Week 1 & 2

Topic: Crude Oil and Petrochemicals

Introduction

Nigeria as a nation is blessed with abundant mineral resources. These minerals include coal, columbine, limestone, tin and crude oil. Crude oil is also called petroleum. Crude oil is a mixture of hydrocarbons. It occurs naturally beneath the earth surface. In Nigeria, it is dark brown in color. It is a source of great revenue to Nigeria. It is believed that natural crude oil (petroleum) was formed from deep carbon deposits (remains of animals and plants) that date back to formation of the earth.

Meaning of Crude Oil as Petrochemicals

Crude oil is a mixture of hydrocarbons. It exists in liquid phase in natural underground reservoirs and remains liquid at atmospheric pressure after passing through surface separating facilities.

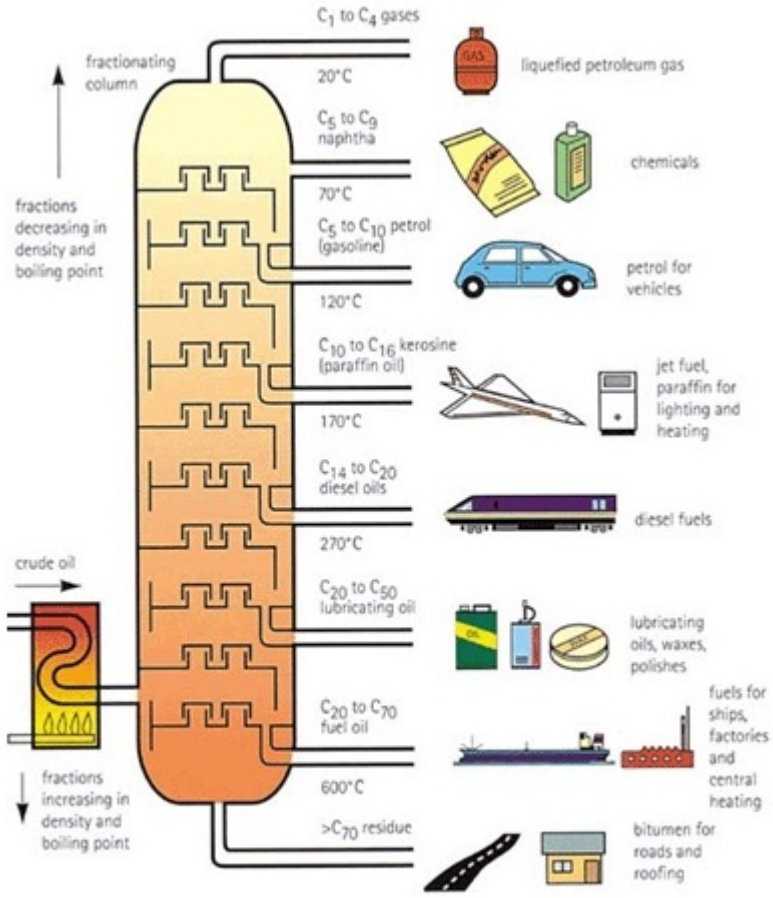
Crude oil occurs in large quantities in Nigeria, especially in Bayelsa, Edo, Imo, rivers, Delta, Abia, Ondo and Cross river state. It is dark brown in color though its composition and consistency vary from place to place. In fact, different oil producing areas yield significantly different varieties of crude oil. We have light and heavy crude oil. The light one has low metal and Sulphur content, light in color and flows easily. It is very expensive. The heavy one has high metal and Sulphur content and must be heated to become fluid. It is less expensive.

Meaning of Petrochemicals

Petrochemicals are chemical substances produced from petroleum in refining operations. They are heavy part of petroleum used mainly to produce plastic materials.

Refining of Crude Oil

Petroleum or crude oil occurs naturally. it contains many useful products also called fractions. These are separated by the method of fractional distillation. This process of obtaining useful fractions from petroleum is called refining.



Fractional distillation of Crude Oil

Fractional distillation of Crude Oil

Fractions of petroleum from refining are petroleum gases (Methane, butane, etc.), petrol or gasoline, kerosene, diesel, lubricating oil and bitumen (asphalt).

Uses of Refined Crude Oil Fractions

1. Petroleum gases are used for welding and as cooking gases
2. Petrol is used for driving cars
3. Kerosene is used for cooking, lighting lanterns and as aviation fuel
4. Diesel is used for driving lorries and trucks
5. Lubricating oil is used for removing rust and loosening nuts

6. Bitumen is used for road construction

Uses of Petrochemicals

1. Padding lining for insulation
2. Raw materials for making plastic items such as chairs, tables, pipes, plates, etc.

Importance of Crude Oil and Petrochemicals

Crude oil and its allied petrochemical products play important roles in the development of Nigeria as a nation. Such roles include:

1. Earning foreign exchange
2. Creating employment for workers
3. Bringing about industrialization in the areas where oil is discovered or refined
4. Providing raw materials for small-scale industries
5. Bringing about international recognition by other countries of the world
6. Providing opportunity for technology transfer

Topic: Elements, Compounds and Mixtures

Introduction

In our environment, we see iron nails, Sulphur roll, copper wire, aluminum sheets, etc. we also breathe in oxygen (air) to stay alive. These substances: iron, Sulphur, copper and oxygen, are referred to as elements.

Elements

Elements are substances that cannot be separated into simpler substances.

Any substance that contains only one kind of an atom is known as an element. Salt is made up of the elements sodium and chloride. Water is made up of the elements hydrogen and oxygen.

Each element is represented by a unique symbol. The notation for each element can be found on the periodic table of elements.

The elements can be divided into three categories that have characteristic properties: metals, nonmetals, and semimetals. Most elements are metals, which are found on the left and toward the bottom of the periodic table. A handful of nonmetals are clustered in the upper right corner of the periodic table. The semimetals can be found along the dividing line between the metals and the nonmetals.

Elements are made up of atoms, the smallest particle that has any of the properties of the element. John Dalton, in 1803, proposed a modern theory of the atom based on the following assumptions.

1. Matter is made up of atoms that are indivisible and indestructible.

2. All atoms of an element are identical.

3. Atoms of different elements have different weights and different chemical properties.

4. Atoms of different elements combine in simple whole numbers to form compounds.

5. Atoms cannot be created or destroyed. When a compound decomposes, the atoms are recovered unchanged.

These are the first 20 elements and their symbols, listed in order:

1 – H – Hydrogen
2 – He – Helium
3 – Li – Lithium
4 – Be – Beryllium
5 – B – Boron
6 – C – Carbon

7 – N – Nitrogen
8 – O – Oxygen
9 – F – Fluorine
10 – Ne – Neon
11 – Na – Sodium
12 – Mg – Magnesium
13 – Al – Aluminum
14 – Si – Silicon
15 – P – Phosphorus
16 – S – Sulfur
17 – Cl – Chlorine
18 – Ar – Argon
19 – K – Potassium
20 – Ca – Calcium

Chemists use one or two letters to represent elements. The symbol for aluminum is Al. The symbol for oxygen is O. The symbol for oxygen is O. “O” stands for one atom of oxygen. Oxygen atoms are joined in pairs. To write a pair of oxygen atoms using symbols, we use the symbol O and the number 2. Oxygen would be (O_2). A pair of oxygen atoms is a molecule of oxygen. A molecule is the smallest particle of a substance that exists independently. Molecules of most elements are made up of only one of atom of that element. Oxygen, along with nitrogen, hydrogen, and chlorine are made up of two atoms. The two balls represent the two oxygen molecules.

Compound

A compound is a substance formed when two or more elements are chemically joined. Water, salt, and sugar are examples of compounds. When the elements are joined, the atoms lose their individual properties and have different properties from the elements they are composed of. A chemical formula is used a quick way to show the composition of compounds. Letters, numbers, and symbols are used to represent elements and the number of elements in each compound.

Elements combine to form chemical compounds that are often divided into two categories.

- Metals often react with nonmetals to form ionic compounds. These compounds are composed of positive and negative ions formed by adding or subtracting electrons from neutral atoms and molecules.
- Nonmetals combine with each other to form covalent compounds, which exist as neutral molecules.

By convention, no subscript is written when a molecule contains only one atom of an element. Thus, water is H_2O and carbon dioxide is CO_2.

Mixtures

Mixtures are two or more substances that are mixed together but not chemically joined. In other word, a mixture contains two or more substances which can easily be separated by physical means. The constituents can be elements or compounds or both. In a given mixture, the constituents which may be present in different proportions retain their individual identities (properties). This is because their physical and chemical properties are not changed by simple mixing. Examples of mixtures are air, urine, blood, milk, coca-cola, petroleum, etc. forming a mixture does not involve chemical change. For instance, a mixture of common salt and water can easily be separated, with each other's component retaining its properties.

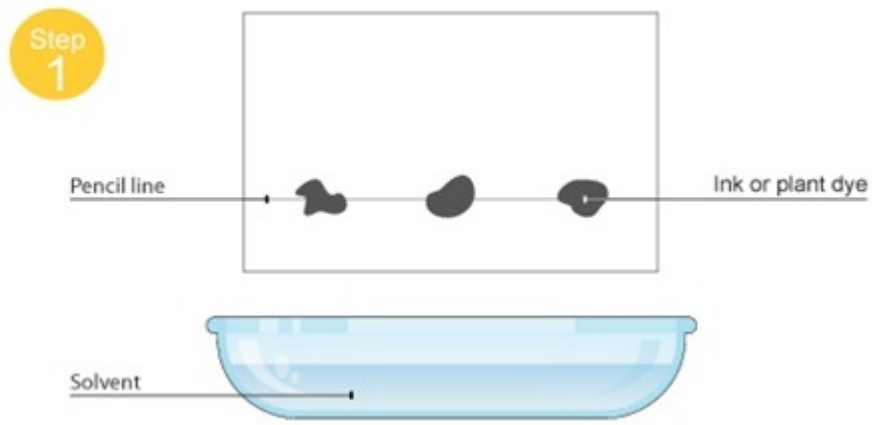
Methods of Separating mixtures

The different substances in mixtures are usually easily separated from one another. The method you use depends upon the type of mixture you have.

Chromatography

This is good for separating dissolved substances that have different colors, such as inks and plant dyes. It works because some of the colored substances dissolve in the liquid better than others, so they travel further up the paper.

Separating dissolved substances

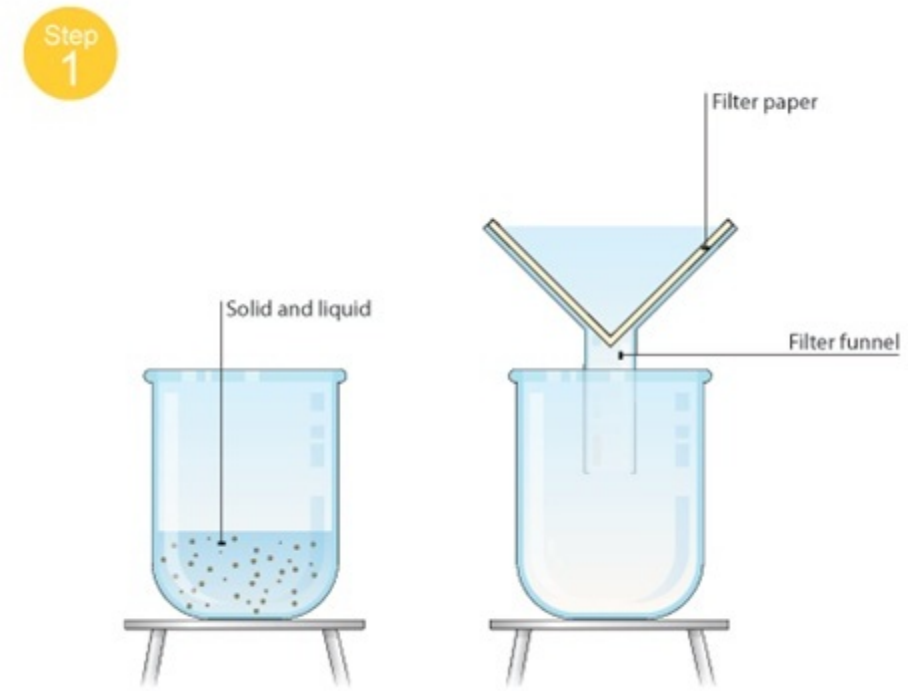


Filtration

Filtration is good for separating an insoluble solid from a liquid. (An insoluble substance is one that does not dissolve).

Sand, for example, can be separated from a mixture of sand and water using filtration. That's because sand does not dissolve in water.

Separating insoluble solids

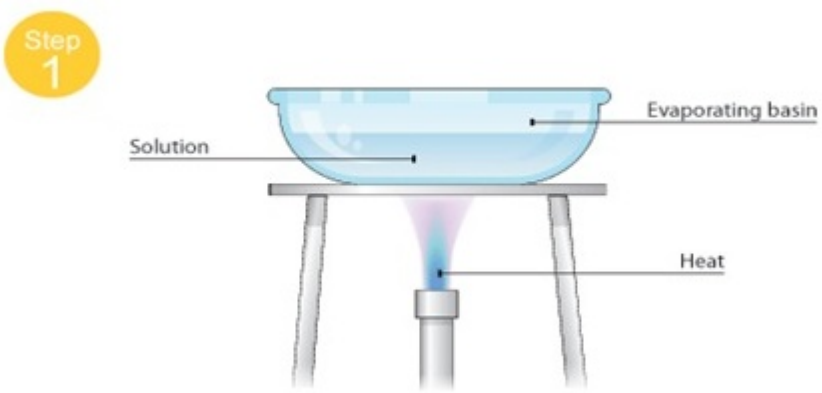


Evaporation

This is good for separating a soluble solid from a liquid (a soluble substance does dissolve, to form a solution).

For example, copper sulphate crystals can be separated from copper sulphate solution using evaporation. Remember that it is the water that evaporates away, not the solution.

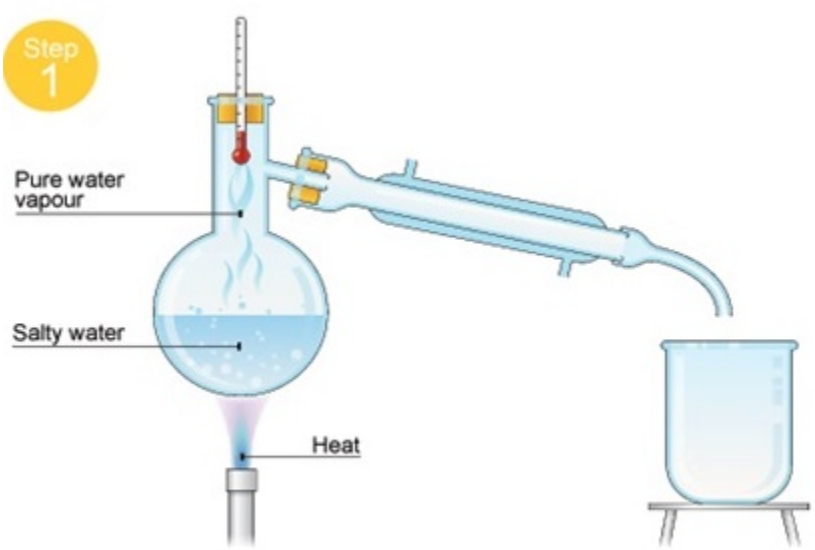
Separating a soluble solid



Simple distillation

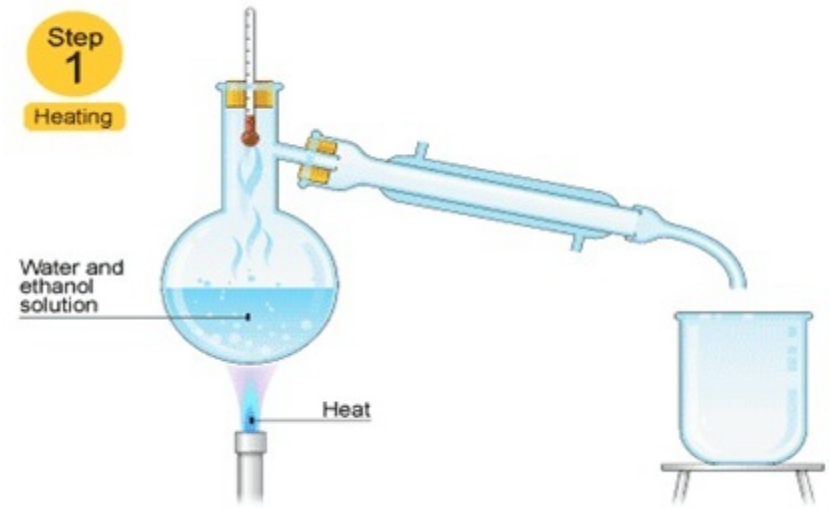
This is good for separating a liquid from a solution. For example, water can be separated from salty water by simple distillation. This method works because the water evaporates from the solution, but is then cooled and condensed into a separate container. The salt does not evaporate and so it stays behind.

Separating a liquid from a solution



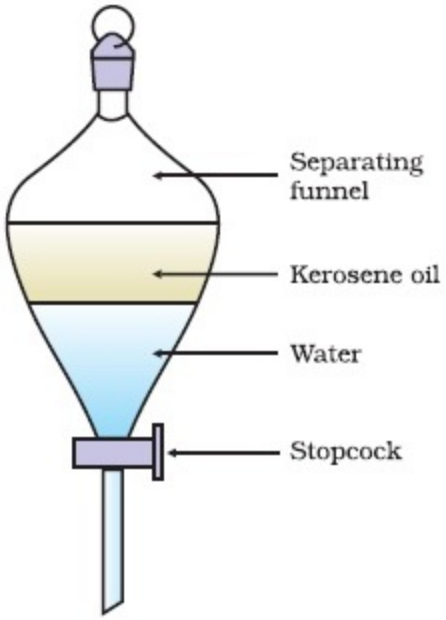
Fractional distillation

This is good for separating two or more liquids from each other. For example, ethanol (alcohol) can be separated from a mixture of ethanol and water by fractional distillation. This method works because the two liquids have different boiling points.



Separating funnel

If two liquids are immiscible, then a separating funnel is used.



For example: If you pour a mixture of oil and water into the funnel, the oil floats on top of the water. All that is left to do is for the tap to be opened to allow the water to pour through. The tap is closed once all the water has passed.