ISS Course Syllabus

Teacher: Peter **Grade: 11**
Course Title: Science

Course Description:

Standards of learning

The standards for the chemistry course are designed to provide students with understanding of the value of factual, detailed knowledge of laws, principles and applications. Through the study of chemistry, students are given the opportunity to explore and understand the natural world and become aware of the impact that chemistry has on everyday life. The study of chemistry is a cumulative process and much of what is learned is then revisited and applied in later parts of the course.

The course will be taught in 15 units as listed below with approximate number of periods per unit started:

1. *Introduction to chemistry (8 periods)*
2. *Atomic Structure and the periodic table (8 periods)*
3. *Chemical names and formulas (12 periods)*
4. *Chemical quantities (8 periods)*
5. *Chemical reactions (6 periods)*
6. *Stoichiometry (8 periods)*
7. *States of matter (8 periods)*
8. *Electron arrangement and periodicity (12 periods)*
9. *Ionic and covalent bonding (12 periods)*
10. *Aqueous systems and solutions (16 periods)*
11. *Reaction rates and equilibrium (12 periods)*
12. *Acids, bases and neutralization (12 periods)*
13. *Oxidation-reduction reactions and electrochemistry (12 periods)*
14. *Chemistry of metals and non-metals (10 periods)*
15. *Hydrocarbon compounds and organic reactions (18 periods)*

Course Contents:

1. The student will plan and conduct investigations in which:

- Length, mass, volume, density, temperature, weight etc. are accurately measured using the International System of Units (SI – metric)
- Electronic balance, thermometers, metric rulers, graduated cylinders are used to gather data
- Data from experiments are recorded and interpreted from bar, line and circle graphs
- Research skills are utilised using a variety of resources
- Independent and dependent variables, constants, controls and repeated trials are identified
- Valid conclusions are made after analysing data
- Research methods are used to investigate practical problems and questions
- Experimental results are presented in an appropriate format

2. The students will investigate and understand the organisation of the Periodic Table and how periodicity relates to atomic structure. Key concepts include:

- The position of an element in the Periodic Table relates to its atomic number and atomic mass and number of electrons available for bonding
- The Periodic Table can be used to identify metals, metalloids, non-metals, halogens, alkali metals, alkaline-earth metals and transition metals
- The nucleus is much smaller in size that the atom yet contains most of its mass
- The experimental basis for the development of the quantum theory of atomic structure and the historical significance of the Bohr model of the atom

3. The students will investigate and understand that properties of matter result from the ability of electrons to form bonds. Key concepts include:

- Atoms combine to form molecules by sharing electrons to form covalent or metallic bonds, or by exchanging electrons to form ionic bonds
- Salt crystals such as NaC1 are repeating patterns of positive and negative ions held together by electrostatic attraction
- In a liquid the inter-molecular forces are weaker than in a solid so that the molecules can move in a random pattern relative to one another
- Predicting the shape of simple molecules and their polarity from Lewis dot structures
- How electro negativity and ionization energy relate to bond information

4. The students will investigate and understand that conservation of atoms in chemical reactions leads to the principle of conversation of matter. Key concepts include:

- Describe chemical reactions by writing balanced equations
- The Quantity one mole is defined so that one mole is defined so that one mole of carbon 12 atoms has a mass of exactly 12 grams
- Determine molar mass of a molecule from its chemical formula and convert the mass of a molecular substance to moles, number of particles or volume of gas at Standard Temperature and Pressure (STP)
- Calculate the mass of reactants and products in a chemical reaction from the mass of one of the reactants of products and calculate percent yield
- Identify reactions that involve oxidation and reduction and how to balance oxidation-reduction reactions

5. The students will investigate and understand that acids, bases and salts are compounds that form ions in water solutions. Key concepts include:

- Properties of acids, bases and salt solutions and use of the pH scale
- Acids are hydrogen-ion donating and bases are hydrogen-ion accepting substances
- Strong acids and bases fully dissociate and weak acids and bases partially dissociate
- Calculate pH from the hydrogen ion concentration
- Buffers stabilize pH in acid-base reactions

6. The students will investigate and understand chemical reaction rates depend on a range of factors. Key concepts include:

- The rate of reaction is the decrease in concentration of reactants or increase in concentration of products over time
- Reaction rates depend on factors such as concentration, temperature and pressure
- Catalysts play a role in increasing reaction rate by increasing activation energy

7. Students will investigate and understand chemical equilibrium is a dynamic process at the molecular level. Key concepts include:

- LeChatelier's Principle predicts the effect of changes in concentration, temperature and pressure
- Equilibrium is established when forward and reverse reaction rates are equal
- How to write and calculate and equilibrium constant expression for a reaction

8. Students will investigate and understand the bonding characteristics of carbon provides the biochemical basis of life. Key concepts include:

- Large molecules (polymers) such as proteins, nucleic acids and starch are formed by repetitive combinations of simple sub-units
- The bonding characteristics of carbon leads to a variety of structures ranging from simple hydrocarbons to complex polymers
- System for naming the ten simplest linear hydrocarbons and isomers containing single bonds, simple hydrocarbons with double and triple bonds and simple molecules containing a benzene ring
- Identify functional groups which form the basis of alcohols, ketones, ethers, amines, esters, aldehydes and organic acids

Resources:

Evaluation System:

Component	%	Comments
Quizzes/Tests		Unit tests and smaller quizzes
Labs and Assignments Home Work		• Formal Lab reports as well as informal write-ups • Oral Presentations • Projects • Posters
Daily work		Homework, in-class assignments
Exam		Final examination at end of the course
Total		A maximum of 100 % is available

Progress marks will be calculated and reported quarterly. Marks do not close until the final exam has been written.

Additional Comments: