Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CHEMISTRY **0620/13**

Paper 1 Multiple Choice (Core) **May/June 2016**

45 Minutes

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

8830351027

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, 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.
DO **NOT** WRITE IN ANY BARCODES.

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.
Electronic calculators may be used.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level1/Level 2 Certificate.

This document consists of **16** printed pages.

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1 In which changes do the particles move further apart?

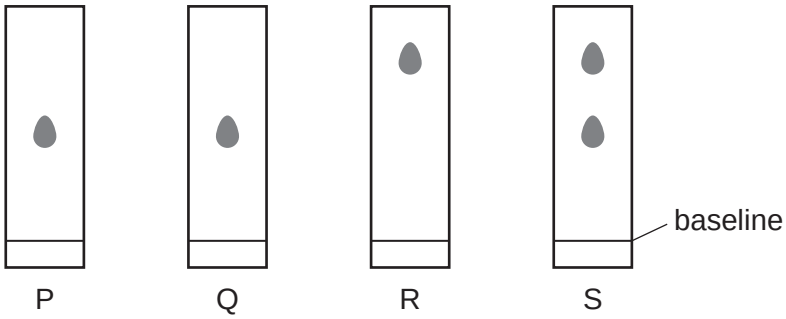
$$\text{gas} \underset{\text{Y}}{\overset{\text{W}}{\rightleftharpoons}} \text{liquid} \underset{\text{Z}}{\overset{\text{X}}{\rightleftharpoons}} \text{solid}$$

A W and X **B** W and Z **C** X and Y **D** Y and Z

2 Chromatography experiments are carried out on four substances, P, Q, R and S.

The same solvent is used in each experiment.

The resulting chromatograms are shown below.



Which statement is **not** correct?

A P and Q are pure substances.

B P and R are different substances.

C R and S are pure substances.

D S is a mixture of substances.

3 One of the instructions for an experiment reads as follows.

Quickly add 50 cm^3 of acid.

What is the best piece of apparatus to use?

A a burette

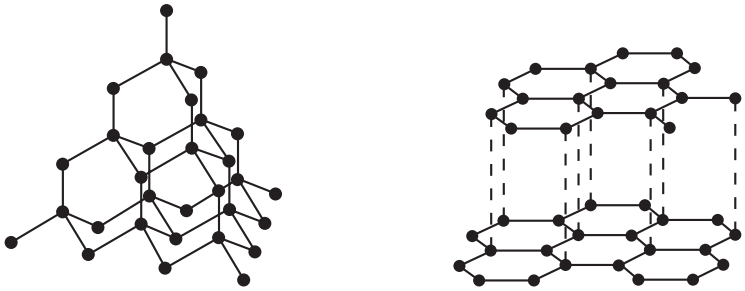
B a conical flask

C a measuring cylinder

D a pipette

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4 The structures of diamond and graphite are shown.



diamond graphite

Which statement about diamond and graphite is **not** correct?

A Diamond is used in cutting tools because the strong covalent bonds make it very hard.

B Graphite acts a lubricant because of the weak bonds between the layers.

C Graphite conducts electricity because the electrons between the layers are free to move.

D Graphite has a low melting point because of the weak bonds between the layers.

5 The table shows the electronic structure of four atoms.

atom	electronic structure
W	2,8,1
X	2,8,4
Y	2,8,7
Z	2,8,8

Which two atoms combine to form a covalent compound?

A W and X **B** W and Y **C** X and Y **D** X and Z

6 The table shows the atomic structure of four atoms.

Which atom is **not** a metal?

	electrons	neutrons	protons
A	18	22	18
B	19	20	19
C	19	21	19
D	20	20	20

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7 Potassium, K, forms a compound with fluorine, F.

Which statements about this compound are correct?

1 The compound is ionic.

2 The formula of the compound is KF.

3 The compound is soluble in water.

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

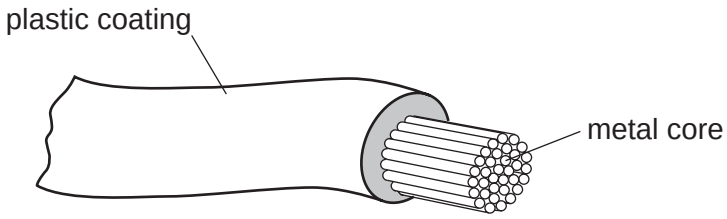
8 The equation shows the reaction between magnesium and sulfuric acid.
[A_r: H, 1; O, 16; Mg, 24; S, 32]

$$Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$$

In this reaction, which mass of magnesium sulfate is formed when 6 g of magnesium react with excess sulfuric acid?

A 8 **B** 24 **C** 30 **D** 60

9 The diagram shows an electrical cable.



Which statement about the substances used is correct?

A The coating is plastic because it conducts electricity well.

B The core is copper because it conducts electricity well.

C The core is copper because it is cheap and strong.

D The core is iron because it is cheap and strong.

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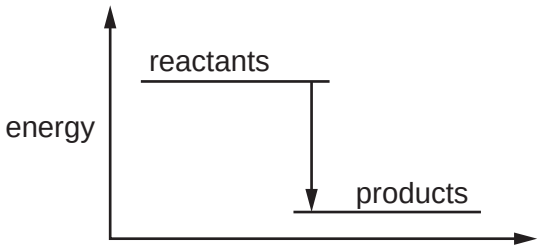
10 Electricity is passed separately through concentrated hydrochloric acid, concentrated aqueous sodium chloride and dilute sulfuric acid.

In which rows are the electrolysis products correctly named?

		cathode product	anode product
1	concentrated hydrochloric acid	hydrogen	chlorine
2	concentrated aqueous sodium chloride	sodium	chlorine
3	dilute sulfuric acid	hydrogen	oxygen

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

11 The energy level diagram shows the energy of the reactants and products in a chemical reaction.

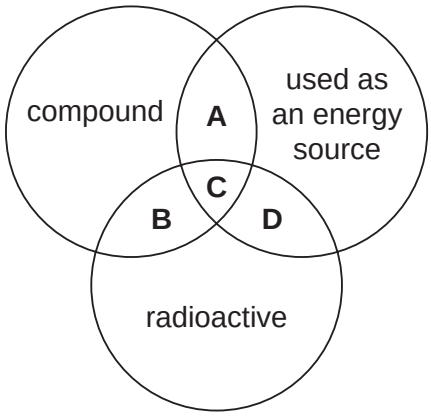


Which row correctly describes the energy change and the type of reaction shown?

	energy change	type of reaction
A	energy is given out to the surroundings	endothermic
B	energy is given out to the surroundings	exothermic
C	energy is taken in from the surroundings	endothermic
D	energy is taken in from the surroundings	exothermic

12 The diagram shows some properties that substances may have.

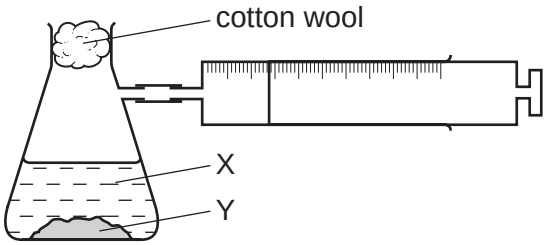
To which labelled part of the diagram does ^{235}U belong?



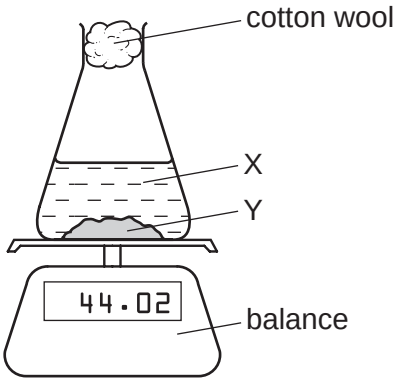
13 A liquid X reacts with solid Y to form a gas.

Which two diagrams show suitable methods for investigating the rate (speed) of the reaction?

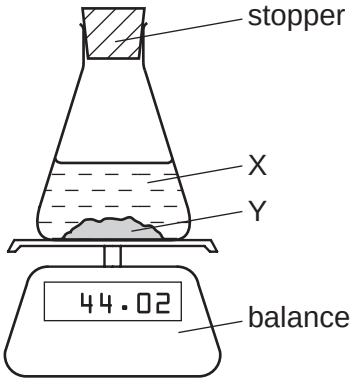
1



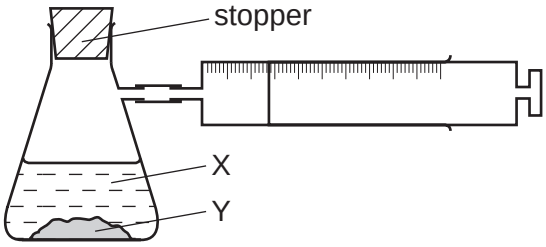
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3



4

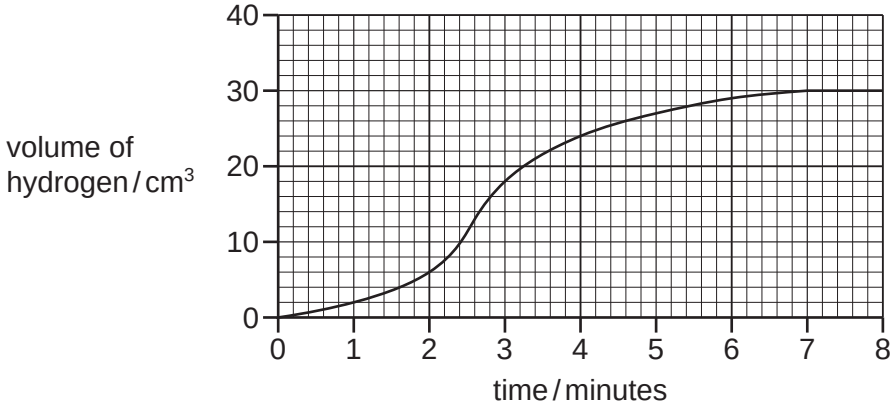


A 1 and 3 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

14 Magnesium is reacted with a dilute acid.

The hydrogen gas is collected and its volume measured.

The results are shown on the graph.



Between which times was the reaction fastest?

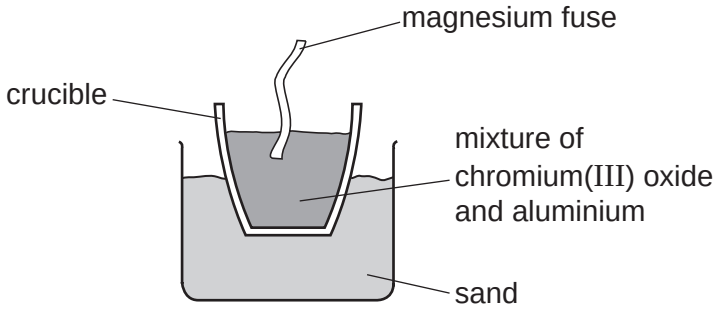
A 0 and 1 minute

B 1 and 2 minutes

C 2 and 3 minutes

D 7 and 8 minutes

15 A violent reaction occurs when a mixture of chromium(III) oxide and aluminium is ignited with a magnesium fuse as shown.



The equation for the reaction is shown.

$$Cr_2O_3 + 2Al \rightarrow 2Cr + Al_2O_3$$

Which substance is oxidised in the reaction?

A aluminium

B aluminium oxide

C chromium

D chromium(III) oxide

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[Turn over

16 Equations for the effect of water on anhydrous cobalt(II) chloride and anhydrous copper(II) sulfate are shown.

$$CoCl_2(s) + 6H_2O(l) \rightarrow CoCl_2.6H_2O(s)$$

$$CuSO_4(s) + 5H_2O(l) \rightarrow CuSO_4.5H_2O(s)$$

Which statement is **not** correct?

A Both reactions can be reversed by changing the conditions.

B Both reactions can be used as a test for water.

C The colour change observed when hydrated copper(II) sulfate is heated is from blue to white.

D The colour change observed when water is added to anhydrous cobalt(II) chloride is from pink to blue.

17 Which statements are properties of an acid?

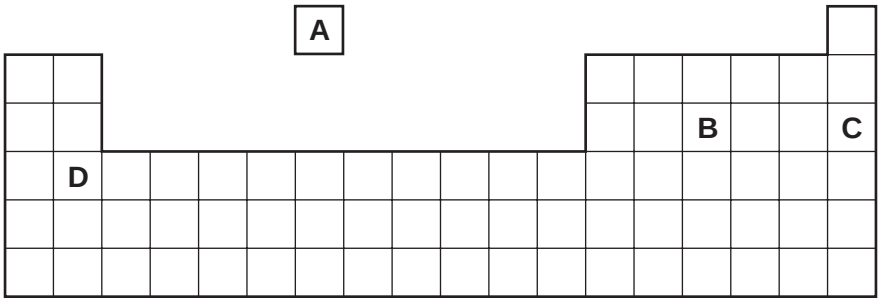
1 reacts with ammonium sulfate to form ammonia

2 turns red litmus blue

	1	2
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

18 Part of the Periodic Table is shown.

Which element forms an acidic oxide?



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19 Salts can be made by adding different substances to dilute hydrochloric acid.

For which substance could any excess **not** be removed by filtration?

A copper(II) oxide

B magnesium

C sodium hydroxide

D zinc hydroxide

20 A solution containing substance X was tested. The table shows the results.

test	result
flame test	lilac colour
acidified silver nitrate solution added	yellow precipitate

What is X?

A lithium bromide

B lithium iodide

C potassium bromide

D potassium iodide

21 Where in the Periodic Table is the metallic character of the elements greatest?

	left or right side of a period	at the top or bottom of a group
A	left	bottom
B	left	top
C	right	bottom
D	right	top

22 Which statement about the elements in Group I is correct?

A Hydrogen is evolved when they react with water.

B Ions of Group I elements have a –1 charge.

C Sodium is more reactive than potassium.

D Solid sodium is a poor electrical conductor.

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23 Osmium is a transition element.

Which row gives the expected properties of osmium?

	melting point	density	compounds formed
A	high	high	coloured
B	high	high	white
C	high	low	white
D	low	high	coloured

24 Two statements about noble gases are given.

1 Noble gases are reactive, monatomic gases.

2 Noble gases all have full outer shells of electrons.

Which is correct?

A Both statements are correct and statement 2 explains statement 1.

B Both statements are correct but statement 2 does not explain statement 1.

C Statement 1 is correct but statement 2 is incorrect.

D Statement 2 is correct but statement 1 is incorrect.

25 Some properties of substance X are listed.

- It conducts electricity when molten.
- It has a high melting point.
- It burns in oxygen and the product dissolves in water to give a solution with pH 11.

What is X?

A a covalent compound

B a macromolecule

C a metal

D an ionic compound

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26 The list shows the order of reactivity of some elements.

K Na Ca Mg Zn Fe (H) Cu

Which statement about the reactivity of these metals is correct?

A Copper reacts with steam to form hydrogen gas.

B Magnesium is more reactive than calcium.

C Potassium reacts with water to form hydrogen gas.

D Sodium oxide is reduced by carbon to sodium.

27 Iron is obtained from its ore in a blast furnace and is used to make steel.

Iron obtained from the blast furnace is contaminated with .....1..... .

In order to remove this substance, ...2..... is passed through the molten iron.

.....3..... is also added to remove oxides of phosphorus and silicon which are .....4..... .

Which words complete the sentences about the conversion of iron to steel?

	1	2	3	4
A	carbon	nitrogen	calcium carbonate	acidic
B	carbon	oxygen	calcium oxide	acidic
C	carbon	oxygen	calcium oxide	basic
D	sand	oxygen	calcium oxide	basic

28 Copper is a transition element used to make saucepans.

Which property is **not** correct for copper?

A good conductor of heat

B insoluble in water

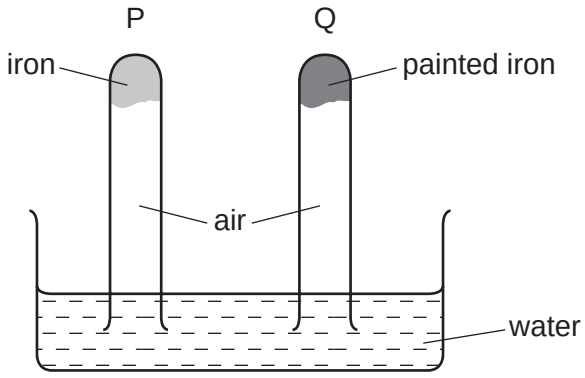
C low melting point

D malleable (can be hammered into shape)

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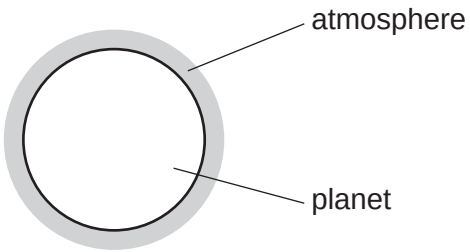
29 The diagram shows an experiment to investigate how paint affects the rusting of iron.



What happens to the water level in tubes P and Q?

	tube P	tube Q
A	falls	rises
B	no change	rises
C	rises	falls
D	rises	no change

30 A new planet has been discovered and its atmosphere has been analysed.



The table shows the composition of its atmosphere.

gas	percentage by volume
carbon dioxide	4
nitrogen	72
oxygen	24

Which gases are present in the atmosphere of the planet in a higher percentage than they are in the Earth's atmosphere?

A carbon dioxide and oxygen

B carbon dioxide only

C nitrogen and oxygen

D nitrogen only

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31 The following substances can be formed when petrol is burnt in a car engine.

Which substance is the main cause of acid rain?

A carbon

B carbon monoxide

C nitrogen dioxide

D water

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

A It is a greenhouse gas.

B It is an alkene.

C It is formed by decomposition of vegetation.

D It is used as a fuel.

33 The formulae of four compounds, W, X Y and Z, are given.

compound	formula
W	$FeSO_4$
X	$(NH_4)_3PO_4$
Y	KNO_3
Z	$NaCl$

Which mixture of compounds makes a complete fertiliser?

A W and X **B** W and Z **C** X and Y **D** Y and Z

34 Which process is used to make lime (calcium oxide) from limestone (calcium carbonate)?

A chromatography

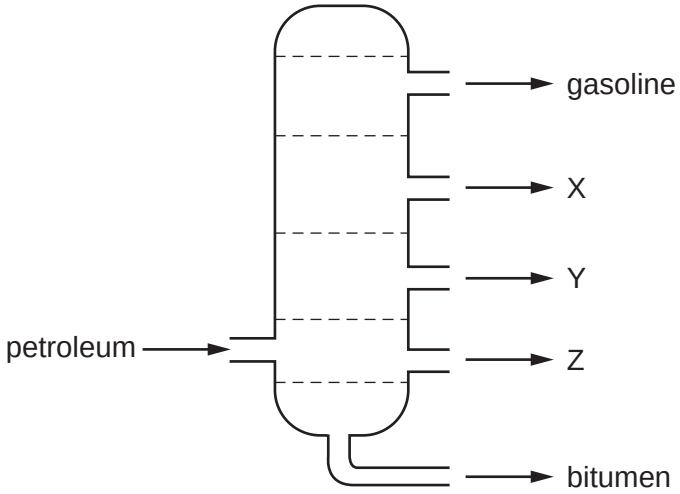
B electrolysis

C fractional distillation

D thermal decomposition

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35 The diagram shows the separation of petroleum into fractions.



What could X, Y and Z represent?

	X	Y	Z
A	diesel oil	lubricating fraction	paraffin
B	lubricating fraction	diesel oil	paraffin
C	paraffin	lubricating fraction	diesel oil
D	paraffin	diesel oil	lubricating fraction

36 Which compound does **not** belong to the same homologous series as the other three compounds?

A CH_3OH **B** C_2H_5COOH **C** C_2H_5OH **D** $C_7H_{15}OH$

37 Which reaction is used as a test for alkenes?

A Alkenes burn in air to give carbon dioxide and water.

B Alkenes decolourise aqueous bromine.

C Alkenes form polymers when heated in the presence of a catalyst.

D Alkenes react with steam to form alcohols.

38 Which statement about ethanol is correct?

A It burns in air to form ethene and water.

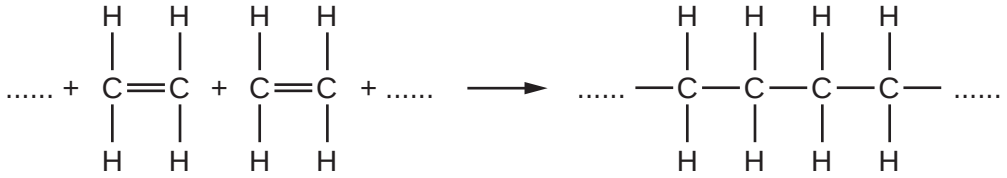
B It is prepared from ethene by fermentation.

C It is prepared from glucose in an addition reaction.

D It is the only product when ethene reacts with steam.

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39 Ethene forms an addition polymer as shown.



Which terms describe this polymer?

A a saturated compound called poly(ethane)

B a saturated compound called poly(ethene)

C an unsaturated compound called poly(ethane)

D an unsaturated compound called poly(ethene)

40 Liquid W burns completely to give carbon dioxide and water.

Liquid W is a compound containing carbon, hydrogen and oxygen.

A solution of liquid W in water is pH 7.

What is liquid W?

A ethanoic acid

B ethanol

C gasoline

D methane

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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.)