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Cambridge Assessment International Education

Cambridge IGCSE™

COMBINED SCIENCE **0653/21**

Paper 2 Multiple Choice (Extended) **October/November 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.

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1 One of the characteristics of living organisms is the ability to detect and respond to changes in the environment.

What is this characteristic?

A excretion

B growth

C movement

D sensitivity

2 Which structure is present in palisade mesophyll cells and is needed for photosynthesis?

A cell wall

B chloroplast

C nucleus

D vacuole

3 Osmosis is the net movement of water molecules through a partially permeable membrane.

In which direction does this net movement of water molecules take place?

A from a concentrated solution to a dilute solution

B from a dilute solution to pure water

C from a region of lower water potential to a region of higher water potential

D from a region of higher water potential to a region of lower water potential

4 The temperature of an enzyme-controlled reaction increases towards its optimum temperature.

Which row shows the effects of this increase in temperature on the reaction?

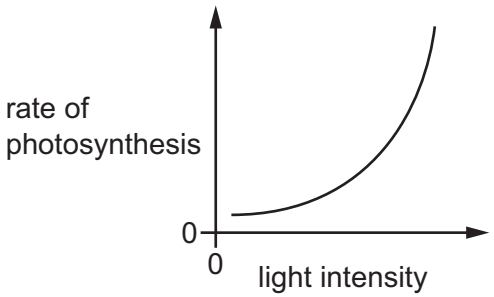
	kinetic energy of substrate	frequency of effective collisions	amount of product formed
A	decreases	decreases	decreases
B	increases	decreases	increases
C	decreases	increases	decreases
D	increases	increases	increases

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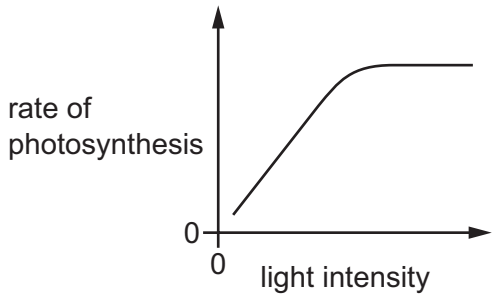
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5 Which graph shows the effect of light intensity on the rate of photosynthesis?

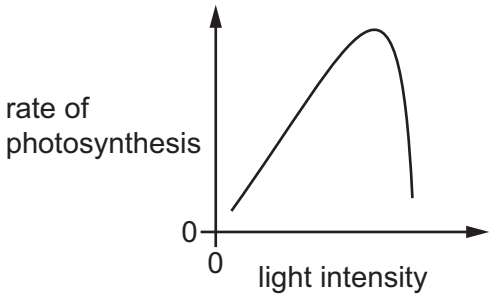
A



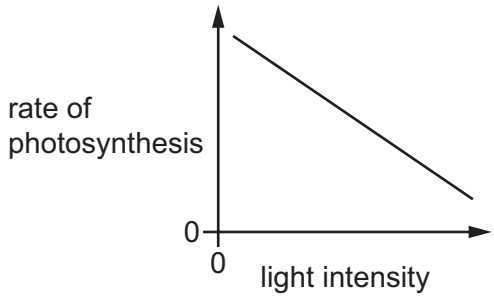
B



C



D



6 A person eats some bread which contains starch.

Which row shows where the chemical digestion of the starch starts and finishes?

	starts	finishes
A	mouth	small intestine
B	mouth	large intestine
C	stomach	small intestine
D	stomach	large intestine

7 Which row describes the structure and function of an artery?

	structure	function
A	thicker wall and smaller lumen than a vein	carries blood at high pressure away from heart
B	thicker wall and smaller lumen than a vein	carries blood at low pressure towards heart
C	thinner wall and larger lumen than a vein	carries deoxygenated blood at low pressure
D	thinner wall and larger lumen than a vein	carries oxygenated blood at high pressure

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8 Which row shows possible causes of coronary heart disease?

	lack of exercise	smoking	stress
A	✓	✓	✓
B	✓	✗	✓
C	✗	✓	✓
D	✗	✗	✗

9 Which row describes gas exchange surfaces in humans?

	thickness of surface	surface area
A	thick	large
B	thick	small
C	thin	large
D	thin	small

10 What is the balanced symbol equation for aerobic respiration?

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

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

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

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

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11 Which food chain shows the correct feeding levels?

A

grass	→	grasshopper	→	bluebird	→	snake
producer		tertiary consumer		secondary consumer		primary consumer

B

grass	→	grasshopper	→	bluebird	→	snake
producer		primary consumer		secondary consumer		tertiary consumer

C

grass	→	grasshopper	→	bluebird	→	snake
tertiary consumer		secondary consumer		primary consumer		producer

D

grass	→	grasshopper	→	bluebird	→	snake
primary consumer		secondary consumer		tertiary consumer		producer

12 What is an example of an ecosystem?

A all the animals in an ocean

B all the organisms and their environment in a desert

C all the plants and their environment in a lake

D all the trees in a forest

13 Which changes to the composition of the atmosphere are caused by cutting down forests?

	concentration of carbon dioxide gas	concentration of oxygen gas
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

14 Which statement describes the changes that occur when water freezes?

A The water molecules gain energy and move faster.

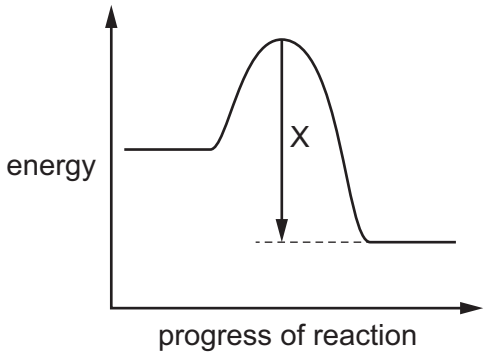
B The water molecules lose energy and move slower.

C The water molecules gain energy as liquid water forms a solid.

D The water molecules lose energy as solid water forms a liquid.

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15 A reaction pathway diagram for a reaction is shown.



Which statement describes and explains energy change X?

A Thermal energy is given out as bonds break.

B Thermal energy is given out as bonds form.

C Thermal energy is taken in as bonds break.

D Thermal energy is taken in as bonds form.

16 Zinc reacts with dilute sulfuric acid.

Which statement explains why the rate of this reaction increases when the temperature of the acid is increased?

A The particles are closer together and the particles collide more frequently.

B The particles move faster and fewer particles have the minimum energy to react.

C The particles collide more frequently and more particles have the minimum energy to react.

D The particles collide more frequently and the activation energy of the reaction is reduced.

17 An element is in Period 3 of the Periodic Table.

Which information is given by the period number of this element?

A its proton number

B its metallic character

C the number of electrons in the outer shell of an atom of the element

D the number of electron shells in an atom of the element

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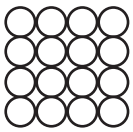
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18 Which diagram represents the atoms in an alloy?

A



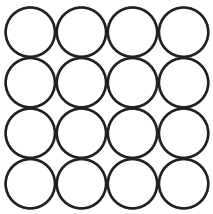
B



C



D



19 Which metal reacts most quickly with cold water?

A calcium

B magnesium

C potassium

D sodium

20 What is the reason for the treatment of the domestic water supply with chlorine?

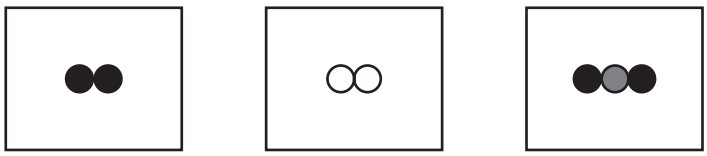
A to improve the taste

B to kill microbes

C to remove odours

D to remove insoluble impurities

21 The diagrams show molecules of three of the main gases in clean, dry air. The different circles represent atoms of different elements.



Which elements are shown as ● and ○?

	●	○
A	hydrogen	nitrogen
B	hydrogen	oxygen
C	oxygen	hydrogen
D	oxygen	nitrogen

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22 Petroleum is a mixture of hydrocarbons.

Which method is used to separate these hydrocarbons?

A crystallisation

B filtration

C fractional distillation

D simple distillation

23 Which equation represents cracking?

A $C_{10}H_{22} \rightarrow 2C_2H_4 + C_6H_{12} + H_2$

B $C_{10}H_{20} + H_2 \rightarrow C_{10}H_{22}$

C $2C_{10}H_{22} + 21O_2 \rightarrow 20CO + 22H_2O$

D $2C_{10}H_{22} + 31O_2 \rightarrow 20CO_2 + 22H_2O$

24 Aqueous chlorine is added to aqueous potassium bromide.

What is observed?

A no visible change

B a white precipitate forms

C reaction mixture becomes lighter in colour

D reaction mixture becomes darker in colour

25 Four equations are listed.

1 $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

2 $C + O_2 \rightarrow CO_2$

3 $2CO \rightarrow C + CO_2$

4 $CO_2 + Fe \rightarrow FeO + CO$

Which equations represent reactions that take place in the blast furnace?

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

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26 Which statement describes how greenhouse gases in the Earth's atmosphere cause global warming?

A They absorb all the thermal energy that reaches the Earth from the Sun.

B They absorb all the thermal energy that is reflected from the Earth's surface.

C They absorb some of the thermal energy that is reflected from the Earth's surface.

D They increase thermal energy loss to space.

27 An electric current is passed through molten calcium chloride using graphite electrodes.

Which row shows the electrode products?

	anode product	cathode product
A	calcium	chlorine
B	chlorine	calcium
C	chlorine	hydrogen
D	hydrogen	chlorine

28 The length of a slope is 1200 m.

A cyclist rides up the slope in a time of 200 s. The cyclist then immediately rides back down the slope in a time of 100 s.

What is the average speed of the cyclist for the whole journey?

A 4.0 m / s **B** 8.0 m / s **C** 9.0 m / s **D** 18 m / s

29 A block of mass 20 kg is lifted up through vertical distance *h*.

The gravitational potential energy of the block increases by 4.9 kJ.

What is the value of *h*?

A 4.1 m **B** 25 m **C** 98 m **D** 245 m

30 What is used to generate electrical power in a geothermal power station?

A fossil fuels

B hot rocks

C light from the Sun

D the wind

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31 Which statement explains why iron is a better thermal conductor than plastic?

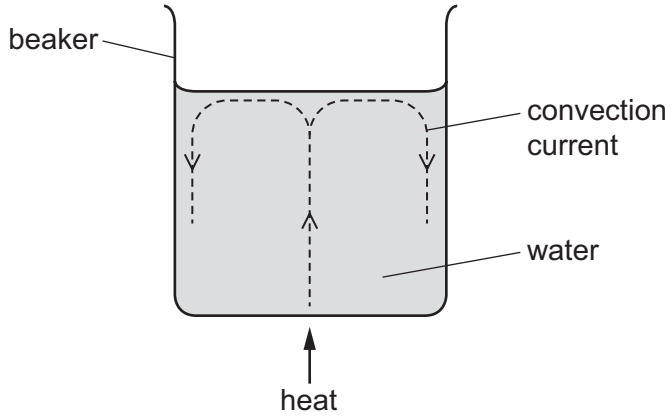
A Atoms in iron vibrate more.

B Electrons in iron vibrate more.

C There are delocalised atoms in iron.

D There are delocalised electrons in iron.

32 The diagram shows a convection current in water in a beaker.



Which statement explains why the hot water at the bottom of the beaker rises?

A It expands and becomes less dense.

B It expands and becomes more dense.

C It contracts and becomes less dense.

D It contracts and becomes more dense.

33 Which surface is the best reflector of thermal radiation?

A dull black

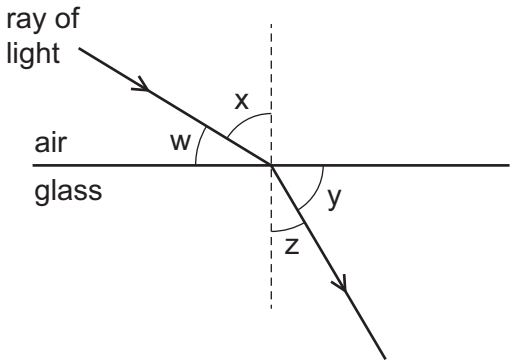
B dull white

C shiny black

D shiny white

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34 The diagram shows a ray of light passing from air into glass.



Which row identifies the angle of incidence and the angle of refraction?

	angle of incidence	angle of refraction
A	w	y
B	w	z
C	x	y
D	x	z

35 Visible light is electromagnetic radiation. The wavelength range for visible light is 4.0×10^{-7} m to 7.0×10^{-7} m.

What is the frequency range for visible light?

A 1.3×10^{-15} Hz to 2.3×10^{-15} Hz

B 1.3×10^{-14} Hz to 2.3×10^{-14} Hz

C 4.3×10^{14} Hz to 7.5×10^{14} Hz

D 4.3×10^{15} Hz to 7.5×10^{15} Hz

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36 The table shows the speed of sound in three different substances, X, Y and Z. One substance is a solid, one is a liquid and one is a gas.

substance	speed of sound / m / s
X	3600
Y	1500
Z	267

Which row identifies the states of the three substances?

	solid	liquid	gas
A	X	Y	Z
B	X	Z	Y
C	Z	X	Y
D	Z	Y	X

37 Which name is given to the rate at which charge flows along a metal wire?

A current

B electromotive force (e.m.f.)

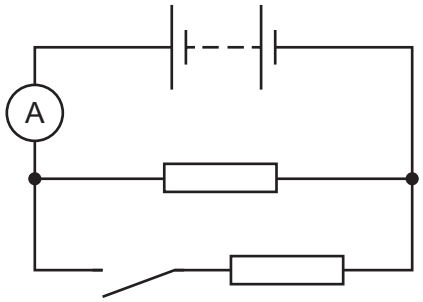
C potential difference (p.d.)

D resistance

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38 In the circuit shown, the switch is open.

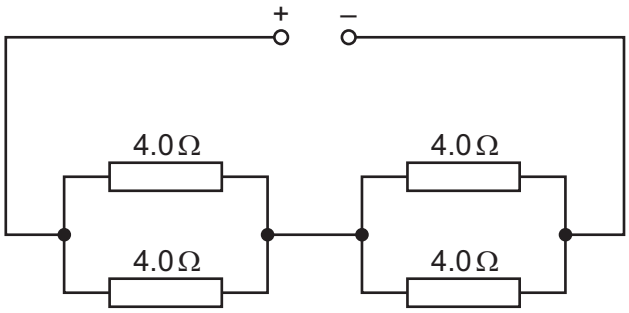


A student closes the switch.

Which row shows what happens to the ammeter reading and what happens to the total resistance of the circuit?

	ammeter reading	total resistance
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

39 The circuit shows four 4.0 Ω resistors connected to a power supply.



What is the total resistance of the circuit?

A 1.0 Ω **B** 2.0 Ω **C** 4.0 Ω **D** 16 Ω

40 What is the main source of the energy released from the Sun?

A fission of helium nuclei to form hydrogen nuclei

B fusion of hydrogen nuclei to form helium nuclei

C hydrogen atoms combining to form hydrogen molecules

D hydrogen atoms reacting with oxygen atoms to form water molecules

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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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