



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CHEMISTRY

0620/13

Paper 1 Multiple Choice

May/June 2010

45 Minutes

Additional Materials: Multiple Choice Answer Sheet
 Soft clean eraser
 Soft pencil (type B or HB is recommended)



READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

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 separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 16.

You may use a calculator.

This document consists of **15** printed pages and **1** blank page.



- 1 The diagram shows a cup of tea.



Which row describes the water particles in the air above the cup compared with the water particles in the cup?

	moving faster	closer together
A	✓	✓
B	✓	x
C	x	✓
D	x	x

- 2 Which row shows the change that takes place when element X gains the new particle shown?

	particle gained	change
A	electron	an isotope of element X is formed
B	electron	the element one place to the right of X in the Periodic Table is formed
C	proton	an isotope of element X is formed
D	proton	the element one place to the right of X in the Periodic Table is formed

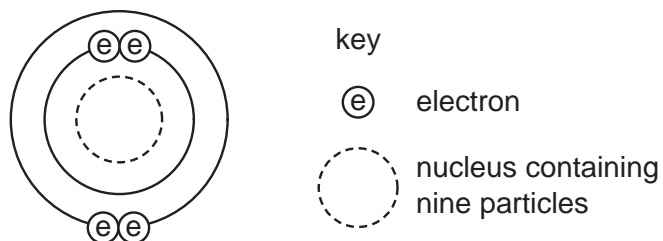
- 3 The symbols of two atoms may be written as shown.



Which statement about these atoms is correct?

- A** They are different elements because they have different numbers of neutrons.
- B** They are different elements because they have different numbers of protons.
- C** They are isotopes of the same element because they have the same nucleon number.
- D** They are isotopes of the same element because they have the same proton number.

- 4 The diagram shows an atom.



What is the proton number and neutron number of the atom?

	proton number	neutron number
A	4	5
B	4	9
C	5	4
D	5	9

- 5 A fruit drink coloured orange contains a dissolved mixture of red and yellow colouring agents. One of these colouring agents is suspected of being illegal.

Which method could be used to show the presence of this illegal colouring agent?

- A** chromatography
- B** distillation
- C** evaporation
- D** filtration
- 6 A student carries out an experiment to find how fast 3 cm pieces of magnesium ribbon dissolve in 10 cm³ samples of sulfuric acid at different temperatures.

Which piece of apparatus does the student **not** need?

- A** balance
- B** measuring cylinder
- C** stop-clock
- D** thermometer

7 Three electrolysis cells are set up. Each cell has inert electrodes.

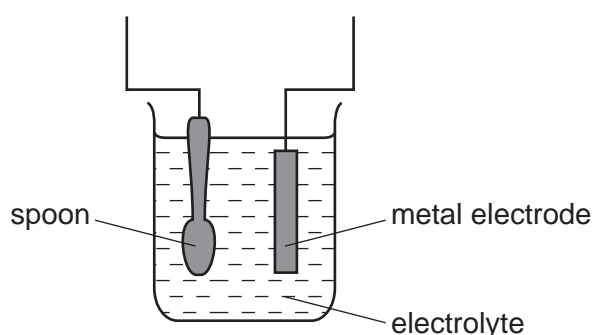
The electrolytes are listed below.

cell 1	aqueous sodium chloride
cell 2	concentrated hydrochloric acid
cell 3	molten lead(II) bromide

In which cells is a gas formed at **both** electrodes?

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

8 The diagram shows apparatus for plating a spoon with silver.



Which statement is **not** correct?

- A** Silver would stick to the spoon because it is a very reactive metal.
B The electrolyte would be a silver salt dissolved in water.
C The metal electrode would be made from silver.
D The spoon would be connected to the negative of the power supply.

9 Aqueous copper(II) sulfate solution is electrolysed using inert electrodes.

Copper(II) ions (Cu^{2+}), hydrogen ions (H^+), hydroxide ions (OH^-) and sulfate ions (SO_4^{2-}) are present in the solution.

To which electrodes are the ions attracted during this electrolysis?

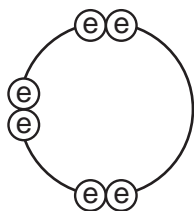
	attracted to anode	attracted to cathode
A	Cu^{2+} and H^+	OH^- and SO_4^{2-}
B	Cu^{2+} and SO_4^{2-}	H^+ and OH^-
C	H^+ and OH^-	Cu^{2+} and SO_4^{2-}
D	OH^- and SO_4^{2-}	Cu^{2+} and H^+


10 In which compounds are pairs of electrons shared between atoms?

- 1 sodium chloride
- 2 methane
- 3 lead bromide

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

11 Element X has six electrons in its outer shell.

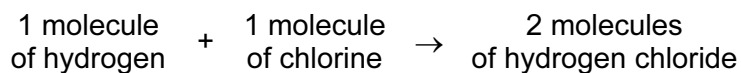


key
 = electron

How could the element react?

- A** by gaining two electrons to form a positive ion
- B** by losing six electrons to form a negative ion
- C** by sharing two electrons with two electrons from another element to form two covalent bonds
- D** by sharing two electrons with two electrons from another element to form four covalent bonds

12 Hydrogen and chlorine react as shown.



What is the equation for this reaction?

- A** $2\text{H} + 2\text{Cl} \rightarrow 2\text{HCl}$
- B** $2\text{H} + 2\text{Cl} \rightarrow \text{H}_2\text{Cl}_2$
- C** $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$
- D** $\text{H}_2 + \text{Cl}_2 \rightarrow \text{H}_2\text{Cl}_2$

13 Which name is given to mixtures of metals?

- A** alloys
- B** compounds
- C** ores
- D** salts

- 14 Iron is extracted from iron oxide using carbon monoxide as shown in the equation.

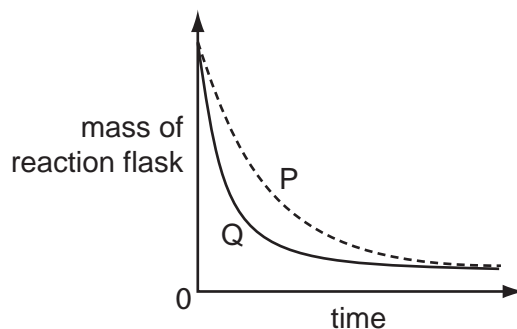


What does the equation show?

- A Carbon monoxide is oxidised to carbon dioxide.
 - B Carbon monoxide is reduced to carbon dioxide.
 - C Iron is oxidised to iron oxide.
 - D Iron oxide is oxidised to iron.
- 15 A student investigates the rate of reaction between marble chips and hydrochloric acid.

The loss in mass of the reaction flask is measured.

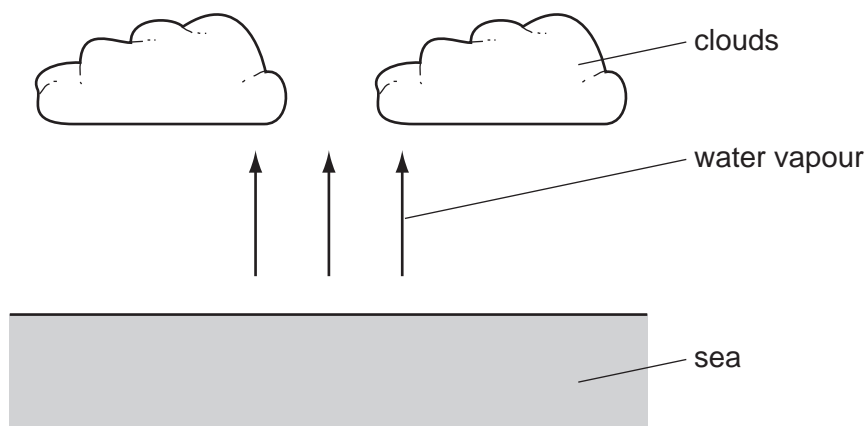
The graph shows the results of two experiments, P and Q.



Which change explains the difference between P and Q?

- A A catalyst is added in P.
- B A higher temperature is used in P.
- C Bigger marble chips are used in Q.
- D Hydrochloric acid is more concentrated in Q.

16 Clouds are formed when water vapour evaporates from the sea.



What is the energy change and what name is given to the type of change when water evaporates?

	energy change	type of change
A	energy given out	endothermic
B	energy given out	exothermic
C	energy taken in	endothermic
D	energy taken in	exothermic

17 Which process is **not** exothermic?

- A** burning a fossil fuel
- B** obtaining lime from limestone
- C** radioactive decay of ^{235}U
- D** reacting hydrogen with oxygen

18 When pink cobalt(II) sulfate crystals are heated, they form steam and a blue solid.

When water is added to the blue solid, it turns pink and becomes hot.

Which terms describe the pink cobalt(II) sulfate crystals and the reactions?

	pink cobalt sulfate	reactions
A	aqueous	irreversible
B	aqueous	reversible
C	hydrated	irreversible
D	hydrated	reversible

19 An element melts at 1455 °C, has a density of 8.90 g/cm³ and forms a green chloride.

Where in the Periodic Table is this element found?

																				A
B																				
										C										
																				D

20 An excess of copper(II) oxide is added to dilute sulfuric acid to make crystals of hydrated copper(II) sulfate.

The processes listed may be used to obtain crystals of hydrated copper(II) sulfate.

- 1 concentrate the resulting solution
- 2 filter
- 3 heat the crystals
- 4 wash the crystals

Which processes are needed and in which order?

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

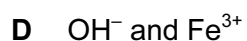
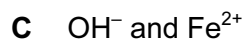
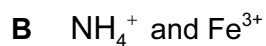
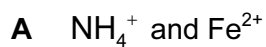
21 Which is **not** a property of Group I metals?

- A** They are soft and can be cut with a knife.
B They corrode rapidly when exposed to oxygen in the air.
C They produce an acidic solution when they react with water.
D They react rapidly with water producing hydrogen gas.

22 Aqueous sodium hydroxide is added to a solid, X, and the mixture is heated.

A green precipitate is formed and an alkaline gas is given off.

Which ions are present in X?



23 An aqueous solution of the organic compound methylamine has a pH greater than 7.

Which statement about methylamine is correct?

A It neutralises an aqueous solution of sodium hydroxide.

B It reacts with copper(II) carbonate to give carbon dioxide.

C It reacts with hydrochloric acid to form a salt.

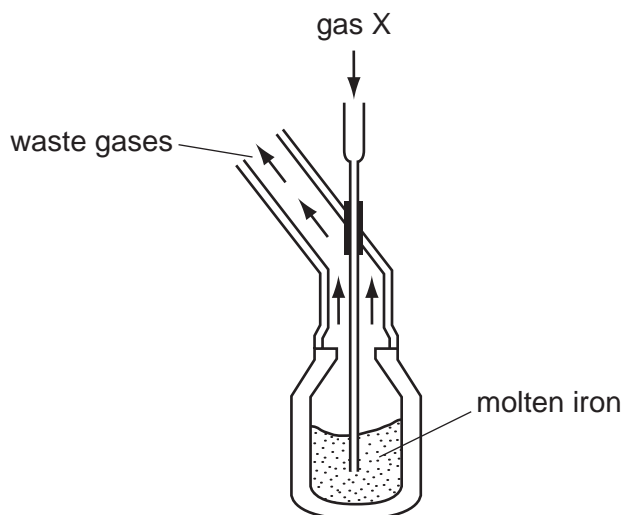
D It turns blue litmus red.

24 The positions in the Periodic Table of four elements are shown.

Which element is **most** likely to form an acidic oxide?

A																			
	B																		
																		C	
																			D

25 The diagram shows the manufacture of steel.



What is gas X?

- A carbon dioxide
- B chlorine
- C hydrogen
- D oxygen

26 A student added dilute hydrochloric acid to four metals and recorded the results.

Not all of the results are correct.

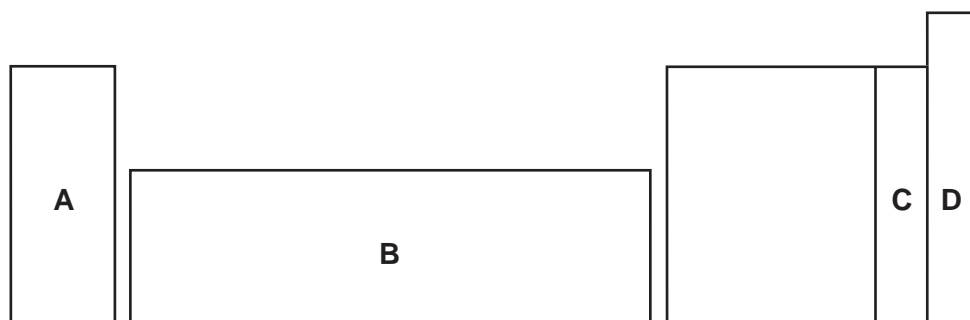
	results	
	metal	gas given off
1	copper	yes
2	iron	yes
3	magnesium	no
4	zinc	yes

Which two results are correct?

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

27 An element does not conduct electricity and exists as diatomic molecules.

In which area of the Periodic Table is the element to be found?



28 Copper, iron and zinc are all used as pure metals.

Which of these three metals are also used in alloys?

	copper	iron	zinc
A	✓	✓	✓
B	✓	✓	x
C	x	✓	✓
D	x	x	✓

29 Solutions of a halogen and a sodium halide are mixed.

Which mixture darkens in colour because a reaction occurs?

- A bromine and sodium chloride
- B bromine and sodium fluoride
- C chlorine and sodium fluoride
- D chlorine and sodium iodide

30 Some properties of four elements are shown in the table.

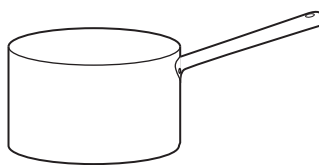
Which element is a metal?

	melting point/°C	electrical conductivity when liquid	electrical conductivity when solid
A	-7	low	low
B	801	high	low
C	1535	high	high
D	3550	low	low

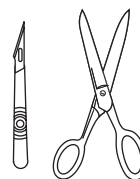
31 The diagram shows three types of item.



cutlery



cooking pan



instruments used
in hospitals

Which method of rust prevention can be used for all three types of item?

- A coating with plastic
- B covering with grease
- C galvanising
- D using stainless steel

32 Aluminium is an important metal with many uses.

Some of its properties are listed.

- 1 It is a good conductor of heat.
- 2 It is a reactive metal.
- 3 It has a low density.
- 4 It has an oxide layer that prevents corrosion.

Which set of properties help to explain the use of aluminium for cooking and storing food?

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

33 To grow roses, a fertiliser containing nitrogen, phosphorus and potassium is needed.

For the best flowers, the fertiliser should contain a high proportion of potassium.

Which fertiliser is best for roses?

fertiliser	proportion by mass		
	N	P	K
A	9	0	25
B	13	13	20
C	29	5	0
D	29	15	5

34 Which statements about water are correct?

- 1 Water is treated with chlorine to kill bacteria.
- 2 Household water may contain salts in solution.
- 3 Water is used in industry for cooling.
- 4 Water for household use is filtered to remove soluble impurities.

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

35 Which statement about methane is **not** correct?

- A It is a liquid produced by distilling petroleum.
- B It is produced as vegetation decomposes.
- C It is produced by animals such as cows.
- D It is used as a fuel.

36 Which compound in polluted air can damage stonework and kill trees?

- A carbon dioxide
- B carbon monoxide
- C lead compounds
- D sulfur dioxide

37 Diesel, petrol and bitumen are all

- A fuels.
- B hydrocarbons.
- C lubricants.
- D waxes.

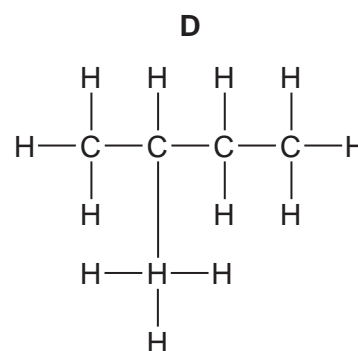
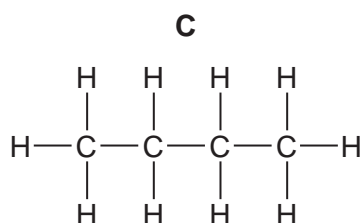
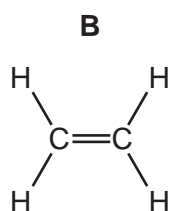
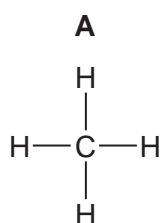
38 A macromolecule is a very large molecule.

Macromolecules can be made by joining smaller molecules together. This is called polymerisation.

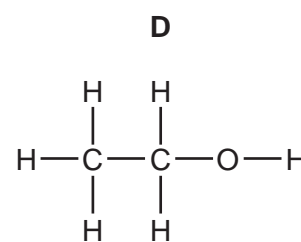
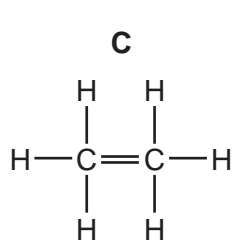
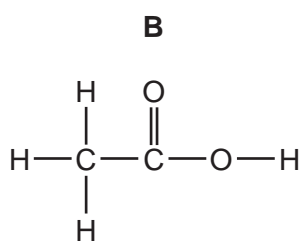
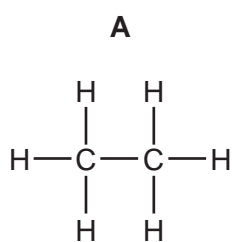
Which row in the table describes the formation of a polymer?

	monomer	polymer
A	ethane	poly(ethane)
B	ethene	poly(ethene)
C	ethane	poly(ethene)
D	ethene	poly(ethane)

39 Which structure shows a compound that belongs to a **different** homologous series to propane?



40 Which structure is **incorrect**?



DATA SHEET
The Periodic Table of the Elements

		Group																											
		I	II	III	IV	V	VI	VII	VIII	IX	X																		
		<table style="margin: auto; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px;">1 H Hydrogen 1</td> <td colspan="10"></td> </tr> </table>										1 H Hydrogen 1																	
1 H Hydrogen 1																													
		<table style="margin: auto; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px;">9 Be Beryllium 4</td> <td colspan="10"></td> </tr> </table>										9 Be Beryllium 4																	
9 Be Beryllium 4																													
		<table style="margin: auto; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px;">23 Na Sodium 11</td> <td style="border: 1px solid black; padding: 2px;">24 Mg Magnesium 12</td> <td colspan="8"></td> <td style="border: 1px solid black; padding: 2px;">19 K Potassium 19</td> <td style="border: 1px solid black; padding: 2px;">20 Ca Calcium 20</td> </tr> </table>										23 Na Sodium 11	24 Mg Magnesium 12									19 K Potassium 19	20 Ca Calcium 20						
23 Na Sodium 11	24 Mg Magnesium 12									19 K Potassium 19	20 Ca Calcium 20																		
		<table style="margin: auto; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px;">39 K Potassium 19</td> <td style="border: 1px solid black; padding: 2px;">40 Ca Calcium 20</td> <td style="border: 1px solid black; padding: 2px;">45 Sc Scandium 21</td> <td style="border: 1px solid black; padding: 2px;">48 Ti Titanium 22</td> <td style="border: 1px solid black; padding: 2px;">51 V Vanadium 23</td> <td style="border: 1px solid black; padding: 2px;">52 Cr Chromium 24</td> <td style="border: 1px solid black; padding: 2px;">55 Mn Manganese 25</td> <td style="border: 1px solid black; padding: 2px;">56 Fe Iron 26</td> <td style="border: 1px solid black; padding: 2px;">59 Co Cobalt 27</td> <td style="border: 1px solid black; padding: 2px;">59 Ni Nickel 28</td> <td style="border: 1px solid black; padding: 2px;">64 Cu Copper 29</td> <td style="border: 1px solid black; padding: 2px;">65 Zn Zinc 30</td> <td style="border: 1px solid black; padding: 2px;">70 Ga Gallium 31</td> <td style="border: 1px solid black; padding: 2px;">73 Ge Germanium 32</td> <td style="border: 1px solid black; padding: 2px;">75 As Arsenic 33</td> <td style="border: 1px solid black; padding: 2px;">79 Se Selenium 34</td> <td style="border: 1px solid black; padding: 2px;">80 Br Bromine 35</td> <td style="border: 1px solid black; padding: 2px;">84 Kr Krypton 36</td> </tr> </table>										39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36												
		<table style="margin: auto; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px;">85 Rb Rubidium 37</td> <td style="border: 1px solid black; padding: 2px;">88 Sr Strontium 38</td> <td style="border: 1px solid black; padding: 2px;">89 Y Yttrium 39</td> <td style="border: 1px solid black; padding: 2px;">91 Zr Zirconium 40</td> <td style="border: 1px solid black; padding: 2px;">93 Nb Niobium 41</td> <td style="border: 1px solid black; padding: 2px;">96 Mo Molybdenum 42</td> <td style="border: 1px solid black; padding: 2px;">101 Ru Ruthenium 44</td> <td style="border: 1px solid black; padding: 2px;">106 Pd Palladium 46</td> <td style="border: 1px solid black; padding: 2px;">108 Ag Silver 47</td> <td style="border: 1px solid black; padding: 2px;">112 Cd Cadmium 48</td> <td style="border: 1px solid black; padding: 2px;">115 In Indium 49</td> <td style="border: 1px solid black; padding: 2px;">122 Sb Antimony 51</td> <td style="border: 1px solid black; padding: 2px;">128 Te Tellurium 52</td> <td style="border: 1px solid black; padding: 2px;">131 Xe Xenon 54</td> </tr> </table>										85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	101 Ru Ruthenium 44	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	122 Sb Antimony 51	128 Te Tellurium 52	131 Xe Xenon 54				
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	101 Ru Ruthenium 44	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	122 Sb Antimony 51	128 Te Tellurium 52	131 Xe Xenon 54																
		<table style="margin: auto; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px;">133 Cs Caesium 55</td> <td style="border: 1px solid black; padding: 2px;">137 Ba Barium 56</td> <td style="border: 1px solid black; padding: 2px;">139 La Lanthanum 57</td> <td style="border: 1px solid black; padding: 2px;">178 Hf Hafnium 72</td> <td style="border: 1px solid black; padding: 2px;">181 Ta Tantalum 73</td> <td style="border: 1px solid black; padding: 2px;">184 W Tungsten 74</td> <td style="border: 1px solid black; padding: 2px;">190 Os Osmium 76</td> <td style="border: 1px solid black; padding: 2px;">195 Pt Platinum 78</td> <td style="border: 1px solid black; padding: 2px;">197 Au Gold 79</td> <td style="border: 1px solid black; padding: 2px;">201 Hg Mercury 80</td> <td style="border: 1px solid black; padding: 2px;">204 Tl Thallium 81</td> <td style="border: 1px solid black; padding: 2px;">209 Pb Lead 82</td> <td style="border: 1px solid black; padding: 2px;">210 Bi Bismuth 83</td> <td style="border: 1px solid black; padding: 2px;">210 Po Polonium 84</td> <td style="border: 1px solid black; padding: 2px;">210 At Astatine 85</td> <td style="border: 1px solid black; padding: 2px;">210 Rn Radon 86</td> </tr> </table>										133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	190 Os Osmium 76	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	209 Pb Lead 82	210 Bi Bismuth 83	210 Po Polonium 84	210 At Astatine 85	210 Rn Radon 86		
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	190 Os Osmium 76	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	209 Pb Lead 82	210 Bi Bismuth 83	210 Po Polonium 84	210 At Astatine 85	210 Rn Radon 86														
		<table style="margin: auto; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px;">226 Ra Radium 88</td> <td style="border: 1px solid black; padding: 2px;">227 Ac Actinium 89</td> <td colspan="10"></td> </tr> </table>										226 Ra Radium 88	227 Ac Actinium 89																
226 Ra Radium 88	227 Ac Actinium 89																												
		<table style="margin: auto; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px;">140 Ce Cerium 58</td> <td style="border: 1px solid black; padding: 2px;">141 Pr Praseodymium 59</td> <td style="border: 1px solid black; padding: 2px;">144 Nd Neodymium 60</td> <td style="border: 1px solid black; padding: 2px;">150 Sm Samarium 62</td> <td style="border: 1px solid black; padding: 2px;">152 Eu Europium 63</td> <td style="border: 1px solid black; padding: 2px;">157 Gd Gadolinium 64</td> <td style="border: 1px solid black; padding: 2px;">159 Tb Terbium 65</td> <td style="border: 1px solid black; padding: 2px;">162 Dy Dysprosium 66</td> <td style="border: 1px solid black; padding: 2px;">165 Ho Holmium 67</td> <td style="border: 1px solid black; padding: 2px;">167 Er Erbium 68</td> <td style="border: 1px solid black; padding: 2px;">169 Tm Thulium 69</td> <td style="border: 1px solid black; padding: 2px;">173 Yb Ytterbium 70</td> <td style="border: 1px solid black; padding: 2px;">175 Lu Lutetium 71</td> </tr> </table>										140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71					
140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71																	
		<table style="margin: auto; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px;">232 Th Thorium 90</td> <td style="border: 1px solid black; padding: 2px;">238 U Uranium 92</td> <td style="border: 1px solid black; padding: 2px;">238 Np Neptunium 93</td> <td style="border: 1px solid black; padding: 2px;">238 Pu Plutonium 94</td> <td style="border: 1px solid black; padding: 2px;">238 Am Americium 95</td> <td style="border: 1px solid black; padding: 2px;">238 Cm Curium 96</td> <td style="border: 1px solid black; padding: 2px;">238 Bk Berkelium 97</td> <td style="border: 1px solid black; padding: 2px;">238 Cf Californium 98</td> <td style="border: 1px solid black; padding: 2px;">238 Es Einsteinium 99</td> <td style="border: 1px solid black; padding: 2px;">238 Fm Fermium 100</td> <td style="border: 1px solid black; padding: 2px;">238 Md Mendelevium 101</td> <td style="border: 1px solid black; padding: 2px;">238 No Nobelium 102</td> <td style="border: 1px solid black; padding: 2px;">238 Lr Lawrencium 103</td> </tr> </table>										232 Th Thorium 90	238 U Uranium 92	238 Np Neptunium 93	238 Pu Plutonium 94	238 Am Americium 95	238 Cm Curium 96	238 Bk Berkelium 97	238 Cf Californium 98	238 Es Einsteinium 99	238 Fm Fermium 100	238 Md Mendelevium 101	238 No Nobelium 102	238 Lr Lawrencium 103					
232 Th Thorium 90	238 U Uranium 92	238 Np Neptunium 93	238 Pu Plutonium 94	238 Am Americium 95	238 Cm Curium 96	238 Bk Berkelium 97	238 Cf Californium 98	238 Es Einsteinium 99	238 Fm Fermium 100	238 Md Mendelevium 101	238 No Nobelium 102	238 Lr Lawrencium 103																	

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

a	X	b
Key		
	a = relative atomic mass	
	X = atomic symbol	
	b = proton (atomic) number	

* 58-71 Lanthanoid series
† 90-103 Actinoid series

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.

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