Cold water evaporates as molecules leave it.

Which molecules leave the water and from which part of the water do they leave?

	molecules that leave the water	where they leave from
A	less-energetic	the surface only
B	less-energetic	throughout the water
C	more-energetic	the surface only
D	more-energetic	throughout the water

34 Which statement describes one of the ways in which solid metals conduct thermal energy?

A Atoms exchange places with neighbouring atoms and transfer energy to each other.

B Atoms move freely through the metal and transfer energy by colliding with other atoms.

C Electrons move freely through the metal and transfer energy by colliding with atoms.

D Electrons vibrate about fixed positions and transfer energy to neighbouring electrons.

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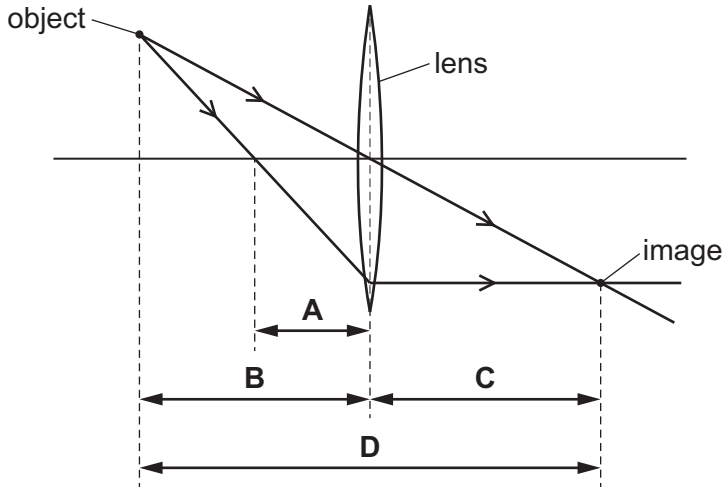
35 Four hot objects are identical except that they have different colours and textures.

Which object is the best emitter of thermal energy by radiation?

	colour	texture
A	black	dull
B	black	shiny
C	white	dull
D	white	shiny

36 The diagram shows a thin converging lens producing a point image of a point object.

Which labelled distance is the focal length of the lens?



37 A student makes three statements about a sound wave in a medium.

1 The particles of the medium vibrate parallel to the direction of travel of the wave.

2 The sound wave is a type of electromagnetic wave.

3 The sound wave is a longitudinal wave.

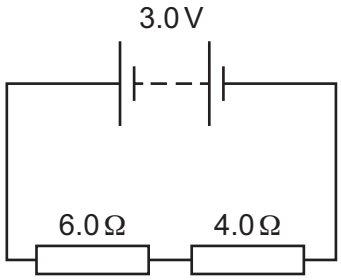
Which statements are correct?

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

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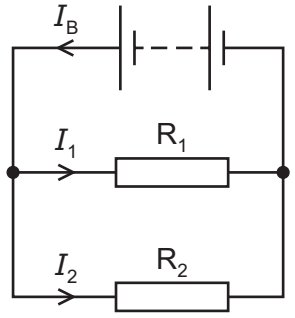
38 A circuit consists of two resistors and a battery.



How much charge flows through the circuit in 2.0 minutes?

A 0.60 C **B** 36 C **C** 60 C **D** 3600 C

39 A circuit consists of two identical resistors, R_1 and R_2, and a battery.



The current in the battery is I_B. The current in R_1 is I_1 and the current in R_2 is I_2.

How are I_B, I_1 and I_2 related?

A $I_B = I_1 = I_2$

B $I_B > I_1$ and $I_1 = I_2$

C $I_B < I_2$ and $I_1 = I_2$

D $I_B > I_1 > I_2$

40 The potential difference (p.d.) across a resistor is V. The resistance of the resistor is R.

What is the power dissipated in the resistor?

A $\frac{V^2}{R}$ **B** V^2R **C** V^2R^3 **D** $\frac{V^3}{R^2}$

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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.).

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