Cambridge
O Level

Cambridge International Examinations
Cambridge Ordinary Level

CHEMISTRY **5070/11**

Paper 1 Multiple Choice **October/November 2017**

1 hour

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

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.

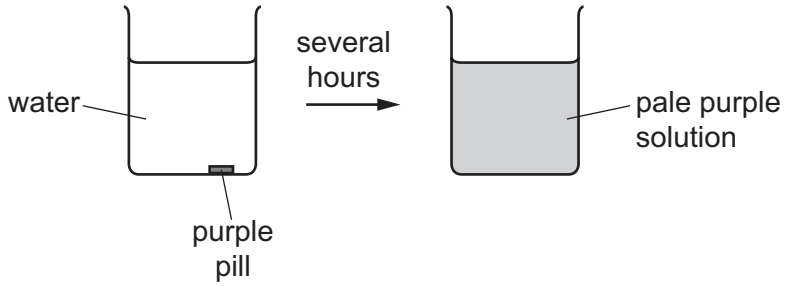
Read the instructions on the Answer Sheet very carefully.

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.

IB17 11_5070_11/6RP

1 A purple pill is placed in a beaker of water. The beaker is left for several hours.

The diagram shows the appearance of the water when the pill is added and several hours later.



Which statement explains why this change occurs?

A Diffusion occurs because the pill is coloured.

B Diffusion occurs faster at higher temperatures.

C Diffusion occurs from an area of high concentration to one of lower concentration.

D Gases diffuse faster than liquids.

2 The results of two tests on solution **X** are shown.

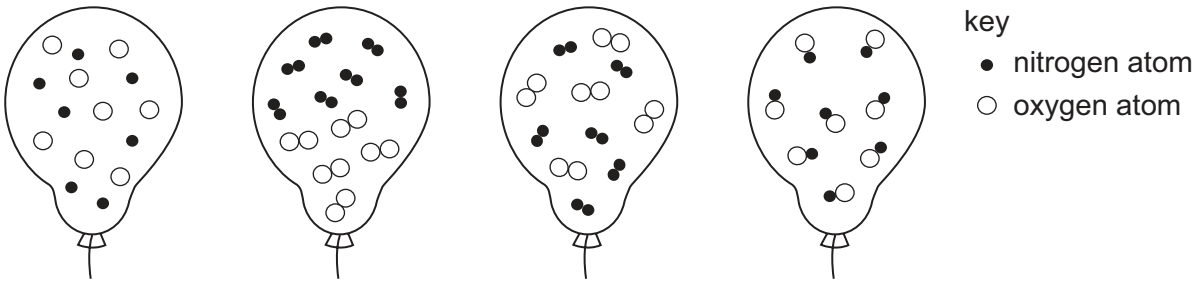
reagent added	observation on adding a few drops of reagent	observation on adding an excess of reagent
aqueous sodium hydroxide	white precipitate	precipitate dissolves
aqueous ammonia	white precipitate	precipitate remains

Which ion is present in solution **X**?

A Al^{3+} **B** Ca^{2+} **C** Cu^{2+} **D** Zn^{2+}

3 Which diagram shows the arrangement of particles inside a balloon containing a mixture of the gases nitrogen and oxygen?

A **B** **C** **D**

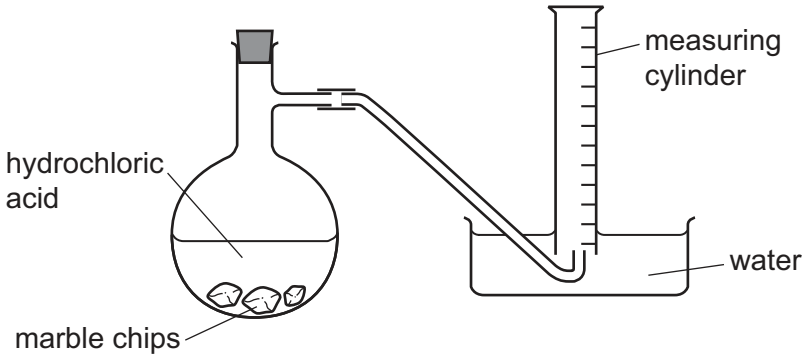


4 A student follows the rate of the reaction between marble chips, $CaCO_3$, and dilute hydrochloric acid.

$$CaCO_3 + 2HCl \rightarrow CaCl_2 + CO_2 + H_2O$$

Which diagrams show apparatus that is suitable for this experiment?

1



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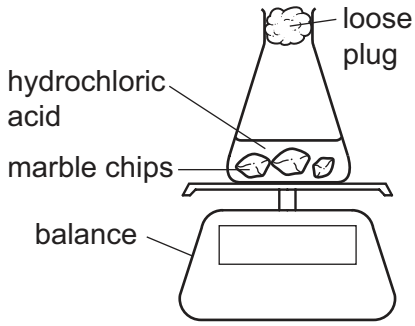

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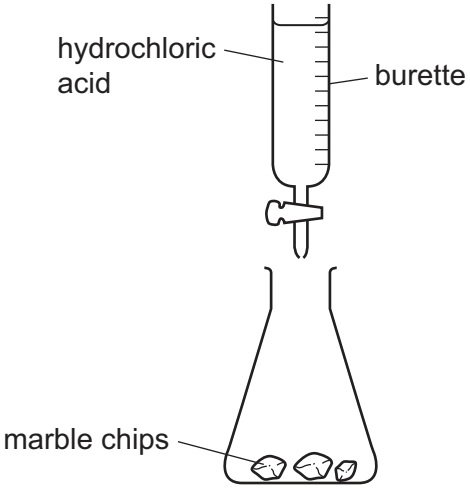

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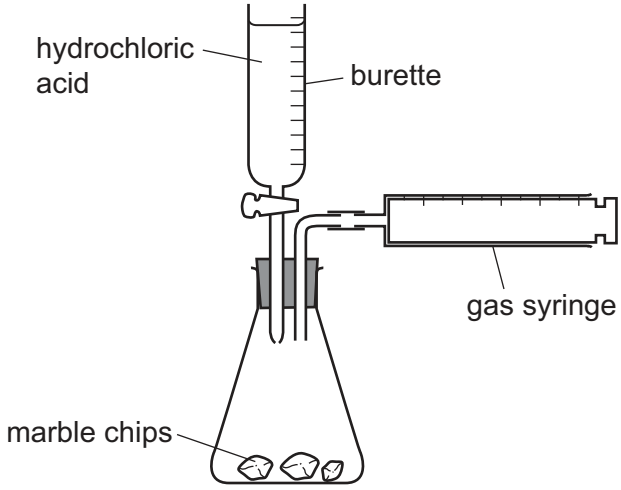


A 1 and 2 only **B** 1 and 3 **C** 1 and 4 only **D** 1, 2 and 4

5 Equal masses of methane gas are stored under different conditions.

Under which set of conditions does the methane gas occupy the smallest volume?

A 0 °C and atmospheric pressure

B 0 °C and twice atmospheric pressure

C 30 °C and atmospheric pressure

D 30 °C and twice atmospheric pressure

6 A particle of an isotope of sulfur contains 18 neutrons and 18 electrons.

What is the symbol for this particle?

A $^{34}_{16}S^{2+}$ **B** $^{34}_{16}S$ **C** $^{34}_{16}S^{2-}$ **D** $^{36}_{16}S$

7 When two elements react together, a compound is formed.

Which statement is correct?

A Equal masses of the elements must be used.

B The compound shows similar chemical properties to those of the elements.

C The elements must both be non-metals.

D When the elements react together, ionic or covalent compounds form.

8 Which statement is correct for all ionic compounds?

A They dissolve in water.

B They are formed when metals share electrons with non-metals.

C They conduct electricity in the molten state.

D They conduct electricity in the solid state.

9 When a piece of sodium is heated in air, it reacts with oxygen to form the ionic compound sodium oxide, Na_2O.

In terms of electrons, which statement correctly explains what happens when sodium reacts with oxygen?

A An oxygen atom shares two electrons with two sodium atoms.

B A sodium atom loses two electrons which are transferred to an oxygen atom.

C A sodium atom shares its outer shell electron with two oxygen atoms.

D Two sodium atoms each lose one electron which are both transferred to one oxygen atom.

10 The relative atomic mass of chlorine is 35.5.

What is the mass of 2 moles of chlorine gas?

A 17.75 g **B** 35.5 g **C** 71 g **D** 142 g

11 The empirical formula of a liquid compound is C_2H_4O.

To find the empirical formula, it is necessary to know

A the density of the compound.

B the percentage composition by mass of the compound.

C the relative molecular mass of the compound.

D the volume occupied by 1 mole of the compound.

12 25.0 g of hydrated copper(II) sulfate crystals are heated to produce anhydrous copper(II) sulfate and water vapour.

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

What is the mass of anhydrous copper(II) sulfate formed?
[M_r: $CuSO_4$, 160; H_2O, 18]

A 9.0 g **B** 16.0 g **C** 22.5 g **D** 25.0 g

13 One mole of an organic compound, **Q**, is completely burnt in oxygen and produces exactly three moles of water.

Which compound is **Q**?

A butane, C_4H_{10}

B ethanol, C_2H_5OH

C propane, C_3H_8

D propanol, C_3H_7OH

14 Aluminium is produced by the electrolysis of molten aluminium oxide.

What is the correct equation for the reaction at the positive electrode?

A $Al \rightarrow Al^{3+} + 3e^-$

B $Al^{3+} + 3e^- \rightarrow Al$

C $O_2 + 4e^- \rightarrow 2O^{2-}$

D $2O^{2-} \rightarrow O_2 + 4e^-$

15 When aqueous copper(II) sulfate is electrolysed using copper electrodes, which observations are correct?

	positive electrode	negative electrode	intensity of blue colour of electrolyte
A	electrode becomes smaller	electrode becomes bigger	constant
B	electrode becomes smaller	gas given off	fades
C	gas given off	electrode becomes bigger	fades
D	gas given off	gas given off	constant

16 Three different solutions were electrolysed using inert electrodes.

solution 1 aqueous sodium chloride

solution 2 concentrated hydrochloric acid

solution 3 dilute sulfuric acid

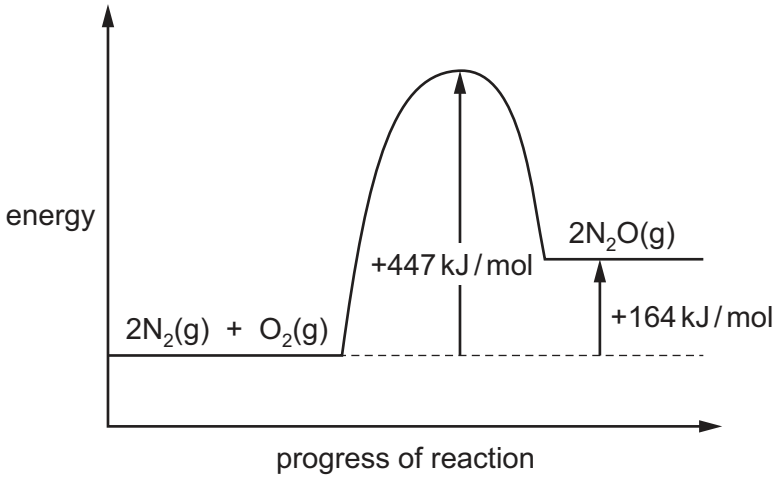
Which solutions produce hydrogen at the negative electrode?

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

17 Under certain conditions nitrogen reacts with oxygen to form N_2O.

$$2N_2(g) + O_2(g) \rightleftharpoons 2N_2O(g)$$

The energy profile diagram for this reaction is shown.



What is the activation energy for the reverse reaction?

A –447 kJ / mol

B –283 kJ / mol

C +141.5 kJ / mol

D +283 kJ / mol

18 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 are endothermic?

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

19 Sulfur trioxide is produced by the following reaction.

$$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g) \qquad \Delta H = -195\,kJ$$

Which change in conditions would produce a greater amount of SO_3 at equilibrium?

A adding a catalyst

B increasing the pressure

C increasing the temperature

D removing some SO_2 and O_2

20 A chemist investigated the rate of the reaction between ethene and hydrogen using a nickel catalyst.

$$C_2H_4(g) + H_2(g) \xrightarrow{Ni} C_2H_6(g)$$

The chemist carried out three experiments under different conditions.

experiment number	pressure / atmospheres	particle size of catalyst
1	1	powder
2	0.5	powder
3	1	large pieces

Which row is correct?

	comparison of the rates of experiments 1 and 2	comparison of the rates of experiments 1 and 3
A	1 greater than 2	1 greater than 3
B	1 greater than 2	3 greater than 1
C	2 greater than 1	1 greater than 3
D	2 greater than 1	3 greater than 1

21 Which change always occurs when a metal atom is oxidised?

A It becomes positively charged.

B It combines with oxygen.

C It gains an electron.

D It gains a proton.

22 Which statement is correct?

A Ammonia is produced when an ammonium salt is warmed with a dilute acid.

B Amphoteric oxides are oxides of certain metals.

C A neutral solution does not contain hydroxide ions.

D Soil with a high pH can be neutralised by adding lime, $Ca(OH)_2$.

23 Which reagent can be used to react with dilute hydrochloric acid to prepare silver chloride?

A aqueous silver nitrate

B solid silver

C solid silver carbonate

D solid silver oxide

24 The table shows some symbols and their meanings.

symbol	meaning
$\rightarrow$	reaction goes to completion
$\rightleftharpoons$	reaction is reversible
cat	catalyst required for reaction
~~cat~~	no catalyst is required for reaction

Which symbols should be used in the equation for the Haber process?

A $\rightarrow$ and cat **B** $\rightarrow$ and ~~cat~~ **C** $\rightleftharpoons$ and cat **D** $\rightleftharpoons$ and ~~cat~~

25 Nitrogenous fertilisers can cause eutrophication to occur in rivers. Eutrophication involves the five stages listed.

1 The fertiliser is washed into the river.

2 Oxygen levels become depleted in the river.

3 Plants die.

4 Plants begin to decay.

5 Plants in the river grow at an increased rate.

In which order do these five stages occur during eutrophication?

	first →				last
A	1	2	4	3	5
B	1	2	5	4	3
C	1	5	2	3	4
D	1	5	3	4	2

26 Three suggested uses of sulfuric acid are listed.

1 as battery acid

2 to make ammonia from ammonium salts

3 to make fertilisers

Which are correct uses of sulfuric acid?

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

27 The total number of electrons in one atom of element Q is 17 and in one atom of element R is 19.

Which statement about elements Q and R is correct?

A Q and R react together to form a covalent compound.

B Q forms positive ions.

C R has more outer shell electrons than Q.

D R is more metallic than Q.

28 Which row shows the correct catalyst for each industrial process?

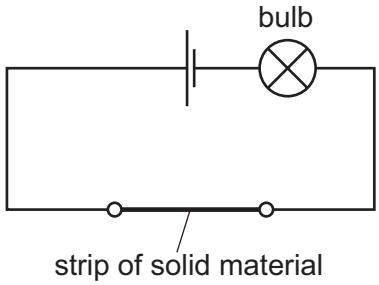
	manufacture of sulfuric acid	manufacture of ammonia	manufacture of margarine
A	nickel	iron	vanadium(V) oxide
B	nickel	vanadium(V) oxide	iron
C	vanadium(V) oxide	iron	nickel
D	vanadium(V) oxide	nickel	iron

29 Which metal is attached to underground pipes made of iron, to provide sacrificial protection from corrosion?

A Ag **B** Cu **C** Mg **D** Pb

30 The diagram shows a circuit used to test the electrical conductivity of strips of solid materials. If the material conducts, the bulb lights.

Strips of brass, nylon and zinc are each tested separately by connecting them into the circuit.



For which strips does the bulb light?

A brass, nylon and zinc

B brass and nylon only

C nylon and zinc only

D zinc and brass only

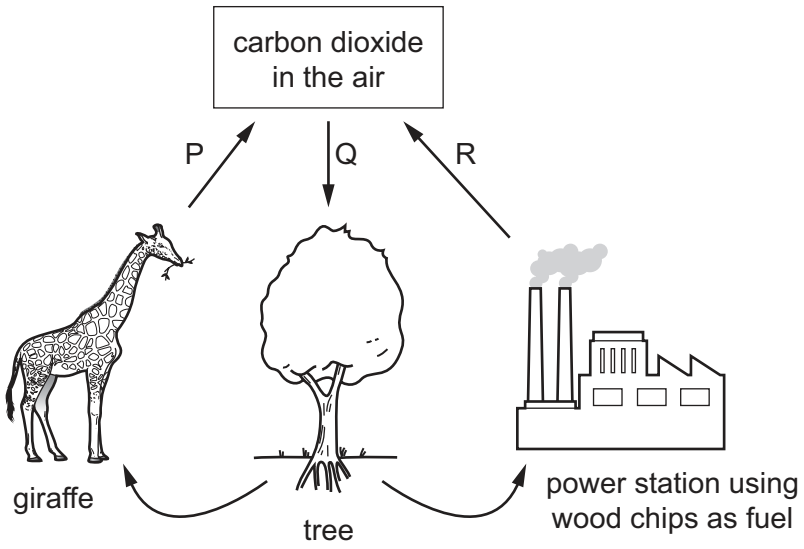
31 Octane, C_8H_{18}, is a hydrocarbon that undergoes combustion in a petrol engine.

$$...W...C_8H_{18} + ...X...O_2 \rightarrow ...Y...CO_2 + ...Z...H_2O$$

Which row shows the figures needed to balance the equation?

	W	*X*	*Y*	*Z*
A	1	8	8	9
B	1	17	8	9
C	2	16	8	9
D	2	25	16	18

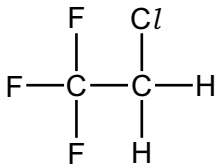
32 The diagram shows part of the carbon cycle.



What are processes P, Q and R?

	P	Q	R
A	combustion	photosynthesis	respiration
B	photosynthesis	combustion	respiration
C	respiration	combustion	photosynthesis
D	respiration	photosynthesis	combustion

33 CFC compounds were used as aerosol propellants. The structure of one CFC compound is shown.



Which element in this compound causes a depletion of ozone in the atmosphere?

A carbon

B chlorine

C fluorine

D hydrogen

34 What is removed or destroyed when water is desalinated to make it drinkable?

A bad odours

B harmful bacteria

C sodium chloride

D solid particles

35 Compounds **S** and **T** both contain two elements only. The compounds have the following properties.

- They both burn in air to form carbon dioxide and water only.
- They both react with chlorine by substitution.
- **S** has a higher boiling point than **T**.

What could compounds **S** and **T** be?

	S	**T**
A	ethane	propane
B	ethene	propene
C	propane	ethane
D	propene	ethene

36 Which row correctly describes alkenes?

	general formula	result when shaken with aqueous bromine
A	C_nH_{2n+2}	no change
B	C_nH_{2n+2}	the aqueous bromine is decolourised
C	C_nH_{2n}	no change
D	C_nH_{2n}	the aqueous bromine is decolourised

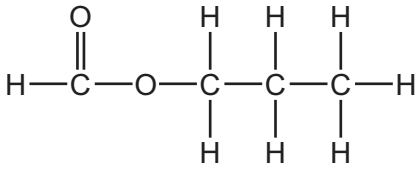
37 The table contains statements about processes by which ethanol is produced on a large scale from ethene and from glucose.

	from ethene	from glucose
1	reaction is faster at 300 °C than at 200 °C	reaction is faster at 100 °C than at 30 °C
2	produces pure ethanol	produces a dilute aqueous solution of ethanol
3	uses a catalyst	uses a catalyst
4	uses steam	produces carbon dioxide

Which rows are correct?

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

38 The structure of an ester is shown.



What is the name of this ester?

A ethyl propanoate

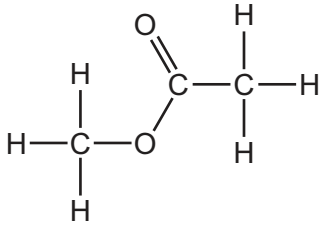
B methyl propanoate

C propyl ethanoate

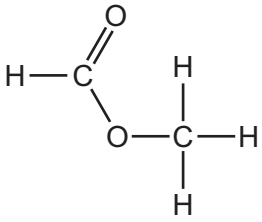
D propyl methanoate

39 Which compound has a pH of less than 7 in aqueous solution?

A



B



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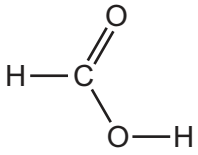
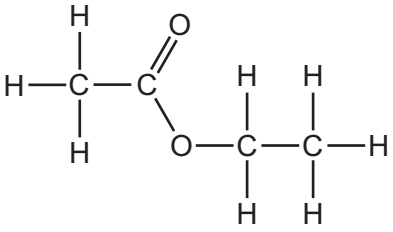
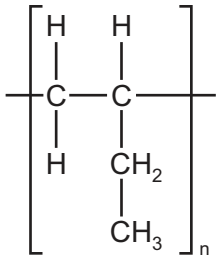


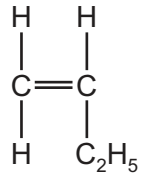
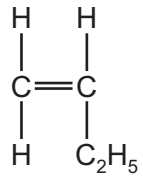
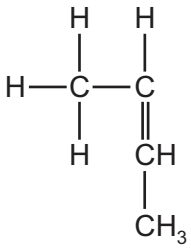
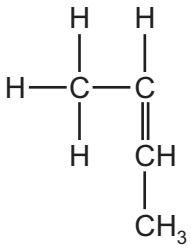
D



40 The diagram shows the repeat unit of a polymer.



Which row correctly identifies the monomer and type of polymerisation involved in making this polymer?

	monomer	type of polymerisation
A		addition
B		condensation
C		addition
D		condensation

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.).