

Name:

Index no:

Class:



Bukit Batok Secondary School
PRELIMINARY EXAMINATIONS 2022
SECONDARY 4 EXPRESS

CHEMISTRY

6092/01

Paper 1 Multiple Choice

24 Aug 2022

1105–1205

1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your name, index number and class on the Answer Sheet in the spaces provided.

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.

The use of an approved scientific calculator is expected, where appropriate.

- 1 An impure sample of X melts at around 90°C.

What is most likely to be the melting point of pure X?

- A below 80°C
- B between 85°C and 90°C
- C between 90°C and 95°C
- D cannot be determined

- 2 A student is given a mixture of oil, sand and copper(II) sulfate solution and is required to produce from the mixture, separate samples of oil, sand and copper(II) sulfate. The student is supplied with filtration apparatus(F), a separating funnel(S) and an evaporating dish(E).

Which is the correct order of the apparatus used to separate the mixture?

- A E, F, then S
- B F, E, then S
- C F, S, then E
- D S, F, then E

- 3 Which statements about kinetic particle theory are **incorrect**?

- 1. When a solid is heated, its particles melt.
- 2. All particles move at a constant speed.
- 3. Ethene particles move faster than carbon monoxide.

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

- 4 Statements A to D refer to an imaginary element discovered in a meteoroid.

Which statement most strongly suggests that the element is a non-metal?

- A It forms an acidic oxide.
- B It is soluble in water.
- C It is a conductor of electricity.
- D It reacts vigorously with chlorine.

- 5 Two particles have the same number of protons and neutrons but different number of electrons.

What can be inferred about the two particles?

- A They are an atom and an ion of different elements.
- B They are an atom and an ion of the same element.
- C They are an atom and an isotope of different elements.
- D They are an atom and an isotope of the same element.

- 6 Elements D, E and G are atoms with proton numbers 3, 8 and 17 respectively.

What are the formulae of their hydrides formed?

	D	E	G
A	DH	HE ₂	HG
B	DH	H ₂ E	HG
C	DH ₂	HE ₂	HG ₇
D	DH ₃	H ₂ E	H ₇ G

- 7 Which row shows the substance in the order of their melting points?

	highest	—————→			lowest
A	chlorine	fluorine	potassium	diamond	
B	diamond	potassium	chlorine	fluorine	
C	diamond	potassium	fluorine	chlorine	
D	potassium	diamond	chlorine	fluorine	

- 8 Which statement explains why sodium chloride has a lower melting point than magnesium oxide?

- A Sodium chloride is covalent but magnesium oxide is ionic.
- B Sodium is more reactive than magnesium.
- C The attraction between the ions in sodium chloride is weaker than that between the ions in magnesium oxide.
- D The melting point of sodium is lower than that of magnesium.

- 9 Carbon disulfide is used in manufacturing polymers and fibres.

Which statement about carbon disulfide is correct?

- A** It has a high boiling point.
B It has a giant molecular structure.
C It is a simple covalent compound with single covalent bonds only.
D It is insoluble in water.

- 10 A carbohydrate has the formula $(\text{CH}_2\text{O})_6$.
 0.50 mole of this carbohydrate is burned in excess oxygen and the gas formed is collected.

What volume of gas, measured at room temperature and pressure, is collected?

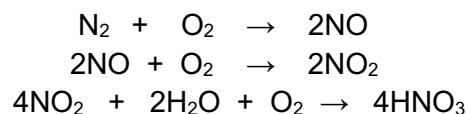
- A** 12 dm³ **B** 24 dm³ **C** 72 dm³ **D** 144 dm³

- 11 The formula of an oxide of element Y is Y_2O_3 .
 16.0 g of the oxide contains 11.2 g of Y.

How many moles of Y does 11.2 g of the element contain?

- A** $\frac{4.8}{16} \times \frac{2}{3}$
B $\frac{4.8}{16} \times \frac{3}{2}$
C $\frac{8}{16} \times \frac{3}{2}$
D $\frac{8}{16} \times \frac{3}{2}$

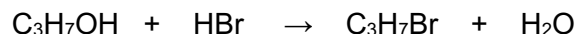
- 12 The equations show the reactions involved in the formation of nitric acid, HNO_3 , from nitrogen.



How many moles of nitric acid are formed from 1.00 mole of nitrogen?

- A** 0.50 **B** 1.00 **C** 2.00 **D** 4.00

- 13 Bromopropane, $\text{C}_3\text{H}_7\text{Br}$, can be made from propanol using the reaction shown.



In an experiment, 8 g of propanol produced 10 g of bromopropane.

What is the percentage yield of bromopropane?

- A** 40.7% **B** 48.8% **C** 61.0% **D** 80.0%

- 14 In a volumetric experiment involving the addition of hydrochloric acid to 25.0 cm^3 of aqueous sodium hydroxide, it is necessary to determine when the reaction is just completed.

Which piece of apparatus could be used to determine the end-point of the reaction?

- A** electronic balance
B gas syringe
C stopwatch
D thermometer

- 15 A salt, S, is dissolved in water to give a green solution. On adding chlorine, the green solution turned yellow. On addition of aqueous sodium hydroxide, the green solution gave a green precipitate and the yellow solution gave a red-brown precipitate. On addition of dilute nitric acid followed by aqueous silver nitrate, the green solution gave a white precipitate.

What is the formula of S?

- A** CuCl_2 **B** FeCl_2 **C** FeCl_3 **D** FeSO_4

- 16 Which pair of reagents can be used to prepare an aqueous solution containing copper(II) chloride as the only salt?

- A** copper metal and dilute hydrochloric acid
B copper(II) nitrate and aqueous sodium chloride
C copper(II) oxide and dilute hydrochloric acid
D copper(II) sulfate and dilute hydrochloric acid

- 17 The following reactions are carried out.

reaction	result
ammonium chloride is warmed with sodium hydroxide solution	gas P is given off
ethanoic acid is added to an aqueous solution of ammonia	compound Q is formed
sulfuric acid is added to an ammonium carbonate	gas R is given off

What are P, Q and R?

	gas P	compound Q	gas R
A	ammonia	ammonium carbonate	carbon dioxide
B	ammonia	ammonium ethanoate	carbon dioxide
C	ammonia	ammonium ethanoate	ammonia
D	chlorine	ammonium ethanoate	ammonia

- 18 On bubbling carbon dioxide into an aqueous solution of X, a white precipitate, Y, is formed. This precipitate dissolves when more carbon dioxide is bubbled through, forming a colourless solution of Z.

What are the formulae of X, Y and Z?

	X	Y	Z
A	CaCO_3	Ca(OH)_2	$\text{Ca(HCO}_3)_2$
B	CaCO_3	$\text{Ca(HCO}_3)_2$	Ca(OH)_2
C	Ca(OH)_2	CaCO_3	$\text{Ca(HCO}_3)_2$
D	Ca(OH)_2	$\text{Ca(HCO}_3)_2$	CaCO_3

- 19 Elements X and Y are in Group VII of the Periodic Table.

X is a liquid at room temperature. Y is a gas at room temperature.

Which statement(s) is/are correct?

1. Atoms of X have more neutrons than atoms of Y.
2. X has a paler colour than Y.
3. X displaces Y from aqueous solutions of Y^- ions.

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

20 Which statement about groups and periods in the Periodic Table is correct?

- A** Atoms gain electrons more easily down Group I.
- B** Melting point increases across Period 2.
- C** The most unreactive group contains only non-metals.
- D** The strongest non-metal oxidising agent is at the bottom of a group.

21 W, X, Y and Z are elements in the Periodic Table.

- W and Z reacts readily with water.
- W has a lower melting point than Z.
- X has a common oxidation state of +1 and Y has a common oxidation state of -2.
- X is formed as an element at the negative electrode during electrolysis.

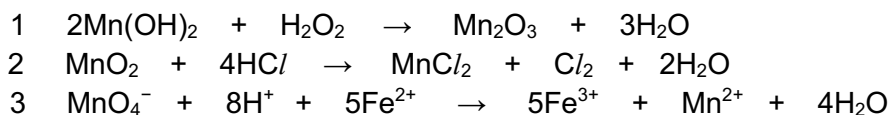
Which statement could be correct?

- A** W could be sodium and Z could be potassium.
- B** X is most likely to be hydrogen.
- C** Y is most likely to be in Group IV.
- D** Z burns in air to form an acidic oxide.

22 Which process does **not** involve either oxidation or reduction?

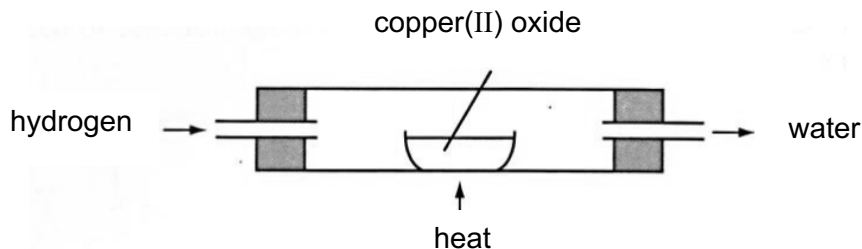
- A** formation of ammonium nitrate from ammonia and nitric acid
- B** formation of nitrogen monoxide from ammonia
- C** formation of sulfuric acid from sulfur
- D** formation of zinc from zinc sulfide

23 In which equations is manganese being oxidised?



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

- 24 An experiment is set up as shown.



A student recorded these inferences.

1. Hydrogen is a reducing agent.
2. Hydrogen gains oxygen to form water.
3. Copper(II) oxide loses oxygen to form copper metal.
4. Copper(II) oxide gains hydrogen and is reduced.

Which of these inferences are **true**?

- A** 1 and 3 only
B 2 and 4 only
C 1, 2 and 3 only
D 1, 2 and 4 only
- 25 In the manufacture of iron by the blast furnace, which are the main gases that escape from the top of the blast furnace?
- A** carbon monoxide, carbon dioxide, hydrogen
B nitrogen, carbon dioxide, carbon monoxide
C nitrogen, oxygen, steam
D oxygen, carbon dioxide, sulfur dioxide
- 26 When heated, solid X gives off a gas. When this gas is bubbled through limewater, a white precipitate is formed.

The residue, after heating solid X, reacts with dilute acid and aqueous alkali.

What is X?

- A** iron(II) carbonate
B lead(II) carbonate
C magnesium carbonate
D sodium carbonate

- 27 Experiments were carried out to determine the reactivity of three metals, X, Y and Z. The results are tabulated below.

experiment	X	Y	Z
reaction with steam	no	yes	yes
reduction of metal oxide with carbon	yes	yes	no

Which metal is likely to be X, Y and Z?

	X	Y	Z
A	copper	zinc	magnesium
B	copper	magnesium	zinc
C	magnesium	zinc	copper
D	zinc	copper	magnesium

- 28 A coil of clean copper wire is suspended in a beaker of aqueous silver nitrate. Crystals of silver are deposited on the copper wire.

Which statement is **not** correct?

- A** The copper is oxidised.
- B** The solution turns blue.
- C** The total mass of the crystals of silver increases gradually.
- D** The total number of positive ions in the solution is unchanged.

29 The table gives information about five metals.

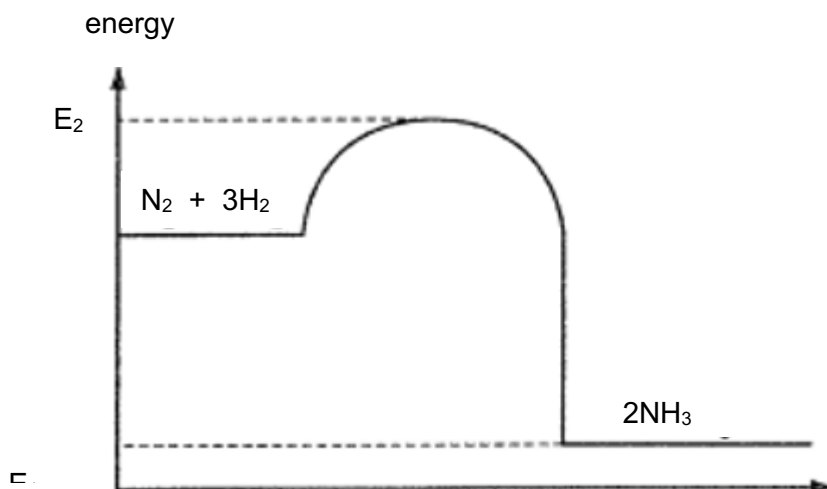
metal	% in earth's crust	cost per tonne / \$
aluminium	8.1	750
copper	0.0007	1080
iron	5	300
tin	0.0002	9500
zinc	0.015	575

The general pattern suggests that the higher the percentage of metal in the earth's crust, the lower the cost.

Aluminium does **not** fit in this pattern. Why is this so?

- A Collection and transportation of used aluminium for recycling cost money.
- B Demand for the uses of aluminium is greater than other metals.
- C Reduction of aluminium oxide using electricity is more expensive.
- D The oxide layer for protecting aluminium has to be removed.

30 The energy profile diagram shows Haber process.



What does the energy change $E_2 - E_1$ represent?

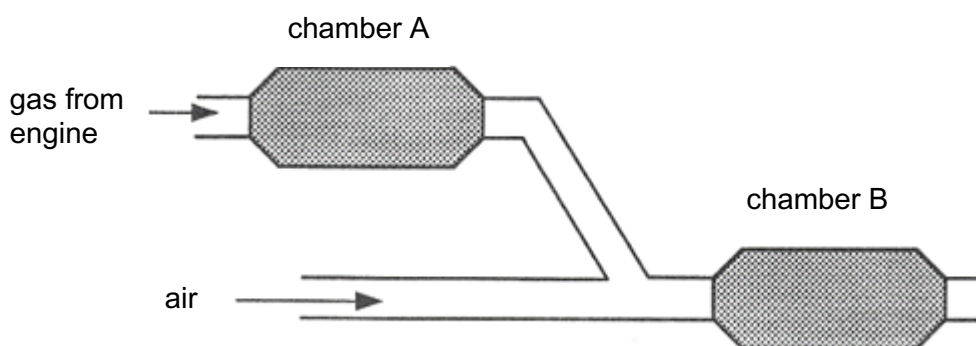
- A activation energy of the forward reaction
- B activation energy of the reverse reaction
- C enthalpy change for the forward reaction
- D enthalpy change for the reverse reaction

- 31** Ammonia is produced by the reaction of the elements hydrogen and nitrogen in the Haber process.

How is ammonia produced during the Haber process separated from the reaction mixture?

- A** cooling the mixture
- B** dissolving the other two gases
- C** filtering out the other two gases
- D** passing gaseous mixture through fused calcium oxide

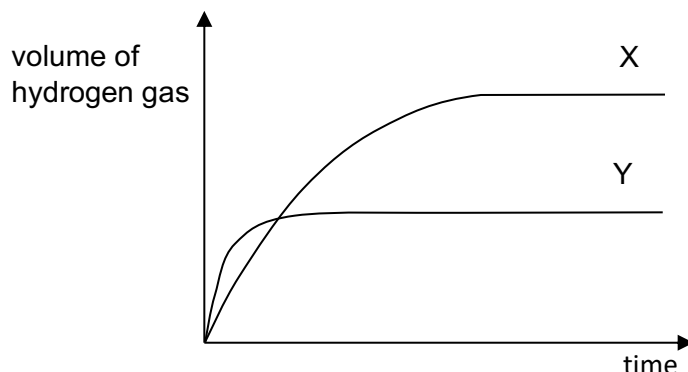
- 32** The diagram below shows a catalytic converter that is installed in a car in which the engine runs on petrol. It consists of a reductive chamber A and an oxidative chamber B.



Which equation represents the reaction that takes place in one of the chambers?

- A** $\text{N}_2 + \text{O}_2 \rightarrow \text{N}_2\text{O}_2$
- B** $2\text{CO} + \text{O}_2 \rightarrow 2\text{CO}_2$
- C** $\text{CH}_4 + 2\text{O}_2 \rightarrow 2\text{H}_2\text{O} + \text{CO}_2$
- D** $2\text{NO} + \text{O}_2 \rightarrow 2\text{NO}_2$

- 33 Two experiments on the reaction between zinc and sulfuric acid are carried out and their results are given in the graph below.



If 4 g of zinc granules reacts with 100 cm³ of 1.0 mol/dm³ sulfuric acid to produce graph X, which of the following could give rise to graph Y?

- A 2 g zinc granules in 100 cm³ of 1.0 mol/dm³ sulfuric acid
 B 2 g zinc granules in 100 cm³ of 2.0 mol/dm³ sulfuric acid
 C 4 g zinc granules in 50 cm³ of 2.0 mol/dm³ sulfuric acid
 D 4 g zinc granules in 25 cm³ of 2.0 mol/dm³ sulfuric acid
- 34 Why is nickel used in the hydrogenation of alkenes?
- A It increases the yield of products.
 B It lowers the activation energy of the reaction.
 C It makes the reaction more exothermic.
 D It prevents a reverse reaction from occurring.
- 35 Which of the following combinations of type of electrodes, electrolyte and products at the electrodes is correct when the solution is electrolysed?

	type of electrodes	electrolyte	product at the anode	product at the cathode
A	carbon	aqueous hydrochloric acid	oxygen	hydrogen
B	carbon	concentrated potassium chloride	chlorine	oxygen
C	copper	dilute copper(II) nitrate	copper	copper
D	platinum	concentrated sodium hydroxide	oxygen	sodium

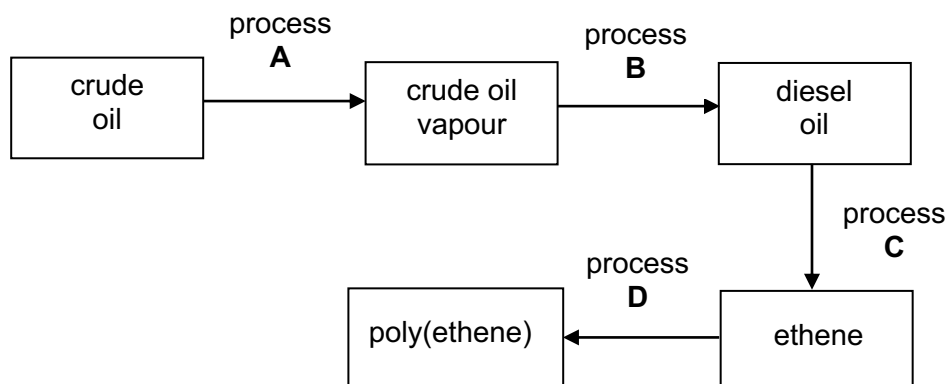
- 36** A metal key is being electroplated with copper. The mass of the key is measured before and after the electroplating process.

	mass of metal key / g
before electroplating	5.43
after electroplating	6.71

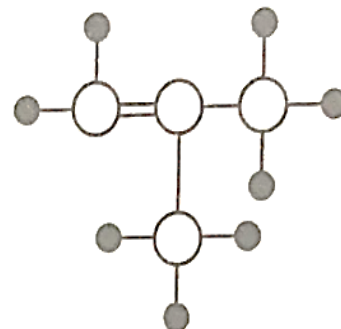
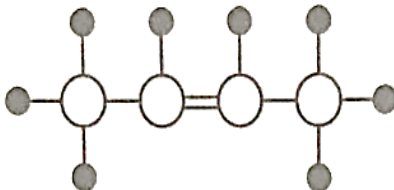
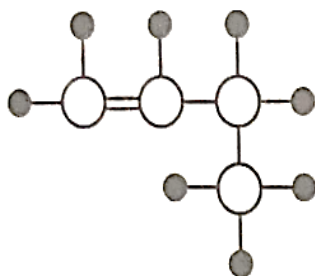
What is the number of moles of oxygen gas formed at the other electrode?

- A** 0.01 mol. **B** 0.02 mol. **C** 0.03 mol. **D** 0.04 mol.
- 37** The flow chart outlines the manufacture of poly(ethene) from crude oil.

Which process involves cracking?



T



key ○ = carbon
 ● = hydrogen

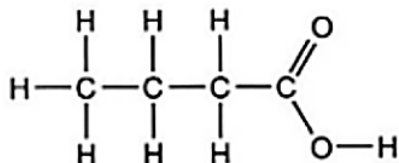
A All three hydrocarbons are isomers of propene.
B R is a branched alkene.
C S is but-1-ene.
D T is an isomer of butene.

- 39 The results of two tests on compound U are shown.

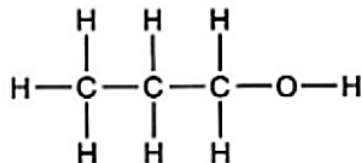
test	result
add aqueous bromine	turns colourless
add acidified potassium manganate(VII) solution	turns colourless

Which structure is U?

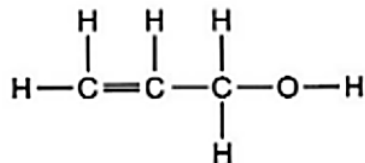
A



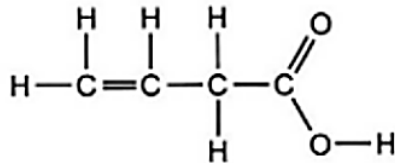
B



C



D



- 40 L has the formula $\text{HOOC}(\text{CH}_2)_4\text{COOH}$ and M has the formula $\text{H}_2\text{N}(\text{CH}_2)_6\text{NH}_2$. When L is reacted with M, a macromolecule is formed.

Which statement about this macromolecule is correct?

- A** Double bonds in the monomers are broken during its formation.
- B** It is non-biodegradable.
- C** It has ester linkages.
- D** It represents the structure of Terylene.

End of Paper

DATA SHEET

The Periodic Table of Elements

Group																					
I	II											III	IV	V	VI	VII	0				
Key proton (atomic) number atomic symbol							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 —		114 Fl Flerovium —		116 Lv Livermorium —						

lanthanoids

57 La Lanthanum 139	58 Ce Cerium 140	59 Pr Praseodymium 141	60 Nd Neodymium 144	61 Pm Promethium 147	62 Sm Samarium 150	63 Eu Europium 152	64 Gd Gadolinium 157	65 Tb Terbium 159	66 Dy Dysprosium 162	67 Ho Holmium 165	68 Er Erbium 167	69 Tm Thulium 169	70 Yb Ytterbium 173	71 Lu Lutetium 175
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 -

actinoids

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