Cambridge Assessment International Education

Cambridge IGCSE™

COMBINED SCIENCE **0653/23**

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 .....1..... is the ability to detect and respond to changes in the environment.

Which word completes gap 1?

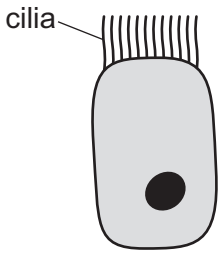
A Excretion

B Movement

C Sensitivity

D Reproduction

2 The diagram shows a ciliated cell.

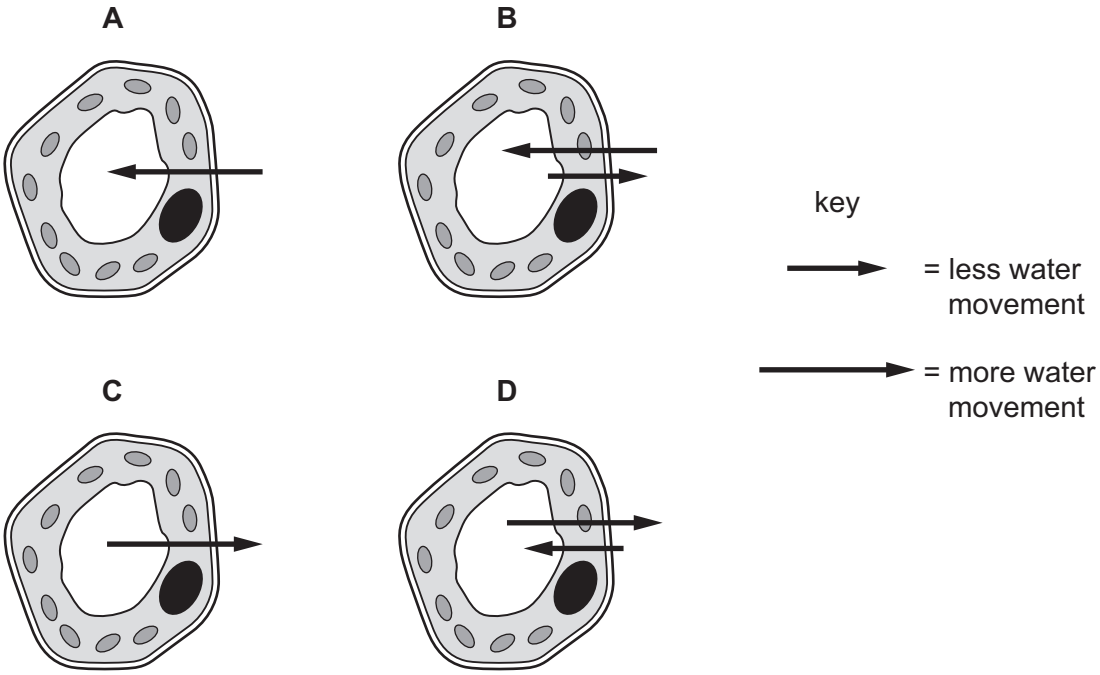


Which row shows where ciliated cells are found in the human gas exchange system and their correct function?

	location of ciliated cells		function of ciliated cells	
	bronchi	trachea	move mucus away from lungs	move mucus towards lungs
A	✓	✓	✓	✗
B	✓	✓	✗	✓
C	✓	✗	✓	✗
D	✗	✓	✗	✓

3 A plant cell was placed in a solution with a lower water potential than the cell.

Which diagram represents the movement of water during the process of osmosis?



4 Which small molecules are used to make proteins?

A amino acids

B fatty acids

C glucose

D glycerol

5 Which substances are used and produced during photosynthesis?

	substances used	substances produced
A	carbon dioxide and glucose	oxygen and water
B	carbon dioxide and water	glucose and oxygen
C	glucose and oxygen	carbon dioxide and water
D	oxygen and water	carbon dioxide and glucose

[Turn over

6 Which process is defined as the taking of substances, for example food and drink, into the body through the mouth?

A absorption

B digestion

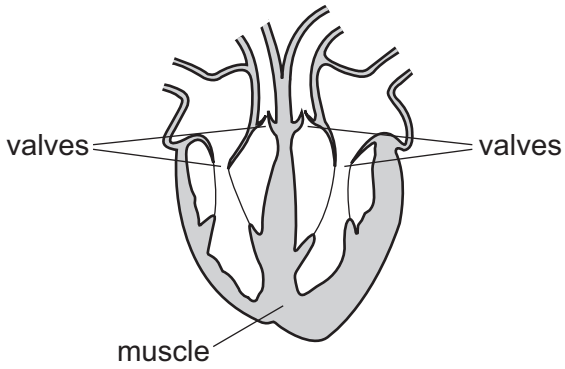
C egestion

D ingestion

7 Which changes will increase transpiration rate?

	humidity	temperature
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

8 A diagram of the human heart is shown.



Which row describes the function of the valves and the action of the muscles when blood is pumped out of the heart?

	valves	muscles
A	allow blood to flow in both directions	contract
B	allow blood to flow in both directions	relax
C	allow blood to flow in one direction only	contract
D	allow blood to flow in one direction only	relax

9 Why do cells respire?

A to produce oxygen

B to produce water

C to release energy

D to use glucose

10 A light shines onto a shoot from one side.

Which row explains why the shoot bends towards the light?

	more auxin on the side of the shoot	more cell elongation on the side of the shoot
A	furthest from the light	furthest from the light
B	furthest from the light	nearest to the light
C	nearest to the light	furthest from the light
D	nearest to the light	nearest to the light

11 Which combination of features describes pollen grains from a wind-pollinated flower?

A large and spiky

B small and light

C spiky and sticky

D sticky and smooth

12 Which type of blood cell is affected by the human immunodeficiency virus (HIV) and which effect does the virus have on those cells?

	type of blood cell	effect on the blood cell
A	red	prevents them carrying oxygen
B	red	reduces antibody production
C	white	prevents them carrying oxygen
D	white	reduces antibody production

13 Some effects that may happen in an ecosystem are listed.

1 decrease in atmospheric carbon dioxide

2 increase in atmospheric carbon dioxide

3 build up of soil

4 loss of soil

Which effects can be caused by deforestation?

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

14 Which term describes ammonia, NH_3?

A atom

B molecule

C element

D ion

15 A mixture of salt water and sand is filtered.

Which statement is correct?

A The salt and the sand are trapped by the filter paper.

B The salt is dissolved in the water and passes through the filter paper.

C The sand is insoluble in water and passes through the filter paper.

D The sand is trapped by the filter paper and pure water is obtained.

16 Copper sulfate crystals dissolve in water.

Which word describes the role of the water?

A filtrate

B solute

C solution

D solvent

17 Which statement about covalent compounds is correct?

A They are formed between a metal and a non-metal.

B They are formed when atoms gain or lose electrons.

C They are formed when atoms share pairs of electrons.

D They conduct electricity when they are molten.

18 Magnesium reacts with dilute hydrochloric acid forming magnesium chloride and hydrogen.

Which equation is correct for this reaction?

A $Mg + 2HCl \rightarrow MgCl + H_2$

B $Mg + 2HCl \rightarrow MgCl_2 + H_2$

C $Mg + HCl \rightarrow MgCl + H$

D $2Mg + 2HCl \rightarrow MgCl_2 + H_2$

19 Concentrated aqueous sodium chloride is electrolysed using platinum electrodes.

Which statements are correct?

1 The equation for the reaction at the cathode is $Na^+(aq) + e^- \rightarrow Na(s)$.

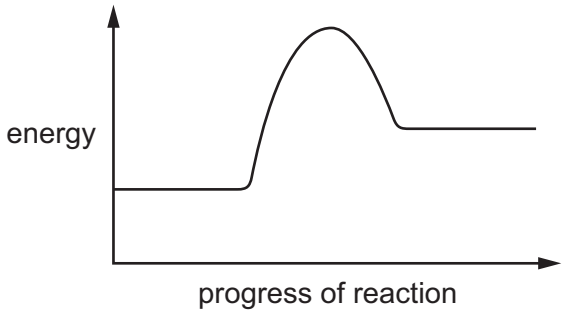
2 The equation for the reaction at the anode is $2Cl^-(aq) \rightarrow Cl_2(g) + 2e^-$.

3 At the positive electrode, hydroxide ions from water form oxygen.

4 At the negative electrode, hydrogen ions from water form hydrogen.

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

20 The energy level diagram for an endothermic reaction is shown.



Which statement about this reaction is correct?

A The activation energy is the minimum energy to react.

B The energy required to break bonds is less than the energy released on making new bonds.

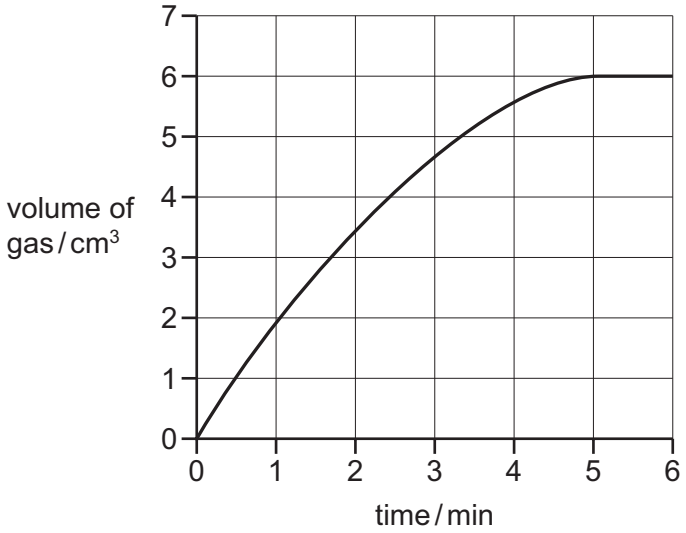
C The activation energy is less than the energy change for the reaction.

D The final products have less energy than the reactants.

21 Magnesium is reacted with dilute hydrochloric acid.

The volume of gas produced is measured for 6 minutes.

The graph obtained from the results is shown.



Which part of the graph shows the greatest rate of reaction?

A between 0 and 1 minute

B between 2 and 4 minutes

C between 4 and 5 minutes

D between 5 and 6 minutes

22 Magnesium sulfate is a soluble salt which is prepared by reacting magnesium with dilute sulfuric acid.

Which row shows the first two steps in the preparation of pure magnesium sulfate?

	step 1	step 2
A	react excess dilute sulfuric acid with magnesium	heat to evaporate unreacted acid
B	react excess dilute sulfuric acid with magnesium	filter to remove the excess acid
C	react dilute sulfuric acid with excess magnesium	filter to remove the unreacted magnesium
D	react dilute sulfuric acid with excess magnesium	heat to evaporate some of the water

23 What is the test for nitrate ions?

A add aqueous sodium hydroxide, then aluminum foil, and warm, test any gas formed with damp red litmus paper

B acidify, then add aqueous barium chloride

C acidify, then add aqueous silver nitrate

D add dilute hydrochloric acid, test any gas produced with limewater

24 Which equation represents a displacement reaction of the elements in Group VII of the Periodic Table?

A $Br_2 + 2NaCl \rightarrow 2NaBr + Cl_2$

B $Cl_2 + 2NaI \rightarrow 2NaCl + I_2$

C $I_2 + 2NaCl \rightarrow 2NaI + Cl_2$

D $I_2 + 2NaBr \rightarrow 2NaI + Br_2$

25 Which statement about the reactivity of metals is correct?

A Sodium is very reactive because its atoms attract electrons very strongly.

B Aluminium is more reactive than magnesium because aluminium forms 3+ ions but magnesium forms 2+ ions.

C Calcium is a reactive metal because it forms very strong covalent bonds with other elements.

D Copper is less reactive than magnesium because magnesium has a greater tendency to form positive ions.

26 Which substance reduces iron(III) oxide in the blast furnace?

A carbon dioxide

B carbon monoxide

C limestone (calcium carbonate)

D oxygen

27 Which statements describe the molecules within a single fraction obtained from petroleum?

1 They are unsaturated hydrocarbons.

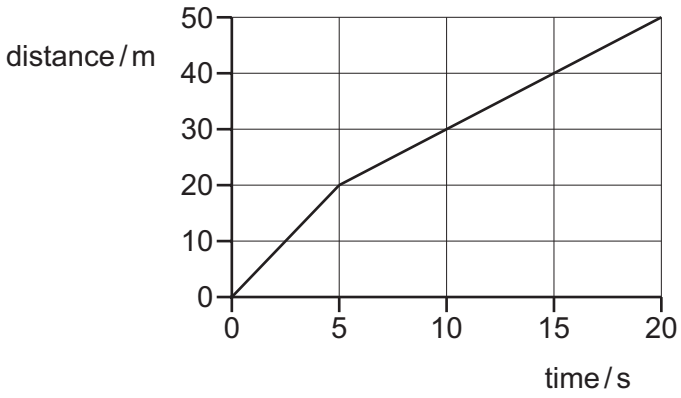
2 They have very different numbers of carbon atoms.

3 They have similar boiling points.

4 They react with other chemicals in a similar way.

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

28 The distance–time graph is for a student walking across a park.



What is the student's average speed walking across the park?

A 2.0 m / s **B** 2.5 m / s **C** 3.0 m / s **D** 4.0 m / s

29 The gravitational field strength is 10 N / kg.

What is the mass of an object that has a weight of 5.0 N?

A 0.50 kg **B** 2.0 kg **C** 5.0 kg **D** 50 kg

30 A wire is stretched by a force. A force–extension graph is produced.

What is the significance of the extension at the limit of proportionality on the graph?

A It is the maximum extension before the wire breaks.

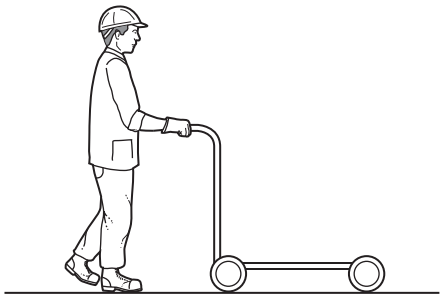
B It is the maximum extension for which Hooke's law is obeyed.

C It is the minimum extension before the wire breaks.

D It is the minimum extension for which Hooke's law is obeyed.

31 A worker exerts a horizontal force on a trolley.

The trolley moves in a straight line along a horizontal surface.



The worker pushes the trolley forwards for 5.0 m and then pulls it backwards for 2.0 m.

The worker exerts a force of 200 N when pushing and when pulling.

How much work does the worker do on the trolley?

A 400 J **B** 600 J **C** 1000 J **D** 1400 J

32 A stone of mass 0.30 kg is thrown upwards with an initial speed of 12 m / s.

The speed of the stone decreases as the stone rises.

By how much does the kinetic energy decrease when the stone reaches 4.0 m / s?

A 2.4 J **B** 9.6 J **C** 19 J **D** 38 J

33 Which statement describes one way in which solids conduct thermal energy?

A Electrons are tightly packed so that vibrations pass from one electron to the next.

B Molecules are tightly packed so that vibrations pass from one molecule to the next.

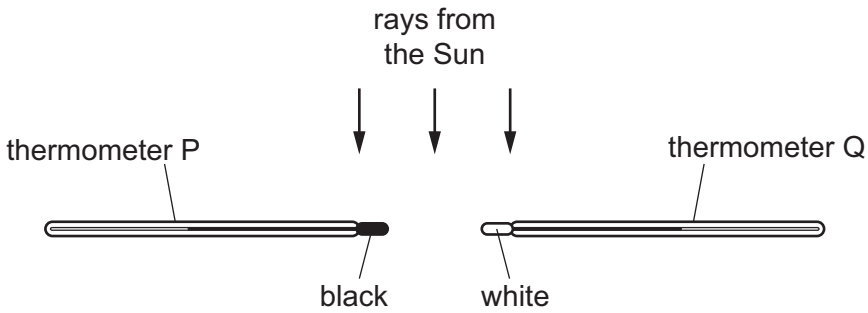
C Solids contain free molecules that are able to move through the solid.

D Solids contain molecules that are arranged in a regular structure so that thermal energy can pass through the spaces between them.

34 The diagram shows two identical thermometers, initially at the same temperature, placed in bright sunshine.

The bulb of thermometer P is painted black.

The bulb of thermometer Q is painted white.



The readings on the thermometers increase by different amounts.

How are the thermometer readings different and why?

A The reading on P is greater than on Q because black surfaces are good absorbers of radiation.

B The reading on P is greater than on Q because black surfaces are poor emitters of radiation.

C The reading on P is smaller than on Q because black surfaces are good emitters of radiation.

D The reading on P is smaller than on Q because black surfaces are poor absorbers of radiation.

35 A converging lens is used as a magnifying glass.

Where is the image formed and what is the nature of the image?

	position of image	nature
A	on the opposite side of the lens from the object	real
B	on the opposite side of the lens from the object	virtual
C	on the same side of the lens as the object	real
D	on the same side of the lens as the object	virtual

36 A telescope in the vacuum of space has an infrared detector, an ultraviolet detector and a visible light detector.

An explosion on the surface of the Sun emits infrared, ultraviolet and visible light at the same time.

Which detector is the first to detect radiation from the explosion?

A the infrared detector

B the ultraviolet detector

C the visible light detector

D all three detect radiation at the same time

37 Two sounds with equal frequencies are produced by a loudspeaker.

The first sound has a large amplitude.

The second sound has a smaller amplitude.

How do the two sounds compare?

A The second sound is higher pitched.

B The second sound is lower pitched.

C The second sound is louder.

D The second sound is quieter.

38 A series circuit consists of a variable resistor and a power supply that supplies a variable electromotive force (e.m.f.).

Both the resistance of the variable resistor and the e.m.f. of the power supply are changed.

Which two changes together **must** cause the current in the circuit to decrease?

	resistance of variable resistor	e.m.f. of power supply
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

39 A car has two lamps connected in parallel to a 12 V battery. Each lamp has a resistance of 2.5 Ω.

What is the total current in the circuit when the lamps are switched on?

A 2.4 A **B** 4.8 A **C** 9.6 A **D** 15 A

40 What is the relationship between energy E transferred in a component, current I through it, potential difference (p.d.) V across it, and time t?

A $E = \frac{It}{V}$ **B** $E = IVt$ **C** $E = \frac{VI}{t}$ **D** $E = \frac{Vt}{I}$

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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.).