Cambridge Assessment International Education

Cambridge O Level

CHEMISTRY **5070/11**

Paper 1 Multiple Choice **October/November 2022**

1 hour

You must answer on the multiple choice answer sheet.

7425830231

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.

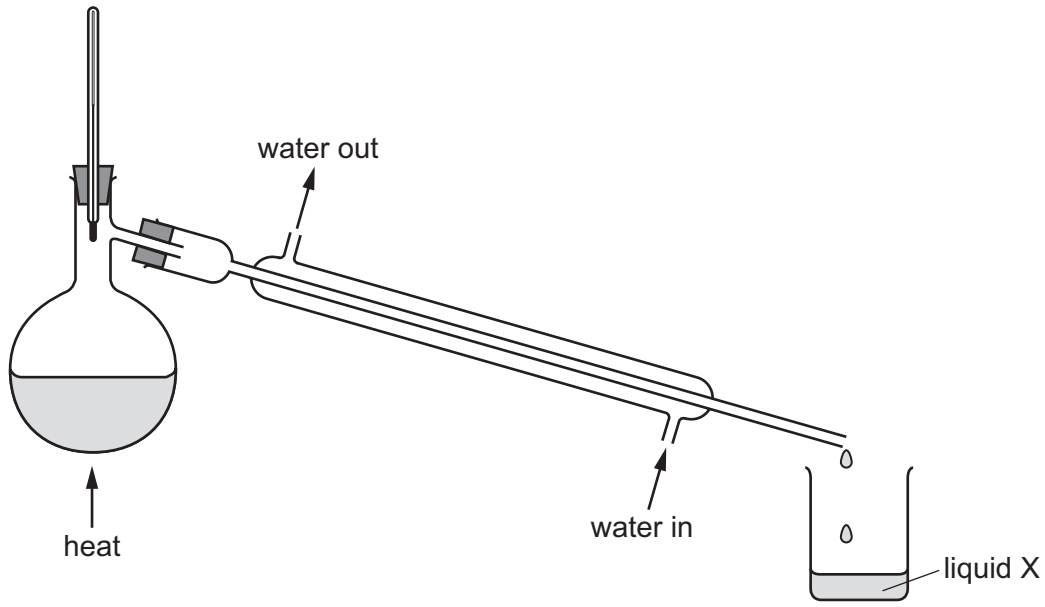
This document has **16** pages. Any blank pages are indicated.

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1 Which row shows the most appropriate apparatus for the measurement given?

	quantity	apparatus
A	25.0 cm^3 of solution	measuring cylinder
B	32.7 cm^3 of solution	pipette
C	75 cm^3 of gas	gas syringe
D	80 cm^3 of solution	burette

2 A liquid, X, is distilled from a mixture using the apparatus shown.



During the distillation, the thermometer reads from 157 °C to 160 °C.

Which information about liquid X is correct?

A The liquids in X may or may not be miscible (mix with each other).

B X is a mixture that can be separated by distillation.

C X must contain two liquids with boiling points 157 °C and 160 °C.

D X must have been obtained by the fractional distillation of petroleum (crude oil).

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3 An aqueous solution contains a salt, Y.

Addition of an aqueous solution X results in a precipitate being formed that redissolves when more X is added.

What could solution X and salt Y be?

	solution X	salt Y
A	$HCl(aq)$	$AgNO_3$
B	$H_2SO_4(aq)$	$Ba(NO_3)_2$
C	$NaOH(aq)$	$CuSO_4$
D	$NaOH(aq)$	$ZnSO_4$

4 Which gas diffuses the fastest at the same pressure?

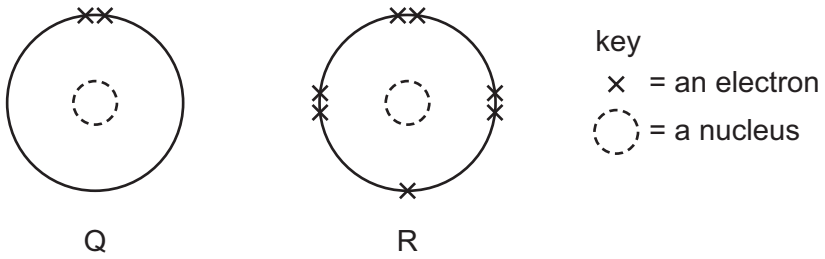
A nitrogen at 25 °C

B nitrogen at 50 °C

C oxygen at 25 °C

D oxygen at 50 °C

5 The diagram shows the outer shell electrons of the atoms of two elements, Q and R.



The sulfate of Q is insoluble.

Element R is gaseous at room temperature and pressure.

Which row could be correct?

	proton number of Q	relative atomic mass of R
A	12	35.5
B	12	80
C	56	80
D	56	35.5

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6 Which statement about iodine atoms and iodide ions is correct?

A They are both isotopes of iodine.

B They undergo the same chemical reactions.

C They have the same number of protons.

D They have the same physical properties.

7 The element chlorine has two isotopes, $^{35}_{17}Cl$ and $^{37}_{17}Cl$.

In the Periodic Table, chlorine is shown as $^{35.5}_{17}Cl$.

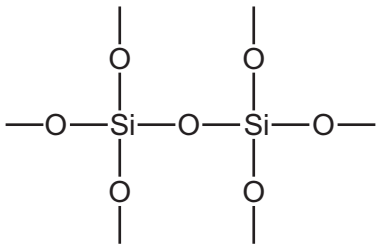
Which row shows the correct percentage of each isotope in a sample of naturally occurring chlorine?

	percentage of $^{35}_{17}Cl$	percentage of $^{37}_{17}Cl$
A	25	75
B	40	60
C	50	50
D	75	25

8 What is the nucleon number of the isotope of uranium, $^{235}_{92}U$?

A 92 **B** 143 **C** 235 **D** 327

9 Silicon dioxide has a giant structure. Each silicon atom is joined to four oxygen atoms by covalent bonds. Part of the structure is shown.



Which property would silicon dioxide be expected to have?

A a good conductor of electricity

B a high melting point

C reacts with hydrochloric acid

D soluble in water

10 Elements X and Y react to form compound XY. Element Y has more electrons in its outer shell than element X. Compound XY conducts electricity in the molten state.

Which row correctly states the electron change that occurs during the reaction and the type of bonding in compound XY?

	electron change during formation of compound XY	type of bonding in compound XY
A	X donates electrons to Y	ionic
B	X shares electrons with Y	covalent
C	Y donates electrons to X	covalent
D	Y shares electrons with X	ionic

11 Which compound has the most single bonds in one molecule?

A CH_3CH_3 **B** CH_3CH_2OH **C** CH_3CO_2H **D** CH_3CHCH_2

12 The formula of ammonium metavanadate is NH_4VO_3. It consists of NH_4 ions and VO_3 ions.

What are the charges on these ions?

	NH_4 ion	VO_3 ion
A	1+	1–
B	2+	2–
C	3+	4–
D	4+	3–

13 Which mass of oxygen gas combines with exactly 16 g of sulfur to form sulfur dioxide, SO_2?

A 4 g **B** 8 g **C** 16 g **D** 32 g

14 The atomic number of ruthenium is 44. One of the oxides of ruthenium is a black solid, X. 5.79 g of X contains 1.39 g of oxygen.

What is the empirical formula of X?

A Ru_2O **B** RuO **C** RuO_2 **D** RuO_4

15 250 cm^3 of 1.0 mol/dm^3 hydrochloric acid reacts with an excess of solid sodium carbonate. The equation is shown.

$$2HCl(aq) + Na_2CO_3(s) \rightarrow 2NaCl(aq) + CO_2(g) + H_2O(l)$$

What is the volume of carbon dioxide produced when measured at room temperature and pressure?

A 3.0 dm^3 **B** 6.0 dm^3 **C** 12 dm^3 **D** 24 dm^3

16 When excess aqueous barium chloride is added to 25.0 cm^3 of 1.00 mol/dm^3 sodium sulfate, a white precipitate of barium sulfate is formed.

$$Na_2SO_4(aq) + BaCl_2(aq) \rightarrow BaSO_4(s) + 2NaCl(aq)$$

The precipitate is filtered off, washed, dried and weighed. 5.36 g barium sulfate is obtained.

What is the percentage yield of barium sulfate?

[M_r: Na_2SO_4, 142; $BaCl_2$, 208; $BaSO_4$, 233; $NaCl$, 58.5]

A 2.3% **B** 27% **C** 92% **D** 97%

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

Which statement is correct?

A Copper is collected at the anode.

B Hydrogen is collected at the cathode.

C Oxygen is collected at the anode.

D Sulfur is collected at the cathode.

18 Concentrated aqueous sodium chloride is electrolysed using inert electrodes.

Which equation shows the reaction that occurs at the anode?

A $2Cl^- \rightarrow Cl_2 + 2e^-$

B $2Cl^- + 2e^- \rightarrow Cl_2$

C $2H^+ + 2e^- \rightarrow H_2$

D $4OH^- \rightarrow O_2 + 2H_2O + 4e^-$

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19 Which pair of equations correctly represents the reactions taking place at the anode and at the cathode during the electrolysis of molten silver bromide?

	anode	cathode
A	$2Br^- \rightarrow Br_2 + 2e^-$	$Ag^{2+} + 2e^- \rightarrow Ag$
B	$Br^{2-} \rightarrow Br_2 + 2e^-$	$Ag^+ + e^- \rightarrow Ag$
C	$2Br^- \rightarrow Br_2 + 2e^-$	$Ag^+ + e^- \rightarrow Ag$
D	$Ag^+ + e^- \rightarrow Ag$	$2Br^- \rightarrow Br_2 + 2e^-$

20 Which two processes are both endothermic?

A combustion and cracking

B combustion and fermentation

C cracking and photosynthesis

D respiration and photosynthesis

21 A sample of sulfuric acid is added to 10 g of zinc granules. A reaction occurs and a gas is produced. The rate of the reaction is increased if a small amount of copper is added. The copper is unchanged after the reaction.

Which statement about this reaction is correct?

A Copper acts as a biological catalyst in this reaction.

B Copper lowers the activation energy of this reaction.

C The rate of the reaction is greater as the particle size of the zinc is greater.

D The rate of the reaction is greater if the pressure is increased.

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22 The rate of reaction between magnesium and dilute hydrochloric acid is investigated. The equation is shown.

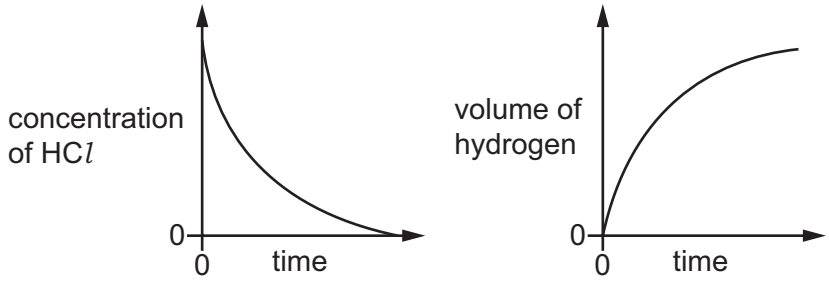
$$Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$$

A known mass of magnesium is added to an excess of dilute hydrochloric acid.

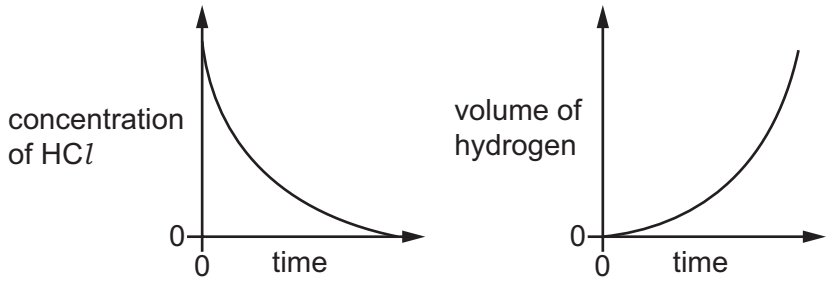
The concentration of the hydrochloric acid and the volume of hydrogen produced is measured at regular time intervals.

Which pair of graphs correctly shows the experimental results?

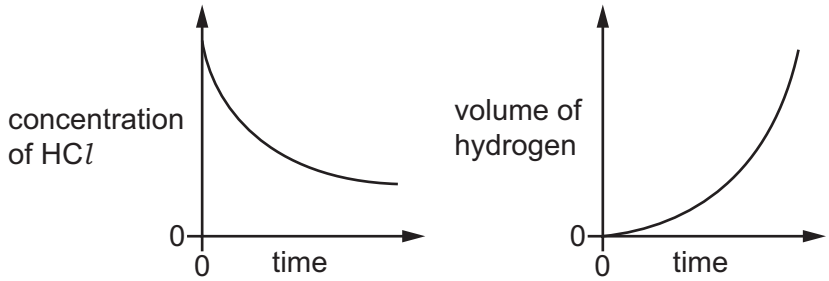
A



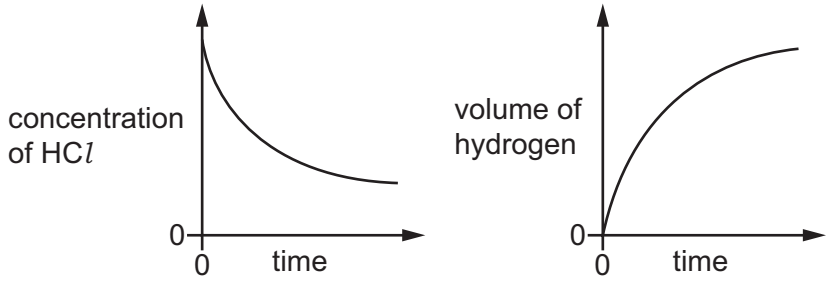
B



C



D



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23 In which reaction is the underlined substance reduced?

A $\underline{Ca}CO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$

B $\underline{Cu^{2+}} + Zn \rightarrow Cu + Zn^{2+}$

C $Fe_2O_3 + 3\underline{C}O \rightarrow 2Fe + 3CO_2$

D $H_2SO_4 + \underline{Zn} \rightarrow ZnSO_4 + H_2$

24 Which change involves reduction?

A calcium carbonate to calcium oxide

B copper to brass

C ethene to poly(ethene)

D sand to silicon

25 Thiosulfate ions, $S_2O_3^{2-}$, react with iodine, I_2, in aqueous solution.

$$2S_2O_3^{2-}(aq) + I_2(aq) \rightarrow 2I^-(aq) + S_4O_6^{2-}(aq)$$

In this reaction, the $S_2O_3^{2-}$ ions .....1..... electrons and are .....2..... .

Which words correctly complete gaps 1 and 2?

	1	2
A	gain	oxidised
B	gain	reduced
C	lose	oxidised
D	lose	reduced

26 The equation shows a reaction in the Contact process.

$$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g) \qquad \Delta H = -196\,kJ/mol$$

Which change would move the position of equilibrium to the left?

A adding more O_2

B increasing the pressure

C increasing the temperature

D removing SO_3 from the reacting mixture

27 Some medicines contain the magnesium salt of a fatty acid. The fatty acids are members of the homologous series of carboxylic acids and contain one carboxylic acid group.

What is the carboxylic acid functional group and how many moles of a fatty acid react with one mole of magnesium?

	functional group	moles of fatty acid
A	$-CO_2H$	1
B	$-CO_2H$	2
C	$-CH_2OH$	1
D	$-CH_2OH$	2

28 Sodium sulfate, Na_2SO_4, and sodium hydrogensulfate, $NaHSO_4$, can both be prepared using aqueous sodium hydroxide and sulfuric acid.

$$2NaOH(aq) + H_2SO_4(aq) \rightarrow Na_2SO_4(aq) + 2H_2O(l)$$

$$NaOH(aq) + H_2SO_4(aq) \rightarrow NaHSO_4(aq) + H_2O(l)$$

$50\,cm^3$ of $1\,mol/dm^3$ sodium hydroxide is used each time.

Which row shows the correct volumes of $1\,mol/dm^3$ sulfuric acid required to prepare a sample of sodium sulfate and a sample of sodium hydrogensulfate?

	volume of sulfuric acid required to make sodium sulfate / cm^3	volume of sulfuric acid required to make sodium hydrogensulfate / cm^3
A	25	50
B	25	12.5
C	50	12.5
D	50	25

29 Which substance reacts with dilute sulfuric acid in the preparation of a pure sample of lead(II) sulfate?

A aqueous lead(II) nitrate

B lead foil

C powdered lead(II) carbonate

D powdered lead(II) oxide

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30 Which statement about sulfuric acid is correct?

A In the manufacture of sulfuric acid, iron is used as the catalyst in the Contact process.

B Sulfuric acid is used in some batteries.

C Sulfuric acid is used as a fertiliser.

D Sulfuric acid is used as a food preservative.

31 Two statements are given.

statement 1 Going down Group I and Group VII, the melting point of the elements increases.

statement 2 Chlorine can displace iodine from aqueous potassium iodide but cannot displace bromine from aqueous potassium bromide.

Which statements are correct?

A both statement 1 and statement 2

B statement 1 only

C statement 2 only

D neither statement 1 nor statement 2

32 A reversible reaction involves a solid reacting with hydrogen.

Which of the metals, aluminium and iron, would catalyse the reaction and what is their effect on the position of equilibrium?

	act as a catalyst	position of equilibrium
A	both aluminium and iron	moves to the right
B	both aluminium and iron	no change
C	iron only	moves to the right
D	iron only	no change

33 Iron is obtained in the blast furnace from the ore haematite.

Which statement is correct?

A Calcium carbonate is used to remove acidic impurities.

B Coke is reduced to carbon dioxide.

C Haematite is oxidised by carbon monoxide.

D Haematite undergoes thermal decomposition.

34 Three statements about the carbon cycle are given.

1 The carbon cycle regulates the amount of carbon dioxide in the atmosphere.

2 During photosynthesis, carbon dioxide is produced.

3 Combustion of hydrocarbons requires oxygen.

Which statements are correct?

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

35 Carbon is used in the purification of the water supply.

What is the reason for this?

A to remove mud and other insoluble solids

B to remove nitrates caused by the excessive use of fertiliser

C to remove tastes and odours

D to sterilise the water by removing harmful bacteria

36 Octane is an alkane with eight carbon atoms per molecule.

What is the molecular formula of octane, and how does its boiling point compare with that of butane?

	molecular formula of octane	boiling point of octane
A	C_8H_{16}	higher than butane
B	C_8H_{16}	lower than butane
C	C_8H_{18}	lower than butane
D	C_8H_{18}	higher than butane

37 Which equation for the reaction between propane and chlorine is correct?

A $C_3H_6 + Cl_2 \rightarrow C_3H_6Cl_2$

B $C_3H_8 + Cl_2 \rightarrow C_3H_6Cl_2 + H_2$

C $C_3H_8 + Cl_2 \rightarrow CH_3Cl + C_2H_5Cl$

D $C_3H_8 + Cl_2 \rightarrow C_3H_7Cl + HCl$

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38 Propanoic acid reacts with calcium carbonate. The products of this reaction are calcium propanoate, carbon dioxide and water.

What is the equation for this reaction?

A $2C_2H_5COOH + Ca_2CO_3 \rightarrow 2C_2H_5COOCa + CO_2 + H_2O$

B $2C_2H_5COOH + CaCO_3 \rightarrow (C_2H_5COO)_2Ca + CO_2 + H_2O$

C $2C_3H_7COOH + Ca_2CO_3 \rightarrow 2C_3H_7COOCa + CO_2 + H_2O$

D $2C_3H_7COOH + CaCO_3 \rightarrow (C_3H_7COO)_2Ca + CO_2 + H_2O$

39 The monomer, $CH_3CH{=}CHCH_3$, can be used to make an addition polymer.

This addition polymer has a chain of carbon atoms joined to each other by C–C single bonds.

Each of these carbon atoms is also bonded to at least one other atom or group of atoms. These are called side groups.

Which statement describes the carbon atoms in the polymer chain made from $CH_3CH{=}CHCH_3$?

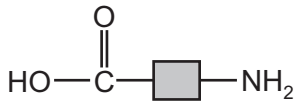
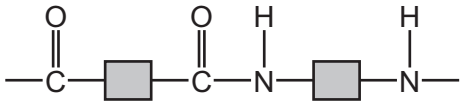
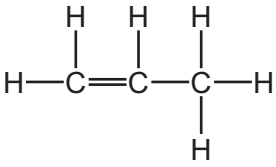
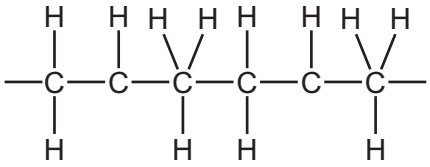
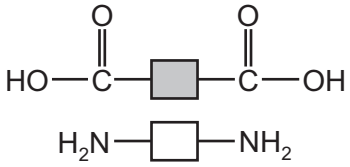
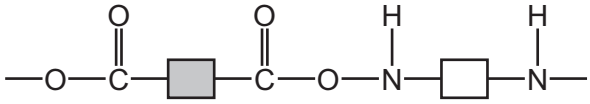
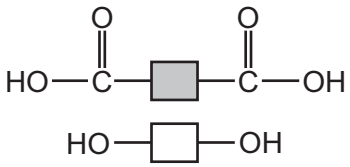
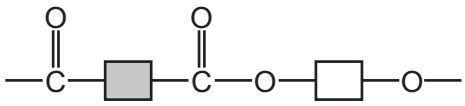
A Every carbon atom in the chain has one $–CH_3$ and one hydrogen atom as side groups.

B Every carbon atom in the chain is joined to a $CH_3–CH–$ side group.

C Every carbon atom in the chain is joined to either two $–CH_3$ or to two hydrogen atoms as side groups.

D Every carbon atom in the chain is joined to hydrogen atoms only as side groups.

40 Which row correctly shows the structure of a polymer and the monomers from which it is made?

	monomers	polymer
A		
B		
C		
D		

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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 –		114 Fl flerovium –		116 Lv livermorium –		

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.).