



# Cambridge IGCSE™

**CHEMISTRY**

**0620/22**

Paper 2 Multiple Choice (Extended)

**October/November 2020**

**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. A mark will not be deducted for a wrong answer.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages. Blank pages are indicated.



1 Which gas has the slowest rate of diffusion?

A H<sub>2</sub>

B NH<sub>3</sub>

C CH<sub>4</sub>

D CO<sub>2</sub>

2 A chromatography experiment is carried out to analyse the pigments present in four different types of leaf. The student carrying out the experiment forgot to complete his table of results, which is shown.

plant leaf	number of pigments identified	colour of identified pigments	distance travelled by the solvent front (cm)	distance travelled from the origin by each pigment (cm)	R <sub>f</sub> value
maple	<b>F</b>	green /yellow	3.7	green: 3.0 yellow: 3.1	green: 0.81 yellow: 0.83
laurel	2	green /yellow	<b>G</b>	green: 2.5 yellow: 2.5	green: 0.78 yellow: 0.78
lime	3	green /yellow /orange	3.5	green: 2.9 yellow: 3.0 orange: 2.7	green: 0.83 yellow: 0.86 yellow: 0.77
ash	3	green /yellow /orange	3.5	green: 2.8 yellow: 3.0 orange: 2.7	green: 0.80 yellow: <b>H</b> orange: 0.77

Which row identifies the values of **F**, **G** and **H**?

	<b>F</b>	<b>G</b>	<b>H</b>
<b>A</b>	2	3.2	0.80
<b>B</b>	3	3.5	0.83
<b>C</b>	2	3.2	0.86
<b>D</b>	3	3.5	0.78

3 Which statement about isotopes is correct?

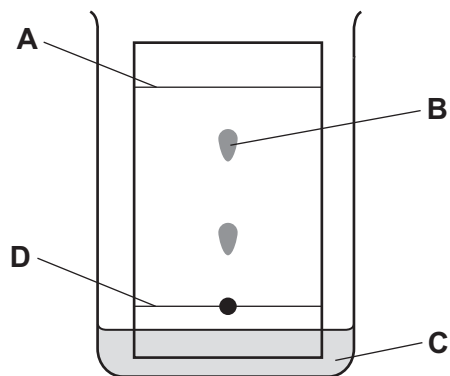
A They have different proton numbers.

B They have different chemical properties.

C They have the same nucleon number.

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

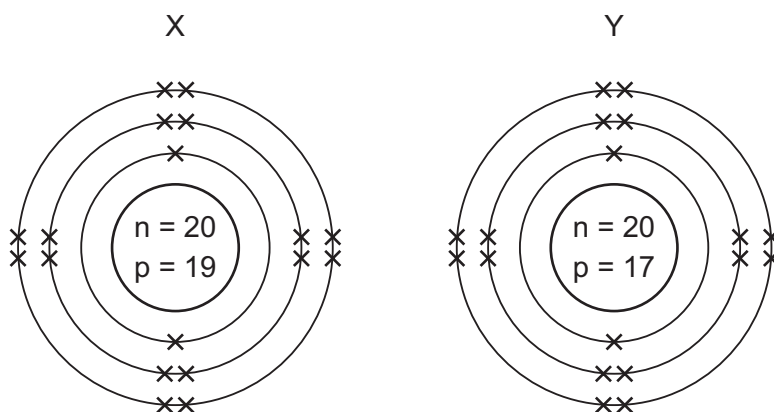
- 4 In the chromatography experiment shown, which label represents the solvent front?



- 5 Different methods of separation rely on substances having different properties.

Which property does distillation make use of?

- A boiling point
  - B colour
  - C particle size
  - D solubility in different solvents
- 6 The arrangements of the electrons in two ions formed from elements X and Y are shown.



Which equation represents the reaction between elements X and Y?

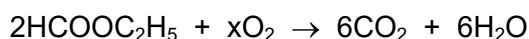
- A  $X_2 + 2Y \rightarrow 2X^+ + 2Y^-$
- B  $X_2 + 2Y \rightarrow 2X^- + 2Y^+$
- C  $2X + Y_2 \rightarrow 2X^+ + 2Y^-$
- D  $2X + Y_2 \rightarrow 2X^- + 2Y^+$

- 7 Which row identifies compounds that contain single covalent bonds only, double covalent bonds only or both single and double covalent bonds?

	single covalent bonds only	double covalent bonds only	both single and double covalent bonds
<b>A</b>	C <sub>2</sub> H <sub>4</sub>	CH <sub>3</sub> OH	CO <sub>2</sub>
<b>B</b>	CH <sub>3</sub> OH	C <sub>2</sub> H <sub>4</sub>	CO <sub>2</sub>
<b>C</b>	CH <sub>3</sub> OH	CO <sub>2</sub>	C <sub>2</sub> H <sub>4</sub>
<b>D</b>	CO <sub>2</sub>	C <sub>2</sub> H <sub>4</sub>	CH <sub>3</sub> OH

- 8 Ethyl methanoate, HCOOC<sub>2</sub>H<sub>5</sub>, burns in excess oxygen to produce carbon dioxide and water.

The equation is shown.



What is the value of x?

- A** 2                      **B** 7                      **C** 9                      **D** 18
- 9 Rubidium is in Group I of the Periodic Table and bromine is in Group VII.

Rubidium reacts with bromine to form an ionic compound.

Which row shows the electron change taking place for rubidium and the correct formula of the rubidium ion?

	electron change	formula of ion formed
<b>A</b>	electron gained	Rb <sup>+</sup>
<b>B</b>	electron gained	Rb <sup>-</sup>
<b>C</b>	electron lost	Rb <sup>+</sup>
<b>D</b>	electron lost	Rb <sup>-</sup>

- 10 Which statement explains why graphite is used as a lubricant?

- A** All bonds between the atoms are weak.  
**B** It conducts electricity.  
**C** It has a low melting point.  
**D** Layers in the structure can slide over each other.

- 11 The relative atomic mass of chlorine is 35.5.

When calculating relative atomic mass, which particle is the mass of a chlorine atom compared to?

- A a neutron
- B a proton
- C an atom of carbon-12
- D an atom of hydrogen-1

- 12 Universal indicator solution is added to a neutral solution of concentrated aqueous sodium chloride.

The solution, which contains  $H^+$  (hydrogen),  $Na^+$  (sodium),  $Cl^-$  (chloride) and  $OH^-$  (hydroxide) ions, is electrolysed.

The product at the cathode is hydrogen gas and the product at the anode is chlorine gas.

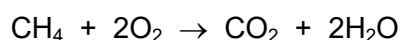
What happens to the colour of the indicator **in the solution** during electrolysis?

- A The colour changes from blue to green.
- B The colour changes from blue to red.
- C The colour changes from green to blue.
- D The colour changes from green to red.

- 13 What is the empirical formula of an oxide of iron, formed by reacting 2.24 g of iron with 0.96 g of oxygen?

- A FeO                      B Fe<sub>2</sub>O                      C Fe<sub>2</sub>O<sub>3</sub>                      D Fe<sub>3</sub>O<sub>4</sub>

- 14 The combustion of methane is exothermic.



Which statement about this reaction is correct?

- A The energy needed to break the bonds in methane and oxygen is greater than the energy released in making new bonds in carbon dioxide and water.
- B The energy needed to break the bonds in methane and oxygen is less than the energy released in making new bonds in carbon dioxide and water.
- C The energy released in breaking bonds in methane and oxygen is greater than the energy needed to make new bonds in carbon dioxide and water.
- D The energy released in breaking bonds in methane and oxygen is less than the energy needed to make new bonds in carbon dioxide and water.

- 15 Hydrogen reacts with oxygen in a fuel cell.



The reaction is exothermic.

286 kJ of energy is released for every mole of water formed.

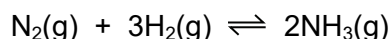
Which volume of hydrogen gas, measured at room temperature and pressure, would react with oxygen with the release of 7000 J of energy?

- A 587 cm<sup>3</sup>      B 1175 cm<sup>3</sup>      C 587 dm<sup>3</sup>      D 1175 dm<sup>3</sup>
- 16 Which substance does **not** require oxygen in order to produce energy?
- A coal  
B hydrogen  
C natural gas  
D <sup>235</sup>U
- 17 Nitrogen, N<sub>2</sub>, and hydrogen, H<sub>2</sub>, can be converted into ammonia, NH<sub>3</sub>, using a catalyst.

What is the purpose of the catalyst?

- A to increase the amount of ammonia produced  
B to increase the rate of reaction  
C to reduce the amount of reactants needed  
D to reduce the rate of reaction

- 18 Ammonia is produced by the Haber process. The equation is shown.

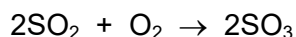


The forward reaction is exothermic.

Which statement is correct?

- A Increasing pressure decreases the yield of ammonia, but speeds up the reaction.  
B Increasing temperature decreases the yield of ammonia, but speeds up the reaction.  
C Increasing the concentration of hydrogen and nitrogen results in a lower yield of ammonia.  
D Increasing the temperature increases the yield of ammonia and speeds up the reaction.

- 19 During the manufacture of sulfuric acid, sulfur dioxide is converted to sulfur trioxide.



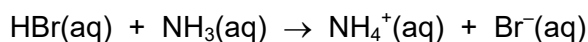
Which type of reaction is this?

- A displacement
  - B neutralisation
  - C oxidation
  - D thermal decomposition
- 20 The equation for a redox reaction is shown.



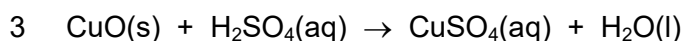
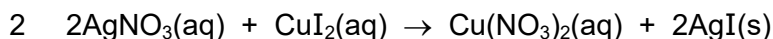
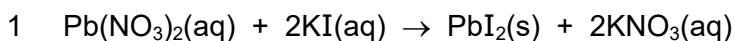
Which element is reduced?

- A chlorine
  - B iron
  - C oxygen
  - D sulfur
- 21 The equation shows a reaction between aqueous hydrogen bromide and aqueous ammonia.



Which statement describes the role of aqueous hydrogen bromide?

- A It is a catalyst.
  - B It is a reducing agent.
  - C It is a proton acceptor.
  - D It is a proton donor.
- 22 The equations for three reactions are shown.



Which reactions are suitable for making a salt by precipitation?

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

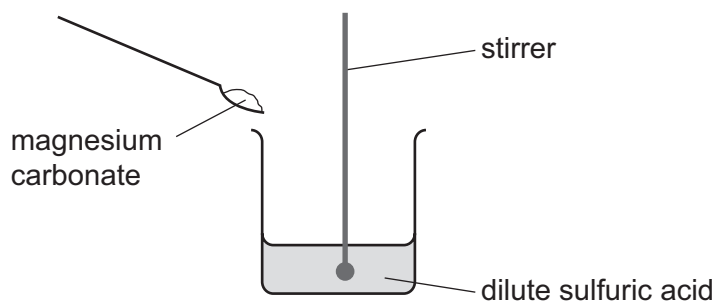
23 Zinc oxide is an amphoteric oxide.

Which row describes the reactions of zinc oxide?

	reaction with alkalis	reaction with acids
<b>A</b>	✓	✓
<b>B</b>	✓	✗
<b>C</b>	✗	✓
<b>D</b>	✗	✗

24 A student carries out an experiment to prepare pure magnesium sulfate crystals.

The diagram shows the first stage of the preparation.



He adds magnesium carbonate until no more reacts.

Which process should he use for the next stage?

- A** crystallisation
- B** evaporation
- C** filtration
- D** neutralisation

25 Which row about elements in the Periodic Table is correct?

	statement 1	statement 2
<b>A</b>	two elements in the same group have similar chemical properties	metals are on the left of the table
<b>B</b>	two elements in the same group have similar chemical properties	metals are on the right of the table
<b>C</b>	two elements in the same period have similar chemical properties	metals are on the left of the table
<b>D</b>	two elements in the same period have similar chemical properties	metals are on the right of the table



26 A new element oxfordium, Ox, was discovered with the following properties.

solubility	electrical conduction	formula of element	bonding in a molecule of Ox <sub>2</sub>
insoluble in water	doesn't conduct	Ox <sub>2</sub>	Ox≡Ox

In which group of the Periodic Table should the new element be placed?

- A Group III
- B Group V
- C Group VII
- D Group VIII

27 A flammable gas needs to be removed from a tank at an industrial plant.

For safety reasons, an inert gas is used.

Which gas is suitable?

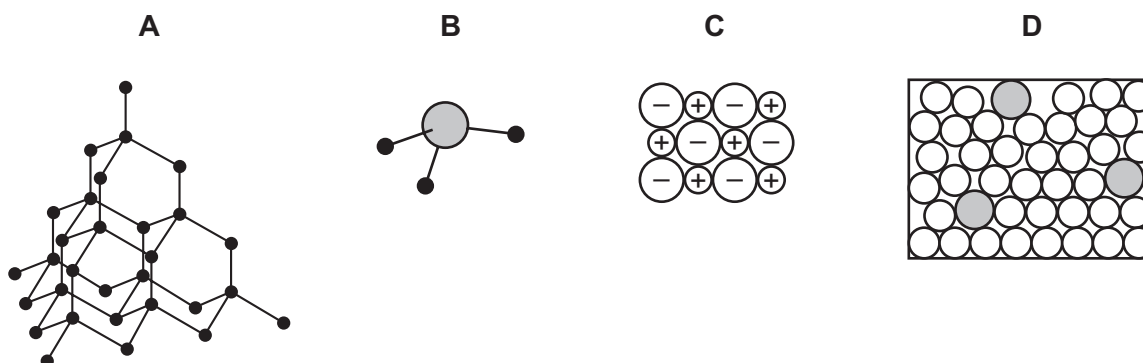
- A argon
- B hydrogen
- C methane
- D oxygen

28 Transition elements can have variable oxidation states.

Which pair of compounds shows a transition element in two different oxidation states?

- A Cr<sub>2</sub>O<sub>3</sub> and Cr<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>
- B Cu<sub>2</sub>O and CuCO<sub>3</sub>
- C ZnS and ZnSO<sub>4</sub>
- D NiO and Ni(NO<sub>3</sub>)<sub>2</sub>

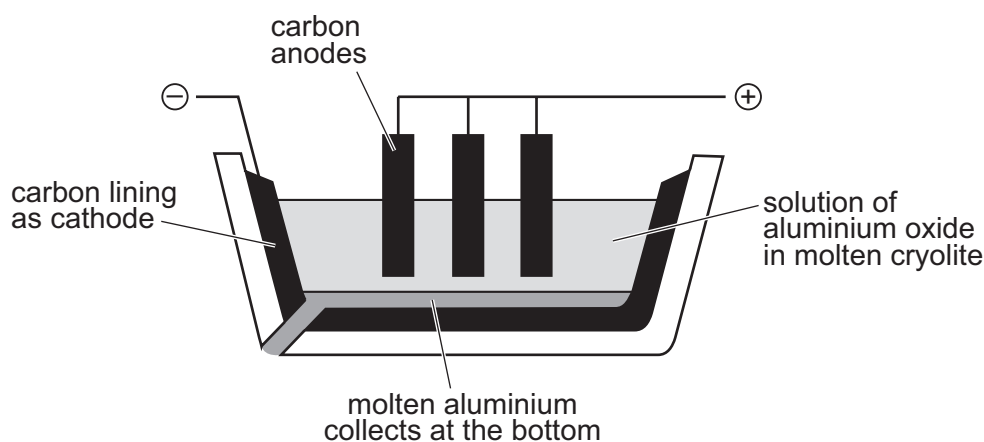
- 29 Which diagram best represents the structure of a substance that is a good conductor of electricity at 25 °C?



- 30 Why is aluminium metal unreactive with air?

- A** It is covered with a layer of oxide.
- B** It is low in the reactivity series.
- C** It is produced by electrolysis of its oxide.
- D** It melts at a high temperature.

- 31 The apparatus used for the extraction of aluminium oxide by electrolysis is shown.



Which equation represents a reaction taking place at the anode?

- A**  $\text{O} + 2\text{e}^- \rightarrow \text{O}^{2-}$
- B**  $2\text{O}^{2-} \rightarrow \text{O}_2 + 4\text{e}^-$
- C**  $\text{Al}^{3-} \rightarrow \text{Al} + 3\text{e}^-$
- D**  $\text{Al}^{3+} + 3\text{e}^- \rightarrow \text{Al}$

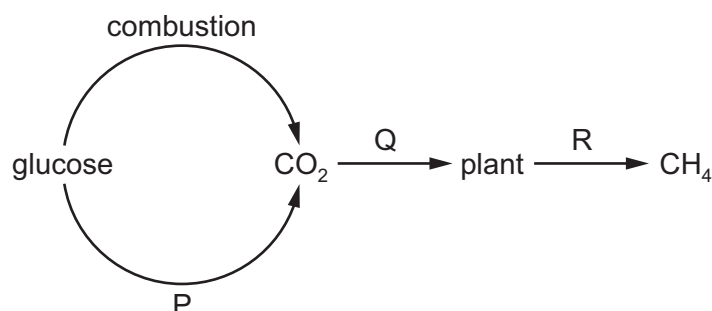
32 The results of tests on solid S and its aqueous solution are shown.

tests on solid S	tests on aqueous solution of S	
effect of heat	effect of aqueous sodium hydroxide	effect of aqueous ammonia
brown gas given off, together with a gas which relights a glowing splint	white ppt., soluble in excess, giving a colourless solution	white ppt., soluble in excess, giving a colourless solution

What is S?

- A aluminium nitrate
- B aluminium sulfate
- C zinc sulfate
- D zinc nitrate

33 Part of the carbon cycle is shown.



What are processes P, Q and R?

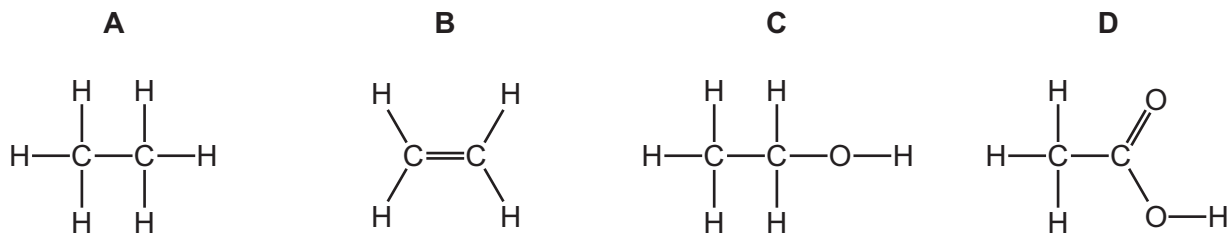
	P	Q	R
A	decomposition	respiration	photosynthesis
B	respiration	photosynthesis	decomposition
C	respiration	decomposition	photosynthesis
D	photosynthesis	respiration	decomposition

34 The element sulfur is found in a number of different minerals.

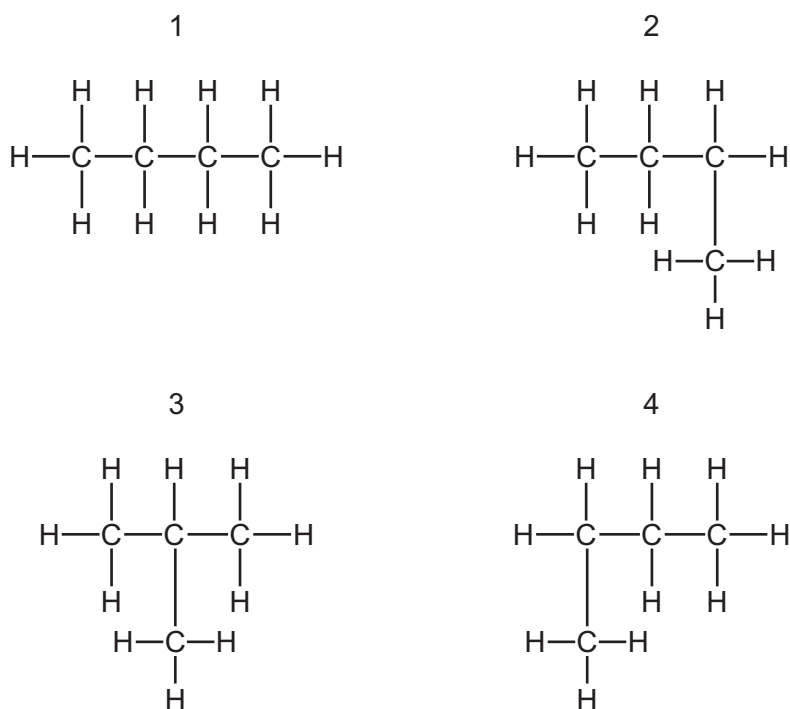
Which mineral contains the greatest percentage by mass of sulfur?

- A barite,  $\text{BaSO}_4$
- B galena,  $\text{PbS}$
- C gypsum,  $\text{CaSO}_4$
- D pyrite,  $\text{FeS}_2$

35 Which structure represents a molecule of ethanol?



36 Which structures are structural isomers of each other?

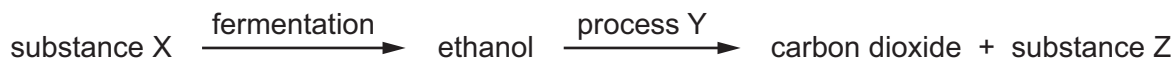


- A** 1, 2, 3 and 4  
**B** 1, 2 and 4 only  
**C** 1 and 3 only  
**D** 2 and 4 only

37 Which molecule is **not** produced by an addition reaction of ethene?

- A**  $\text{CH}_3\text{CH}_3$       **B**  $\text{CH}_2\text{BrCH}_2\text{Br}$       **C**  $\text{CH}_3\text{CH}_2\text{OH}$       **D**  $\text{CH}_3\text{CH}_2\text{CH}_3$

- 38 The flow chart shows the preparation of ethanol and some important chemistry of ethanol.



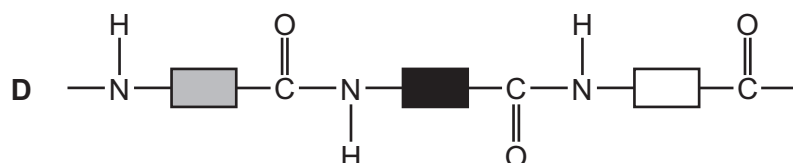
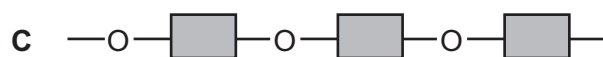
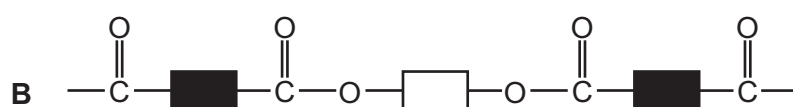
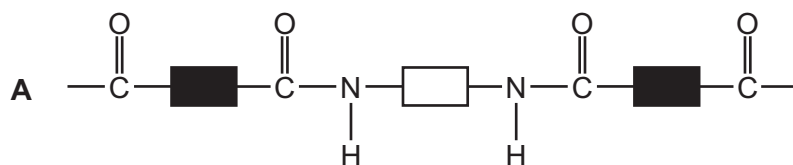
What are X, Y and Z?

	X	Y	Z
<b>A</b>	yeast	combustion	oxygen
<b>B</b>	glucose	combustion	steam
<b>C</b>	glucose	polymerisation	water
<b>D</b>	yeast	fermentation	glucose

- 39 Which statement about nylon and *Terylene* is correct?

- A** Nylon and *Terylene* are made from monomers with C=C bonds.  
**B** Nylon and *Terylene* contain the same linkage.  
**C** Nylon is a polyester.  
**D** *Terylene* is made from two different monomers.

- 40 Which diagram represents the structure of a protein?



**BLANK PAGE**

**BLANK PAGE**

---

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at [www.cambridgeinternational.org](http://www.cambridgeinternational.org) after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.

The Periodic Table of Elements

		Group																																																																																																																																																																																																					
I	II	III	IV	V	VI	VII	VIII																																																																																																																																																																																																
3 Li lithium 7	4 Be beryllium 9	11 Na sodium 23	12 Mg magnesium 24	19 K potassium 39	20 Ca calcium 40	37 Rb rubidium 85	55 Cs caesium 133	87 Fr francium —	1 H hydrogen 1	2 He helium 4	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 oganeson —	119 Uu unbinilium —	120 Uub unbinilium —	121 Uut ununilium —	122 Uuq ununilium —	123 Uuq ununilium —	124 Uuq ununilium —	125 Uuq ununilium —	126 Uuq ununilium —	127 Uuq ununilium —	128 Uuq ununilium —	129 Uuq ununilium —	130 Uuq ununilium —	131 Uuq ununilium —	132 Uuq ununilium —	133 Uuq ununilium —	134 Uuq ununilium —	135 Uuq ununilium —	136 Uuq ununilium —	137 Uuq ununilium —	138 Uuq ununilium —	139 Uuq ununilium —	140 Uuq ununilium —	141 Uuq ununilium —	142 Uuq ununilium —	143 Uuq ununilium —	144 Uuq ununilium —	145 Uuq ununilium —	146 Uuq ununilium —	147 Uuq ununilium —	148 Uuq ununilium —	149 Uuq ununilium —	150 Uuq ununilium —	151 Uuq ununilium —	152 Uuq ununilium —	153 Uuq ununilium —	154 Uuq ununilium —	155 Uuq ununilium —	156 Uuq ununilium —	157 Uuq ununilium —	158 Uuq ununilium —	159 Uuq ununilium —	160 Uuq ununilium —	161 Uuq ununilium —	162 Uuq ununilium —	163 Uuq ununilium —	164 Uuq ununilium —	165 Uuq ununilium —	166 Uuq ununilium —	167 Uuq ununilium —	168 Uuq ununilium —	169 Uuq ununilium —	170 Uuq ununilium —	171 Uuq ununilium —	172 Uuq ununilium —	173 Uuq ununilium —	174 Uuq ununilium —	175 Uuq ununilium —	176 Uuq ununilium —	177 Uuq ununilium —	178 Uuq ununilium —	179 Uuq ununilium —	180 Uuq ununilium —	181 Uuq ununilium —	182 Uuq ununilium —	183 Uuq ununilium —	184 Uuq ununilium —	185 Uuq ununilium —	186 Uuq ununilium —	187 Uuq ununilium —	188 Uuq ununilium —	189 Uuq ununilium —	190 Uuq ununilium —	191 Uuq ununilium —	192 Uuq ununilium —	193 Uuq ununilium —	194 Uuq ununilium —	195 Uuq ununilium —	196 Uuq ununilium —	197 Uuq ununilium —	198 Uuq ununilium —	199 Uuq ununilium —	200 Uuq ununilium —	201 Uuq ununilium —	202 Uuq ununilium —	203 Uuq ununilium —	204 Uuq ununilium —	205 Uuq ununilium —	206 Uuq ununilium —	207 Uuq ununilium —	208 Uuq ununilium —	209 Uuq ununilium —	210 Uuq ununilium —	211 Uuq ununilium —	212 Uuq ununilium —	213 Uuq ununilium —	214 Uuq ununilium —	215 Uuq ununilium —	216 Uuq ununilium —	217 Uuq ununilium —	218 Uuq ununilium —	219 Uuq ununilium —	220 Uuq ununilium —	221 Uuq ununilium —	222 Uuq ununilium —	223 Uuq ununilium —	224 Uuq ununilium —	225 Uuq ununilium —	226 Uuq ununilium —	227 Uuq ununilium —	228 Uuq ununilium —	229 Uuq ununilium —	230 Uuq ununilium —	231 Uuq ununilium —	232 Uuq ununilium —	233 Uuq ununilium —	234 Uuq ununilium —	235 Uuq ununilium —	236 Uuq ununilium —	237 Uuq ununilium —	238 Uuq ununilium —	239 Uuq ununilium —	240 Uuq ununilium —	241 Uuq ununilium —	242 Uuq ununilium —	243 Uuq ununilium —	244 Uuq ununilium —	245 Uuq ununilium —	246 Uuq ununilium —	247 Uuq ununilium —	248 Uuq ununilium —	249 Uuq ununilium —	250 Uuq ununilium —	251 Uuq ununilium —	252 Uuq ununilium —	253 Uuq ununilium —	254 Uuq ununilium —	255 Uuq ununilium —	256 Uuq ununilium —	257 Uuq ununilium —	258 Uuq ununilium —	259 Uuq ununilium —	260 Uuq ununilium —	261 Uuq ununilium —	262 Uuq ununilium —	263 Uuq ununilium —	264 Uuq ununilium —	265 Uuq ununilium —	266 Uuq ununilium —	267 Uuq ununilium —	268 Uuq ununilium —	269 Uuq ununilium —	270 Uuq ununilium —	271 Uuq ununilium —	272 Uuq ununilium —	273 Uuq ununilium —	274 Uuq ununilium —	275 Uuq ununilium —	276 Uuq ununilium —	277 Uuq ununilium —	278 Uuq ununilium —	279 Uuq ununilium —	280 Uuq ununilium —	281 Uuq ununilium —	282 Uuq ununilium —	283 Uuq ununilium —	284 Uuq ununilium —	285 Uuq ununilium —	286 Uuq ununilium —	287 Uuq ununilium —	288 Uuq ununilium —	289 Uuq ununilium —	290 Uuq ununilium —	291 Uuq ununilium —	292 Uuq ununilium —	293 Uuq ununilium —	294 Uuq ununilium —	295 Uuq ununilium —	296 Uuq ununilium —	297 Uuq ununilium —	298 Uuq ununilium —	299 Uuq ununilium —	300 Uuq ununilium —

**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<sup>3</sup> at room temperature and pressure (r.t.p.).