

# Candidate Marks Report

## *Series : 6 2026*

This candidate's script has been assessed using On-Screen Marking. The marks are therefore not shown on the script itself, but are summarised in the table below.

|                  |               |                   |      |
|------------------|---------------|-------------------|------|
| Centre No :      | PK470         | Assessment Code : | 5070 |
| Candidate No :   | 58            | Component Code :  | 22   |
| Candidate Name : | HUZAIFA UMER, |                   |      |

In the table below 'Total Mark' records the mark scored by this candidate.  
'Max Mark' records the Maximum Mark available for the question.

| <b>Paper:</b> | <b>5070/22</b>           |  |
|---------------|--------------------------|--|
| <b>Paper</b>  | <b>76 / 80</b>           |  |
| <b>Total:</b> |                          |  |
| Question      | Total / Max<br>Mark Mark |  |
| 1a            | 1 / 1                    |  |
| 1b            | 1 / 1                    |  |
| 1c            | 1 / 1                    |  |
| 1d            | 1 / 1                    |  |
| 1e            | 1 / 1                    |  |
| 2a            | 3 / 3                    |  |
| 2b            | 1 / 1                    |  |
| 2c            | 0 / 1                    |  |
| 2d            | 3 / 3                    |  |
| 2e            | 2 / 2                    |  |
| 2f            | 1 / 1                    |  |
| 3a            | 3 / 3                    |  |
| 3b            | 1 / 1                    |  |
| 3c            | 1 / 1                    |  |
| 3d            | 2 / 2                    |  |
| 3e            | 2 / 2                    |  |
| 4a            | 4 / 4                    |  |
| 4b            | 2 / 2                    |  |
| 4ci           | 1 / 1                    |  |
| 4cii          | 1 / 1                    |  |
| 4di           | 1 / 1                    |  |
| 4dii          | 2 / 2                    |  |
| 5a            | 1 / 1                    |  |
| 5b            | 1 / 1                    |  |
| 5c            | 3 / 3                    |  |
| 5d            | 1 / 1                    |  |
| 5e            | 1 / 3                    |  |
| 5f            | 3 / 3                    |  |
| 5g            | 2 / 2                    |  |
| 6a            | 1 / 1                    |  |
| 6bi           | 1 / 1                    |  |
| 6bii          | 1 / 1                    |  |

|       |   |     |
|-------|---|-----|
| 6ci   | 1 | / 1 |
| 6cii  | 2 | / 2 |
| 6di   | 2 | / 2 |
| 6dii  | 2 | / 2 |
| 6ei   | 1 | / 1 |
| 6eii  | 1 | / 1 |
| 7a    | 2 | / 2 |
| 7b    | 2 | / 2 |
| 7ci   | 1 | / 1 |
| 7cii  | 1 | / 1 |
| 7d    | 3 | / 3 |
| 8a    | 2 | / 2 |
| 8b    | 1 | / 1 |
| 8c    | 1 | / 1 |
| 8di   | 0 | / 1 |
| 8dii  | 1 | / 1 |
| 8diii | 1 | / 1 |
| 8e    | 2 | / 2 |



## Cambridge O Level

CANDIDATE  
NAME

Huzaifa Umer

CENTRE  
NUMBER

P K 4 7 0

CANDIDATE  
NUMBER

0 0 5 8

CHEMISTRY

5070/22

Paper 2 Theory

May/June 2026

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

## INSTRUCTIONS

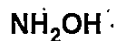
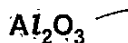
- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen. Do **not** use correction fluid or tape.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

## INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].
- The Periodic Table is printed in the question paper.

This document has 20 pages. Any blank pages are indicated.

1 Choose from the following compounds to answer the questions.



0905

Each compound can be used once, more than once or not at all.

State which compound:

(a) is an amphoteric oxide

.....  $\text{Al}_2\text{O}_3$  ..... [1]

(b) has a molecule containing only two atoms

.....  $\text{H}_2$  ..... [1]

(c) has a molecule with only 10 electrons

.....  $\text{NH}_3$  ..... [1]

(d) has an element with an oxidation number of +3

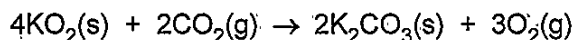
.....  $\text{Al}_2\text{O}_3$  ..... [1]

(e) is an alkane.

.....  $\text{C}_3\text{H}_8$  ..... [1]

[Total: 5]

- 2 Potassium superoxide,  $\text{KO}_2$ , reacts with carbon dioxide to make potassium carbonate and oxygen.



$$\text{KO}_2 = 71$$

- (a) A sample of 13.0 g of potassium superoxide reacts with excess carbon dioxide.

Calculate the volume of oxygen, measured at r.t.p., that is formed.

Give your answer to **three** significant figures.

Ratio in grams  $\rightarrow$

|               |              |                                        |                                                               |
|---------------|--------------|----------------------------------------|---------------------------------------------------------------|
| $\text{KO}_2$ | $\text{O}_2$ | moles = $\frac{4.394}{32}$<br>= 0.1373 | moles $\times 24 = v$<br>3.295 $\approx$ <del>3.29</del> 3.30 |
| 284           | 96           |                                        |                                                               |
| 13            | x            |                                        |                                                               |
| x = 4.394 g   |              |                                        |                                                               |

volume of oxygen = 3.30 dm<sup>3</sup> [3]

- (b) Potassium superoxide is an ionic compound.

Deduce the formula of a superoxide ion.

$\text{O}_2^{-1}$  [1]

- (c) Potassium superoxide has a giant ionic lattice.

Explain what is meant by the term giant ionic lattice.

A block containing [many] large number of positive and negative ions bonded ionically together. [1]

- (d) Describe the separation, arrangement and motion of particles in solid carbon dioxide.

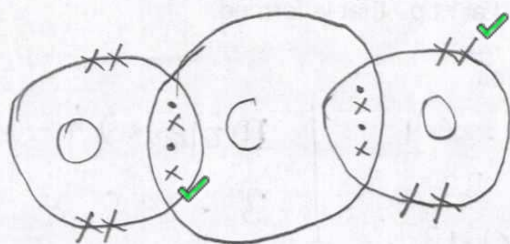
Particles are present very close to each other (alm) and touching and are arranged in regular rows. They vibrate on their mean position.

[3]



- (e) Draw a dot-and-cross diagram to show the electronic configuration in a molecule of carbon dioxide.

Show only the outer shell electrons.



[2]

- (f) Explain why carbon dioxide has a low boiling point.

Because it has weak (inter<sup>m</sup>) intermolecular forces of attraction.

[1]

[Total: 11]



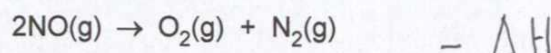


SEEN

Turn over



- 3 The equation for one of the reactions that happens in a catalytic converter is shown.



This decomposition reaction is exothermic.

- (a) Complete the reaction pathway diagram in Figure 3.1 for this decomposition reaction.

Label the:

- axes ✓
- reactants and products ✓
- enthalpy change,  $\Delta H$ . ✓

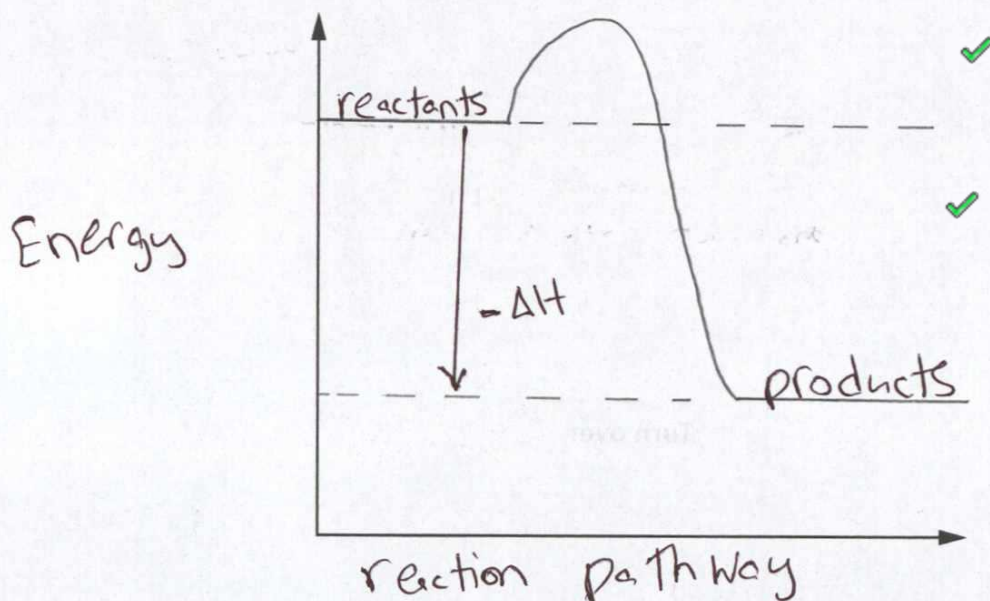


Figure 3.1

[3]

- (b) The rate of the decomposition reaction is increased by using a catalyst.

Explain how a catalyst increases the rate of the decomposition reaction.

<sup>Catalyst</sup>  
~~It~~ lowers the activation energy of the reaction, which ultimately increases rate of decomposition. [1]

- (c) Suggest why it is important that the solid catalyst in a catalytic converter has a large surface area.

Large surface area catalyst  
~~So that it~~ reacts with more molecules, leading to (more) decrease in activation energy, increasing rate of reaction. [1]  
 of more reactants.

- (d) The rate of the decomposition reaction increases when the pressure of the reactants is increased at constant temperature.

Explain why.

As pressure of reaction increases, particles come close to each other. Due to which they collide more frequently. Leading to more effective collisions increasing the rate of reaction. [2]

- (e) The rate of the decomposition reaction increases when the temperature of the reactants is increased at constant pressure.

Explain why.

Because when the temperature increases, kinetic energy of molecules also increase. Due to which they collide more frequently. Increasing the rate of effective collisions which leads to increased rate of reaction. [2]  
[Total: 9]

4 Copper(II) sulfate is an ionic compound.

(a) The electrolysis of aqueous copper(II) sulfate is done using copper or graphite electrodes.

Complete Table 4.1 about the observations made in the two electrolysis reactions.

Table 4.1

|                           | observation at anode                      | observation at cathode           |
|---------------------------|-------------------------------------------|----------------------------------|
| using copper electrodes   | size of anode decreases and it dissolves. | pink solid deposited on cathode. |
| using graphite electrodes | bubbles of oxygen gas                     | pink solid deposited on cathode. |

[4]

(b) Molten barium iodide is electrolysed using graphite electrodes.

Construct ionic half-equations to show the reactions at the anode and at the cathode.

anode .....  $2 I^{-} \rightarrow I_2 + 2 e^{-}$  ✓

cathode .....  $Ba^{+2} + 2 e^{-} \rightarrow Ba$  ✓

[2]

(c) Graphite is a suitable material for the electrodes used in electrolysis because it is inert and has good electrical conductivity.

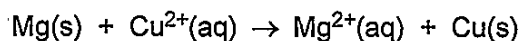
(i) State the meaning of the word inert.

..... Unreactive ..... [1]

(ii) Name one metal that is used as an inert electrode.

..... Platinum ..... [1]

(d) The ionic equation for the reaction between magnesium and aqueous copper(II) sulfate is shown.



(i) State the oxidation number of copper in copper(II) sulfate.

..... + 2 ..... [1]



(ii) The reaction is an example of a redox reaction.

Explain how the equation shows that both oxidation and reduction take place during the reaction.

oxidation ... As Magnesium loses 2<sup>✓</sup> electrons:

Which means it is oxidised.

reduction ... As Copper<sup>ion</sup> gains 2 electrons - which

means it is reduced. ✓

[2]

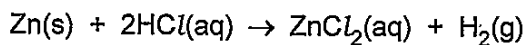
O: 11

R: 9.9

[Total: 11]



- 5 Zinc chloride is prepared by reacting excess zinc with warm dilute hydrochloric acid.



- (a) Use the equation to predict one observation made during this reaction.

Effervescence of hydrogen gas. [1]

- (b) Explain why an excess of zinc is used in this preparation.

So that <sup>the</sup> zinc reacts completely with the acid and all acid is used up. [1]

- (c) A sample of 3.24 g of zinc is added to 50.0 cm<sup>3</sup> of 1.50 mol/dm<sup>3</sup> hydrochloric acid.

Show by calculation that the zinc is in excess.

$$\begin{aligned} \text{moles of zinc provided} &= \frac{3.24}{65} \\ &= 0.0498 \end{aligned}$$

$$\begin{aligned} \text{moles of HCl provided} &= 1.50 \times \frac{50}{1000} \\ &= 0.075 \end{aligned}$$

|                  |                        |
|------------------|------------------------|
| Zn               | 2 HCl                  |
| 1                | 2                      |
| x                | <del>0.075</del> 0.075 |
| x = 0.0375 moles |                        |

0.0375 moles of zinc are needed but 0.0498 are provided. Which means zinc is in excess. [3]

- (d) State how excess zinc is removed from the reaction mixture.

Filtration [By passing it through filter paper] [1]

- (e) Describe how pure dry zinc chloride crystals are prepared from aqueous zinc chloride.

Aqueous zinc chloride is poured into evaporating dish. It is then gently heated by Bunsen burner, till the crystallisation point. The crystals are then filtered by filter paper. They are cooled and dried by filter paper or towel. [3]

(f) The formula of a sample of zinc chloride crystals is  $\text{ZnCl}_2 \cdot 3\text{H}_2\text{O}$ .

Calculate the percentage by mass of water of crystallisation in these crystals.

$$\text{Total mass of } \text{ZnCl}_2 \cdot 3\text{H}_2\text{O} = 65 + 71 + 54 \\ = 190$$

$$\text{Total mass of crystallisation} = 54$$

$$\% = \frac{54}{190} \times 100$$

$$= 28.4\%$$

percentage by mass =  $28.4\%$  [3]

(g) Describe the effect of adding aqueous ammonia drop by drop until in excess to a sample of aqueous zinc chloride.

At first a white ppt is formed. Then this white ppt dissolves in excess ammonia giving a colourless solution. [2]

[Total: 14]

6 Copper and aluminium are metals.

Both metals have good electrical conductivity.

- (a) Explain why both metals have good electrical conductivity.

Use ideas about structure and bonding.

Because they have free (mobile) electrons in a giant metal lattice, <sup>these electrons</sup> ~~which~~ conducts electricity. [1]

- (b) Copper is a transition element but aluminium is **not**:

Aluminium has a lower melting point and boiling point than copper.

- (i) Suggest one **other** difference between the physical properties of these two metals.

Copper has higher density than aluminium. [1]

- (ii) Suggest one difference between the chemical properties of these two metals.

Copper has variable oxidation state while Aluminium don't. [1]

- (c) Copper is used to make the alloy brass.

- (i) Name the main element mixed with copper to make brass.

Zinc [1]

- (ii) Brass is harder than pure copper.

Explain why.

Use ideas about structure and bonding.

Because in brass different sized metal ions are present. Which makes it harder difficult to slip and slide over each other. Resulting in rigidity and making it harder than pure copper. [2]

- (d) Aluminium is used to manufacture food containers because of its resistance to corrosion.

- (i) Explain why aluminium is resistant to corrosion.

Because aluminium forms an oxide layer <sup>on its surface</sup> which is impermeable and prevents its reaction with air or water. Making it resistant to corrosion. [2]

- (ii) State one **other** use for aluminium and explain why aluminium is suitable for this use.

use Use to make airplanes.  
explanation It has low density allowing the plane to <sup>fly</sup> ~~move~~ easily in air.

[2]

- (e) Aluminium is manufactured by the electrolysis of purified bauxite mixed with cryolite. Carbon electrodes are used.

- (i) Explain why cryolite is added to the purified bauxite.

It acts as a solvent dissolving bauxite, as well as lowers (its<sup>\*)</sup> bauxite's melting point. [1]

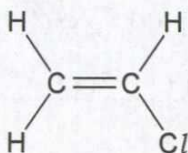
- (ii) Explain why the carbon anodes need to be regularly replaced.

As carbon anodes react with oxygen due to high temperature forming  $\text{CO}_2$  which decreases <sup>their</sup> anode's size. Hence they are replaced regularly. [1]

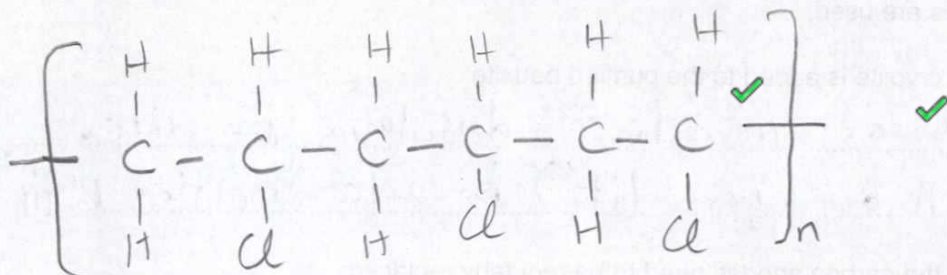
[Total: 12]

- 7 Chloroethene is a monomer used to make poly(chloroethene).

The displayed formula of chloroethene is shown.



- (a) Draw the structure of poly(chloroethene).



[2]

- (b) There is an accumulation of plastics such as poly(chloroethene) in the oceans.

Suggest **two** properties of poly(chloroethene) that explain this accumulation.

- 1 It is non-biodegradable. ✓
- 2 It does not dissolve in water. ✓

[2]

- (c) Burning is used for the disposal of some plastics.

This method of disposal causes environmental challenges.

- (i) One of these challenges is the production of greenhouse gases.

Name a greenhouse gas produced by burning plastics.

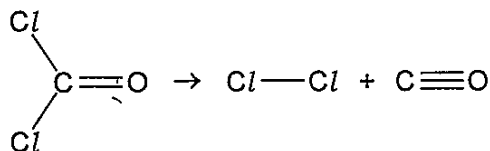
Carbon dioxide [1]

- (ii) Another environmental challenge is the production of toxic gases.

Name **one** toxic gas produced during the burning of plastics.

Carbon monoxide [1]

(d) Phosgene,  $\text{COCl}_2$ , decomposes when heated strongly.



Show that the enthalpy change for the reaction is  $+101 \text{ kJ/mol}$ .

Use the bond energies shown in Table 7.1.

Table 7.1

| bond                     | bond energy in $\text{kJ/mol}$ |
|--------------------------|--------------------------------|
| $\text{C}=\text{O}$      | 740                            |
| $\text{C}-\text{Cl}$     | 340                            |
| $\text{Cl}-\text{Cl}$    | 242                            |
| $\text{C}\equiv\text{O}$ | 1077                           |

$$2(\text{C}-\text{Cl}) + \text{C}=\text{O} = \text{Cl}-\text{Cl} + \text{C}\equiv\text{O}$$

$$2(340) + 740 = 242 + (1077)$$

$$680 + 740 = 1314$$

$$1420 = 1314$$

$$1420 - 1314 = \Delta H$$

$$+101 \text{ kJ/mol} = \Delta H$$

[3]

[Total: 9]

8 This question is about carboxylic acids.

(a) Vinegar is an aqueous solution containing ethanoic acid.

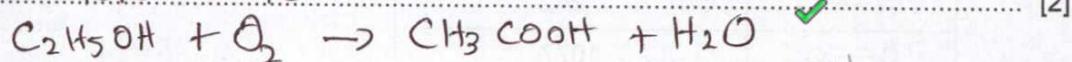
During the production of vinegar, ethanoic acid is formed from ethanol.

Water is also formed as a product.

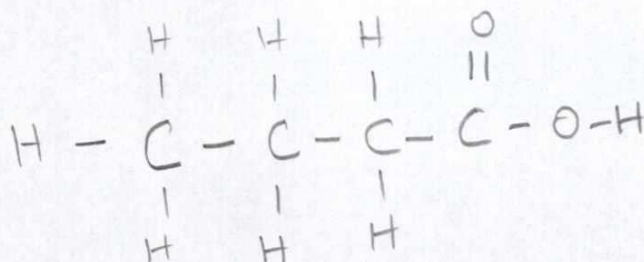
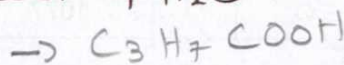
Describe the formation of ethanoic acid from ethanol during the production of vinegar.

Include a symbol equation for the formation of ethanoic acid from ethanol and the conditions for the production of vinegar.

[Bacterial/oxidation of ethanol takes place using] Ethanol is placed in an open container where bacterial oxidation takes place forming ethanoic acid.



(b) Draw the displayed formula of butanoic acid.



[1]

(c) Ethyl ethanoate is a structural isomer of butanoic acid.

State the meaning of the term structural isomer.

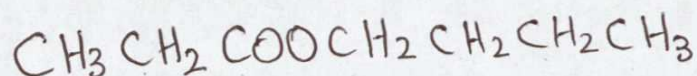
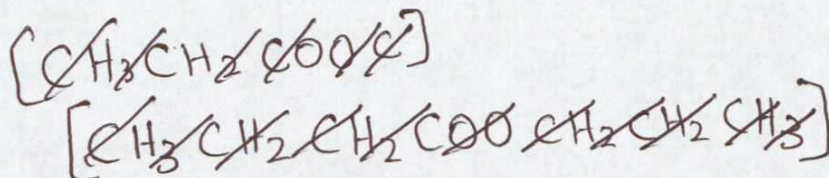
Compounds with same molecular formula but different structural formula. [1]

(d) Propanoic acid reacts with butan-1-ol to make an ester.

(i) Name the ester made in this reaction.

Butyl propanoate [1]

(ii) Draw the structural formula of the ester made in this reaction.



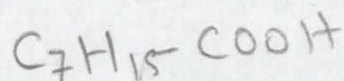
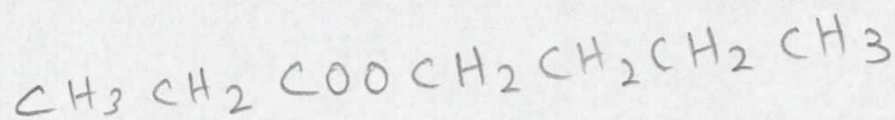
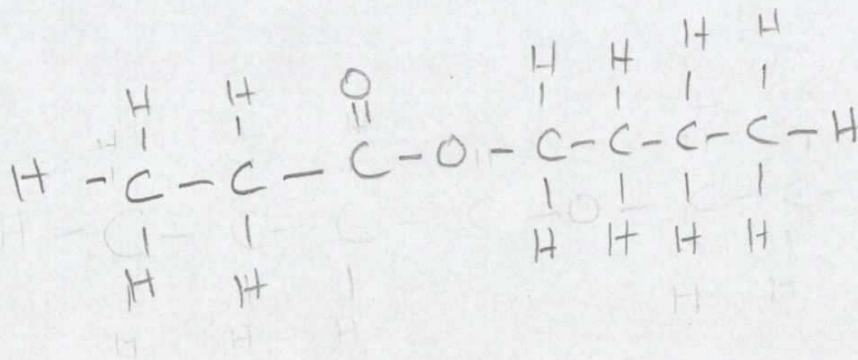
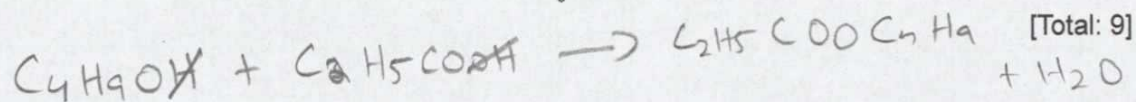
[1]

(iii) State **one** condition needed for this esterification reaction.

Acid catalyst [1]

(e) Deduce the molecular formula of an unbranched carboxylic acid that has only eight carbon atoms in its molecule and no other functional groups.

$\text{C}_8\text{H}_{16}\text{O}_2$  ✓ ✓ [2]





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The Periodic Table of Elements

| Group                      |                             |                                                                       |                                 |                             |                              |                             |                              |                              |                                |                               |                               |                             |                             |                             |                               |                              |                             |                             |                           |                             |                         |                              |                         |
|----------------------------|-----------------------------|-----------------------------------------------------------------------|---------------------------------|-----------------------------|------------------------------|-----------------------------|------------------------------|------------------------------|--------------------------------|-------------------------------|-------------------------------|-----------------------------|-----------------------------|-----------------------------|-------------------------------|------------------------------|-----------------------------|-----------------------------|---------------------------|-----------------------------|-------------------------|------------------------------|-------------------------|
| I                          | II                          | 1<br>H<br>hydrogen<br>1                                               |                                 |                             |                              |                             |                              |                              |                                |                               |                               | III                         | IV                          | V                           | VI                            | VII                          | VIII                        |                             |                           |                             |                         |                              |                         |
|                            |                             | Key<br>atomic number<br>atomic symbol<br>name<br>relative atomic mass |                                 |                             |                              |                             |                              |                              |                                |                               |                               |                             |                             |                             |                               |                              |                             |                             |                           |                             |                         |                              |                         |
| 3<br>Li<br>lithium<br>7    | 4<br>Be<br>beryllium<br>9   |                                                                       |                                 |                             |                              |                             |                              |                              |                                |                               |                               |                             |                             |                             |                               |                              |                             | 5<br>B<br>boron<br>11       | 6<br>C<br>carbon<br>12    | 7<br>N<br>nitrogen<br>14    | 8<br>O<br>oxygen<br>16  | 9<br>F<br>fluorine<br>19     | 10<br>Ne<br>neon<br>20  |
| 11<br>Na<br>sodium<br>23   | 12<br>Mg<br>magnesium<br>24 |                                                                       |                                 |                             |                              |                             |                              |                              |                                |                               |                               |                             |                             |                             |                               |                              |                             | 13<br>Al<br>aluminium<br>27 | 14<br>Si<br>silicon<br>28 | 15<br>P<br>phosphorus<br>31 | 16<br>S<br>sulfur<br>32 | 17<br>Cl<br>chlorine<br>35.5 | 18<br>Ar<br>argon<br>40 |
| 19<br>K<br>potassium<br>39 | 20<br>Ca<br>calcium<br>40   | 21<br>Sc<br>scandium<br>45                                            | 22<br>Ti<br>titanium<br>48      | 23<br>V<br>vanadium<br>51   | 24<br>Cr<br>chromium<br>52   | 25<br>Mn<br>manganese<br>55 | 26<br>Fe<br>iron<br>56       | 27<br>Co<br>cobalt<br>59     | 28<br>Ni<br>nickel<br>59       | 29<br>Cu<br>copper<br>64      | 30<br>Zn<br>zinc<br>65        | 31<br>Ga<br>gallium<br>70   | 32<br>Ge<br>germanium<br>73 | 33<br>As<br>arsenic<br>75   | 34<br>Se<br>selenium<br>79    | 35<br>Br<br>bromine<br>80    | 36<br>Kr<br>krypton<br>84   |                             |                           |                             |                         |                              |                         |
| 37<br>Rb<br>rubidium<br>85 | 38<br>Sr<br>strontium<br>88 | 39<br>Y<br>yttrium<br>89                                              | 40<br>Zr<br>zirconium<br>91     | 41<br>Nb<br>niobium<br>93   | 42<br>Mo<br>molybdenum<br>96 | 43<br>Tc<br>technetium<br>- | 44<br>Ru<br>ruthenium<br>101 | 45<br>Rh<br>rhodium<br>103   | 46<br>Pd<br>palladium<br>106   | 47<br>Ag<br>silver<br>108     | 48<br>Cd<br>cadmium<br>112    | 49<br>In<br>indium<br>115   | 50<br>Sn<br>tin<br>119      | 51<br>Sb<br>antimony<br>122 | 52<br>Te<br>tellurium<br>128  | 53<br>I<br>iodine<br>127     | 54<br>Xe<br>xenon<br>131    |                             |                           |                             |                         |                              |                         |
| 55<br>Cs<br>caesium<br>133 | 56<br>Ba<br>barium<br>137   | 57-71<br>lanthanoids                                                  | 72<br>Hf<br>hafnium<br>178      | 73<br>Ta<br>tantalum<br>181 | 74<br>W<br>tungsten<br>184   | 75<br>Re<br>rhenium<br>186  | 76<br>Os<br>osmium<br>190    | 77<br>Ir<br>iridium<br>192   | 78<br>Pt<br>platinum<br>195    | 79<br>Au<br>gold<br>197       | 80<br>Hg<br>mercury<br>201    | 81<br>Tl<br>thallium<br>204 | 82<br>Pb<br>lead<br>207     | 83<br>Bi<br>bismuth<br>209  | 84<br>Po<br>polonium<br>-     | 85<br>At<br>astatine<br>-    | 86<br>Rn<br>radon<br>-      |                             |                           |                             |                         |                              |                         |
| 87<br>Fr<br>francium<br>-  | 88<br>Ra<br>radium<br>-     | 89-103<br>actinoids                                                   | 104<br>Rf<br>rutherfordium<br>- | 105<br>Db<br>dubnium<br>-   | 106<br>Sg<br>seaborgium<br>- | 107<br>Bh<br>bohrium<br>-   | 108<br>Hs<br>hassium<br>-    | 109<br>Mt<br>meitnerium<br>- | 110<br>Ds<br>darmstadtium<br>- | 111<br>Rg<br>roentgenium<br>- | 112<br>Cn<br>copernicium<br>- | 113<br>Nh<br>nihonium<br>-  | 114<br>Fl<br>flerovium<br>- | 115<br>Mc<br>moscovium<br>- | 116<br>Lv<br>livermorium<br>- | 117<br>Ts<br>tennessine<br>- | 118<br>Og<br>oganesson<br>- |                             |                           |                             |                         |                              |                         |

|             |                              |                            |                                 |                              |                             |                             |                             |                               |                            |                               |                              |                           |                               |                              |                              |
|-------------|------------------------------|----------------------------|---------------------------------|------------------------------|-----------------------------|-----------------------------|-----------------------------|-------------------------------|----------------------------|-------------------------------|------------------------------|---------------------------|-------------------------------|------------------------------|------------------------------|
| lanthanoids | 57<br>La<br>lanthanum<br>139 | 58<br>Ce<br>cerium<br>140  | 59<br>Pr<br>praseodymium<br>141 | 60<br>Nd<br>neodymium<br>144 | 61<br>Pm<br>promethium<br>- | 62<br>Sm<br>samarium<br>150 | 63<br>Eu<br>europium<br>152 | 64<br>Gd<br>gadolinium<br>157 | 65<br>Tb<br>terbium<br>159 | 66<br>Dy<br>dysprosium<br>163 | 67<br>Ho<br>holmium<br>165   | 68<br>Er<br>erbium<br>167 | 69<br>Tm<br>thulium<br>169    | 70<br>Yb<br>ytterbium<br>173 | 71<br>Lu<br>lutetium<br>175  |
| actinoids   | 89<br>Ac<br>actinium<br>-    | 90<br>Th<br>thorium<br>232 | 91<br>Pa<br>protactinium<br>231 | 92<br>U<br>uranium<br>238    | 93<br>Np<br>neptunium<br>-  | 94<br>Pu<br>plutonium<br>-  | 95<br>Am<br>americium<br>-  | 96<br>Cm<br>curium<br>-       | 97<br>Bk<br>berkelium<br>- | 98<br>Cf<br>californium<br>-  | 99<br>Es<br>einsteinium<br>- | 100<br>Fm<br>fermium<br>- | 101<br>Md<br>mendelevium<br>- | 102<br>No<br>nobelium<br>-   | 103<br>Lr<br>lawrencium<br>- |

The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.).