Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CHEMISTRY **0620/12**

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)

* 2 8 4 7 1 4 4 7 3 0 *

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 20.
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 **17** printed pages and **3** blank pages.

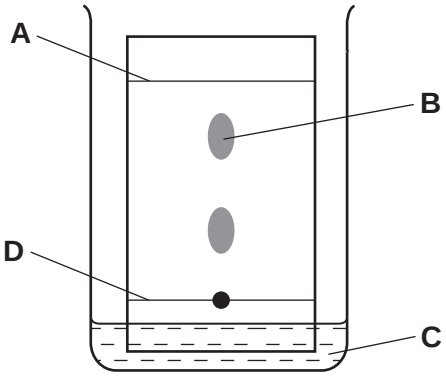
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1 In which changes do the particles move further apart?

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

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

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



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

4 Two statements about diamond are given.

1 Diamond has a giant three-dimensional covalent structure of carbon atoms.

2 Diamond is one of the hardest substances known.

Which is correct?

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

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.

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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 An atom of element Q contains 19 electrons, 19 protons and 20 neutrons.

What is Q?

A calcium

B potassium

C strontium

D yttrium

7 Lithium is in Group I of the Periodic Table. Nitrogen is in Group V of the Periodic Table.

Lithium reacts with nitrogen to form the ionic compound lithium nitride.

What happens to the electrons when lithium atoms and nitrogen atoms form ions?

	lithium atoms	nitrogen atoms
A	each lithium atom loses one electron to form a Li^+ ion	each nitrogen atom gains three electrons to form an N^{3-} ion
B	each lithium atom loses one electron to form a Li^+ ion	each nitrogen atom gains five electrons to form an N^{5-} ion
C	each lithium atom gains one electron to form a Li^- ion	each nitrogen atom loses three electrons to form an N^{3+} ion
D	each lithium atom gains one electron to form a Li^- ion	each nitrogen atom loses five electrons to form an N^{5+} ion

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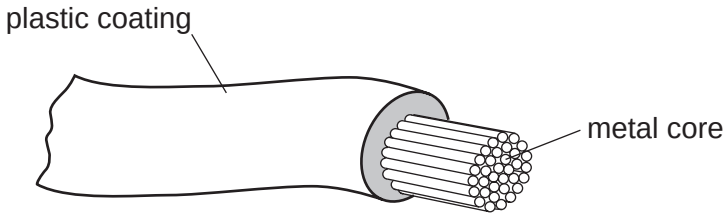
8 The equation shows the reaction between magnesium and sulfuric acid.
[A_r: H, 1; O, 16; Mg, 24; S, 32]

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

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.

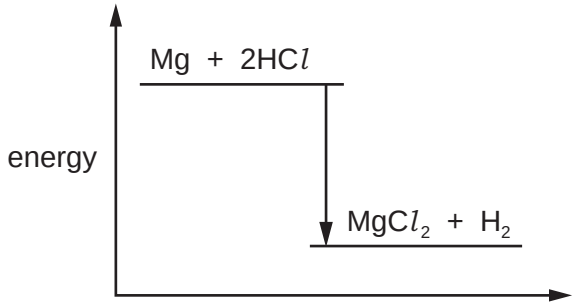
D The core is iron because it is cheap and strong.

10 What are the products at the electrodes when dilute sulfuric acid is electrolysed using inert electrodes?

	anode	cathode
A	hydrogen	oxygen
B	oxygen	hydrogen
C	sulfur	oxygen
D	sulfur dioxide	hydrogen

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11 The energy level diagram for the reaction between magnesium and hydrochloric acid is shown.



Which statement about the reaction is **not** correct?

A Energy is given out during the reaction.

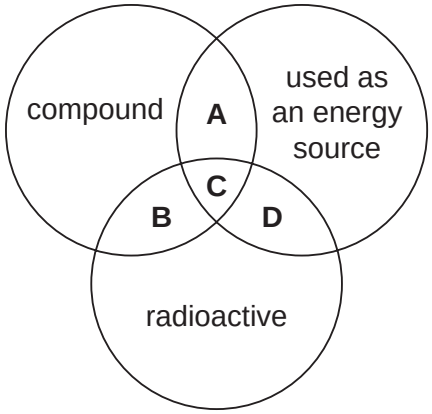
B The products are at a lower energy level than the reactants.

C The reaction is endothermic.

D The temperature increases during the reaction.

12 The diagram shows some properties that substances may have.

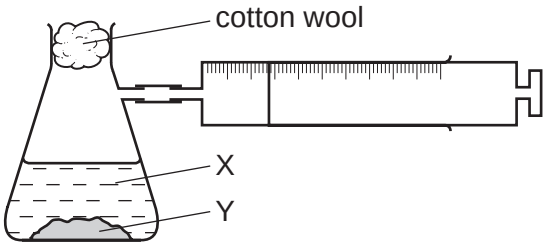
To which labelled part of the diagram does ^{235}U belong?



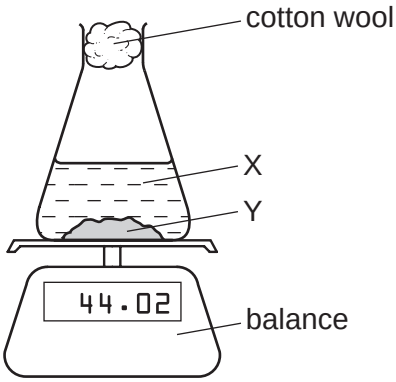
13 A liquid X reacts with solid Y to form a gas.

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

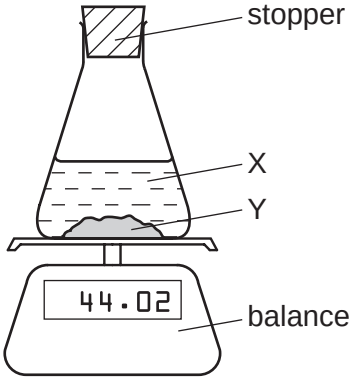
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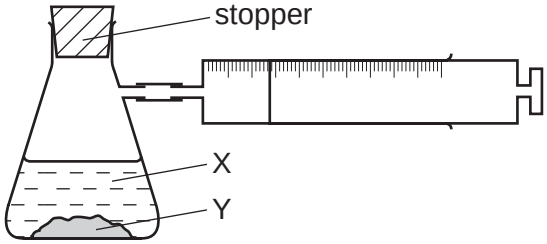
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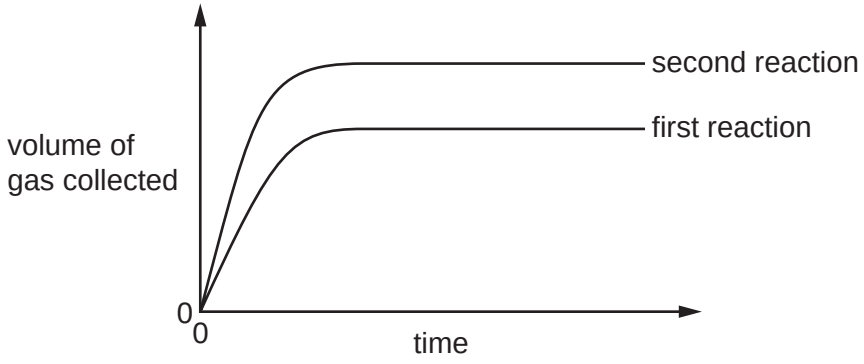
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A 1 and 3 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

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14 The results of two separate reactions between excess calcium carbonate and hydrochloric acid are shown.



Which statement explains the differences between the reactions?

A More calcium carbonate was used in the second reaction.

B The same volume of more concentrated acid was used in the second reaction.

C The second reaction was allowed to react for longer.

D The temperature was higher in the second reaction.

15 The equations below all show redox reactions.

$$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$$

$$2ZnO + C \rightarrow 2Zn + CO_2$$

$$Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe$$

$$2CO + 2NO \rightarrow 2CO_2 + N_2$$

Which oxide is oxidised in these reactions?

A Fe_2O_3 **B** CO **C** ZnO **D** NO

16 In which reaction is the colour change from blue to white?

A heating hydrated cobalt(II) chloride

B heating hydrated copper(II) sulfate

C adding water to anhydrous cobalt(II) chloride

D adding water to anhydrous copper(II) sulfate

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17 Which statements are properties of an acid?

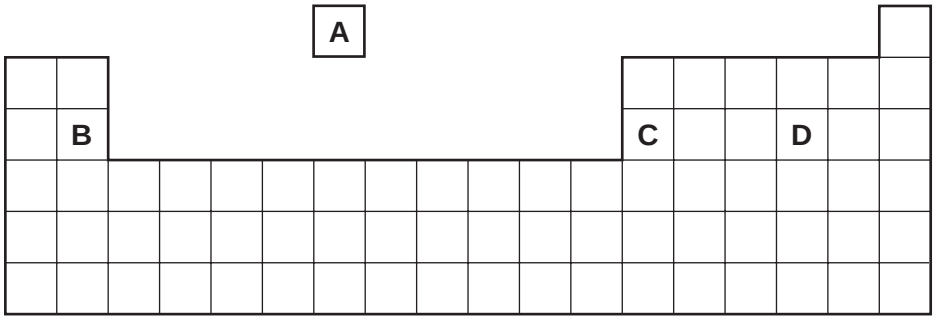
1 reacts with ammonium sulfate to form ammonia

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?



19 What is the correct sequence of steps for the preparation of a pure sample of copper(II) sulfate crystals from copper(II) oxide and sulfuric acid?

A dissolving → crystallisation → evaporation → filtration

B dissolving → evaporation → filtration → crystallisation

C dissolving → filtration → crystallisation → evaporation

D dissolving → filtration → evaporation → crystallisation

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20 The following tests are carried out on an aqueous solution of salt X.

test	observation
sodium hydroxide solution is added	a green precipitate is formed which dissolves in excess
a small piece of aluminium foil is then added to the mixture and the mixture is heated	a gas is given off which turns damp, red litmus paper blue

What is X?

A aluminium nitrate

B ammonium sulfate

C chromium(III) nitrate

D iron(II) nitrate

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 Rubidium is a Group I metal.

Which statement about rubidium is **not** correct?

A It has a higher melting point than lithium.

B It has one electron in its outer shell.

C It reacts vigorously with water.

D It reacts with chlorine to form rubidium chloride, RbCl.

23 The table gives information about four elements, P, Q, R and S.

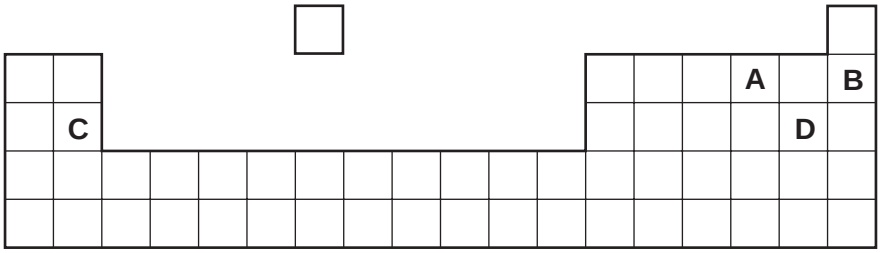
	melting point in °C	electrical conductivity of element when solid	density in g / cm^3	colour of iodide of element
P	98	good	0.97	white
Q	–39	good	13.53	red
R	1410	poor	2.33	colourless
S	1535	good	7.87	green

Which elements could be transition elements?

A P, Q and S **B** Q and S only **C** R and S only **D** S only

24 Part of the Periodic Table is shown.

Which element is a gas that does **not** form a compound with potassium?



25 Which property is **not** considered a typical metallic property?

A good conductor of heat

B low melting point

C malleable (can be hammered into shape)

D strong

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26 Some chemical properties of three metals W, X and Y and their oxides are shown.

metal	reaction with steam	reaction with dilute hydrochloric acid	reaction of metal oxide with carbon
W	reacts	reacts	reacts
X	no reaction	no reaction	reacts
Y	reacts	reacts	no reaction

What is the order of reactivity of these metals, most reactive first?

A W → Y → X

B X → Y → W

C Y → W → X

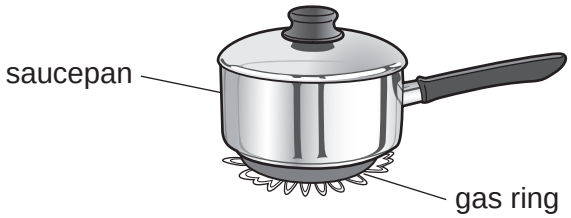
D Y → X → W

27 Iron from a blast furnace is treated with oxygen and with calcium oxide to make steel.

Which substances in the iron are removed?

	oxygen removes	calcium oxide removes
A	carbon	acidic oxides
B	carbon	basic oxides
C	iron	acidic oxides
D	iron	basic oxides

28 Copper is sometimes used to make cooking utensils.



Three properties of copper are given.

1 corrosion resistant

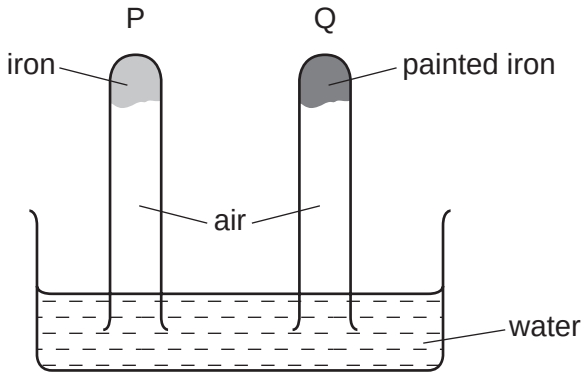
2 good conductor of electricity

3 good conductor of heat

Which properties make copper a suitable metal for making cooking utensils?

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

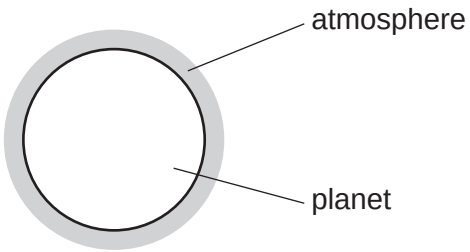
29 The diagram shows an experiment to investigate how paint affects the rusting of iron.



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 Which of the following are tests for water?

1 It turns anhydrous copper(II) sulfate blue.

2 It boils at 100 °C.

3 It turns anhydrous cobalt(II) chloride paper blue.

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

32 Sulfur dioxide, carbon monoxide and oxides of nitrogen are common gaseous pollutants found in the air.

Which pollutants contribute to acid rain?

A carbon monoxide and sulfur dioxide

B oxides of nitrogen and sulfur dioxide

C oxides of nitrogen only

D sulfur dioxide only

33 Which compound is **not** used as a fertiliser?

A ammonium phosphate

B ammonium sulfate

C calcium carbonate

D potassium nitrate

34 Lime (calcium oxide) is used to treat waste water from a factory.

Which substance is removed by the lime?

A ammonia

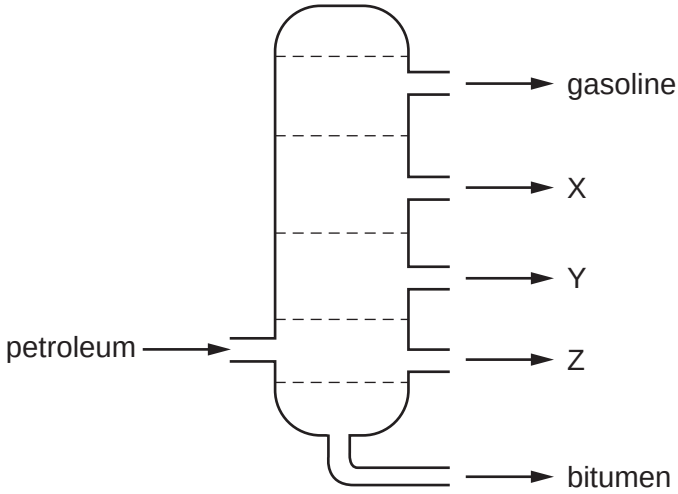
B sodium chloride

C sodium hydroxide

D sulfuric acid

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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 is **not** an alkane, C_nH_{2n+2}?

A $CH_3CH_2CH_2CH_3$

B $(CH_3)_2CHCH_3$

C $CH_3CHCHCH_3$

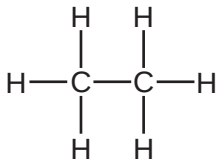
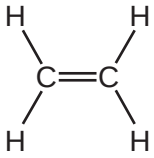
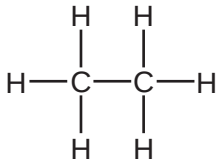
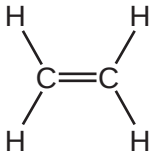
D $(CH_3)_3CH$

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37 A hydrocarbon W burns to form carbon dioxide and water.

W decolourises bromine water.

What is the name of W and what is its structure?

	name of W	structure of W
A	ethane	
B	ethane	
C	ethene	
D	ethene	

38 Which term describes the formation of ethanol from glucose?

A cracking

B distillation

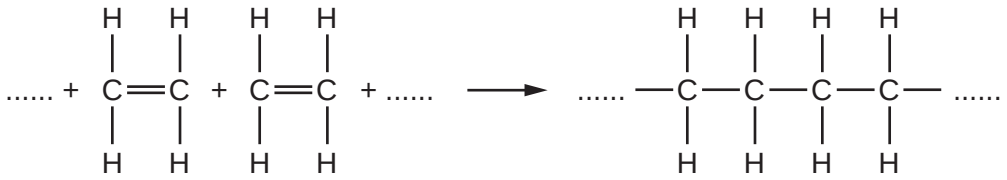
C fermentation

D polymerisation

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[Turn over

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 Which statement about carboxylic acids is **not** correct?

A Aqueous ethanoic acid has a pH below pH 7.

B They contain the functional group –COOH.

C They produce carbon dioxide when reacted with a metal carbonate.

D Methyl orange turns yellow in aqueous ethanoic acid.

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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.)