



Diffusion is insufficient to meet oxygen requirement of multicellular organism because:

- a. Diffusion is a very slow process
- b. All the part of body of multicellular organism is not exposed to environment.

✓ Criteria of life- **(i) Growth (ii) Molecular Movement**

✓ Nutrition- The process in which an organism takes in food, utilizes it to get energy, for growth, repair and maintenance, etc. and excretes the waste materials from the body.

Types of nutrition

1. Autotrophic nutrition (Auto =self: trophos = nourishment) E.g. Plants, Algae, blue green bacteria.

Process – Photosynthesis(Photo=light; Synthesis= to combine)

Raw materials- (i) Carbon dioxide (ii) Water

Equation- $\text{6CO}_2 + 6\text{H}_2\text{O} \xrightarrow[\text{Chlorophyll}]{\text{sunlight}} \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$

- o Factors- (i) Carbon dioxide (ii) Water(iii) Light (iv) Temperature

Events/ Steps of photosynthesis-

Light dependent Phase	Light Independent Phase
(i) Absorption of light energy by chlorophyll (ii) Conversion of light energy to chemical energy & Splitting of water molecule into Hydrogen & oxygen	Reduction of Carbon dioxide to Carbohydrate

End Product of Photosynthesis: Glucose ($\text{C}_6\text{H}_{12}\text{O}_6$)

By product – Oxygen

Stomata: It is tiny aperture present on dorsal surface of leaf in the epidermis.

Structure: Made up of pair of Guard cells, surrounded by epidermal cells

Opening and closing of stomata:

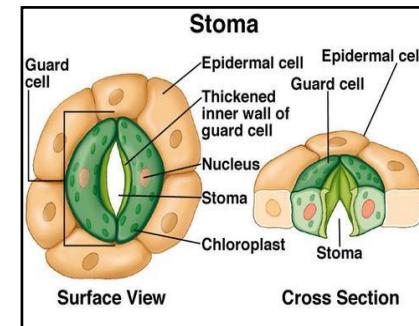
Guard cells absorb water, becomes turgid and stomata opens.

Closing of Stomata:

Guard cells lose water, becomes flaccid and stomata closes.

Function of Stomata:

- a. Transpiration: Loss of water vapour from leaves
- b. Exchange of Gases between environment and leaf .



2. Heterotrophic nutrition (Hetero =others: trophos = nourishment) Eg. Animals, plants lacking chlorophyll like fungi.

(a) **Saprophytic nutrition:** Organisms feeds on dead decaying plants or animals material. E.g. Fungi, Bacteria

(b) **Parasitic nutrition:** Organisms obtain food from the body of another living (host)

o **Endoparasite** lives inside the body of the host e.g. tapeworm, roundworm.

o **Exoparasite** : lives on the body of the host. E.g. lice, leech.

Note- The parasite benefits while the host is usually harmed e.g. **Cuscuta**-plant parasite (**amar bel**), plasmodium (malarial parasite).

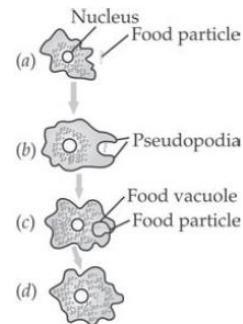
(c) **Holozoic nutrition:** Organism (mostly animals) take in whole food and then digest it into smaller particles with enzyme. Eg. Amoeba, Paramecium. Animals, human beings.

Steps in Holozoic nutrition

- (i) Ingestion: taking in of food.
- (ii) Digestion: breaking down of complex food into simpler, absorbable form.
- (iii) Absorption and Assimilation: Utilization of digested food from the body.
- (iv) Egestion: Removing undigested food from the body

Nutrition in Amoeba:

Amoeba fuses its pseudopodia over food and engulfs it by endocytosis. The lysosomes break down the food in vacuole and makes it absorbable. The undigested food is thrown out by exocytosis.



- **Amoeba and Paramecium shows holozoic nutrition but paramecium ingests food from a fixed spot whereas Amoeba can ingest from any part of its cellular body.**

Nutrition in human beings

Alimentary canal-

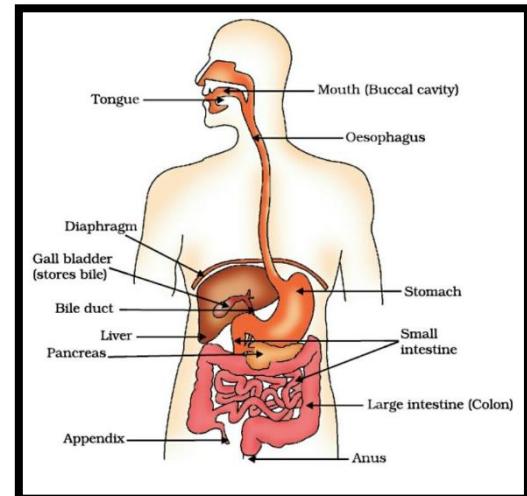
Mouth → Oesophagus → Stomach → Small intestine
→ Large intestine

Important gland;
Salivary gland

Liver: Largest Exocrine gland of the body.

It Secretes Bile which **contains no Enzyme but is very important because:**

- a. It emulsifies the fat globules
- b. It provides alkaline medium at small intestine for functioning of digestive enzymes.



Summary of digestive enzymes and Glands in Human :

Organ	Gland	Enzyme/Juice	Function
Mouth	Salivary glands	Salivary Amylase	Converts starch into sugar
Stomach	Gastric glands	Gastric juice- (i) Hydrochloric acid (ii) Pepsin (iii) Mucus	(a) Kills harmful bacteria that enters with the food. (b) Makes the medium alkaline for the action of Pepsin Digests proteins Protects the inner lining of the stomach from the corrosive action of Hydrochloric acid.
Small intestine	1) Liver 2) Pancreas	(i) Bile juice (ii) Pancreatic Juice ▪ Amylase → ▪ Trypsin → ▪ Lipase →	(a) Makes the medium acidic for the action of Pancreatic enzymes. (b) Breaks down large fat molecules into smaller globules so that enzymes can act upon them. Converts Carbohydrates to glucose Converts Proteins to Amino acids Converts Fats into Fatty acids & Glycerol

Peristaltic movements- Rhythmic contraction of muscles of the lining of Alimentary canal to push the food forward.

Sphincter muscle- Helps in the exit of food from the stomach.

How Is Intestine designed for absorption of Food ?

Walls of small Intestine have **Villi- Small finger like projections that increase the surface area for the absorption of food.**

Large intestine- absorption of water.

Intestine of Carnivores is shorter than Herbivores as herbivores eats grass that contains cellulose which contains more surface area to get digested.

Respiration- The process by which digested food is broken down with the help of Oxygen to release energy.

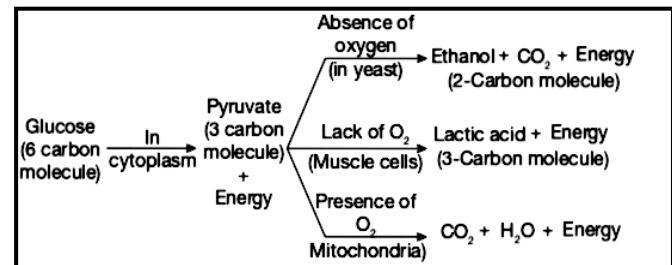
- Types of respiration- (i) **Aerobic respiration** (ii) **Anaerobic respiration**

Aerobic respiration

Anaerobic respiration

Comparison of aerobic and anaerobic respiration

	Aerobic respiration	Anaerobic Respiration	
		in animals	in plants and yeast
Oxygen required?	yes	no	no
Occurs in (part of the cell)	mitochondria	cytoplasm	cytoplasm
Glycolysis occurs	yes	yes	yes
ATP yield	38ATP/36NET	4ATP/2NET	4ATP/2NET
Glucose completely broke down?	yes	no	no
End products	CO ₂ and H ₂ O	Lactic acid	Ethanol and CO ₂



Some common features of Respiratory organs-

- (i) Large surface area- for greater rate of diffusion of respiratory gases.
- (ii) Thin permeable walls – to ensure easy diffusion & exchange of gases.
- (iii) Extensive blood supply- Respiratory organs are richly supplied with blood vessels for quick transport of gases.

Gaseous exchange in animals-

- Terrestrial animals- take Oxygen from the atmosphere.
- Aquatic animals- take Oxygen dissolved in water. (**Oxygen content is low in water, therefore they breathe faster.**)

Human Respiratory system-

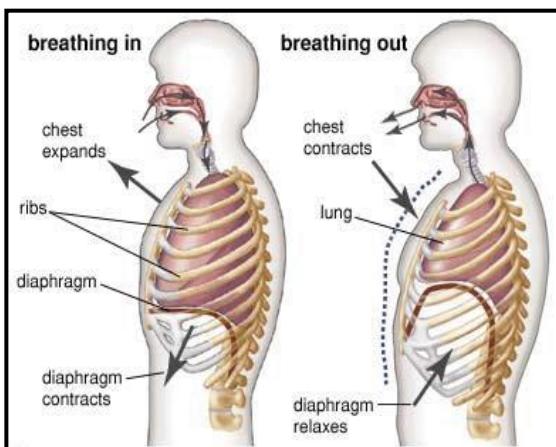
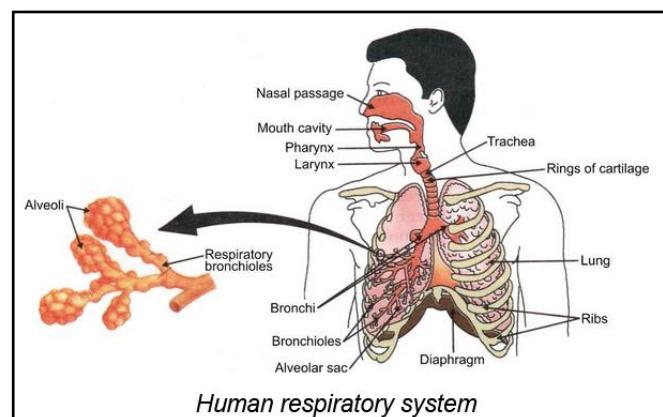
External nostrils → Nasal cavity → Trachea → Bronchi → Bronchioles → Alveoli

- **Rings of cartilage** present in the throat ensure that the trachea (air passage) does not

collapse when there is less air in it.

Respiration occurs in two phases:

- (i) External-Breathing, which is a mechanical process.
- (ii) Internal - Cellular respiration
 - ✓ Mechanism of breathing – It includes :
 - (i) Inhalation (ii) Exhalation



Inhalation: When we breathe in air, the muscles of the diaphragm contracts and moves downward and the chest cavity expands and air enters into the lungs.

Exhalation: When we breathe out air, the muscles of the diaphragm relaxes and moves upward and the chest cavity contracts and air goes out of the lungs.

Transport of Oxygen: Through Haemoglobin in Blood as OXYHAEMOGLOBIN

Transport of Carbon Di Oxide: Carbon dioxide is more soluble in water than Oxygen, so it Gets dissolves in blood and is thus transported.

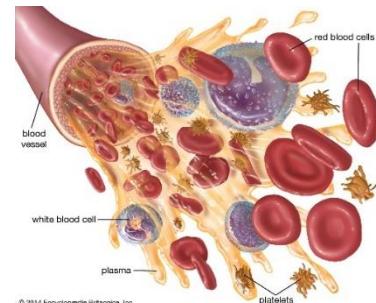
CO₂ is also transported as CARBAMINOHAEMOGLOBIN.

Transportation

Transportation in human beings-

Blood-

- (i) It is a fluid connective tissue.
 - (ii) **Components**- Fluid medium- Plasma, Red blood corpuscles, White blood corpuscles, Platelets suspended in plasma
 - (iii) Plasma transports food, Oxygen, Carbon dioxide, Nitrogenous wastes, etc.



Functions of blood-

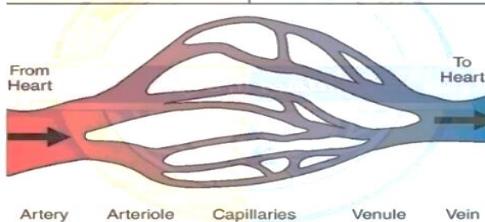
- (i) Transport of respiratory gases.
 - (ii) Transport of nutrients.
 - (iii) Transport of waste products.
 - (iv) Defence against infection

- ✓ Platelets- Plug the leaks of arteries and veins by clotting the blood.
 - ✓ **Lymph- Extracellular fluid similar to plasma but colourless with lesser protein.**

Function of lymph-

- (i) Transportation of digested & absorbed fats from the small intestine.
 - (ii) Drains excess fluid from the intercellular spaces back in the blood.

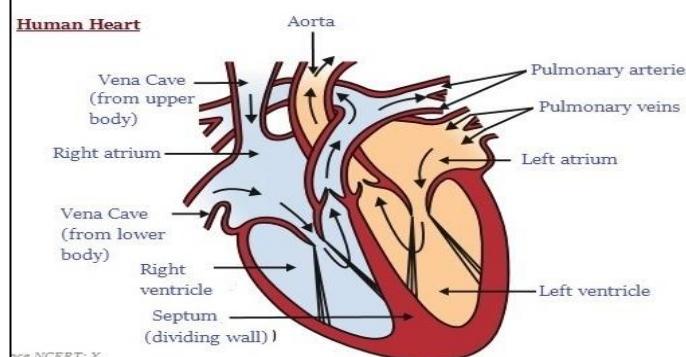
ARTERIES VERSUS VEINS	
Arteries	Veins
1. Carry blood from the heart, carry oxygenated blood (except pulmonary artery)	1. Carry blood to the heart, carry deoxygenated blood (except pulmonary vein)
2. Normally bright red in color	2. Normally dark red in color
3. Elastic walls that expand with surge of blood	3. Thin walls/less elastic
4. No valves	4. Valves



BP measuring apparatus = **SPHYGMOMANOMETER**

Blood Pressure = 120 mm Hg/ 80 mm Hg

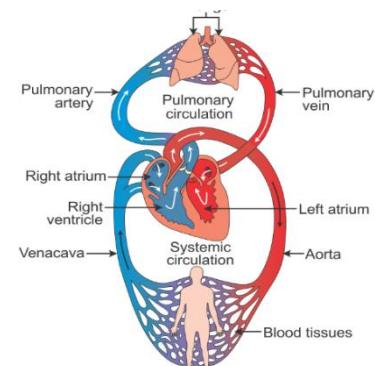
(Systolic/Diastolic)



Double circulation in Human-

because the blood passes through the heart twice in one complete cycle of the circulation.

- ✓ Higher animals- E.g., birds, mammals. (**Advantage**)
 - (i) Oxygenated blood & Deoxygenated blood are completely separate for efficient Oxygen supply.
 - (ii) This is to fulfil higher energy needs and to maintain body temperature (warm blooded animals).
 - ✓ Amphibians & reptiles- **have 3 chambered hearts** where little mixing of Oxygenated blood & Deoxygenated blood takes place. Therefore, their body temperature varies with the temperature of the environment. (cold blooded animals)



Transportation in plants

Transport of water

- (i) Takes place by xylem tissue present in roots, stem, leaves and is therefore interconnected.
 - (ii) Root cells take up ions from the soil, which creates a concentration difference between root and soil. Column of water therefore rises upwards.

(iii) In very tall plants- transpiration creates a suction pressure, which pulls the water upwards.

Transport of food-

- (i) Takes place by phloem tissue.
 - (ii) Movement of prepared food in plants is called translocation.

Food from the leaves is transferred to the xylem by the energy of ATP molecules. Due to osmotic pressure water enters the phloem and helps in the transport of food.

Excretion

Excretion- The biological process of removal of harmful metabolic wastes in living organisms.

- ✓ Excretion is the process by which the waste products produced during metabolic activities is removed from the body.
- ✓ In unicellular organism the waste products are removed from the cells into the surroundings by diffusion.
- ✓ In multicellular organisms the waste products are removed through specialised organs.

Habitat	Excretory Product
Aquatic	Ammonia
Terrestrial	Urea
Volant or Arial	Uric Acid

Function of Kidneys:

- Excretion or removal of Nitrogenous wastes.
- Osmoregulation or maintenance of water and ion content in Body.

THE HUMAN EXCRETORY

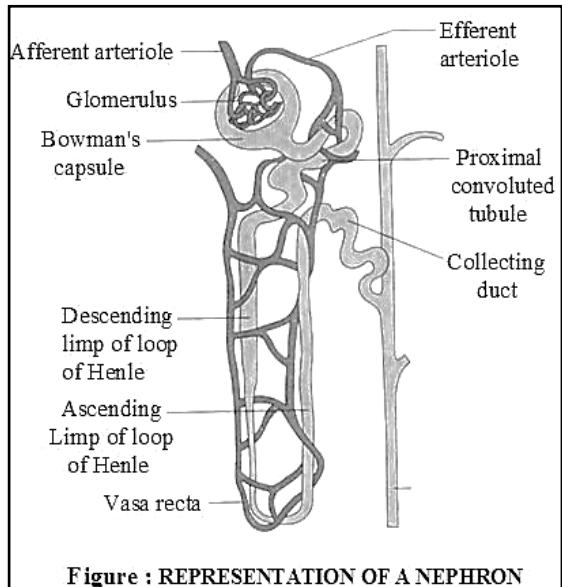
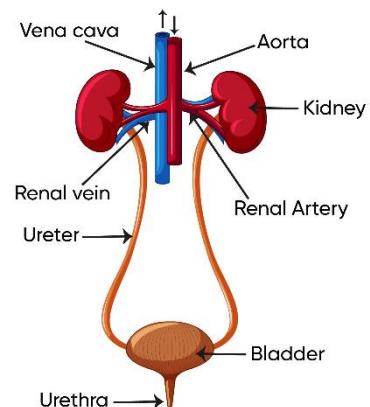


Figure : REPRESENTATION OF A NEPHRON

Mechanism of Urine Formation:

- ✓ **Ultrafiltration:** Blood flows through afferent arteriole and due to narrowness of efferent tubule, it gets **filtered at glomerulus**. Small volume of filtrates as urea, uric acid ,ammonia, amino acid, glucose, Na and K ions filtered out ($\text{Rate of filtration} = 125 \text{ ml/min i.e. } 180 \text{ lit/day}$)
- ✓ **Selective Reabsorption:** The PCT(Proximal Convolved Tubule) actively reabsorbs vital material as Amino acid, Glucose etc from Primary Filterate. Further at DCT, water is reabsorbed due to ADH or Vasopressin Hormone.
- ✓ **Tubular secretion:** Active secretion of wastes in kidney tubules to augment the urine.

ARTIFICIAL KIDNEYS = HAEMODIALYSIS