NORTHERN PROVINCE

PROVINCIAL SCHEMES OF WORK FOR CHEMISTRY 5070

Subject: CHEMISTRY 5070 Grade: 12 Term: Two Year: 20…. Teacher: ---------- periods per week: 6

WK	TOPIC	SUBTOPIC	SPECIFIC OUTCOMES	METHODOLOGY	SUGGESTED EXPTS	REFERENCES
1	**Non Metals**	General properties of non-metals	**Describe the physical and chemical properties of non-metals.** The physical and chemical properties of non-metals: In terms of density, melting points, boiling points, oxidizing agent (electronegative elements)	Question and Answer	Show example of non-metals eg carbon	Senior Secondary chemistry 10
		Hydrogen	**Demonstrate the laboratory preparation, collection and test for hydrogen.** Laboratory preparation, collection and test for hydrogen :By action of moderate reactive metals on water/steam and dilute acids and collect by upward delivery method, puts out a lighted splint with a 'pop' sound.**Describe the physical and chemical properties of hydrogen** The physical and chemical properties of hydrogen: In terms of colour,**o**dour,**d**ensity/"**w**eight",**s**olubility and chemical (effect	Laboratory	Reaction of water with metals eg Zinc and water	

		oxygen	on**l**itmus,**i**nflammability,**p**oisonous, **s**upport of combustion)(COWSLIPS **Describe industrial manufacture of hydrogen.** Manufacture of hydrogen: By cracking, electrolysis of water (brine) and from natural gas **Describe the uses of hydrogen.** Uses of hydrogen Such as reducing agent, fuel for rockets, manufacturing ammonia and margarine, balloons filler, welding **Demonstrate the laboratory preparation, collection and test for oxygen.** Laboratory preparation, collection and test for oxygen By catalytic decomposition of hydrogen peroxide and thermal catalytic decomposition of potassium chlorate, collected above water and re-lights the glowing splint **Describe the physical and chemical properties of oxygen.** The physical and chemical properties of oxygen: Such as colour, odour,		Prepare oxygen	

			solubility ,combustion **Describe the industrial manufacture of oxygen** Manufacture of oxygen: By fractional distillation of liquid air **Describe the uses of oxygen in industry and in natural processes** Uses of oxygen: Such as burning, welding, in blast furnace and respiration **Explain the importance of ozone layer and dangers of its depletion.** Importance of ozone layer and dangers of its depletion: It traps radiation, if depleted by CFCs causes skin cancer, respiratory diseases **Demonstrate the chemical test for water** Chemical test for water: Using white anhydrous copper (II) sulphate which turns blue.	Laboratory	using hydrogen peroxide	
2		Nitrogen	**Describe industrial manufacture of nitrogen.** Manufacture of nitrogen: By fractional	Demonstration Class discussion		GCSE Chemistry

			distillation of liquid air **Explain the characteristics and importance of Nitrogen as a gas.** Characteristics and importance of Nitrogen: As non-reactive insoluble gas hence used as refrigerant, food packaging. Manufacture of ammonia gas. **Demonstrate the preparation collection and test for ammonia in the laboratory** The preparation collection and test for ammonia: Action of a base on ammonium salt and collected by upward delivery method, turns damp red litmus paper blue. **Describe the manufacture of ammonia.** Manufacture of ammonia: Haber Process (Temperature, catalyst, pressure (Haber process). **Describe the physical and chemical**		Show chart of preparation of ammonia	

			properties of ammonia. The physical and chemical properties of ammonia: In terms of **c**olour, **o**dour, **d**ensity/"**w**eight", **s**olubility and as reducing agent, a base/alkali, a complexing reagent. **Describe the thermal dissociation of ammonium salts.** Thermal dissociation of ammonium salts: Such as ammonium chloride, ammonium nitrate, ammonium carbonate **Describe the uses ammonia** The uses of ammonia: In manufacture of fertilizers, explosives, nitric acid **Describe the manufacture of nitric acid** Manufacture of nitric acid: by Ostwald Process **Explain the importance of nitrogenous fertilizers** Importance of nitrogenous fertilizers: Nitrogen for growth. Include Phosphorous for root development and potassium for seed formation (NPK) **Describe the effects of nitrogenous**	Laboratory	Fountain experiment Heat any ammonium carbonate	

			fertilizers on the environment Effects of nitrogenous fertilizers on the environment: Such as eutrophication and acidic soils		Use of a chart	
3		Chlorine	**Demonstrate the laboratory preparation, collection and test for chlorine gas.** By action of hot concentrated Hydrochloric acid on manganese (IV) oxide, collected by downward delivery method, turns damp blue litmus paper red and then bleaches it **Describe the physical and chemical properties of chlorine gas** Physical and chemical properties of chlorine gas Such: as colour, odour, density, solubility, poisonous. Reactions with Iron, non-metals (H_2,S,O_2,P), sulphur dioxide, Iron(II)salts and halides.	Demonstration Discussion	Use of a video showing production of chlorine Use of a chart	Senior secondary chemistry 10

			Describe the uses of chlorine. Uses of chlorine For sterilizing water, manufacture of PVC, HCl and in bleaching agents. **Describe the industrial manufacture of chlorine.** Manufacture of chlorine: By the electrolysis of brine ($NaCl_{(aq)}$) **Demonstrate the method for preparation, collection and test for hydrogen chloride gas** Preparation of hydrogen chloride: By action of concentrated sulphuric acid on solid metallic chlorides, collected by downward delivery method, react with ammonia to form white smoke. **Describe the physical and chemical properties of hydrogen chloride gas** In terms colour, odour, density, solubility and poisonous. Reactions with ammonia and water **Demonstrate the method for preparation of hydrochloric acid.** By dissolving hydrogen chloride gas in water **Describe the reactions of dilute hydrochloric acid.** Such as reaction		Use of a chart	

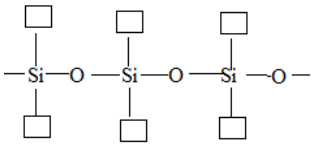
			with alkalis, metals, carbonates, ammonia and silver nitrate **Describe the formation of sulphur dioxide.** The formation of sulphur dioxide: By combustion of sulphur, fossil fuels **Demonstrate the laboratory preparation, collection and test for sulphur dioxide** Laboratory preparation, collection and test for sulphur dioxide: By action of warm dilute acids on sulphites, collected by downward delivery, turns acidified potassium dichromate (VI) green/decolourises purple potassium manganate (VII). **Describe the physical and chemical properties of sulphur dioxide** The physical and chemical properties of sulphur dioxide: In terms of colour, odour, density, solubility, poisonous. Reaction with water, action on indicators and as a reducing agent E.g. turns acidified potassium dichromate (VI) green/decolourises purple potassium manganate (VII). **Describe the uses of sulphur dioxide** Uses of sulphur dioxide: As food preservative, bleaching wood pulp for paper making, manufacture of sulphuric			

		Sulphur	acid **Describe the industrial manufacture of sulphuric acid.** Manufacture of sulphuric acid: By Contact Process (catalyst, temperature) **Describe the uses of sulphuric acid.** Uses of sulphuric acid: Such as in explosives, as drying agent, making of soaps, fertilizers.		Use of video Reaction of water and Sulphur	

4		**Carbon and carbonates**	**Describe what allotropes are** Allotropes: As different forms of an element existing in the same physical state **Describe the physical properties of the allotropes of carbon.** The physical properties of the allotropes	Demonstration Question and Answer	Chart and a video	Complete chemistry

			of carbon: In terms crystalline and non-crystalline allotropes of carbon **Describe the formation and properties of carbon monoxide.** Formation and properties of carbon monoxide: By incomplete combustion of carbon and carbon compounds, reduction of carbon dioxide by carbon. In terms of colour, odour, density, solubility, poisonous. Reacts as reducing agent. **Demonstrate the laboratory preparation, collection and the test for carbon dioxide.** Laboratory preparation, collection and the test for carbon dioxide: By reaction of dilute acids with carbonates or bicarbonates, collected by downward delivery method/ above water, forms white precipitate with limewater **Describe the physical and chemical properties of carbon dioxide.** The physical and chemical properties of carbon dioxide: In terms of colour, odour, density, solubility. Reactions with limewater/alkalis, water		Reaction of carbonate with	

			and carbon **Describe the uses of carbon dioxide.** Uses of carbon dioxide: Such as in fire extinguishers, carbonated drinks, dry ice, baking, photosynthesis. **Describe the manufacture of lime from limestone.** Manufacture of lime from limestone: By thermal dissociation of limestone **Describe the uses of lime and slaked lime.** Uses of lime and slaked lime: Such as in neutralizing acidic soils, lime as a drying agent for ammonia. **Describe the uses of limestone.** Uses of limestone: Such as in manufacturing of lime, cement, glass, iron. **Describe the greenhouse effect** Greenhouse effect: As global warming due to increase of carbon dioxide in the atmosphere **Describe the properties of silicon.**		dilute acid Test using lime water	

		Silicon	The properties of silicon: As a metalloid **Describe the use of silicon.** Use of silicon: Used in semi-conductors Such as transistors, diodes and capacitors. **Describe what silicones are.** Silicones: As macromolecules that exist as oils, waxes or plastics and their structures represented as:  **Compare the fire resistance of siliconeplastics to carbon based macromolecules.** The nature of silicones: With reference to nature of combustion products, silicones produce silicon dioxide (sand) while organic based macromolecules produce carbon dioxide. **Describe the uses of silicon dioxide (sand)** Uses of silicon dioxide: Such as in making glass, as fire extinguisher, in iron extraction.		Chart and a video Chart showing the structure of silicon	

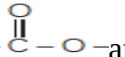
5	**Organic Chemistry**	Saturated and unsaturated Hydrocarbons	**Describe what an organic compound is** Organic compound: As a compound of carbon other than oxides and carbonates **Describe what hydrocarbon is** Hydrocarbon: As a binary compound of carbon and hydrogen. **Name the structures of the aliphatic alkanes up to five carbon atoms**. Structures of the aliphatic alkanes: Involve concept of catenation (Chain), use the general formula C_nH_{2n+2}, Named by IUPAC system, all should end with *ane*, **Demonstrate the structures of isomers and their names**. Structures of isomers: Use idea of	Question and Answer	Use charts	New certificate chemistry

			branched(side chains) and unbranched butane and pentane and nomenclature follows IUPAC system **Describe what fractional distillation of petroleum (crude oil) is** Fractional distillation of petroleum: As different fractions of crude oil collected at different boiling temperatures **Describe the uses of the fractions of crude oil** Uses of the fractions of crude oil: Such as domestic fuel, road construction. NB: leaded fuel is no longer recommended due to harmful effects **Describe the chemical properties of alkanes.** Chemical properties of alkanes: Such as combustion, cracking, substitution, steam reforming			
6			**Account for the apparent non reactivity of alkanes as compared to other organic compounds** The apparent non reactivity of alkanes: Lack of a specific site of chemical attack (functional group) and they are saturated. **Illustrate instauration in alkenes.** Instauration in alkenes: Using the concept of catenation and models.	Class Discussion	Use charts	Periodic Tables -complete chemistry

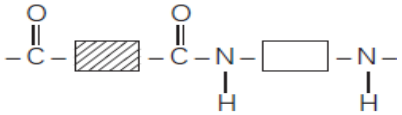
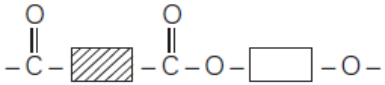
			Name the structures of the alkenes up to 5 carbon atoms. Structures of the alkenes up to 5 carbon atoms: Use the concept of catenation and the general formula $C_nH_{2n.}$ Structures must contain one carbon to carbon double bond. Named using the IUPAC system all should end with- *ene* **Demonstrate the structures of isomers of alkenes.** Structures of isomers of alkenes: Using the unbranched structures of butene and pentene (positional isomers) **Describe the chemical properties of alkenes.** Chemical properties of alkenes: Such as combustion, addition reactions (hydrogenation, hydration, hydrohalogenation, halogenation, addition polymerisation) **Illustrate the differences and similarities between saturated and unsaturated Hydrocarbons** Differences and similarities between saturated and unsaturated Hydrocarbons: Using structures and bromine solution to distinguish between saturated and unsaturated hydrocarbons **Describe the chemical tests for**			

			unsaturated hydrocarbons (alkenes) The chemical tests of hydrocarbons: As alkenes decolourise bromine solution rapidly. **Describe the uses of alkenes.** Uses of alkenes: As in formation of polymers (Petrochemical industries)			
7		Alcohols (Alkanols)	**Describe the chemical composition of an alcohol.** Chemical composition of an alcohol: As an organic compound with a hydroxyl group with general formula $C_nH_{2n+1}OH$ **Name structures of primary alcohols up to five carbon atoms.** Structures of primary alcohols up to five carbon atoms: Using concept of catenation (Chain). Named following IUPAC nomenclature and all should end with- ***ol***). **Demonstrate isomerism in alcohols** Isomerism in alcohols: Using branched and unbranched and positional isomers of propanol, butanol and pentanol. **Describe the formation of alcohols.** Formation of alcohols: By hydration of alkenes, hydrolysis of esters and fermentation for ethanol	Discussion Group work	Use charts/video and models	Chemistry 10

			Describe the chemical properties of alcohols Chemical properties of alcohols: Such as combustion,esterification,dehydration and oxidation **Describe the uses of alcohols** Uses of alcohols: Such as fuel, antiseptic, organic solvent, alcoholic beverages.			
8		Carboxylic acids (alkanoic acids)	**Name structures of carboxylic acids up to five carbon atoms.** Structures of carboxylic acids up to five carbon atoms: Using concept of catenation (Chain), organic compounds with a carboxylic group (COOH), general formula $C_nH_{2n+1}COOH$, all should end with- ***oic acid.*** **Describe the formation of carboxylic acids** Formation of carboxylic acids: By the oxidation of alcohols and hydrolysis of esters **Demonstrate the chemical properties of carboxylic acids.** Chemical properties of carboxylic acids: Such as reaction with bases, carbonates, metals and alcohols (esterification)	Question and Answer	Use charts/video and models	New certificate chemistry

		Esters (Alkanoates)	**Describe the uses of carboxylic acids** Uses of carboxylic acids: Such as formation of esters **Name the structures of esters up to five carbon atoms.** Structures of esters up to five carbon atoms: Using the concept of catenation (Chain), Organic compounds with an ester link  and all should end with –***oate*****.** **Describe the chemical properties of esters** Chemical properties of esters: Such as combustion and hydrolysis **Describe the uses of esters** Uses of esters: Such as in perfumes, food flavourants because of having pleasant smell.			
9		Homologous series	**Describe what homologous series is** Homologous series: As a collection of organic compounds belonging to the same family with the same general formula (consider alkanes, alkenes, alcohols, acids, esters).	Board illustration discussion	Use charts/video and models	GCSE chemistry

		Macromolecules (Polymers)	**Describe the general characteristics of homologues (members).** The general characteristics of homologues: Such as members of each homologous series have the same general formula and similar chemical properties. Physical properties (states, melting point, boiling point, density, solubility) of members show gradual changes as molecular mass changes. Adjacent members differ by CH_2 and have a general method of preparing members. **Describe what macromolecules (polymers) are** Macromolecules (polymers): As giant molecules formed by combination of many small molecules (monomers) **Describe what synthetic macromolecules are.** Synthetic macromolecules: As human made giant molecules (polymers). **Describe the formation of polyalkenes.** Formation of polyalkenes: By addition polymerisation E.g. polyethene, polyvinylchloride, polypropene, polystyrene. **Classify the types of plastics**			

			Types of plastics: As thermal plastics and non-thermal plastic **Describe the formation of nylon and Terylene.** Formation of nylon and Terylene: By condensation polymerisation, Nylon: from a diamine and dioic acid structures represented as:  Terylene: from diol and dioic acid. Structures represented as:  **Differentiate between the structure of Nylon and and Terylene** Nylon and Terylene: Nylon as polyamide and Terylene as polyester.			
10			**Describe typical uses of plastics and synthetic fibres.** Typical uses of plastics and synthetic fibres: Plastics used as in carrier bags, buckets, pipes Nylon and terylene as in clothing, tents, strings, ropes. **Describe the biodegradability of**	Discussion	Use charts	O'level chemistry

			synthetic fibres. Biodegradability of synthetic fibres: As non-biodegradable (cannot be broken down by microorganisms) **Describe what natural macromolecules are** Natural macromolecules: Such as Carbohydrates, proteins and fats (lipids) **Describe composition of carbohydrates** Composition of carbohydrates: Carbohydrates contain carbon, hydrogen and oxygen in the form $C_xH_{2y}O_y$ where x is a multiple of six **Identify linkages in starch, proteins and fats** linkages of starch, proteins and fats: In starch – glycosidic, –O–□–O–□– Proteins – amide, fats – ester linkages **Relate linkages in synthetic and natural polymers.** **and natural polymers:** Linkages in synthetic Such as difference and similarities between nylon and proteins. Terylene and fats.	Illustrations		GCSE Chemistry

			Describe hydrolysis of fats (saponification) Hydrolysis of fats (saponification): As formation of soaps and glycerine (glycerol) **Identify the products of the hydrolysis of starch and proteins.** Products of the hydrolysis of starch and proteins: Using chromatography to identify the amino acids from proteins, simple sugars from starch.			
11, **12** **&** **13**	REVISION WORK AND MOCK EXAMINATIONS					