Cambridge
O Level

Cambridge International Examinations
Cambridge Ordinary Level

CHEMISTRY **5070/11**

Paper 1 Multiple Choice **May/June 2017**

1 hour

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

5783488245

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.

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

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1 Gas X has the following properties.

1 colourless

2 no effect on either red or blue litmus papers

3 no effect on limewater

4 flammable

What is gas X?

A ammonia

B chlorine

C hydrogen

D oxygen

2 A gas is evolved during a reaction.

Which two pieces of apparatus would enable the rate of this reaction to be measured?

A balance and pipette

B gas syringe and thermometer

C stopclock and gas syringe

D stopclock and pipette

3 Which statement about pure hexane, C_6H_{14}, is correct?

A It boils over a range of temperatures.

B It burns in excess oxygen to form carbon monoxide and water only.

C It mixes with water.

D It melts at a fixed temperature.

4 Which statement about the particles $^{19}_{9}F^{-}$, $^{20}_{10}Ne$ and $^{23}_{11}Na^{+}$ is correct?

A They all contain more electrons than protons.

B They all contain more neutrons than protons.

C They all contain the same number of electrons.

D They all contain the same number of protons.

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5 An aqueous solution of zinc chloride is tested by adding reagents.

Which observation is correct?

	reagent added to zinc chloride (aq)	observations
A	acidified aqueous barium nitrate	forms a white precipitate
B	aqueous ammonia	forms a white precipitate, soluble in excess of the reagent
C	aqueous sodium hydroxide	forms a white precipitate, insoluble in excess of the reagent
D	powdered copper	forms a grey precipitate

6 How many of the molecules shown contain only one covalent bond?

Cl_2 H_2 HCl N_2 O_2

A 2 **B** 3 **C** 4 **D** 5

7 Which substance has a giant covalent structure and contains atoms of more than one element?

A diamond

B graphite

C methane

D sand

8 Which statement correctly explains why chlorine, Cl_2, at 40 °C diffuses more slowly than neon, Ne, at 20 °C?

A Chlorine has a relative molecular mass of 71 whilst neon has a relative atomic mass of 20.

B Chlorine is at a higher temperature than neon.

C Chlorine is diatomic and neon is monatomic.

D Chlorine is more reactive than neon.

9 Metals conduct electricity.

The movement of which particles is responsible for this conductivity?

A anions

B cations

C electrons

D protons

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10 Which substance, when molten, conducts electricity?

A bitumen

B caesium iodide

C diamond

D sand

11 A compound contains 70% by mass of iron and 30% by mass of oxygen.

What is its empirical formula?

[A_r: O, 16; Fe, 56]

A FeO **B** Fe_2O_3 **C** Fe_3O_2 **D** Fe_3O_4

12 The formula for hydrated copper(II) nitrate is $Cu(NO_3)_2.xH_2O$. It contains 36.5% water of crystallisation by mass.

What is the value of *x*?

[A_r: H, 1; N, 14; O, 16; Cu, 64]

A 4 **B** 5 **C** 6 **D** 7

13 Dilute sulfuric acid is electrolysed between inert electrodes.

Which statements are correct?

1 Hydrogen is released at the negative electrode.

2 Oxygen is released at the positive electrode.

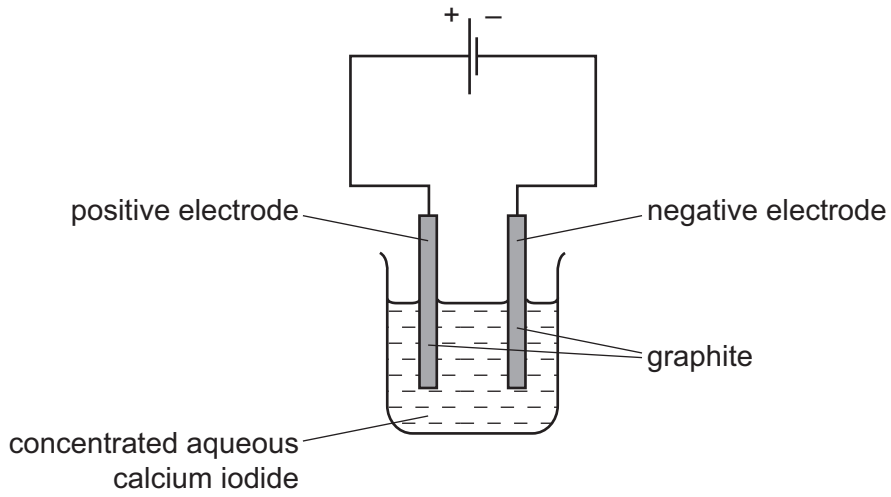
3 Sulfur dioxide is released at the positive electrode.

4 The acid becomes more concentrated.

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

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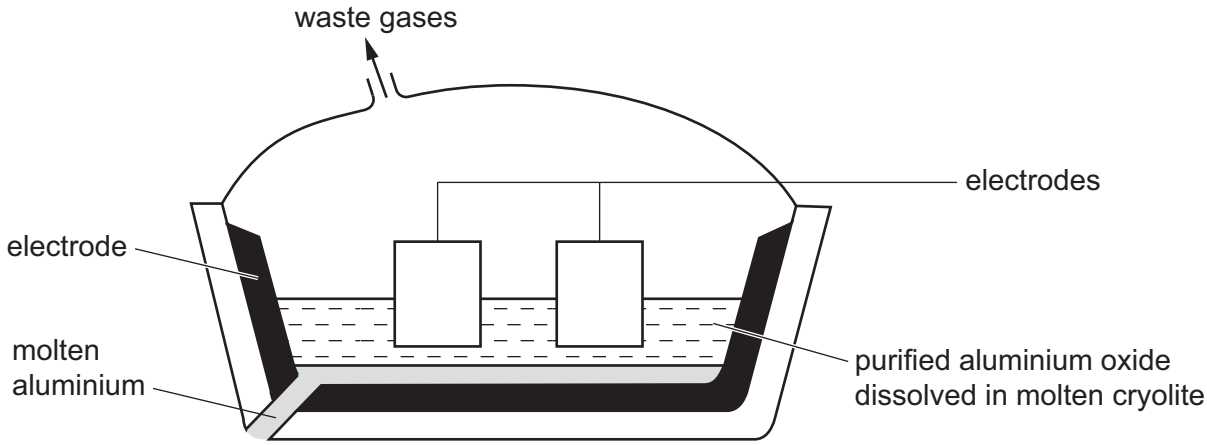
14 Concentrated aqueous calcium iodide undergoes electrolysis in a similar way to concentrated aqueous sodium chloride.



What would be formed at each electrode?

	product at positive electrode	product at negative electrode
A	iodine	calcium
B	iodine	hydrogen
C	oxygen	calcium
D	oxygen	hydrogen

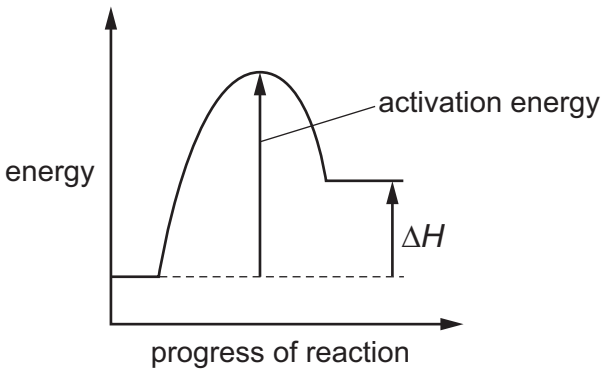
15 Aluminium is obtained by the electrolysis of molten aluminium oxide.



Which row shows the electrode at which aluminium is formed and the correct equation for its formation?

	electrode	equation
A	anode	$Al^{3+} + 3e^- \rightarrow Al$
B	anode	$Al^{3+} - 3e^- \rightarrow Al$
C	cathode	$Al^{3+} + 3e^- \rightarrow Al$
D	cathode	$Al^{3+} - 3e^- \rightarrow Al$

16 The energy profile diagram for the **forward** direction of a reversible reaction is shown.



For the **reverse** reaction, which row correctly shows the sign of the activation energy and the type of enthalpy change?

	sign of activation energy	type of enthalpy change
A	negative	endothermic
B	negative	exothermic
C	positive	endothermic
D	positive	exothermic

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17 The formation of liquid water from hydrogen and oxygen may occur in three stages.

1 $2H_2(g) + O_2(g) \rightarrow 4H(g) + 2O(g)$

2 $4H(g) + 2O(g) \rightarrow 2H_2O(g)$

3 $2H_2O(g) \rightarrow 2H_2O(l)$

Which stages would be exothermic?

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

18 The equation shows the formation of sulfur trioxide in the contact process.

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

What would **decrease** the yield of sulfur trioxide?

A addition of more oxygen

B an increase in pressure

C an increase in temperature

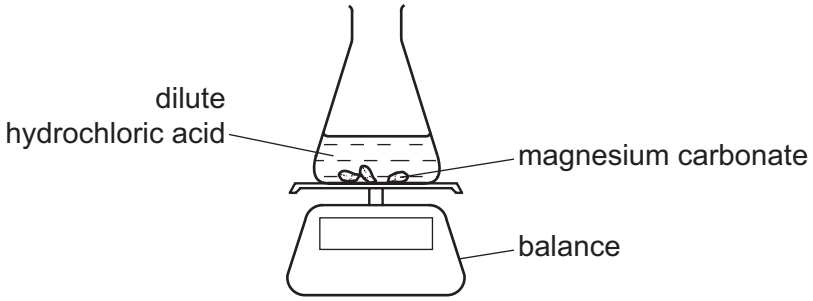
D removal of sulfur trioxide from the reaction chamber

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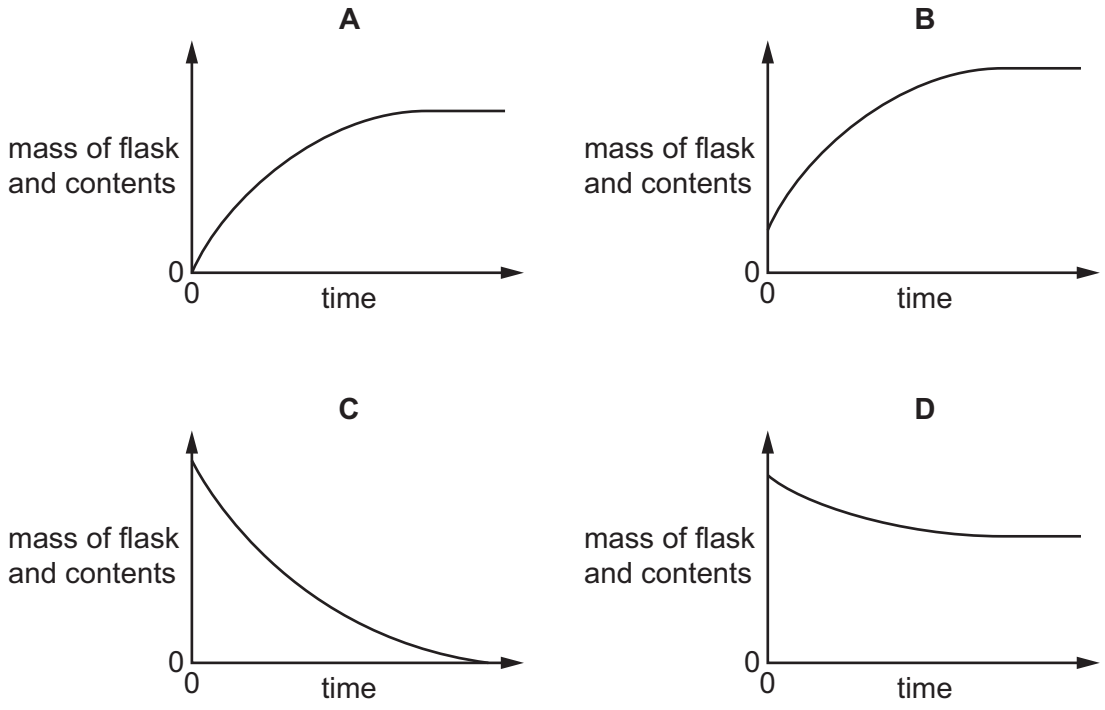
19 Magnesium carbonate reacts with dilute hydrochloric acid to form magnesium chloride, carbon dioxide and water.

$$MgCO_3(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + CO_2(g) + H_2O(l)$$

The rate of the reaction is found by reacting the magnesium carbonate and dilute hydrochloric acid in a conical flask. The mass of the flask and contents is measured every twenty seconds.



Which graph correctly shows the change in the mass of the flask and contents with time?



20 At the start of a reaction, a 1.00 dm^3 solution contains 0.300 mol of ethanol.

After 100 seconds the concentration of the ethanol has decreased to 0.296 mol/dm^3.

What is the rate of reaction over the first 100 seconds?

A 2.96×10^{-3} $mol/dm^3/s$

B 3.00×10^{-5} $mol/dm^3/s$

C 4.00×10^{-5} $mol/dm^3/s$

D 8.00×10^{-5} $mol/dm^3/s$

21 Which statement about sulfuric acid is correct?

Sulfuric acid is used

A as a bleach.

B in food preservation.

C in the manufacture of detergents.

D in the purification of drinking water.

22 Which row shows the order of increasing pH (lowest to highest) for strong acids, strong bases, weak acids and weak bases at the same concentration?

	pH ⟶			
A	strong acids	weak acids	weak bases	strong bases
B	strong bases	weak bases	weak acids	strong acids
C	weak acids	strong acids	weak bases	strong bases
D	weak bases	strong bases	strong acids	weak acids

23 The table shows the proton numbers of four elements.

element	Q	R	T	Z
proton number	9	11	17	19

Which statement is correct?

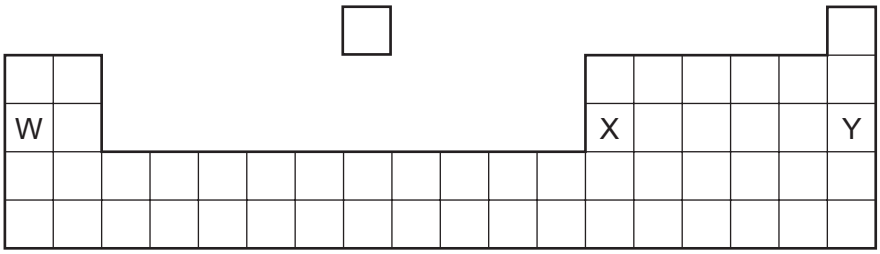
A Q is a metal.

B Q is more reactive than T.

C R is more reactive than Z.

D T and Z are in the same period.

24 The diagram shows part of the Periodic Table.



Which row about the elements W, X and Y is correct?

	combines with oxygen in the ratio 2 : 3	exists as single atoms and is chemically unreactive	forms a carbonate which is not decomposed by heating in a Bunsen flame
A	W	X	Y
B	W	Y	X
C	X	W	Y
D	X	Y	W

25 Lead(II) sulfate can be made by reacting dilute sulfuric acid with which substance?

A aqueous lead(II) nitrate

B lead

C lead(II) carbonate

D lead(II) oxide

26 Which pair gives two uses of argon?

A disinfecting water and in balloons

B disinfecting water and in light bulbs

C in balloons and in the manufacture of steel

D in light bulbs and in the manufacture of steel

27 Which two substances are removed from the bottom of a blast furnace?

1 coke

2 iron

3 limestone

4 slag

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

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28 Which row has the correct catalyst for the named process?

	process	catalyst
A	contact process	vanadium(V) oxide
B	Haber process	manganese(IV) oxide
C	hydrogenation of alkenes	iron
D	photosynthesis	glucose

29 Some metals and the compounds in their ores are shown.

metal	A*l*	Ca	Pb	Na	Fe	Mg
compound in their ore	Al_2O_3	$CaCO_3$	PbS	Na*Cl*	Fe_2O_3	$MgCO_3$

Which type of reaction occurs in the extraction of each of these metals from their ore?

A decomposition by heat

B electrolysis

C precipitation

D reduction

30 After the collapse of a river bridge, a new car was immersed in the river water for several months.

When it was recovered, the parts of the car made of steel, an alloy of iron, were found to be corroded. The parts made of aluminium were not corroded.

Which statement explains these differences in corrosion?

A Aluminium has a coating of aluminium oxide.

B Aluminium has a very low density.

C Aluminium is an excellent conductor of electricity.

D Aluminium is less reactive than iron.

31 A farmer spread ammonium nitrate, a nitrogenous fertiliser, on a field. The next day he spread calcium hydroxide on the same field. This caused a loss of nitrogen from the ammonium nitrate.

Which chemical reaction occurred?

A The calcium ions reacted with the ammonium ions, producing ammonia gas.

B The calcium ions reacted with the nitrate ions, producing oxides of nitrogen.

C The hydroxide ions reacted with the ammonium ions, producing ammonia gas.

D The hydroxide ions reacted with the nitrate ions, producing oxides of nitrogen.

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[Turn over

32 Which row correctly compares carbon dioxide and methane?

	both contain carbon	both are described as a greenhouse gas	both lower the pH of water when they dissolve in it
A	✓	✗	✓
B	✓	✓	✗
C	✗	✓	✓
D	✗	✓	✗

33 Fossil fuels are used to power some internal combustion engines.

Which pollutants are produced by an internal combustion engine burning fossil fuels?

1 carbon monoxide

2 nitrogen oxides

3 sulfur dioxide

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

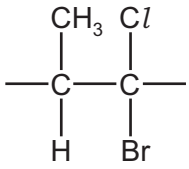
34 An ester is produced by reacting together the carboxylic acid HCO_2H and the alcohol $CH_3CH_2CH_2OH$.

What is the name and structure of this ester?

	name	structure
A	methyl propanoate	$CH_3CH_2CO_2CH_3$
B	methyl propanoate	$HCO_2CH_2CH_2CH_3$
C	propyl methanoate	$CH_3CH_2CO_2CH_3$
D	propyl methanoate	$HCO_2CH_2CH_2CH_3$

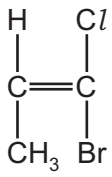
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35 The repeat unit of a polymer is shown.

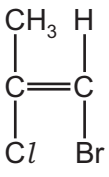


Which monomer would produce this polymer?

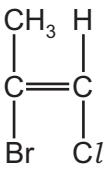
A



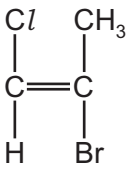
B



C



D



36 Each of compounds W, X, Y and Z is either an unbranched alkane or an unbranched alkene.

W C_9H_{18}

X C_9H_{20}

Y $C_{10}H_{20}$

Z $C_{10}H_{22}$

Which two compounds undergo an addition reaction with bromine?

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

37 One mole of each alkane undergoes complete combustion.

Which alkane will produce seven moles of products?

A CH_4 **B** C_2H_6 **C** C_3H_8 **D** C_4H_{10}

38 Which statement about macromolecules is correct?

A Nylon and *Terylene* are both polyesters.

B Proteins and nylon have the same monomer units.

C Proteins have the same amide linkages as nylon.

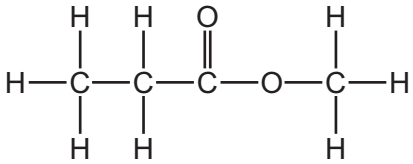
D *Terylene* and fats are esters but with different linkages.

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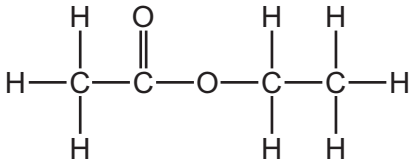
39 An organic compound, X, has a molecular formula $C_4H_8O_2$ and turns damp, blue litmus paper red.

What is the structure of X?

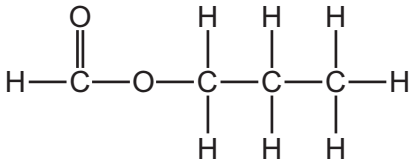
A



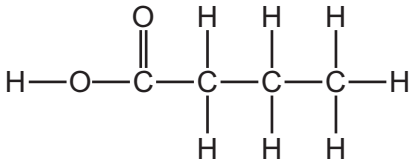
B



C



D



40 Which polymer contains only three different elements?

A protein

B poly(ethene)

C poly(propene)

D starch

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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.).