HERBERT MORRISON TECHNICAL HIGH SCHOOL

CHEMISTRY CSEC SYLLABUS

GRADE 10

Section A- Principles of Chemistry

1. STATES OF MATTER

Students should be able to:

1.1 explain how evidence supports the particulate theory of matter;

Evidence obtained from practical work involving processes, such as diffusion and osmosis. Use of salt or sugar to control garden pests and as a preservative.

Experiments of diffusion of ammonia and hydrogen chloride gases in cylindrical tube. Osmosis of Pawpaw (green) strips in a container of distilled water. Potassium manganate (VII) in water.

Biology- Osmosis, diffusion.

Physics-Kinetic Theory.

1.2 distinguish among the three states of matter;

Arrangement of particles, energy of particles, strength of forces of interaction. Consideration of characteristics of states.

Example: Volume, density, compressibility.

1.3 explain the changes between the three states of matter in terms of energy and arrangement of particles.

Consideration of freezing, melting, boiling, evaporation, sublimation, condensation; heating and cooling curves.

Heat the following ice, water, butter, Iodine (in a fume hood).

Physics - Specific latent heat.

2. MIXTURES AND SEPARATIONS

Students should be able to:

2.1 distinguish between pure substances and mixtures;

Elements, compounds, atoms, molecules, fixed composition, properties, variable composition, variable properties.

Compare boiling point of pure water and sodium chloride solution.

Biology – Solutions in life processes.

2.2 distinguish among solutions, suspensions and colloids;

Reference to particle sizes, passage of light, sedimentation.

Filtration, use of lamp light to view particles.

2.3 identify different types of solutions;

Types of solutions: solid in liquid, solid in solid, gas in liquid, liquid in liquid, gas in gas.

Observe examples of each type of solution.

2.4 investigate the effect of temperature on solubility of solids in water;

Examples showing that a decrease in solubility with increasing temperature will not be required.

Determine the solubility of a solute in water, for example, potassium nitrate.

Biology – Transport system.

2.5 apply suitable separation techniques based on differences in properties of the components of mixtures;

Properties to be included: particle size, boiling point, crystalline structure, solubility and solute mobility in solvent.

Include line drawing to represent the separation process.

Refer to SO B1.2, B3.8, C5.8.

Use of simple filtration, simple and fractional distillation, paper chromatography, and the separating funnel.

Biology – Function of the kidney, digestive system.

2.6 describe the extraction of sucrose from sugar cane.

A simple treatment of the following crushing, precipitation, filtration, vacuum distillation, crystallisation, centrifugation.

A field visit to a sugar producing plant.

Physics – Gas Laws, circular motion, Specific latent heat.

3. ATOMIC STRUCTURE

Students should be able to:

3.1 describe with illustrations, the structure of atoms of atomic number 1 to 20;

The atom as consisting of three basic particles: protons, neutrons and electrons arranged in shells. No consideration of orbitals is expected.

Make models.

Physics-Particles in the atom.

3.2 state properties of electrons, protons and neutrons;

Properties related to relative mass and relative charge only.

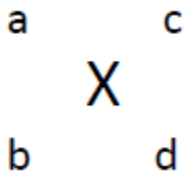
3.3 define atomic number and mass number;

Physics – Particles in the atom.

3.4 define relative atomic mass;

Relative atomic mass based on carbon-12 isotope.

3.5 interpret notations of the form



a – mass number;

b – atomic number;

c - charge;

d - number of items in the entity;

X – symbol of atom.

3.6 define isotopy;

Isotopes as atoms with the same number of protons and different number of neutrons.

Physics-Radioactivity.

3.7 list uses of radioactive isotopes.

At least three uses of radioactive isotopes; for example, carbon dating, radiotherapy, tracers, pacemakers and energy generation.

Physics-Radioactivity

4. PERIODIC TABLE AND PERIODICITY

Students should be able to:

4.1 explain the basis for the arrangement of elements in the periodic table;

Mention historical development of the periodic table, for example, contributions from Mendeleev and Dobereiner. Classification based on atomic number, atomic structure. Arrangement in periods and groups.

Physics-Structure of the atom.

4.2 explain trends in Group II;

Ease of ionisation, reactivity with oxygen, water, and dilute hydrochloric acid.

Reactions of magnesium and calcium with water, air, and dilute hydrochloric acid.

4.3 explain trends in Group VII;

Consideration of the following properties: physical state at room temperature, strength of oxidising power.

Carry out simple displacement reactions with chlorine, bromine and iodine. Observe the physical state of these elements.

4.4 identify trends in period 3;

Metallic to semi-metallic to non-metallic properties. Refer to SO A7.1.

4.5 predict properties of unknown elements based on the position in periodic table.

Plan and design an investigation of the position of element X in the periodic table.

5. STRUCTURE AND BONDING

Students should be able to:

5.1 explain the formation of ionic and covalent bonds;

Draw dot and cross diagrams to show ionic and covalent bonding.

Refer to SO B2.1.

5.2 predict the likelihood of an atom forming an ionic or a covalent bond based on atomic structure;

5.3 write formulae to represent ions, molecules and formula units;

5.4 explain metallic bonding;

Arrangement of cations and mobile electrons.

Refer to SO C1.1.

Physics-Particles in the atom.

5.5 describe ionic crystals, simple molecular crystals and giant molecular crystals;

Make diagrammatic representations of sodium chloride, graphite and diamond.

Make models of sodium chloride, graphite and diamond.

5.6 distinguish between ionic and molecular solids;

Use melting point, solubility in water and organic solvents, and conductivity.

Investigate melting point and solubility of solids and conductivity of resulting solutions.

Physics – Electricity, specific latent heat. Biology – Life processes.

5.7 relate structure of sodium chloride, diamond and graphite to their properties and uses;

Use melting point, solubility in water, conductivity, hardness and lubricating power.

Physics - Electricity, latent heat.

Biology - Solutions in life processes.

5.8 explain the term allotropy.

Reference to the allotropes of carbon – diamond and graphite.

6. MOLE CONCEPT

Students should be able to:

6.1 Define mole and molar mass

6.2 Perform calculations involving the mole;

Calculations from mass to moles and moles to mass and percentage composition by mass.

Calculate relative molecular mass or relative formula mass given atomic masses.

No definitions are required for the relative masses. Distinguish between molar mass and relative masses.

6.3 State Avogadro's Law;

Calculations involving molar volumes. [rtp and stp].

6.4 State the Law of Conservation of Matter;

6.5 Write balanced equations;

Use of both ionic and molecular equations (including state symbols) to represent chemical reactions referred to in the syllabus.

Use simple chemical reactions to illustrate.

6.6 Apply the mole concept to equations, both ionic and molecular;

Calculations involving masses and volumes. Refer to SO A7.11.

6.7 Define the term standard solution.

Molar concentration and mass concentration.

Refer to SO A7.11.

Prepare standard solutions.

7. ACIDS, BASES AND SALTS

Students should be able to:

7.1 define acid, acid anhydride, base, alkali, salt, acidic, basic, amphoteric and neutral oxides;

Consideration of proton donor or acceptor and replaceable hydrogen. Relate to basic and acidic oxides.

Refer to SO A4.4.

7.2 relate acidity and alkalinity to the pH scale;

pH scale - No formal definition of pH required.

Refer to SO C6.3.

Carry out simple exercises with litmus paper and universal indicator.

Biology - Digestion, blood, enzyme activity.

7.3 discuss the strength of acids and alkalis on the basis of their completeness of ionisation;

Degree of ionisation linked to strength and the pH of the solution.

Use pH meter.

7.4 investigate the reactions of non- oxidising acids;

Reactions of acids with metals, carbonates, hydrogen carbonates, bases.

Refer to SO C1.2, C5.3.

Practicals to demonstrate reactions of acids. Demonstrate reactions with antacids, baking powder, fire extinguishers.

Biology – Use of antacids.

7.5 list examples of acids in living systems;

Vitamin C (ascorbic acid), methanoic acid (in ants), lactic acid (build-up in muscles). Neutralisation of Vitamin C with sodium hydrogen carbonate. Formula of Vitamin C not required. The treatment of ant stings, use of vinegar in food preservation due to low pH. Use of lime juice to remove rust stains.

Plan, design and conduct an investigation to compare the vitamin C content of a named fruit juice before and after heating.

Biology – Nutrition, respiration.

7.6 investigate the reaction of bases with ammonium salts;

Refer to SO A 7.10, SO C5.2.

7.7 identify an appropriate method of salt preparation based on the solubility of the salt;

A general knowledge of the solubility of sulfates, nitrates, chlorides, carbonates and bases.

Uses of salts in everyday life.

Prepare insoluble salts by precipitation; prepare soluble salts by direct combination and by replacing hydrogen ions of an acid directly or indirectly by a metal or ammonium radical.

7.11 perform calculations using volumetric analysis data.

Number of moles reacting.

The mole ratio in which the reactants combine.

The molar concentration and mass concentration of reactants.

Refer to SO A6.6, A6.7.

Acid-Base titrations.

8. OXIDATION – REDUCTION REACTIONS

Students should be able to:

8.1 investigate the action of common oxidising and reducing substances in everyday activities;

Action of bleach (stain removal, browning of cut fruits and rusting. Sodium sulfite or sulfur dioxide used as food preservatives.

8.2 define oxidation and reduction;

Loss and gain of electrons and a change in oxidation number.

8.3 deduce oxidation number from formulae;

8.4 identify oxidation and reduction reactions including reactions at electrodes;

Refer to SO A9.8.

8.5 distinguish between oxidising and reducing agents;

Equations involving formulae for potassium chromate(VI), potassium manganate(VII) and household bleach are not required.

Inclusion of at least one example of a substance, which can behave both as an oxidising and a reducing agent.

Refer to SO B3.7, C6.3.

Perform reduction and oxidation reactions with potassium manganate (VII) iron(II)sulfate, potassium chromate(VI), hydrogen peroxide and potassium iodide.

Concentrated hydrogen peroxide should be handled with care.

8.6 perform tests for oxidising and reducing agents.

Refer to SO C6.3.

***SO = specific objectives**