**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 2Topic 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 2Week 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 3Week 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 |