Q#1: a- What is Circulatory System? Describe the role of Human Heart in circulation of Blood.

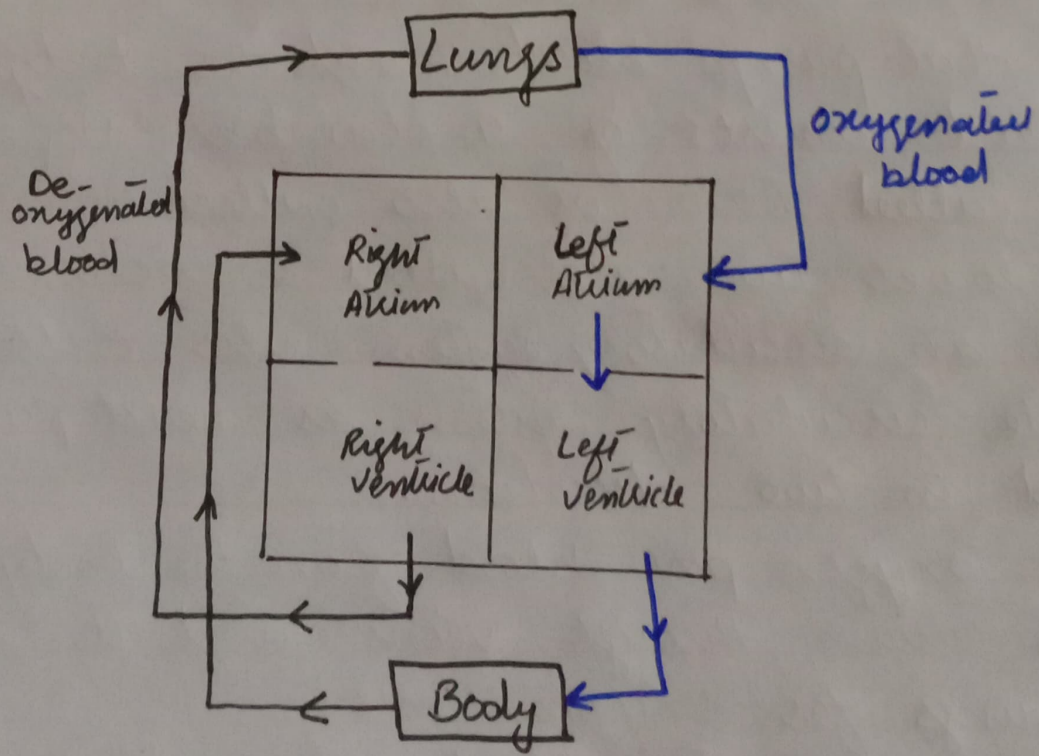
Ans: **Circulatory System:-**

The blood circulatory system is a system of organs that include **heart**, **blood vessels** and the **blood** which is circulated throughout the entire body of a human or other vertebrate

⇒ **Role of Human heart in Circulation:**

- Human heart is a fist sized, muscular organ that pumps blood through the body.
- Heart consists of 4-chambers. Upper two are called **Atria** or also called **Auricles**. The lower two are called **Ventricles**.
- Human circulatory system also called double circulatory system as heart pumps blood in two directions.
- The oxygen poor blood from the body pour into **atrium** through veins and it is sent to lungs for **oxygenation**.
- The oxygenated blood returns back to the left atrium This is called **Pulmonary circulation**

- The oxygenated blood is then taken from left side of the heart to the bodies through **Arteries.**
- The heart usually beats **60 - 100** times per minute, with each heart beat the heart sends blood throughout the body carrying oxygen to every cell.
- Heart has four valves to prevent the back-flow of the blood.
  i) Two valves are known as **Atrio-ventricular** These are located between atria and ventricles
  ii) The other Two are known as **Semi-lunar valves** and located between ventricles and arteries.
  Valves opens in the direction of blood flow.



Q#2:b- What are the Carbohydrates? Give its Classification:

Ans: **Carbohydrates:**

Carbohydrate is a biomolecule consisting of carbon, hydrogen and oxygen atoms usually with a hydrogen oxygen ratio is 2:1. It has the empirical formula

$C_m(H_2O)_n$

Carbohydrates are also called **Saccharides** The word saccharid comes from Greek word **Sakkhron** which means **Sugar.**

⇒ **Classification of Carbohydrates.**

Carbohydrates are classified into

1- Simple Carbohydrates

2- Complex Carbohydrates.

1- Simple Carbohydrates:

Simple carbohydrates are

1- Monosaccharides 2- Oligosaccharides.

i) **Monosaccharides:**

Mono means 'one' and saccharide means **Sugar** Monosaccharides are often called simple sugars. They are simplest sugars and cannot be

Hydrolyzed. Their general formula is $C_n(H_2O)_n$
Monosaccharides are subdivided into Tetroses, Pentoses hexoses, heptoses etc.

Examples: Glucose, Galactose, Fructose. These are monosaccharide.

ii) **Oligosaccharides:**

Oligo means 'Few'. These are compound sugars that yield 2 to 10 molecule of same or different monosaccharid on Hydrolysis.

The general formula of oligo saccharides oligosaccharide are disaccharides, Trisaccharides and so on.

Example: Sucrose, Lactose, Maltose These are oligosaccharides.

2- Complex Carbohydrates:

Complex carbohydrates include Polysaccharides

i) Polysaccharide:

Poly means 'Many'. These are compound sugar and yield more than 10 molecule of monosaccharide on hydrolysis. They are of further two types

i) **Homo polysaccharide:** Monosaccharides of the same type

ii) **Hetero Polysaccharide:** Monosaccharides of different type

General formula of Polysaccharide is $(C_6H_{10}O_5)_n$

Example: Starch, glycogen, cellulose, Pectin etc
These are Polysaccharides.

Q#3: a- Describe the Role of Kidney in urine formation?

Ans: **Kidneys:**

Kidneys are the part of excretory system Kidneys is composed of numerous microscopic coiled Tubules called **Nephron** or renal Tubules Nephron is the functional unit of kidney

⊙ **Structure of Nephron:**

Nephron consists of a Twisted Tubule closed at one end, open at the other with a network of associated blood vessels.

Nephron is differentiated into 4 regions

i) **Bowman's Capsule**
ii) **Proximal convoluted Tubule**
iii) **Loop of Henle**
iv) **Distal convoluted Tubule**

→ **Role of Kidney in Urin formation**

Three steps involved in urine formation

1- **Glomerular Filteration:**

Glomerulus is a net of capillaries surrounded by a cup like structure Bowman capsule. As the blood flows through the glomerulus, blood

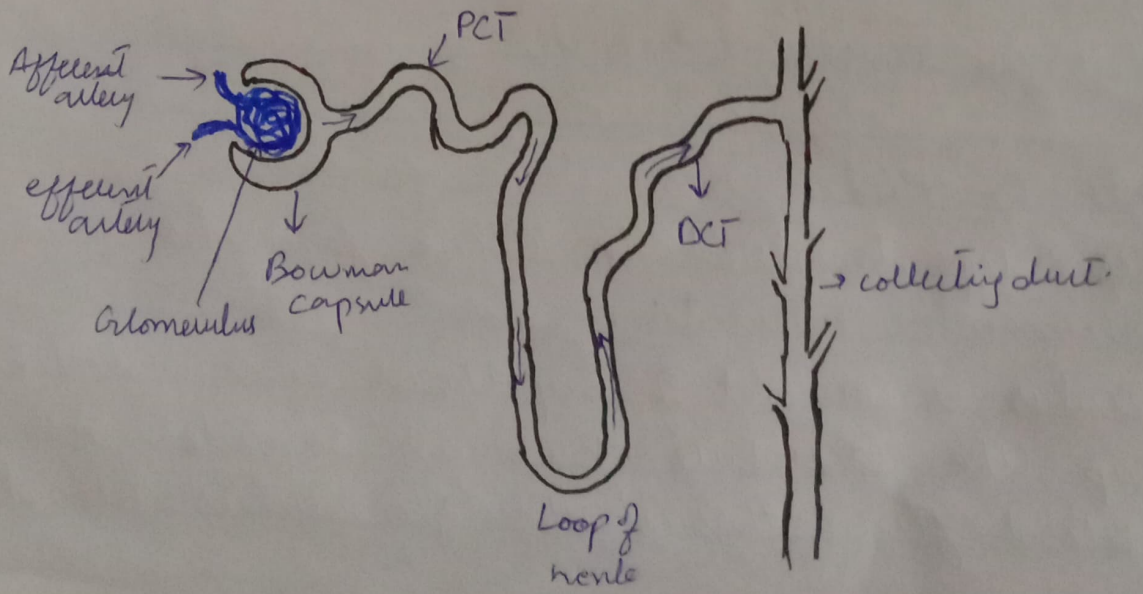
Pressure pushes water and solute from the capillaries into capsule through a **Filteration membrane.**
The **Filterate** flows from the capsule further into nephron.

2- Reabsorption:

Glomerulus filterate water and small solutes out of the blood stream. Now the filterate flows into a duct in the nephron called the renal tube.
As the filterate passes through loop of henle further reabsorption occur into capillaries

3- Secretion:

As the reabsorption occur in the renal tubule At the same time waste ions and hydrogen ions pass from the capillaries into renal tubule
This process is called Secretion.
The secreted ions combines with the remaining filtrate and become urine. Urine flows out of nephron tubule into collecting duct. It passes out of kidney through renal pelvis into ureter and down to bladder.



Q#3-b- Describe Food Preservation Method?

Ans: **Food Preservation:**

It is any of a number of methods by which food is kept from spoilage after harvest or slaughter.

→ **Methods of Food Preservation:**

Following are the methods of food preservation

1- Heat:

Most bacteria, yeast and molds grow best in the temperature range of about 16-38°C. Thermophile will grow in the range 66-82°C. Most bacteria are killed in the range 82-93°C but many bacterial spores are not destroyed even by boiling water at 100°C. To ensure sterility, total destruction of microorganism a temperature of 121°C must be maintained for 15 min or longer.

Most of the disease causing bacteria are destroyed by **Pasteurization** at 63°C for 30 min

2- Cold:

Most bacteria, yeast and molds grow best in Temperature range 16-38°C. Psychrotrophs will grow down to 0°C. At temperature lower

than 10°C the growth is slow and becomes slower the colder it gets. The slowing of microbial activity with decreased temperature is the principle behind **Refrigeration** and **Freezing**.

3- Drying:

Microorganism in a healthy growing state may contain in excess of 80% water. They get this water from the food in which they grow. if water is removed from the food water will also be removed from bacterial cell and multiplication will stop. This process of preservation used since ages.

4- Sugar and Salt:-

Fruits are preserved by placing them in Sugar Syrup. Certain meat products are preserved by placing them brine solution. when bacteria, yeast and mold are placed in heavy sugar syrup or salt brine water in the cells move out through the membrane in the concentrated syrup or brine This causes Partial dehydration of bacterial cell referred to as **Plasmolysis**.

5- Chemicals.

Many chemicals kill or inhibit the growth of micro-organism but most of these are not permitted in food. A few that are permitted in prescribed low levels in certain food include. **Sodium benzoate, Sorbic acid Sodium and calcium propionate, ethyl formate, Sulphur dioxide**. Surface of cheese Treated with Sorbic acid. Sorbic acid is effective in preventing Mold.

Q#4-a- What is Vaccine? Elaborate the different types of vaccines?

Ans: **Vaccine:-**

A vaccine is a biological preparation that improves immunity to a particular disease. A vaccine typically contains an agent that resembles a disease causing micro-organism and is often made from weakend or killed forms of the microbe, its toxins or one of its suface proteins.

The agent stimulates the body's immune system to recognize the agent as foreign, destroy it and remember it, so that the immune system can more easily recognize and destroy any of these microorganism that it later encounter.

⇒ **Types of Vaccine:**

Following are the different types of vaccine

1- Attenuated vaccine:

It is a vaccine created by reducing the virulence of a pathogen but still keeping

viable. It can still provoke an immune response

Example: Vaccines for measles, Mumps and Rubella (MMR) are attenuated vaccines

2- Killed (inactivated):

It is a vaccine consisting of either whole viruses or bacteria, or fractions of either that have been grown in culture and then killed using physical and chemical method

Example: IPV (inactivated Polio virus) vaccine

3- Toxoid Vaccines:

It contain an inactivated toxin produce by the bacterium. The immune response is targeted to the toxin instead of the whole germ.

Example: Vaccines for Diphtheria and Tetnus are toxoid vaccines.

4- Conjugate Vaccine:

It is a type of vaccine which combines a weak antigen as a carrier so that the immune system has a stronger response to the weak antigen

Example: Haemophilius Influenza Type b or Hib contain parts of bacteria combined with Protein.

Q#4-b- Show diagrammatically, how an ionic and covalent bond is formed?

Ans: **Ionic Bond:**

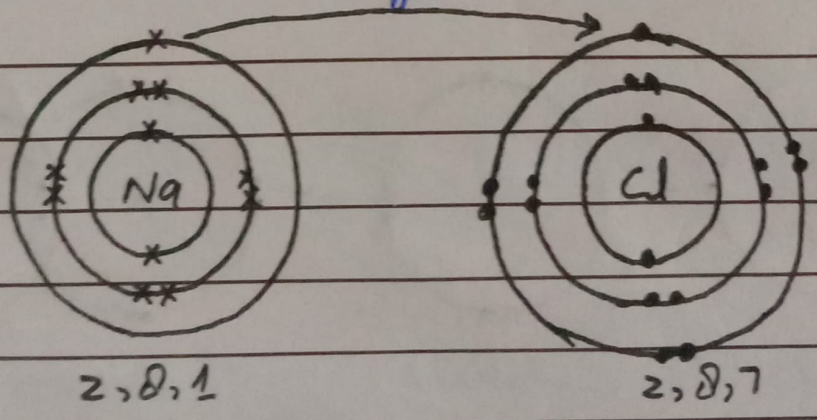
The electrostatic force of attraction between oppositely charged ions result in the formation of ionic bond or electrovalent bond.

Bond Formation:

Lets take an example of sodium chloride (NaCl)

- The sodium ion has the electronic structure $[2,8]^+$, same as that of neon.
- The chloride ion has the electronic structure $[2,8,8]^-$, same as that of Argon.

Dot and Cross Diagram



Both sodium and chlorine to attain nearest noble gas electronic configuration forms bond

sodium loses its electron and becomes positive ion while chlorine accept this electron and becomes negative ion.

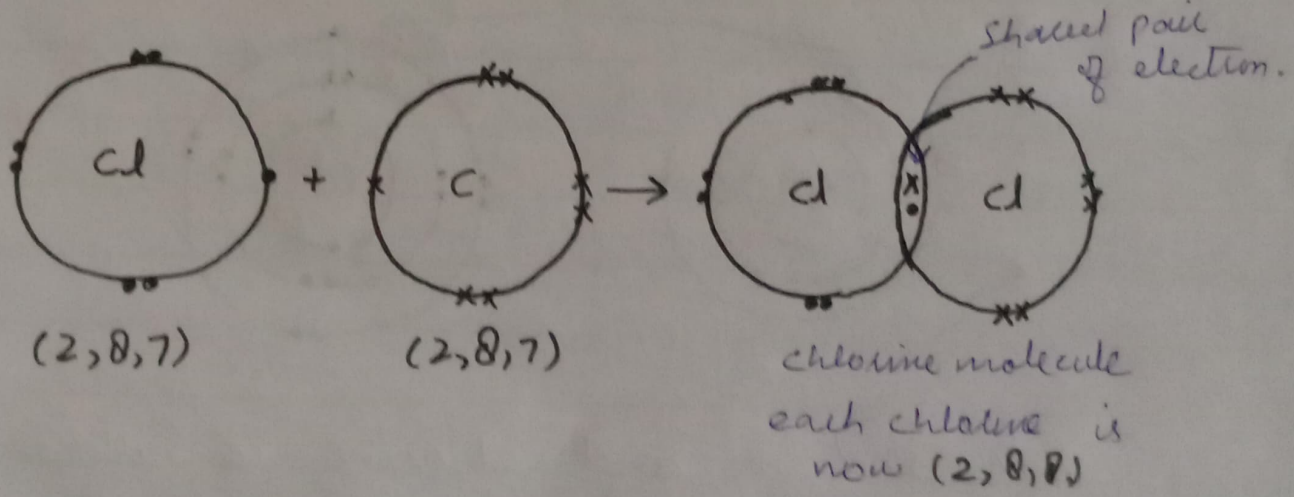
2- Covalent Bond:-

It is a chemical bond that involves the sharing of electrons between atoms.
when two non-metal atoms combine, they share one, or more pairs of electron.
A single covalent is represented by single line. Double covalent bond represented by double line and Triple with Triple line.

Bond Formation:

Lets take an example of chlorine. It exist as diatomic gas. when chlorine atom combines not all the electron pair take part in bond formation. The electron pair not used in bonding are called **Lone pair.**

Dot and cross diagram:



Q#NO6 - i)

Sol: Present age of son = 30 year

Present age of Father = x.

5 years ago age of Father = $x-5$

5 years ago age of son = $30-5$

~~thrice~~

Sol: $x-5 = 30-5$

~~$x-5$~~

Father age was thrice of son's age

$$x-5 = 3(30-5)$$

$$x-5 = 3(25)$$

$$x-5 = 75$$

$$x = 75+5$$

$$\boxed{x = 80}$$

Hence:

The current age of the Father is 80.