**CHEMISTRY 2 ASSIGNEMENT**

1. **Briefly describe the process of refining petroleum**

* Refining is the technology that includes physical and chemical processes for separating complex mixtures into simpler mixtures or near-pure components.
* The process involves;

1. **Desalting**: crude oil often contains impurities such as salts, sulfur and water. Desalting removes these impurities by mixing the crude oil with water and then separating the water-soluble impurities from the oil.
2. **Fractional distillation**: The crude oil is heated in a distillation tower. Different hydrocarbon components in the crude oil vaporizes at different temperature. As the vapor rises through the tower, they cool and condense into liquid fractions at different levels. Lighter fractions such as gasoline and naphtha condense at the top of the tower, while heavier fractions like diesel and lubricating oil condense at lower levels.
3. **Conversion process**

* Cracking – In cracking, heavier hydrocarbon molecules are broken down into lighter ones by heat and pressure. This process increases the yield of valuable products like gasoline.
* Reforming – Reforming rearranges the molecular structure of hydrocarbon to produce higher octane gasoline components.
* Alkylation – Alkylation combines smaller molecules to produce larger, high-octane molecules for gasoline blending.
* Hydrotreating – Hydrotreating removes impurities like sulfur, nitrogen and metals from the fraction by reacting them with hydrocarbon under high pressure and temperature.

1. Treatment process

* Desulfurization – Removes sulfur compounds from various fractions to reduce air pollution when the fuel is burned.
* Hydrogenation – Adds hydrogen to unsaturated hydrocarbons to improve stability and reduce reactivity.
* Sweetening – Removes hydrogen to sulfide from hydrocarbons to improve odor and safety.

1. **Blending:** The refined products undergo blending to achieve the desired specifications for various fuels such as gasoline, diesel, jet, fuel and heating oil. Additives may be included to enhance performance and meet regulatory requirements.
2. **Final product storage and distribution**: The refined products are stored in tanks and then transported via pipelines, trucks, trains or ships to distribution centers and ultimately to consumers.

**PRODUCTS FORMED FROM REFINING CRUDE OIL**

* Gasoline
* Kerosene
* Wax
* Asphalt
* Lubricating oil
* Tar

**TEMPERATURES USED IN REFINING CRUDE OIL**

The temperature used during the refining of petroleum ranges i.e.,

1. Gasoline is a volatile liquid fuel that is commonly used in vehicles. It is obtained by distilling crude oil at temperature ranging from approximately 100 to 400 degrees Celsius.
2. Diesel fuel mostly used in engines is produced by distilling crude oil at temperature ranging from around 200 to 350 degrees Celsius.
3. Jet fuel, a specialized type of fuel used in aircraft, it is obtained by distilling crude oil at a temperature ranging from approximately 150 to 275 degrees Celsius.
4. Liquified petroleum gas, a flammable gas commonly used for cooking and heating is produced by distilling crude oil at a temperature ranging from around 0 to 50 degrees Celsius.
5. Heating oil, also known as fuel oil, used for heating homes and buildings is obtained from distilling crude oil at a temperature ranging from approximately 275 to 350 degrees Celsius.
6. Lubricating oil is produced by refining crude oil at a temperature ranging from 350 to 400 degrees Celsius.
7. Asphalt, used in road construction is obtained by distilling crude oil at a temperature ranging from 300 to 400 degrees Celsius.

**2) Define the following terms** -**cracking**

**-catalytic reforming**

**CRACKING**

* Cracking is an industrial process in which larger hydrocarbon molecules are broken down at high temperatures, with or without a catalyst, to produce smaller hydrocarbon molecules
* THERMAL CRACKING

It is accomplished using only high temperature and pressure.

It is wasteful because it produces large quantities of solid coke.

* CATALYTIC CRACKING

This process breaks apart larger molecules, but in the presence of a catalyst, along with less severe reaction condition.

**3) Define catalytic reforming**

CATALYTIC REFORMING – refers to the chemical process involved in converting molecules in a naphtha (gasoline) fraction into aromatic gasoline molecules

Aliphatic molecule aromatic molecule + hydrogen

CH3-(CH2)5-CH3 CH3-CH-CH2-CH-CH3

CH3 CH3

(heptane) (2,4- dimethylpeptane)