**Stage 2 Chemistry: Program 2: 20 credits**

This teaching program articulates with learning and assessment plan 2.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Week** | **Science Understandings** | **SIS** | **SHE** | **Summative Assessment** |
| Term 1 Week 1 | Introduction to Stage 2  Topic 1: Monitoring the Environment   * Greenhouse Gases * climate change * Oceans and CO2 * Equations-acids and carbonates | * Practical: Carbonates and Acids | * Watch sections of An Inconvenient Truth * Discuss the impact of the thawing of Permafrost * Kyoto |  |
| Week 2 | * Calculations for pH * Nitrogen Oxides and equation * Ozone * Nitrogen Oxides and cars |  | * Importance of ozone for absorbing UV radiation. |  |
| Week 3-4 | * Units for concentration, interconvert * Stoichiometric calculations | * Practical: Titrations |  |  |
| Week 5-6 | * Chromatography * Calculations * Intro to Ion exchange chromatography | * Practical: Investigate caffeine in energy drinks using TLC * Separate chlorophyll from spinach leaves- column chromatography |  | Practical Investigation: Compare effectiveness of 2 antacids |
| Week 7 | * Atomic Spectroscopy * Use in quantitative analysis | * Video | * Applications of AAS |  |
| Week 8 | Topic 2: Managing Chemical Processes   * Rates of reactions (include enzymes) * Collision Theory * Energy profile diagrams | * Practical: Investigate the rate of reactions |  | Test: Topic 1: Monitoring the Environment |
| 9-11 | * Equilibrium * LeChatelier’s principle * Industrial Processes | * Practical: effects of change in concentration on the equilibrium concentration of Fe(SCN)2+ | * Impact of Fertilisers (Haber Process) |  |
| Term 2  Week 1 | Topic 3: Organic and Biological Chemistry   * Molecular formula of organic compounds (extended, condensed or skeletal formula) | * Practise naming and drawing organic molecules | * Effect of advertising that uses scientific information, e.g. Hylamide, on purchase of beauty products | Test: Topic 2: Managing Chemical Processes |
| Week 2 | * Review secondary interactions * Physical properties of organic compounds | * Simple experiments to observe the physical properties in organic compounds |  |  |
| Week 3 | * Alcohols | * Practical: Test a range of alcohols with acidified K2Cr2O7 |  |  |
| Week 4 | * Aldehydes and Ketones | * Practical: prepare an aldehyde |  |  |
| 5 | * Carbohydrates * Disaccharides and Polysaccharides |  |  |  |
| 6 | * Carboxylic Acids * Equations * Solubility | * Practical: Titration (review from Topic 1) | * Organic compounds in drugs |  |
| 7 | * Amines * Structure (primary, secondary, tertiary) |  |  |  |
| 8 | * Esters * Condensation reactions * Reflux * Hydrolysis | * Practical: prepare and ester (could also hydrolyse) |  |  |
| 9. | * Amides * Edible fats and oils * Triglycerides- saturated and unsaturated | * Practical: Bromine solution and saturated/unsaturated triglycerides |  |  |
| 10 | * Proteins * Amino acids * Peptide links * Structure of proteins-secondary interactions * Biological functions |  |  | Test: Topic 3: Organic and Biological Chemistry |
| Term 3  Week 1 | Topic 4: Managing Resources   * Carbon based fuels * Photosynthesis * Respiration * Combustion * Fossil Fuels |  |  |  |
| 2 | * Renewable Energy * Fossil Fuels * Bio Fuels * Effect on environment |  | * Microbes and bio-fuels- innovative technologies | SHE TASK: Topic selection. |
| 3 | * Bio-fuel production * Renewable energy sources and global warming | * Practical: Fermentation or produce bio-diesel | * Advantages and disadvantages of adding ethanol to petrol | SHE TASK: Class time and verification |
| 4 | * Carbon based fuels and energy * Feedstock * Equations |  |  | SHE Investigation Due |
| 5 | * Incomplete combustion * Energy released in combustion can be experimentally measured | * Calorimetry |  | Design Practical Investigation: Charcoal fuels |
| 6 | * Energy Output of Fuels * Photovoltaic and Fuel Cells vs Steam Turbines * Flow cells |  | * Photovoltaic cells- clean energy |  |
| 7 | * Water Treatment |  |  |  |
| 8 | * Soil Chemistry * Plant nutrients and soil nutrient levels * Nitrogen, phosphorus, potassium * Fertilisers |  |  |  |
| 9 | * Materials-polymers * Synthetic polymers * Organic polymers * Metal extraction | * Practical: electrolysis- using copper electrodes to extract metals from solution |  |  |
| 10 | * Recycling * Review |  | * Discuss the energy cost to recycle aluminium cans | Test: Topic 4: Managing Resources |