7th Applied Past Paper S.Qs

(2017)

(i)

Role of sweetening process:

- Sweetening, a major refinery treatment of gasoline, treats sulfur compounds (hydrogen sulfide, thiophene and mercaptan) to improve color, odour & oxidation stability.
- Sweetening also reduces concentrations of CO_2.

(ii)

Chemistry of Platforming:

Platforming is defined as a catalytic reforming process in which a hydrocarbon fraction containing naphthenes and paraffins and boiling in the gasoline boiling range is contacted in the vapor phase and in the presence of a substantial pressure of hydrogen with a catalyst containing platinum on a suitable support such as alumina under dehydrogenating conditions of temperature e.g 800/000 F, whereby a product of improved octane number is obtained.

(iii)

4 raw materials for paper industry:

Following raw materials are used for paper manufacturing

- Pulp
- Bamboo
- Cellulose
- Wood

Cellulose is mainly used to produce paperboards & paper.

(iv)

Phosphorus as macro-nutrient:

Phosphorus is one of the three macro-nutrients essential for plant growth. It is required for photosynthesis process, coverting the sun's energy into food for plant. It is also required for strong root development. A plant must be able to access phosphorus to ensure a healthy growing cycle.

(v)

Applications of potash fertilizers:

- Potash increases disease resistance, drought tolerance, plumpness of grain and seed.

- It improves stem rigidity and cold hardiness.
- It also enhances firmness, texture, flavor, size and color of fruit crops.
- Also increases oil content of oil crops.

(vi)

Function of urea as fertilizer:

- The main function of urea as fertilizer is to provide plant with nitrogen to promote green leafy growth and make the plants look lush.
- The function of urea fertilizer is to provide plants with the nutrients they need to grow and thrive.
- In the critical period of apple flower bud differentiation, new shoots grow low and nitrogen content of leaves is decreased. The effects of spraying 0.5% aqueous urea solution can increase the leaf nitrogen content, accelerate shoots growth, restrain flower bud differentiation. In this way, the amount of flowers is appropriate.

(vii)

Isomerization of light naphtha:

The isomerization process upgrades the octane number of light naphtha fractions and also simultaneously reduces benzene content by saturation of the benzene fraction. Isomerization complements catalytic reforming process in upgrading the octane number of refinery naphtha streams.

(viii)

Importance of desalting of crude oil:

Desalting is the first process applied to crude oil. This process is very important because it removes salt, water and solid particles that would otherwise lead to operational problems during refining such as corrosion, fouling of equipment, or poisoning of catalyst.

(ix)

Significance of beating in pulping process:

Within papermaking beating of the pulp is an important process stage. The purpose is to increase the strength of the produced paper. However, the beating process also affects some pulp and paper properties negatively. The reason why the pulp is beaten is to accomplish certain wanted characteristics, mainly strength of the produced paper.

(x)

Abiogenic theory of petroleum origin:

The abiogenic petroleum origin hypothesis proposes that most of earth's petroleum and natural gas deposits were formed inorganically. Scientific evidence overwhelmingly supports a biogenic origin for most of the worlds petroleum deposits.

(2018)

(i)

Products of refining:

Refineries can produce high-value products such as gasaline, diesel fuel, and jet fuel from light crude oil with simple distillation. When refineries use simple distillation on denser (heavier) crude oils (with lower API gravity), they produce low value products.

(ii)

Raw materials for normal superphosphate fertilizers:

For the production of normal super-phosphate following raw materials are used.

- Rock phosphate
- Sulphuric acid

where rock phosphate is a natural deposite of calcium phosphate containing fluorine & carbonate.

(iii)

Natural organic fertilizers:

- Manure used as fertilizer can include

manure from cows, horses and chickens.

- **Compost** is made from decomposing materials such as food scarps and leaves.
- **Minerals** such as potassium sulphate, can mined from the ground.

(iv)

Soda pulping:

Soda pulping is a chemical process for making wood pulp with sodium hydroxide as the cooking chemical. This method is mainly used for processing annual crops such as straw, bagasse and hardwood.

(v)

Beating process of paper production:

Beating means processing plant fiber and cloth rags into a pulp with water, that one can then form into paper sheets.

(vi)

Action of calcium cyanide as fertilizer:

Finely ground nitrolim when applied to the soil, gets hydrolysed to $Ca(OH)_2$ & NH_2CONH_2 (urea). The hydrolysis is catalysed by soil catalysts or microorganisms.

$$CaCN_2 + 4H_2O \longrightarrow Ca(OH)_2 + CO(NH_2)_2 + H_2O$$

$$CaCN_2 + 3H_2O \longrightarrow Ca(OH)_2 + NH_2CONH_2$$

This urea is then hydrolysed with the help of enzyme urease into NH_3 which is then converted in nitrates by oxidation.

$$NH_2CONH_2 + H_2O \longrightarrow CO_2 + 2NH_3$$

(vii)

Processes involve in chemical treatment of petroleum products:

Following methods are involved in the chemical treatment of petroleum products.

- Oxidative processes
- Caustic Processes
- Acid Processes
- Solvent Processes

(viii)

Reforming:

Reforming is a process designed to increase the volume of gasoline that can be produced from a barrel of crude oil. Hydrocarbons in the naphtha stream have roughly the same number of carbon atoms as those in gasoline, but their structure is generally more complex.

(ix)

Catalytic cracking:

Catalytic cracking is an important process in the oil industry where petroleum vapor passes through a low-density bed of catalyst, which causes the heavier fractions to 'crack' producing lighter more valuable products. In the petrochemicals industry they are used for producing polyolefins on a very large scale.

(x)

Examples of phosphate fertilizers:

The most common phosphate fertilizers

are

- Single Superphosphate (SSP)
- Triple Superphosphate (TSP)
- Monoammonium phosphate (MAP)
- Di-ammonium phosphate (DAP)
- Ammonium polyphosphate liquid

(2019)

(i)

Fractions obtained from fractional distillation of petroleum:

The products or fractions obtained from the fractional distillation of petroleum are:

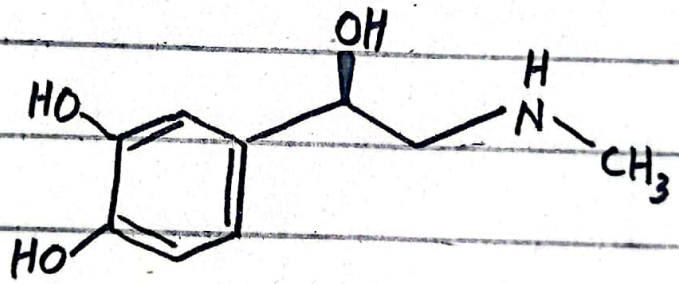
Sr No	Fractions	Carbon range	Temp range
1-	Gases	C_1 to C_4	298K
2-	Petrol	C_5 to C_{10}	303K to 393K
3-	Naphtha	C_8 to C_{10}	393K to 453K
4-	Kerosene	C_{12} to C_{15}	453K to 533K
5-	Diesel	C_{15} to C_{18}	533K to 613K
6-	Lubricating oil	C_{16} to C_{20}	Above 613K

(ii)

Isomerization:

Isomerization is a chemical process that converts a compound into its optical or geometric isomer. The therapeutic activity of chemical compounds vary with their isomeric forms.

Example: for example, the Levo (l) form of adrenaline has 15-20 times greater effect than than the Dextro (d) form.



(iii)

Different unit process in treatment of crude oil:

(iv)

Urea assimilation in soil:

Urea is one of the most important nitrogen fertilizer used for vegetable production in the field. Soil takes up nitrogen in the form of ammonium or nitrate ions and forms amino acids with carbon compounds in the complex chemical system in plants. These amino acids are then converted into proteins and enzymes. When urea applied to the soil reacts with water and the soil enzymes urease and is rapidly converted to ammonium. This conversion is called urea hydrolysis.

$$\underset{\text{(Urea)}}{CO(NH_2)_2} + \underset{\text{(Water)}}{2H_2O} + H^+ \xrightarrow{\text{urease}} \underset{\text{(Ammonium)}}{2NH_4^+} + \underset{\text{(Bicarbonate)}}{HCO_3^-}$$

In this reaction H^+ ions consumed, causing the soil pH near the fertilizer to rise.

(v)

4 raw materials for paper industry:

Repeated 2017 (iii)

(vi)

Role of sweetening in crude oil refining:

Repeated 2017 (i)

(vii)

Temperature for Haber's process:

Forward reaction is a exothermic one. Therefore using low temperature will increase the forward reaction and give higher percentage of ammonia. But having low temperature will reduce the reaction rate. By considering both product amount and production rate 400°C - 450°C temperature is applied.

Catalyst for Haber's process:

The Haber process lies on catalyst to accelerate N_2 hydrogenation. The catalysts are heterogeneous, solids that interact with gaseous reagents. In Haber process, we can use an iron catalyst to increase the rate of reaction. A catalyst remains unchanged at the end of a reaction.

(viii)

Migration:

The movement of an organism or a group of organisms from one area to another at a specific time each year is referred to as migration.

(ix)

Micro-nutrients	Macro-nutrients
• Nutrients required in small quantities.	• Nutrients required in large quantities.
• They are present in low concentration in plant.	• They are present in excessive concentration in plant.
• They are called trace elements.	• They are called major elements.
• Examples: Fe, Mn, Cu, Zn, Mo, B, Cl and Ni.	• Examples: C, H, O, N, P, K, Ca, S and Mg.

(x)

Desalting of crude oil:

Repeated 2017 (viii)

(2020)

(i)

Unit process involved in treatment of oil:

Repeated 2019 (iii)

(ii)

Migration of oil:

Movement of petroleum from source rock toward a reservoir or seep. Primary migration is expulsion of petroleum from fine-grained source rock, while secondary migration moves petroleum through a coarse-grained carrier bed or fault to a reservoir or seep.

(iii)

Catalytic alkylation:

Alkylation is defined broadly as combining an olefin with an aromatic or a paraffin hydrocarbon using a catalyst. The most common catalyst is sulfuric acid. Catalytic alkylation process is used in petroleum refineries to upgrade light olefins and isobutane into a highly

branched Paraffins.

(iv)

Prilling in urea manufacturing:

Prilling is a process in which a melted substance is sprayed against upward-flowing air in a tower to form solid particles. The urea particles are produced by prilling, in which a urea melt is cooled by contact with a gas, for example cold air and solidified to form particles.

(v)

Role of beating in pulp refining:

- Refining or beating of a chemical pulps is the mechanical treatment and modification of fibers so that they can be formed into paper or board of the desired properties.
- It is one of the most important unit operations when preparing papermaking fibers for high-quality papers or paperboards.
- It also increases the strength of the produced paper.

(vi)

Action of ammonium sulphate as fertilizer:

It react with lime present in the soil to form ammonium hydroxide which is oxidised by air the help of nitrosifying bacteria into nitrous acid. The latter is then converted into nitrites. The nitrous acid and nitrites also undergo oxidation by means of air in presence of nitrosifying bacteria and form nitric acid & nitrates. The bases present in the soil react with nitric acid to form potassium & calcium nitrate etc. Most of the plants take up nitrogen in the form of these soluble nitrates.

(vii)

Kraft pulping process:

It is a chemical method for the production of wood pulp which consist of pure cellulose fibres (the main component of paper) that employs a solution of caustic soda and sodium sulfide as the liquor in which the pulpwood is cooked in order to loosen the

fibres. The technology entails several steps, both mechanical and chemical. It is the dominant method for producing paper. The process name is derived from German word "Kraft" meaning "strength" in this context, due to the strength of the kraft paper produced using this process.

(viii)

Temp & catalytic conditions in Haber's Process:

Repeated

(ix)

Agriculture waste used for making paper:

The most important agricultural residues used in paper industry are straw & bagasse and for panel products bagasse and flax strives, but these are a number of other residues which are also used.

- Cotton Linters
- Cotton Staple
- Cotton Stalks
- Sugarcane Bagasse
- Sorghum Stalks
- Corn Stalks

(x)

Significance of potash fertilizer:

Potash fertilizer is important and essential for plants because it increases water retention in plants, improves crop yields and influences the taste, texture and nutritional value of many plants. Potash is used to regulate the movement and storage of solutes throughout the plant comparable to the blood system in animals or humans.

(2021)

(i)

Fractions obtained from fractional distillation of petroleum:

Repeated 2019 (i)

(ii)

Reforming:

Repeated 2018 (viii)

(iii)

Catalytic cracking:

Repeated 2018 (ix)

(iv)

Product of refining:

Repeated 2018 (i)

(v)

Importance of desalting of crude oil:

Repeated 2017 (viii) & 2019 (x)

(vi)

Bleaching of paper pulp:

Bleaching is the process of making pulp white to improve printing properties and its ability to absorb liquids. Bleaching also attacks some contaminants to reduce stray dark colored particles in the final sheet of paper. Two methods are commonly used for bleaching pulp:

- Oxidative bleaching
- Reduction bleaching

(vii)

Soda pulping:

Repeated 2018 (iv)

(viii)

Wheat straw preffered over rice straw:

Wheat straw is the by-product of wheat while the rice straw is the by-product of rice. Rice straw contains about twice the amount of leaves as compared to wheat straw. The leaf portion and nodes of the straw contains more non-fibrous cells and more silicon. The non-fibrous cells creates lots of fines during pulping processes which in turn effects the paper production, quality of paper produced and poor bleachability. This is the reason wheat straw preffered over rice straw for paper pulp.

(ix)

Beating process of paper production:

Repeated 2018 (v)

Paper pulp cause water pollution:

The pulp paper industries release wastewater containing very complex organic and inorganic pollutants. Among them, the wastewater discharged from the pulping process is the most polluted.

The dark brown wastewater discharged during pulp washing is called black liquor, and the wastewater discharged from the bleaching process contains acids, alkalis and biochemical oxygen consumption (BOD).

Papermaking wastewater contains a large amount of organic matter and suspended matter and large amount of chemicals and impurities and is one of the main pollution sources of modern water bodies.

Papermaking black liquor contains a large number of suspended solids, organic pollutants and toxic substances which can cause serious pollution when directly discharged into water bodies.

(xi)

Action of calcium cyanide as fertilizer:

Repeated 2018 (vi)

(xii)

Examples of phosphate fertilizers:

Repeated 2018 (x)

(xiii)

Raw materials for normal superphosphate fertilizers:

Repeated 2018 (ii)

(xiv)

Natural organic fertilizers:

Repeated 2018 (iii)

(xv)

Diff b/w macro & micro nutrients:

Repeated 2019 (ix)