SOUTHWESTERN UNIVERSITY OF NIGERIA

LECTURE NOTE

COURSE TITLE: GENERAL CHEMISTRY

COURSE CODE: GNS 214/229

LECTURER: ENGR. OGUNSHINA

LECTURE 1: TOPIC: **INTRODUCTION TO CHEMISTRY**

Chemistry is the science that is interested in studying the composition and properties of the matter, it is interested in the changes that occur on it , It is interested in different substances reactions with each other & the suitable conditions for these reactions

The fields of studying chemistry

Science of chemistry is interested in studying the atomic and molecular structure of the matter (the bonds within it) to identify the properties of the matter quantitatively and qualitatively .
Science of chemistry is interested in understanding and controlling the chemical reactions and their conditions , It is interested in obtaining new beneficial products that can be used in medicine , agriculture , engineering and industry .
Science of chemistry is interested in treating some environmental problems such as Rust , pollution of (water – air – soil) , the shortage of water and the energy resources .

Some applications of chemistry

Since the ancient civilizations, chemistry has been related to metals , mining , production of colors , medicine and some technical industries like tanning , dyeing clothes and production of glass , The ancient Egyptians used some chemicals in mummifying their dead .

The **pharmacological** industry is one of the most important applications of chemistry , All food consist of chemicals ever if they are organically grown , Fuel and all parts of the car are made up of chemicals .
The dyeing of fabrics is a chemical process , Chemical reactions can be used to produce **the electricity** , The water treatment and purification is an important chemical method .

The chemistry is related to many fields in our life , So , Chemistry is considered the centre of most other sciences like biology , physics , medicine , agriculture and other sciences .

Chemistry and Biology
Biology is interested in studying **the living organisms** , Chemistry is interested with biology in a science called Biochemistry which is the science that is interested in studying the chemical structure of the parts of the cell in the various organisms .

Biochemistry is interested in the chemical reactions that occur inside the living organisms (e.g. digestion , respiration and photosynthesis) , It is interested in studying the chemical structure of the parts of the cell (e.g. carbohydrates , fats , proteins and nucleic acids .

Chemistry and Physics

Physics studies all about the matter like its movement and energy , inventing new methods for measuring more accurately to understand the natural phenomena , Chemistry is integrated with physics in a science called Physical chemistry which studies the properties and structure of matter .

physical chemistry is the science that is interested in studying the properties and structure of the matter and the particles that form these matter .

The physical chemistry allows the physicists to perform their studies in an easier method because it studies the properties and structure of the matter and the particles that form these matter .

Chemistry , Medicine and Pharmacy

Medicines are the chemical compounds which have healing properties and they can be extracted from natural sources or prepared in the laboratories , Chemistry plays an important role in each of medicine and pharmacy fields , By knowing the nature of functions of **the hormones** and enzymes and explaining the role of medicine inside the human body .

Chemistry and Agriculture

Chemistry helps in agriculture by selecting the suitable soil for planting a certain crop by the chemical analysis which determines the ratios of the soil components and the degree of sufficiency of these components for this plant or crop .

Chemistry helps in agriculture by increasing the productivity of crops , as chemistry can prepare the suitable fertilizers for each crop and also the insecticides to get rid of the agricultural pests .

Chemistry and the future

We can discover and form some substances with extraordinary properties through using **Nanochemistry** which is the science that is interested in discovering and forming some substances with extraordinary properties that may be used for improving of some various fields such as engineering , communications , medicine , the environment , transportation and provide numerous human needs

ASSIGNMENT 1

1. State two other definitions of chemistry
2. List and explain any five applications of chemistry

QUIZ 1

1. What do you understand by **Nanochemistry?**

LECTURE 2

TOPIC: SOME BASIC TERMS IN CHEMISTRY

Atomic number, mass number and isotopes

Atoms contain protons, neutrons and electrons. The electrons are arranged in shells around the nucleus. The periodic table is a chart of all the elements arranged in increasing atomic number.

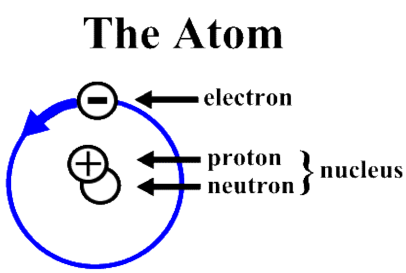


Figure 2.1:Atomic Structure

Proton: It is a positively charged particle of mass equal to that of hydrogenation

Electron: It is negatively charged, its charged being equal in magnitude but of opposite sign to the charge on a proton. It has a very small mass of about 1/1840 of the mass of the proton

Neutron: It has no charge (electrically neutral) and its mass equal to the mass of a proton

The **relative atomic mass** of an element is defined as the weight in grams of the number of **atoms** of the element contained in 12.00 g of carbon-12. To **calculate** the **relative atomic mass** of chlorine, the **average mass** of one **atom** of chlorine is found by considering 100 **atoms** of chlorine.

Relative mass is the mass of an atom or molecule relative to that of 1/12 of a carbon-12 atom. Under this scheme, a neutral hydrogen atom has a mass of 1. You can think of this as counting each proton or neutron as 1 and ignoring the masses of electrons because they are so small in comparison. So the formula for relative atomic mass is simply:

Relative atomic mass *= number of protons + number of neutrons*

However, since scientists set a carbon-12 atom as the "standard atom," the technical definition is:

Relative atomic mass = mass of atom ÷ (1/12 of the mass of a carbon-12 atom)

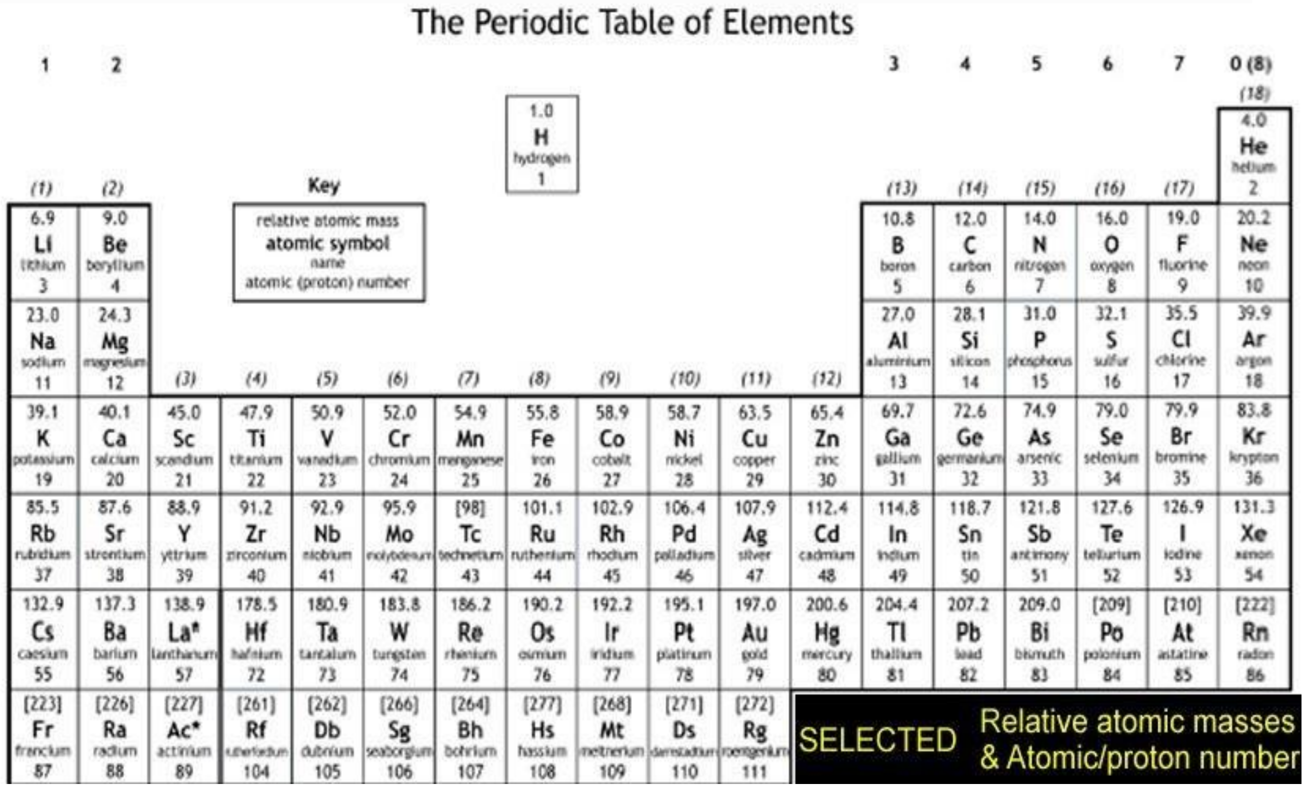
elative atomic mass = (isotope 1 mass × isotope 1 abundance + isotope 2 mass × isotope 2 abundance + ...) ÷ 100

So for **chlorine**, this is:

Relative atomic mass = (35 × 75 + 37 × 25) ÷ 100

= (2,625 + 925) ÷ 100 = 35.5

For chlorine, the relative atomic mass on the periodic table shows **35.5** in line with this calculation.



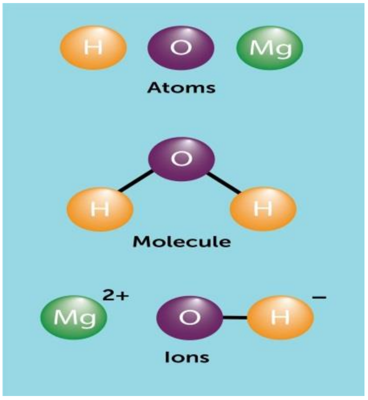
Isotopes [**ahy**-s*uh*-tohps] are atoms with the same number of protons but differing numbers of neutrons. In other words, isotopes have different atomic weights. Isotopes are different forms of a single element.

Key Takeaways: Isotopes

- Isotopes are samples of an element with different numbers of neutrons in their atoms.
- The number of protons for different isotopes of an element does not change.
- Not all isotopes are radioactive. Stable isotopes either never decay or else decay very slowly. Radioactive isotopes undergo decay.
- When an isotope decays, the starting material is the parent isotope. The resulting material is the daughter isotope.

There are 250 isotopes of the 90 naturally occurring elements and there are over 3,200 radioactive isotopes, some of which are natural and some synthetic.**1** Every element on the periodic table has multiple isotope forms. The chemical properties of isotopes of a single element tend to be nearly identical; the exceptions are the isotopes of hydrogen since the number of neutrons has such a significant effect on the size of the hydrogen nucleus.

An **element** is a substance that cannot be broken down into any other substance. There are about 100 **elements**, each with its own type of atom. Everything in the universe contains the atoms of at least one or more **elements**. The periodic table lists all the known **elements**, grouping together those with similar properties



A **molecule** is a particle made up of two or more atoms that are chemically bonded together; the number of atomic nuclei making up a **molecule** is a determinate number.
For example, $HCl_{(g)}$ is a **molecule** made of one hydrogen atom bonded to one chlorine atom. It is made of two atoms and is called a diatomic **molecule**.

ASSIGNMENT 2

1. List the first ten elements in the periodic table and calculate their relative atomic mass
2. Define the followings: (a) Molecule (b) Isotope (c) Element

QUIZ 2

1. From the first 20 elements, categorize the elements to metals, non-metals and metalloids
2. List three properties of isotopes

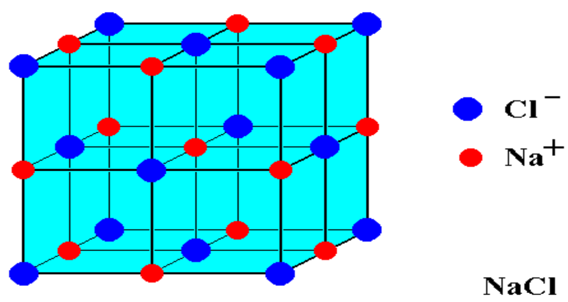
LECTURE 3

TOPIC: Neutralization Reaction

The **reaction** between an acid and a base is known as a **neutralisation reaction**. ... **Sodium chloride** is made up of **Na**+ cations from the base (NaOH) and **Cl−** anions from the acid (HCl). HCl (aq)+NaOH (aq)→H2O (l)+**NaCl** (aq) Hydrogen bromide **reacts** with potassium **hydroxide** to form potassium bromide (a salt) and water.

NaCl crystal

Sodium Chloride (**NaCl**) **Crystal**. ... With molar masses of 22.99 and 35.45 g/mol respectively, 100 g of **NaCl** contain 39.34 g Na and 60.66 g Cl. The salient features of its structure are: **Chloride** ions are ccp type of arrangement, i.e., it contains **chloride** ions at the corners and at the center of each face of the cube



$H^+ + OH^- \rightarrow H_2O$. Positive **sodium** ions from NaOH and negative **chloride** ions from HCL combine to form the salt **sodium chloride** (**NaCl**), commonly called table salt.

A Method of Making a Water Soluble Salt

METHOD

(a) Neutralising a soluble acid with a soluble base (alkali) to give a soluble salt

One important point is to recognise that all the reactants are soluble here, which is why you need a titration procedure to work out how much of the acid is to be added to a given volume of alkali.

e.g. the hydroxide of an alkali metal like sodium hydroxide, potassium hydroxide or ammonia solution (wrongly called)ammonium hydroxide. Steps (1) to (3) below is called a titration.

Typical common soluble bases (alkalis) used for preparing soluble salts:

NaOH sodium hydroxide, KOH potassium hydroxide and some soluble carbonates

Typical examples shown by the word and symbol equations below include ...

Sodium hydroxide + hydrochloric acid ==> sodium chloride + water

$NaOH_{(aq)} + HCl_{(aq)} ==> NaCl_{(aq)} + H_2O_{(l)}$

Sodium hydroxide + sulfuric acid ==> sodium sulfate + water

$2NaOH_{(aq)} + H_2SO_{4(aq)} ==> Na_2SO_{4(aq)} + 2H_2O_{(l)}$

potassium hydroxide + sulfuric acid ==> potassium sulfate + water

$2KOH_{(aq)} + H_2SO_{4(aq)} ==> K_2SO_{4(aq)} + 2H_2O_{(l)}$

sodium hydroxide + nitric acid ==> sodium nitrate + water

$NaOH_{(aq)} + HNO_{3(aq)} ==> NaNO_{3(aq)} + 2H_2O_{(l)}$

ammonia + nitric acid ==> ammonium nitrate

$NH_{3(aq)} + HNO_{3(aq)} ==> NH_4NO_{3(aq)}$

potassium hydroxide + hydrobromic acid ==> potassium bromide + water

$KOH_{(aq)} + HBr_{(aq)} ==> KBr_{(aq)} + H_2O_{(l)}$

sodium carbonate + hydrochloric acid ==> sodium chloride + water + carbon dioxide

$Na_2CO_{3(s)} + 2HCl_{(aq)} ==> 2NaCl_{(aq)} + H_2O_{(l)} + CO_{2(g)}$

ASSIGNMENT 3

1. Describe another method of making a water soluble salt apart from the method described in this section
2. State five areas where salts are use

QUIZ 3

1. Define neutralization?
2. List and describe five various types of salts

LECTURE 4

TOPIC: PROCESSING OF CRUDE OIL

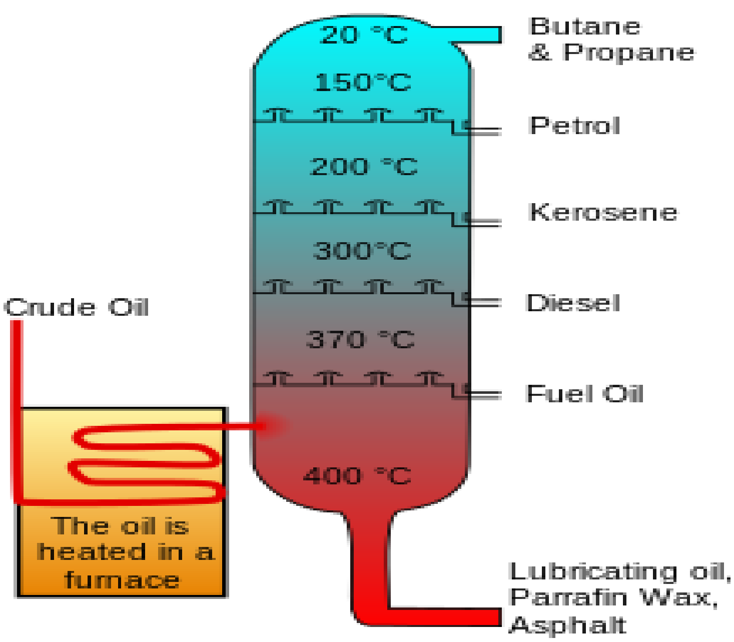
Crude Oil refining **process**

In the refining **process**, **crude oil** is refined to produce different **petroleum** products like gasoline, diesel, and jet fuel. For the conversion to take place, **crude oil** is heated and introduced into the distillation tower. In the tower, **oil** is broken down into various **petroleum** products

Petroleum refining processes are the chemical engineering processes and other facilities used in petroleum refineries (also referred to as oil refineries) to transform crude oil into useful products such as liquefied petroleum gas (LPG), gasoline or petrol, kerosene, jet fuel, diesel oil and fuel oils.[1][2][3]

Refineries are very large industrial complexes that involve many different processing units and auxiliary facilities such as utility units and storage tanks. Each refinery has its own unique arrangement and combination of refining processes largely determined by the refinery location, desired products and economic considerations.

Some modern petroleum refineries process as much as 800,000 to 900,000 barrels (127,000 to 143,000 cubic meters) per day of crude oil.



ASSIGNMENT 4

1. Explain the procedures involve in refining crude oil into the different products
2. What do you know about OPEC?

QUIZ 4

1. Mention the top ten oil-producing countries in the world
3. What are the applications of the various petroleum products

LECTURE 5

TOPIC: Chemical Bonding

A **chemical bond** is a lasting attraction between atoms, ions or molecules that enables the formation of **chemical** compounds. The **bond** may result from the electrostatic force of attraction between oppositely charged ions as in ionic bonds or through the sharing of electrons as in **covalent** bonds

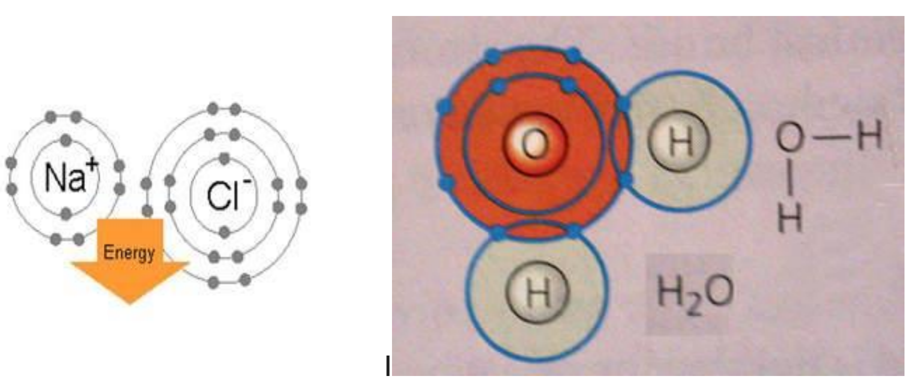
Chemical bonding describes a variety of interactions that hold atoms together in chemical compounds.

Key Points

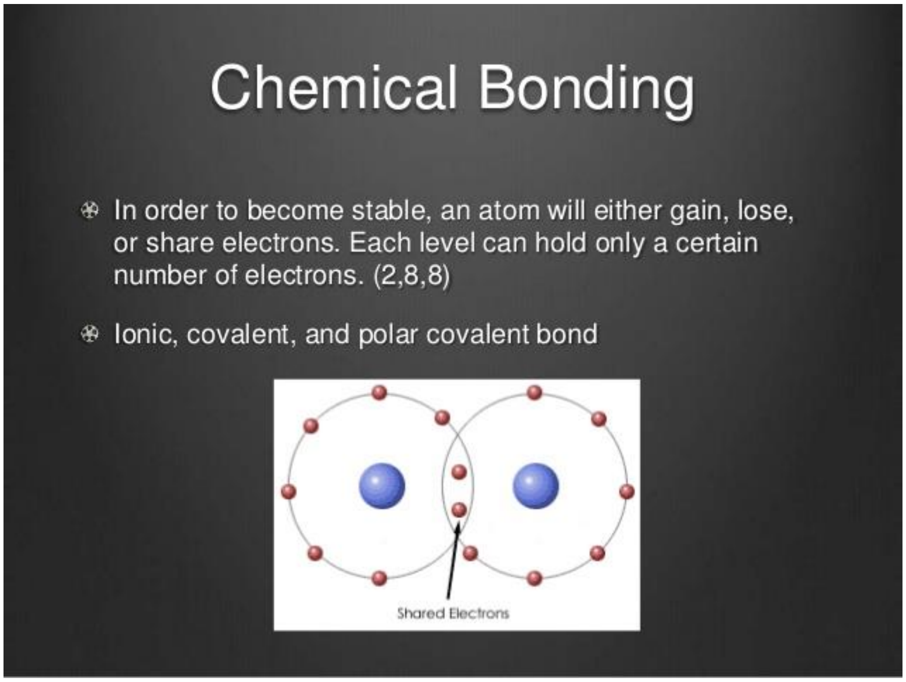
- Chemical bonds are forces that hold atoms together to make compounds or molecules.
- Chemical bonds include covalent, polar covalent, and ionic bonds.
- Atoms with relatively similar electronegativities share electrons between them and are connected by covalent bonds.
- Atoms with large differences in electronegativity transfer electrons to form ions. The ions then are attracted to each other. This attraction is known as an ionic bond.

Key Terms

- **bond**: A link or force between neighboring atoms in a molecule or compound.
- **ionic bond**: An attraction between two ions used to create an ionic compound. This attraction usually forms between a metal and a non-metal.
- **covalent bond**: An interaction between two atoms, which involves the sharing of one or more electrons to help each atom satisfy the octet rule. This interaction typically forms between two non-metals.
- **intramolecular**: Refers to interactions within a molecule.
- **intermolecular forces**: Refers to interactions between two or more molecules.



Figures 5.1a and 5,1b: **Ionic Bond and Covalent Bond**



ASSIGNMENT 5

1. Explain the different types chemical bonding and give examples in each
2. An atom will either gain, lose or share electrons to become stable, explain in details?

QUIZ 5

1. Sketch the different bonding being exhibited by atoms
2. State the types of bonds exhibited by elements in groups 1, 4 and 7of the atomic periodic table

LECTURE 6

TOPIC: Properties of Matter

Matter is any substance that has **mass** and takes up space by having **volume**. All everyday objects that can be touched are ultimately composed of atoms, which are made up of interacting **subatomic particles**, and in everyday as well as scientific usage, "matter" generally includes atoms and anything made up of them, and any particles (or combination of particles) that act as if they have both rest mass and volume. However it does not include **massless** particles such as photons, or other energy phenomena or waves such as light or sound.

The **mass** of an object is the quantity of matter it contains. Do not confuse an object's mass with its **weight**, which is a force caused by the gravitational attraction that operates on the object. Mass is a fundamental property of an object that does not depend on its location.In physical terms, the mass of an object is directly proportional to the force required to change its speed or direction

Under normal conditions, there are three distinct states of matter: solids, liquids, and gases. **Solids** are relatively rigid and have fixed shapes and volumes. A rock, for example, is a solid. In contrast, **liquids** have fixed volumes but flow to assume the shape of their containers, such as a beverage in a can. **Gases**, such as air in an automobile tire, have neither fixed shapes nor fixed volumes and expand to completely fill their containers. Whereas the volume of gases strongly depends on their temperature and **pressure** (the amount of force exerted on a given area), the volumes of liquids and solids are virtually independent of temperature and pressure. Matter can often change from one physical state to another in a process called a **physical change**. For example, liquid water can be heated to form a gas called steam, or steam can be cooled to form liquid water. However, such changes of state do not affect the chemical composition of the substance.

Metals, Non-Metals and Metalloids

Metals

With the exception of hydrogen, all elements that form positive ions by losing electrons during chemical reactions are called metals. Thus metals are electropositive elements with relatively low ionization energies. They are characterized by bright luster, hardness, ability to resonate sound and are excellent conductors of heat and electricity. Metals are solids under normal conditions except for Mercury.

Nonmetals

Elements that tend to gain electrons to form anions during chemical reactions are called non-metals. These are electronegative elements with high ionization energies. They are non-lustrous, brittle and poor conductors of heat and electricity (except graphite). Non-metals can be gases, liquids or solids.

A **metalloid** is an element that has properties that are intermediate between those of metals and nonmetals. **Metalloids** can also be called semimetals. On the periodic table, the elements colored yellow, which generally border the stair-step line, are considered to be **metalloids**.

The six commonly recognised metalloids are boron, silicon, germanium, arsenic, antimony, and tellurium. Five elements are less frequently so classified: carbon, aluminium, selenium, polonium, and astatine. On a standard periodic table, all eleven elements are located in a diagonal region of the p-block extending from boron at the upper left to astatine at lower right. Some periodic tables include a dividing line between metals and nonmetals and the metalloids may be found close to this line.

Mixture

In **chemistry**, a **mixture** is a material made up of two or more different substances which are physically combined. A **mixture** is the physical combination of two or more substances in which the identities are retained and are mixed in the form of solutions, suspensions and colloids

Examples of Mixtures

- Sand and water.
- Salt and water.
- Sugar and salt.
- Ethanol in water.
- Air.: a **mixture** of various gases like oxygen, carbon dioxide, nitrogen, argon, neon, etc.
- Soda.
- Salt and pepper.
- Solutions, colloids, suspensions.
- Crude oil: A **mixture** of organic compounds (mainly hydrocarbons)
- Seawater: A **mixture** of various salt and water.
- Ink: A **mixture** of coloured dyes.
- Gunpowder: A **mixture** of sulfur, potassium nitrate and carbon.

Chemical compound, any substance composed of identical molecules consisting of atoms of two or more **chemical** elements. A **compound** is a substance formed when two or more **chemical** elements are chemically bonded together. ... Example 1: Pure water is a **compound** made from two elements - hydrogen and oxygen. The ratio of hydrogen to oxygen in water is always 2:1. Each molecule of water contains two hydrogen atoms bonded to a single oxygen atom.

Difference Between Compound and **Mixture**. ... The **compound** is the chemical combination of elements, bonded together in specific proportion. The **mixture** is the physical combination of substances, bonded together in any proportion. While the **compound** is a pure substance, the **mixture** is an impure substance

Air constituents are a mixture of gases in varying amounts. It consists of 78% nitrogen, 21% oxygen, argon and other inert gases to the extent of about 1.0%. In addition, carbon dioxide is another important constituent of the atmosphere which varies in amount from 0.1% to 0.3%. The variation is mainly due to combustion photosynthetic processes. The other gases, e.g., sulphur dioxide, nitrogen dioxide, ozone, etc. are found in very small quantities. Water vapor is also an important constituent which varies from region to region.

Atmospheric nitrogen reacts with oxygen under the action of lightening producing oxides of nitrogen which are carried to the earth by rain or snow in the form of nitrous or nitric acid.

Unlike nitrogen, oxygen is a very reactive substance. It is indispensable in life functions of most plants and animals. In fact metabolism can be considered as an efficient oxidation process.

Carbon dioxide though present in much smaller amounts as compared to nitrogen and oxygen, is crucial for sustaining life. Food chain starts with photosynthesis, in which plants utilize carbon dioxide and water in the presence of sunlight to make sugar and starch. The levels of carbon dioxide in the atmosphere also play a part in determining the global temperature.

ASSIGNMENT 6

1. Differentiate amongst metals, non-metals and metalloids with examples
2. Give examples of five mixtures and their compositions

QUIZ 6

1. Differentiate between mixture and compound
2. How would you differentiate between mass and weight?

LECTURE 7

TOPIC: Air and Air Pollution

By volume, dry air contains 78.09% **nitrogen**, 20.95% **oxygen**, 0.93% **argon**, 0.04% **carbon dioxide**, and small amounts of other gases. Air also contains a variable amount of water vapor, on average around 1% at sea level, and 0.4% over the entire atmosphere.

Air pollution refers to the release of **pollutants** into the **air** that are detrimental to human health and the planet as a whole. The Clean **Air** Act authorizes the **Environmental** Protection Agency (EPA) to protect public health by regulating the emissions of these harmful **air pollutants**.

- The burning of fossil fuels. Sulfur dioxide emitted from the combustion of fossil fuels like coal, petroleum and other factory combustibles are one the major cause of air pollution. ...
- Agricultural activities. ...
- Exhaust from factories and industries. ...
- Mining operations. ...
- Indoor air pollution.

Ways to Prevent Indoor and Outdoor Air Pollution

OUTDOORS PREVENTION

1. Minimize air pollution from cars
2. Walk, bike or use public transportation
3. Save energy
4. Maintain your wood stove or fireplace
5. Recycle & buy recycled products
6. Consume less & choose sustainable products
7. Eat local, organic produce & less meat
8. Grow your own food
9. Plant trees
10. Raise awareness

INDOORS PREVENTION

1. Keep air-purifying indoor plants
2. Open windows

3. Use natural products
4. Use essential oils
5. Test your home for radon
6. Do not smoke indoors
7. Keep indoor humidity low
8. Vacuum clean with a HEPA filter
9. Clean dust
10. Use air purifiers

ASSIGNMENT 7

1. Explain the composition of air
2. Why is air pollution dangerous?
3. How can we prevent air pollution both indoors and outdoors

QUIZ 7

1. Which regulating body is responsible for air pollution prevention
2. Explain the legal framework for preventing air pollution?

LECTURE 8

TOPIC: WATER

Water is an inorganic, transparent, tasteless, odorless, and nearly colorless chemical substance, which is the main constituent of Earth's hydrosphere and the fluids of most living organisms. It is vital for all known forms of life, even though it provides no calories or organic nutrients

Types Of Water

- Surface Water. Surface waters include streams, rivers, lakes, reservoirs, and wetlands. ...
- Ground Water. Groundwater, which makes up around 22% of the water we use, is the water beneath the earth's surface filling cracks and other openings in beds of rock and sand. ...
- Wastewater. ...
- Stormwater.

Hard water is **water** that has high mineral content (in contrast with "soft **water**"). **Hard water** is formed when **water** percolates through deposits of limestone, chalk or gypsum which are largely made up of calcium and magnesium carbonates, bicarbonates and sulfates.

Hard water... is **water** that contains an appreciable quantity of dissolved minerals (like calcium and magnesium). **Soft water**... is treated **water** in which the only ion is sodium. As rainwater falls, it is naturally **soft**.

There are two **types of hard water**. "**Water** that contains bicarbonate of calcium and magnesium or of both is called temporary **hard water**." These bicarbonate are soluble in **water** and produce corresponding ions. **Water** that contains chlorides or sulphates of calcium or magnesium or of both is called Permanent **water**.

The simple definition of water hardness is the amount of dissolved calcium and **magnesium** in the water. Hard water is high in dissolved minerals, largely calcium and **magnesium**. You may have felt the effects of hard water, literally, the last time you washed your hands.

The recharging is done by passing a salt (brine) solution through the resin. The sodium replaces the calcium and magnesium which are discharged in the waste **water**. Hard **water treated** with an ion exchange **water** softener has sodium added.

Temporary **hardness** present in the **water** can be **removed** by heating hard **water** and treating it with lime **water**. Permanent **hardness** present in the **water** can be **removed** by treating it with soda **water** and using permutit process.

The **advantages of hard water** are

1. Most people agree that it tastes better.
2. It is thought to reduce the number of heart illnesses.
3. It provides useful calcium ions for the healthy growth of bones and teeth.
4. The formation of lime scale in pipes (see below) causes the inside of the pipe to be covered with insoluble carbonates. This layer of carbonate prevents the water in the pipe from coming into contact with the metal of the pipe and so prevents pipe corrosion and prevents poisonous metal salts becoming dissolved in the water.

The **disadvantages of hard water** are

1) Lime scale furring of kettles and pipes. The fur is the insoluble carbonate formed during heating water with temporary hardness. The deposits of lime scale can build up on the inside of the pipe restricting the flow of water or causing a blockage.
This can happen in industry where hot water is used or in domestic heating systems (like the hot water in your house). Lime scale deposits can be removed using a weak acid.

Lime scale in pipes can be prevented using a water softener or a scale inhibitor. Lime scale in pipes can also be an advantage (see above).

2) Soap is wasted because more soap is required for washing.
Soap in hard water forms a "scum" from reacting with the calcium or magnesium compounds in the water.
Other detergents which do not contain soap do not form wasteful scum during washing.

ASSIGNMENT 8

1. List the different types of water and their sources
2. Why is water so important? State five reasons
3. What makes water hard and how can your treat hard water

QUIZ 8

1. What are the advantages and disavantages of hard water
2. Explain the steps involve in setting up a water treatment company

LECTURE 9

TOPIC: SALTS, ACIDS AND BASES

Salt is a neutral substance whose aqueous solution does not affect litmus. According to Faraday: **acids**, **bases, and salts** are termed as electrolytes. Further, Liebig proposed that **acids** are compounds which contain hydrogen that can be replaced by metals.

Salt is an ionic compound that results from the neutralization reaction of acids and bases. Salts are constituted of positively charged ions, known as cations and negatively charged ions, known as anions, which can either be organic or inorganic in nature. These ions are present in a relative amount, thus rendering the nature of the salt neutral.

The formation of salt can be seen from the chemical reactions shown in the equations below.

$$HCl + NaOH \leftrightarrow NaCl + H_2O$$

$$H_2SO_4 + Ca(OH)_2 \leftrightarrow CaSO_4 + H_2O$$

Salts are Formed from the Neutralization Reactions of Acids and Bases

Acids

The term acid is derived from a Latin word ‘acidus’ or ‘acere’, which means sour. The most common characteristic is their sour taste. An acid is a substance that renders ionizable hydronium ion (H_3O^+) in its aqueous solution. It turns blue litmus paper red. These dissociate in their aqueous solution to form their constituent ions, as given by the following examples.

$$HCl(aq) \leftrightarrow H^+ + Cl^-$$

$$H_2SO_4(aq) \leftrightarrow 2H^+ + SO_4{}^{2-}$$

$$CH_3CO_2H \leftrightarrow H^+ + CH_3CO_2{}^-$$

Bases

The most common characteristic of bases is their bitter taste and soapy feel. A base is a substance that renders hydroxyl ion(OH^-) in their aqueous solution. Bases turn the colour of red litmus paper to blue.

The bases dissociate in their aqueous solution to form their constituent ions, given by the following examples.

$$NaOH(aq) \leftrightarrow Na^+ + OH^-$$

$$Ca(OH)_2 \leftrightarrow Ca^{2+} + 2OH^-$$

Dissociation of Bases

ASSIGNMENT 9

1. Explain the differences amongst acids, bases and salt
2. What do you understand by electrolytes?
3. Give different chemical equations for different salt, acid and base?

QUIZ 9

1. State and explain the properties of salt, acids and bases
2. What do you understand by pH, pH scale and pH values of salt, water , acid and bases?