

## CURRICULUM CONTENT

### 1. States of matter

- Describe the states of matter and explain their inter conversion in terms of the kinetic particle theory
- Describe and explain diffusion
- Describe evidence for the movement of particles in gases and liquids (a treatment of Brownian motion is **not** required)

### 2. The atom

- State the relative charges and approximate relative masses of protons, neutrons and electrons
- Define proton number and nucleon number
- Use proton number and the simple structure of atoms to explain the basis of the Periodic Table with special reference to the elements of proton number 1 to 20
- Define isotopes
- State the two types of isotopes as being radioactive and non-radioactive
- State one medical and one industrial use of radioactive isotopes
- Describe the build-up of electrons in 'shells' and understand the significance of the noble gas electronic structures and of valency electrons (the ideas of the distribution of electrons in s and p orbitals and in d block elements are **not** required.)

### 3. Atoms combining

#### a) Bonding: the structure of matter

- Describe the differences between elements, mixtures and compounds, and between metals and non-metals
- Describe an alloy, such as brass, as a mixture of a metal with other elements

#### b) Ions and ionic bonds

- Describe the formation of ions by electron loss or gain
- Describe the formation of ionic bonds between elements from Groups I and VII
- Describe the formation of ionic bonds between metallic and non-metallic elements
- Describe the lattice structure of ionic compounds as a regular arrangement of alternating positive and negative ions

#### c) Molecules and covalent bonds

- Describe the formation of single covalent bonds in H<sub>2</sub>, Cl<sub>2</sub>, H<sub>2</sub>O, CH<sub>4</sub>, and HCl as the sharing of pairs of electrons leading to the noble gas configuration

- Describe the differences in volatility, solubility and electrical conductivity between ionic and covalent compounds
  - Describe the electron arrangement in more complex covalent molecules such as N<sub>2</sub>, C<sub>2</sub>H<sub>4</sub>, CH<sub>3</sub>OH and CO<sub>2</sub>
- d) Metallic bonding**
- Describe metallic bonding as a lattice of positive ions in a ‘sea of electrons’ and use this to describe the electrical conductivity and malleability of metals

#### 4. The Periodic Table

- Describe the Periodic Table as a method of classifying elements and its use to predict properties of elements
- Describe the change from metallic to non-metallic character across a period
- Describe the relationship between Group number, number of valency electrons and metallic/non-metallic character
- Describe lithium, sodium and potassium in Group I as a collection of relatively soft metals showing a trend in melting point, density and reaction with water
- Predict the properties of other elements in Group I, given data, where appropriate
- Describe chlorine, bromine and iodine in Group VII as a collection of diatomic non-metals showing a trend in colour, and state their reaction with other halide ions
- Predict the properties of other elements in Group VII, given data where appropriate
- Describe the transition elements as a collection of metals having high densities, high melting points and forming coloured compounds, and which, as elements and compounds, often act as catalysts
- Describe the noble gases as being unreactive
- Describe the uses of the noble gases in providing an inert atmosphere, i.e. argon in lamps, helium for filling balloons

#### 5. The Mole and chemical equations

- Use the symbols of the elements and write the formulae of simple compounds
- Deduce the formula of a simple compound from the relative numbers of atoms present
- Deduce the formula of a simple compound from a model or a diagrammatic representation
- Determine the formula of an ionic compound from the charges on the ions present

- Construct word equations and simple balanced chemical equations
- Define relative atomic mass,  $A_r$
- Define relative molecular mass,  $M_r$ , as the sum of the relative atomic masses (relative formula mass or  $M_r$  will be used for ionic compounds) (Calculations involving reacting masses in simple proportions may be set. Calculations will **not** involve the mole concept.)
- Define the mole and the Avogadro constant
- Use the molar gas volume, taken as  $24 \text{ dm}^3$  at room temperature and pressure
- Construct equations with state symbols, including ionic equations
- Deduce the balanced equation for a chemical reaction, given relevant information
- Calculate stoichiometric reacting masses and volumes of gases and solutions, solution concentrations expressed in  $\text{g/dm}^3$  and  $\text{mol/dm}^3$ . (Calculations involving the idea of limiting reactants may be set. Questions on the gas laws and the conversion of gaseous volumes to different temperatures and pressures will **not** be set.)
- Calculate empirical formulae and molecular formulae
- Calculate % yield and % purity

## 6. Redox

- Define oxidation and reduction in terms of oxygen loss/gain. (Oxidation state limited to its use to name ions, e.g. iron(II), iron(III), copper(II), manganate(VII), dichromate(VI).)
- Define redox in terms of electron transfer
- Identify redox reactions by changes in oxidation state and by the colour changes involved when using acidified potassium manganate(VII), and potassium iodide. (Recall of equations involving  $\text{KMnO}_4$  is **not** required.)

## 7. Acids and bases

- Describe the characteristic properties of acids as reactions with metals, bases, carbonates and effect on litmus
- Describe the characteristic properties of bases as reactions with acids and with ammonium salts and effect on litmus
- Describe neutrality and relative acidity and alkalinity in terms of pH (whole numbers only) measured using Universal Indicator paper
- Describe and explain the importance of controlling acidity in soil
- Define acids and bases in terms of proton transfer, limited to aqueous solutions

- Describe the meaning of weak and strong acids and bases
- Classify oxides as either acidic or basic, related to metallic and non-metallic character
- Describe the preparation, separation and purification of salts as examples of some of the techniques specified in the book
- Describe the preparation of insoluble salts by precipitation
- Suggest a method of making a given salt from suitable starting material, given appropriate information

