LIFE PROCESSES

Life Processes

For a living being it is necessary to perform basic functions for proper body functioning, so that it can prevent damage and breakdown of body and it's functions. These are basic functions performed by organisms to maintain life are known as life processes.

(L.P.) : What processes would you consider essential for maintaining life?

Four basic processes that are essential for maintaining life processes are-

1. Nutrition- it is the process of transferring source of energy(food) from outside to the body of an organism.
2. Respiration- it is the process of acquiring oxygen from outside into the body and using it for breaking down of glucose to release energy for cellular needs.
3. Transportation- it is process of carrying food and oxygen from one place to another.
4. Excretion- it is a process of removing by-products from body which are formed during energy generating reactions.

(L.P.) : Which are outside raw materials used by an organism?

arbon based molecules i.e food is used by body from outside to meet it's energy need. Oxygen is used to oxidise food and release energy. So food and oxygen are the basic raw materials used by an organism.

(L.P.) : Transportation system transports waste products then what is the need of excretory system?

Transportation system transports waste products away from cells but to discard it from the body to outside excretory system is needed.

(L.P.) : Name the process used by single celled organisms for ingestion of food, gaseous exchange and waste removal? Why is this process insufficient to meet the oxygen requirements in multicellular organisms?

Diffusion is the process used by single celled organisms to carry out basic life processes such as gas exchange, etc.

It is insufficient because multicellular organisms like humans have complex body designs and large body size. Thus they bear specialised cells and tissue for performing various tasks.

Unlike unicellular,multicellular organisms do not have the cells in direct contact with environment. Hence, diffusion cannot meet their oxygen requirements.

NUTRITION

It is the process of transferring source of energy(food) from outside to inside the body of an organism for maintaining living structure.

Modes of Nutrition:

1. AUTOTROPHIC NUTRITION

It is mode of nutrition in which organisms, mainly green plants manufacture their food by itself. This mode of nutrition is performed by organisms called autotrophs.

On the basis of sources of energy:

1. **Photosynthesis Autotrophs-** organisms which fulfil their carbon and energy requirements by process of photosynthesis using sunlight as a source of energy. Eg- Green plants.
2. **Chemosynthesis autotrophs-** organisms which utilise chemical energy to synthesize their organic materials(food). For eg- Bacteria

Kuch Kaam Ki Baat (K^3B) :

PHOTOSYNTHESIS

It is a complex process by which green parts of the plant synthesize organic food in the form of glucose form carbon-di-oxide and water in the presence of sunlight and chlorophyll.

Reaction-

$6CO_2 + 12H_2O \rightarrow C_6H_{12}O_6 + 6H_2O + 6O_2 \uparrow$

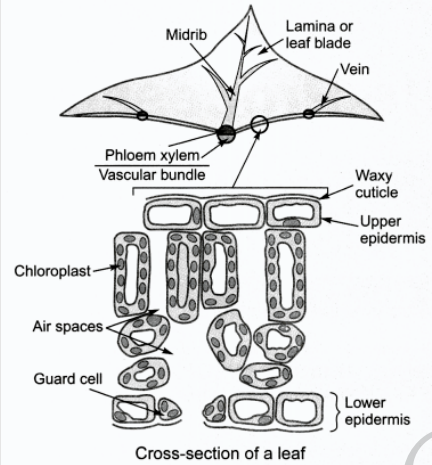
Carbohydrates (glucose) are utilised for providing energy to the plant. Remaining glucose which is not used are stored in form of starch that serves as reserved energy.

- **Leaves** are the major photosynthesis organs of a plant. Therefore, lets study about the INTERNAL STRUCTURE OF LEAF:

INTERNAL STRUCTURE OF LEAF

- Epidermis- outermost layer, parts-
- Upper epidermis- it is a single layer of transparent cells with no chloroplasts. It is covered by a waxy cuticle which protects internal leaf tissues by preventing excessive loss of water through transpiration.
- Lower epidermis- it contains stomata and helps in gaseous exchange and allows sunlight to pass in leaves.

- Stomata- these are tiny pores, mostly found in the lower epidermis of plants, which allows gases to enter and exit in the leaf more rapidly between plant and atmosphere.
- Guard cells- these are beans shaped cells that frame the stomatal opening. Hence, they control rate of diffusion of water and gases in and out of leaf.



Cross-section of a leaf

(L.P.) : How does the turgor pressure of guard cells regulate stomatal pore?

The turgor pressure of guard cells regulates the opening and closing of stomatal pores. The stomatal pores are open when guard cells are turgid due to absorption of water and get closed when guard cells are in flaccid condition due to loss of water.

 # Chloroplasts : The green coloured plastids contained in leaves are called chloroplasts. They are the site of photosynthesis as they contain green pigment called chlorophyll which traps solar energy from sun. They are just below upper epidermis. It is present as dot-like structure on leaves.

#Events of Photosynthesis :

- Absorption of light by chlorophyll.
- Conversion of light energy into chemical energy and splitting of water molecules into hydrogen and oxygen.
- Reduction of carbon dioxide to carbohydrates.

#Conditions Necessary for Photosynthesis:

(i) Sunlight- It affects the rate of photosynthesis by varying its intensity, quality, etc. Eg-

(a) Rate of photosynthesis is minimum when light is green.

(b) Rate of photosynthesis is maximum when light is red or blue.

(ii) Chlorophyll- Green colour photosynthetic pigment found in chloroplast that is responsible for trapping the solar energy from sun.

Lets do some activities for conditions necessary for photosynthesis.

NCERT ACTIVITY

(AASAN BHASHA MEI)

Activity to demonstrate that Chlorophyll is necessary for Photosynthesis

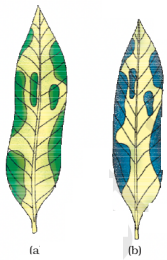


Figure 6.2
Variegated leaf (a) before and (b) after starch test

Activity 6.1

- Take a potted plant with variegated leaves – for example, money plant or crotons.
- Keep the plant in a dark room for three days so that all the starch gets used up.
- Now keep the plant in sunlight for about six hours.
- Pluck a leaf from the plant. Mark the green areas in it and trace them on a sheet of paper.
- Dip the leaf in boiling water for a few minutes.
- After this, immerse it in a beaker containing alcohol.
- Carefully place the above beaker in a water-bath and heat till the alcohol begins to boil.
- What happens to the colour of the leaf? What is the colour of the solution?
- Now dip the leaf in a dilute solution of iodine for a few minutes.
- Take out the leaf and rinse off the iodine solution.
- Observe the colour of the leaf and compare this with the tracing of the leaf done in the beginning (Fig. 6.2).
- What can you conclude about the presence of starch in various areas of the leaf?

Chalo Ab Ise AASAN BHASHA MEI Samajhte hai :

- *Take a potted plant with variegated leaves – for example, money plant or crotons.*
- *Keep the plant in a dark room for three days so that all the starch gets used up.*
- *Now keep the plant in sunlight for about six hours.*
- *Pluck a leaf from the plant. Mark the green areas in it and trace them on a sheet of paper.*
- *Dip the leaf in boiling water for a few minutes.*
- *After this, immerse it in a beaker containing alcohol.*
- *Carefully place the above beaker in a water-bath and heat till the alcohol begins to boil.*
- *Now dip the leaf in a dilute solution of iodine for a few minutes.*
- *Take out the leaf and rinse off the iodine solution.*
- *Observe the colour of the leaf and compare this with the tracing of the leaf done in the beginning .*

Question 1. What happens to the colour of the leaf? What is the colour of the solution?

Answer. The green leaf becomes colourless. On immersing green leaf in a alcohol, chlorophyll responsible for its green colour gets dissolves in alcohol. The colour of the alcohol solution turns green

Question 2. What can you conclude about the presence of starch in various areas of the leaf?

Answer. The green areas of leaf, which turns dark blue on dipping in iodine solution, indicate the presence of starch where as colorless part of leaf show no formation of starch. From this activity we can conclude that chlorophyll is essential for photosynthesis

NCERT ACTIVITY

(AASAN BHASHA MEI)

Activity to show that amount of Carbon Dioxide (CO2), essentially affects the process and outcome of Photosynthesis

Activity 6.2

- Take two healthy potted plants which are nearly the same size.
- Keep them in a dark room for three days.
- Now place each plant on separate glass plates. Place a watch-glass containing potassium hydroxide by the side of one of the plants. The potassium hydroxide is used to absorb carbon dioxide.
- Cover both plants with separate bell-jars as shown in Fig. 6.4.
- Use vaseline to seal the bottom of the jars to the glass plates so that the set-up is air-tight.
- Keep the plants in sunlight for about two hours.
- Pluck a leaf from each plant and check for the presence of starch as in the above activity.
- Do both the leaves show the presence of the same amount of starch?
- What can you conclude from this activity?

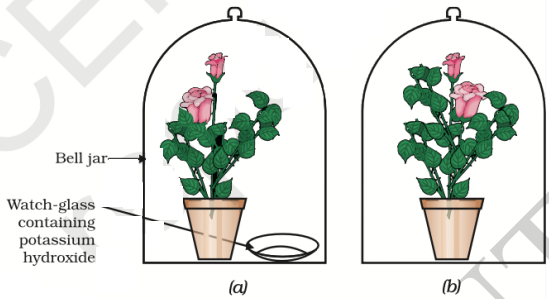


Figure 6.4 *Experimental set-up (a) with potassium hydroxide (b) without potassium hydroxide*

Chalo Ab Ise AASAN BHASHA MEI Samajhte hai :

- *Take two healthy potted plants which are nearly the same size.*
- *Keep them in a dark room for three days.*
- *Now place each plant on separate glass plates. Place a watch-glass containing potassium hydroxide by the side of one of the plants. The potassium hydroxide is used to absorb carbon dioxide.*
- *Cover both plants with separate bell-jars as shown in Fig. .*
- *Use Vaseline to seal the bottom of the jars to the glass plates so that the set-up is air-tight.*
- *Keep the plants in sunlight for about two hours.*
- *Pluck a leaf from each plant and check for the presence of starch as in the above activity.*

Question 1. Do both the leaves show the presence of the same amount of starch?

Answer. No, both the leaves do not show the presence of the same amount of starch, because in photosynthesis starch is produced using sun light, chlorophyll and CO2. In first set up availability of CO2 will be less for making starch by the plant leaves, as potassium hydroxide (KOH) absorb the CO2. In second plant setup, the leaves will have more amount of starch.

Question 2. What can you conclude from this activity?

Answer. From this activity, we can conclude that amount of Carbon Dioxide (CO2) , essentially affects the process and outcome of photosynthesis.

 # Raw materials required for photosynthesis:

- CO2 – It is taken up through stomata from the atmospheric in case of land plants ,while in aquatic plants take up CO2 dissolved in water.
- Water- it is taken up by the roots through the process of osmosis and its transported to the leaves by xylem vessels.
- Other Materials- Nitrogen, Iron and Magnesium are also required for photosynthesis taken up from soil.

#Significance of Photosynthesis:

It not only sustains plants but indirectly provides nutrition and oxygen to other organisms as well as it provides→

a) Food- green plants synthesize food from raw materials for themselves and other organisms and thus sustain life on earth.

b) Oxygen- In process of photosynthesis, oxygen releases in air which is used by other organisms.

(L.P.) : Is 'nutrition' a necessity for an organism? Discuss.

All the living organisms ned energy to perform various life processes. They get enery from nutrition i.e. food. Thus, it is the basic requirement of all organisms. It is needed because-

1. It provides energy to perform various metabolic processes in body.
2. It is essential for growth of new cells and repair of worn out cells.
3. It is needed to develop resistance against various diseases. Therefore, nutrition is a necessity for an organism.

(L.P.) :Draw a well labelled diagram of stomata. List of two functions of stomata.

1. Allow the loss of water from surface of leaves(transpiration).
2. Allow the exchange of gases i.e. intake of carbon-di-oxide and release of oxygen during photosynthesis.

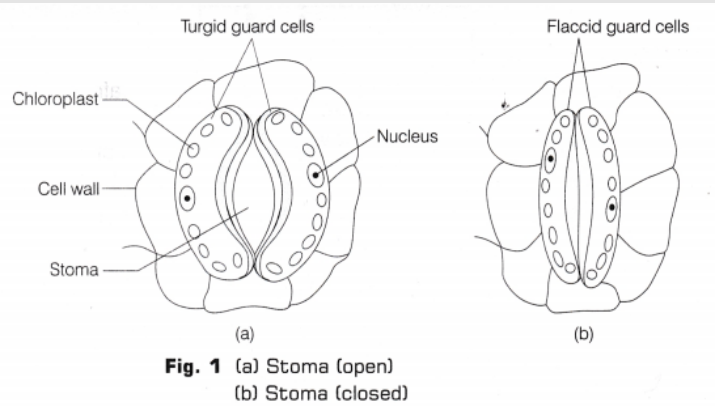


Fig. 1 (a) Stoma (open) (b) Stoma (closed)

1. HETEROTROPHIC NUTRITION

In this mode of nutrition, organisms can't prepare their own food on their own.They instead obtain from other organism. Types:

1. **Holozoic Nutrition-** complex food molecules are taken in and then broken down into simpler and soluble molecules in this type of nutrition. Eg- Amoeba, human being, herbivores, carnivores and omnivores posses this mode of nutrition.
2. **Saprophytic Nutrition-** In this, organism usually feed upon dead and decay organic matter, breaking down complex material outside body and absorb it. Eg- Fungi,Yeast,etc.
3. **Parasitic Nutrition-** In this organism live either on or inside the body of organism(host) to obtain nutrition without killing them. Eg- amarbel.

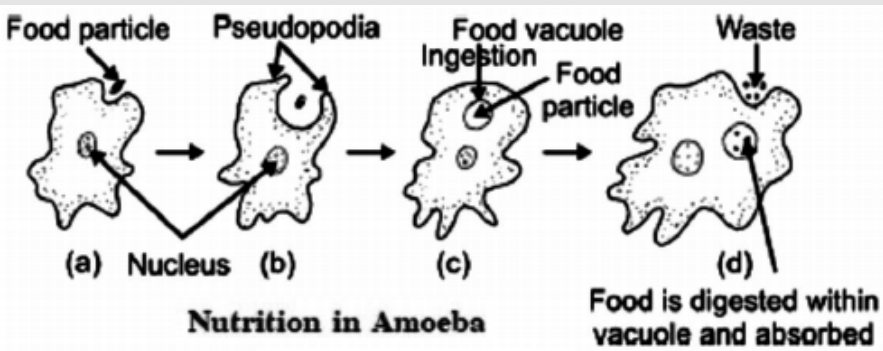
Kuch Kaam Ki Baat (K^3B) :

NUTRITION IN AMOEBA

Amoeba is a unicellular organism that does not possess specialised organs for the process of nutrition. Mode of nutrition is holozoic and takes place with the help of pseudopodia.

PROCESS:

- Ingestion: pseudopodia engulfs the food comes in contact with it's cell surface and form food vacuole. This process is called ingestion.
- Digestion: it is intracellular (takes place inside the cell) in Amoeba. Inside the food vacuole, complex food is broken down into small soluble molecules.
- Absorption: Small soluble molecules are then readily absorbed by cytoplasm. This process is called Absorption.
- Assimilation: the absorbed food is farther assimilated by amoeba to use energy for growth.
- Egestion: the undigested food material is removed by cell membrane which ruptures suddenly at any place and eliminated out the undigested food which is known as egestion.



Nutrition in Amoeba

NUTRITION IN HUMAN BEINGS

Digestion is a catabolic process in which complex and large components of food are broken down into simpler and smaller forms with help of enzymes. These simpler parts are taken by different parts of body and absorbed. Entire system is known as digestive system.

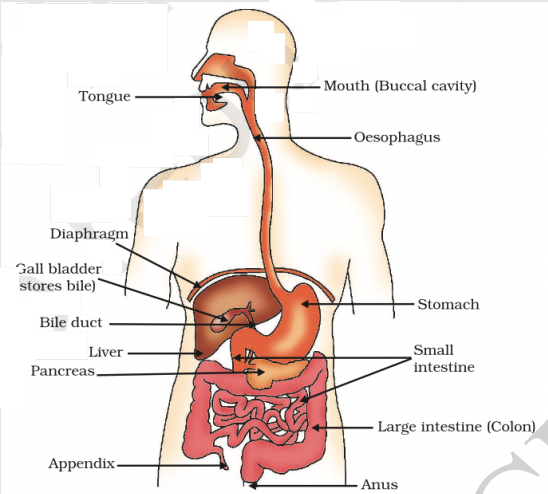


***Figure 6.6** Human alimentary canal*

(L.P.) :Why herbivores have long small intestine while carnivores have shorter ones?

Herbivores have longer small intestine to facilitate cellulose digestion. Cellulose is not digested by human alimentary canal as there is no digestive enzyme that can act upon cellulose. Carnivores have shorter length of small intestine as meat is easily digestible.

NCERT ACTIVITY

(AASAN BHASHA MEI)

Activity 6.3

- Take 1 mL starch solution (1%) in two test tubes (A and B).
- Add 1 mL saliva to test tube A and leave both test tubes undisturbed for 20-30 minutes.
- Now add a few drops of dilute iodine solution to the test tubes.
- In which test tube do you observe a colour change?
- What does this indicate about the presence or absence of starch in the two test tubes?
- What does this tell us about the action of saliva on starch?

Chalo Ab Ise AASAN BHASHA MEI Samajhte hai :

- *Take 1 mL starch solution (1%) in two test tubes (A and B).*
- *Add 1 mL saliva to test tube A and leave both test tubes undisturbed for 20–30 minutes.*
- *Now add a few drops of dilute iodine solution to the test tubes.*

Question 1. In which test tube do you observe a colour change?

Answer. We will observe a colour change in test tube B, showing presence of starch. Where as test tube A will show no colour change as due to addition of saliva, starch is converted into sugar.

MECHANISM OF DIGESTION OF FOOD

- **Ingestion**- it means taking in food into mouth or buccal cavity. As the food enters the mouth it is moistened by saliva and moved around in mouth in order to make chewing and swallowing easy by tongue. Food is converted to small particles by teeth.
- **Digestion**- as food is complex in nature, so it is converted into it's simpler form by the action of biological catalyst called enzymes. This process of breaking down of large organic molecules (like carbohydrates) to small molecules (like simple sugar) is called digestion.
- **Absorption**- it is the process by which digested food passes from alimentary canal into the blood. All the digested food is taken up by walls of intestine. The inner surface of small intestine has numerous villi and lacteals which increase the surface area of intestine and helps in absorption of digested food.
- **Assimilation**- it is the process of distribution of digested food products to various cells of the body for their utilisation in various metabolic processes. The villi in small intestine are richly supplied with blood vessels which take the absorbed food to each and every cell of body to building new cells or repair the older ones.
- **Egestion**- the process of elimination of undigested food formed in the color of the large intestine through anus is called egestion.

PERISTALTIC MOVEMENT

Contraction and expansion of muscles of the oesophagus to push the food forward.

TABLE : SUMMARY OF DIGESTION ENZYMES OF VARIOUS GLANDS WITH THEIR SECRETIONS AND END PRODUCTS OF DIGESTION IN MAN

S.No.	Name of gland	Secretion	Site of action	Enzymes	Food acts upon	End product
1	Salivary glands	Saliva	Buccal cavity	Salivary amylase	Starch	Maltose
2	Gastric glands	Gastric Juice	Stomach	Pepsin	Proteins	Peptones & proteoses
				Renin	Casein of milk	Paracasein
		HCl	Stomach	—	Pepsinogen	Pepsin
3	Liver	Bile	Duodenum	—	Fats	Emulsification of fats
4	Pancreas	Pancreatic Juice	Duodenum	Amylase Trypsin Lipase	Starch & Glycogen Proteins Emulsified fats	Maltose & Isomaltose Peptones & peptides Fatty acids & glycerol
5	Intestinal glands	Intestinal Juice	Samall intestine	Erepsin Maltase Sucrase Lactase Lipase	Peptones & Peptides Maltose Sucrose Lactose Triglycerides	Amino acids Glucose Glucose & fructose Glucose & galactose Monoglycerides & fatty acid
		Mucous	Large intestine	—	Lubrication of faecal matter	—

(L.P.) :Differentiate between autotrophic and heterotrophic nutrition?

Autotrophic Nutrition	Heterotrophic Nutrition
(i) In this mode of nutrition, food is prepared by organism itself.	(i)In this mode of nutrition, food is obtained from other organisms.
(ii) Raw material is required to make food.	(ii)Raw material is not required.
(iii) Chlorophyll is present in autotrophs for trapping sunlight.	(iii)It is absent.
(iv) They are known as producers.	(iv)They are known as consumers

Tooth Decay :

The tooth decay in mouth occurs due to formation of a plaque. It occurs when bacterial cells act upon the food particles, containing sugars and produce acids that soften the enamel.

Brushing of teeth after eating is one of the treatment.

(L.P.) : What happens if mucus is not secreted by the gastric glands?

If mucus is not secreted by gastric glands, it will lead to the destruction of inner lining of stomach causing acidity and ulcer by HCL.

(L.P.) : A patient in hospital had his gall bladder removed and needs a special diet. Which nutrient free diet would be suitable for this patient?

The diet free from fat would be suitable for the patient whose gall bladder is removed because bile stored in gall bladder helps in the digestion of fat.

(L.P.) : Function of digestive enzymes?

It helps to breakdown large and insoluble food molecules into small water soluble molecules.

Eg- Amylase breakdown, starch and trypsin breakdown, protein and form maltose and peptones.

(L.P.) : How are fats digested in our bodies? Where does this process take place?

The small intestine is site of the complete digestion of fats. The upper part of small intestine receives bile juice from bileduct which contains bile salts for breakdown of fats into smaller globules thereby increasing the efficiency of the enzyme action. This process is known as emulsification. Bile also makes medium alkaline so that pancreatic lipase further converts fats into fatty acids and glycerol. The walls of small intestine also secrete intestinal juice containing enzyme called lipase that finally convert the fats into fatty acids and glycerol. Thus completing fat digestion.

(L.P.) :How is small intestine designed to absorb digested food?

OR

Why does absorption of digested food occur mainly in small intestine?

Maximum absorption of digested food occurs in small intestine due to following reasons-

1. Digestion is completed in small intestine.
2. Inner lining of small intestine is provided with villi which increases the surface area for better absorption.
3. Wall of intestine is richly supplied with blood vessels which take the absorbed food to each and every cell.

RESPIRATION

It is the process by which food is oxidised to release energy. For this oxygen is required from outside of the body to breakdown the food.
The organic substances undergoing oxidative breakdown during respiration are called respiratory substances. Eg- Glucose

Types of Respiration:

1) **Aerobic Respiration:** It is described as the process in which fairly large amount of energy is released in the presence of oxygen from the breakdown of food substances.

Glucose → Pyruvate + Energy → $6CO_2 + 6H_2O + 38$ ATP

$C_6H_{12}O_6$ → $6CO_2 + 6H_2O$ + Energy

- This process starts in cytoplasm and continues in the mitochondria of cell. Each glucose molecule releases 38 ATP molecules. Water and Glucose are waste products. The energy released is utilised in other life processes.

2) **Anaerobic Respiration:** it is described as the respiratory process in which small amount of energy is released in absence of oxygen from breakdown of food substances. It takes place in yeast, bacteria and in human muscles. Only 2 molecules of ATP is released.

Types:

i) **Alchoholic fermentation-** it is the process of incomplete breakdown of sugar into ethanol, and CO_2 to release energy. This process occurs mainly in yeast which is used to producd beer, urine, etc. Equation-

Glucose → Pyruvate + Energy → 2Ethanol + $2CO_2$ + 2ATP

ii) **Lactic Fermentation-** it is process of incomplete breakdown of sugar into lactic acid + energy in some bacteria and in our muscle cells.

Kuch Kaam Ki Baat (K^3B) :

In our muscles during vigorous exercise glucose is metabolised to form lactic acid and then fatigue and muscle cramp occur. This usually takes place when small amount of ATP stored in muscles is used up for immediate need of energy.

Glucose (6C) $\xrightarrow{\text{In cytoplasm}}$ Pyruvate (3C) + Energy $\xrightarrow[\text{in muscle cells}]{\text{lack of } O_2}$ Lactic acid + 2ATP

Overall process of breakdown of glucose in both aerobic & anaerobic respiration :-

Glucose (6C)
↓ in cytoplasm
Pyruvate (3C) + Energy
- $\xrightarrow[\text{in yeast}]{\text{Absence of } O_2}$ Ethanol + CO_2 + Energy (2ATP)
- $\xrightarrow[\text{in muscle cells}]{\text{lack of } O_2}$ Lactic acid + Energy (2 ATP)
- $\xrightarrow[\text{in mitochondria}]{\text{presence of } O_2}$ $CO_2 + H_2O$ + Energy (38 ATP)

NCERT ACTIVITY

(AASAN BHASHA MEI)

Activity 6.4

- Take some freshly prepared lime water in a test tube.
- Blow air through this lime water.
- Note how long it takes for the lime water to turn milky.
- Use a syringe or *pichkari* to pass air through some fresh lime water taken in another test tube (Fig. 6.7).
- Note how long it takes for this lime water to turn milky.
- What does this tell us about the amount of carbon dioxide in the air that we breathe out?

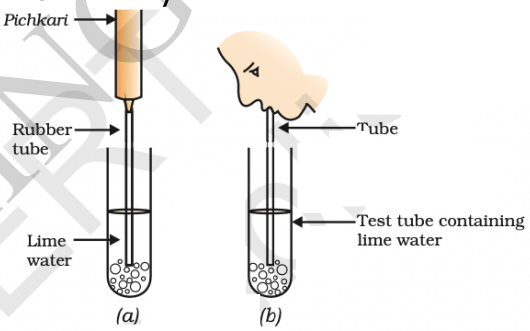


Figure 6.7
(a) Air being passed into lime water with a pichkari/ syringe, (b) air being exhaled into lime water

Chalo Ab Ise AASAN BHASHA MEI Samajhte hai :

- *Take some freshly prepared lime water in a test tube.*
- *Blow air through this lime water.*

Question 1. Note how long it takes for the lime water to turn milky?

Answer. When we blow air through mouth, the lime water in test tube turns milky within no time. Use a syringe or pichkari to pass air through some fresh lime water taken in another test tube.

Question 2. Note how long it takes for this lime water to turn milky?

Answer. When we use syringe or pichkari, to pass air through the lime solution, it takes much time and effort to turn the lime water milky.

Question 3. What does this tell us about the amount of carbon dioxide in the air that we breathe out ?

Answer. This indicates that the amount of carbon dioxide in the air that we breathe out is much more as compared to normal air outside.

NCERT ACTIVITY

(AASAN BHASHA MEI)

Activity 6.5

- Take some fruit juice or sugar solution and add some yeast to this. Take this mixture in a test tube fitted with a one-holed cork.
- Fit the cork with a bent glass tube. Dip the free end of the glass tube into a test tube containing freshly prepared lime water.
- What change is observed in the lime water and how long does it take for this change to occur?
- What does this tell us about the products of fermentation?

Chalo Ab Ise AASAN BHASHA MEI Samajhte hai :

- *Take some fruit juice or sugar solution and add some yeast to this. Take this mixture in a test tube fitted with a one-holed cork.*
- *Fit the cork with a bent glass tube. Dip the free end of the glass tube into a test tube containing freshly prepared lime water.*

Question 1. What change is observed in the lime water and how long does it take for this change to occur?

Answer. The lime water becomes milky as carbon dioxide is produced by mixing yeast in sugar along with alcohol. Time taken for this change to occur, should be observed by students themselves.

Question 2. What does this tell us about the products of fermentation?

Answer.The products of fermentation are alcohol and carbon dioxide.

(L.P.) :Differentiate between aerobic and anaerobic respiration.

Aerobic Respiration	Anaerobic respiration
1. It occurs in presence of oxygen.	1. It occurs in absence or lack of oxygen.
2. Energy is released in large amount. (38 ATP)	2. Energy is released in relatively small amount. (2 ATP)
3. Eg- most of plants and animals.	3. Eg- anaerobic bacteria, yeast.

(L.P.) : Name the energy currency in the living organism. When and where it is produced?

ATP (Adenosine Triphosphate) is the energy currency of cell as it provide energy for doing functions of cells and other organs. It is produced in mitochondria of cell during respiration in the living organisms.

Different stages of respiration

1. **External breathing-**

a)**Breathing-** it is process of taking in required gas and giving out unrequired gases. It has two types inhalation and exhalation. For eg- human beings, takes in O2 and gives out CO2.

b)**Exchange of gases-** it involves diffusion of O2 from lungs to blood and CO2 from blood to lungs. In plants, gaseous exchange takes place through stomata of leaf with the environment.

1. **Internal breathing-** it is gaseous exchange between arterial blood and cells.

(a)**Cellular respiration-** it is process of breakdown of glucose on other respiratory substrate in the cell to produce energy for performing various functions.

(L.P.) : Respiration is a catabolic process. Justify the statement.

It is a catabolic process because it involves the breakdown of complex organic molecule i.e. glucose into pyruvate and further breakdown into carbon dioxide and water with release of energy.

(L.P.) : Anaerobic respiration plays and important role in process of bread making. Discuss the statement.

During bread making, yeast is mixed with dough where it undergoes anaerobic respiration partially oxidising the starch of flour into CO2 + ethanol. CO2releases in this process causes dough to rise and makes bread fluffy. This shows that it is important.

(L.P.) : Compare alcohol and lactic fermentation.

In alcohol fermentation, pyruvate is breakdown into ethanol and CO2 with release of energy. Whereas in lactic fermentation pyruvate is breakdown into lactic acid with release of energy.

Respiration in Plants

Lallu Problem (L.P.) : Diffusion acts as the process of gaseous exchange. Write the factors on which it depends.

Factors-

1. Conditions of the environment.
2. Requirements of the plant.

Lallu Problem (L.P.) : Which structures are responsible for the gaseous exchange in the stem of a woody plant?

Gaseous exchange occurs trough small pores called lenticles in stem of woody plant.

Lallu Problem (L.P.) : Explain the structures of a plant that are involved in the process of respiration.

1. Roots- the exchange of gases (respiration) in roots of a plant takes place by process of diffusion.
2. Stems- in herbaceous plants stomata helps in respiration and in woody plants, respiration takes place through tiny pores called lenticles.
3. Leaves- respiration takes place by diffusion of oxygen through stomata into cells of leaf and CO_2 released from same stomata into atmosphere.

Lallu Problem (L.P.) : Green plants fails to photosynthesis at night while respiration occurs during the daytime as well as night. Justify the statement.

During night, the process of photosynthesis does not occur in green plants due to absence of sunlight. But respiration keep on going, plant take O_2 and give out CO_2in night while in daytime CO_2 is utilised for photosynthesis.

Lallu Problem (L.P.) : Land plants cannot survive for a long time without water. Do you agree? If yes, justify the statement.

Yes, land plants extend to die when their roots water logged for longer time. This happen because O_2 present in soil is not available to perform aerobic respiration. The roots starts anaerobically alcohol which can kill the plant.

Lallu Problem (L.P.) : What happens to the waste products of respiration generated in a plant?

1. Water- it is usually used for photosynthesis in leaves, as a solvent for transport of mineral salts and nutrients.
2. CO_2- it diffuses out of the plant tissues into surrounding during night. During day time, it is used by the plants in photosynthesis.

Mechanism of gaseous exchange in humans

The phenomenon of taking in oxygen is termed as inspiration and of giving out carbon-di-oxide is termed as expiration.

Breathing or gaseous exchange in human involves three steps-

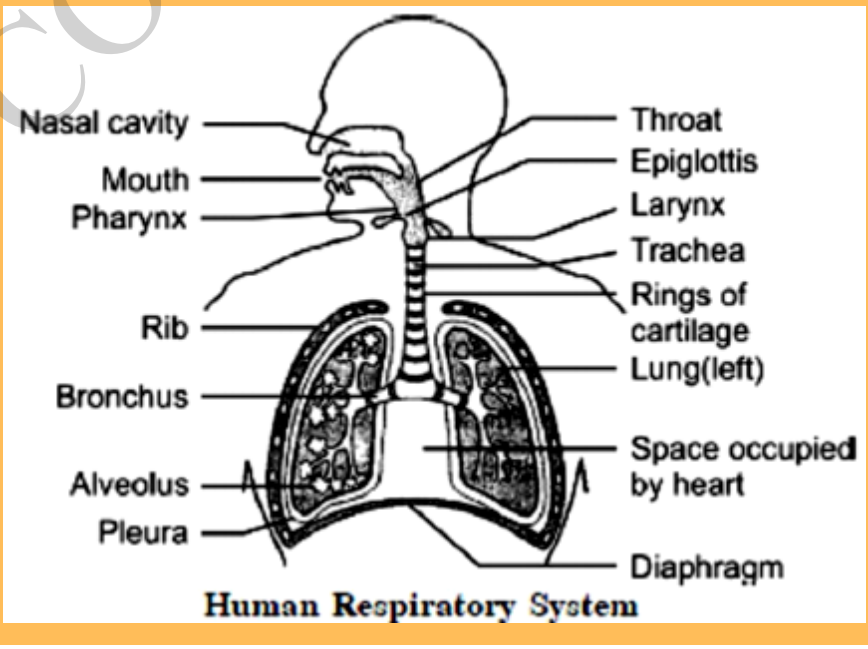
1. **Inhalation-** when we breathe in, air passes through trachea and ribs move up and flatten the diaphragm due to which the chest cavity becomes larger. As a result, air is sucked into the lungs and fills the expanded alveoli.
2. **Gaseous Exchange-** haemoglobin binds with the oxygen and carries along it along the blood in the body. As the blood passes through the tissue of the body, oxygen from the blood diffuses into the cell, and CO2 which is produced as waste products during respiration diffuses into blood and is carried back to lungs for expiration.
3. **Expiration-** Ribs moves down and diaphragm becomes dome-shaped decreasing the chest cavity. Thus, pushing the air out from lungs.

Complete Pathway-

Nostrils→Nasal passage→ Pharynx→Larynx→Trachea→lungs→bronchi→ bronchioles→Alveoli→blood→cells.

Parts:

1. **Trachea-** the air passes from it. Rings of cartilage keep trachea open allowing the passage of air to lungs and also prevent it from collapsing when there is not air in it.
2. **Bronchi-** Trachea divides into two smaller tubes on entering air into the lungs.
3. **Bronchioles-** Bronchi are sub-divided into smaller branches called bronchioles. Each bronchioles is finally terminated into many alveoli.
4. **Alveoli-** these are balloon like structures which increases the surface area for gaseous exchange in lungs.
5. **Diaphragm-** Movement in diaphragm helps in breathing.



Human Respiratory System

Lallu Problem (L.P.) : What is the role of respiratory pigment in respiration? Give one example.

Animals have large body size due to which, the diffusion pressure alone can't deliver oxygen to all parts of body. Therefore the respiratory pigments take up oxygen from lungs along with blood and carry into all tissues which are deficient of oxygen.
Haemoglobin is one such respiratory pigment found in Red Blood Cells (RBCs) of human beings to carry oxygen.

QUESTIONS

1. What advantage over an aquatic organism does a terrestrial organism have with regard to obtaining oxygen for respiration?
2. What are the different ways in which glucose is oxidised to provide energy in various organisms?
3. How is oxygen and carbon dioxide transported in human beings?
4. How are the lungs designed in human beings to maximise the area for exchange of gases?

Answer1: For respiration purpose, terrestrial organisms survive on atmospheric oxygen, which is present in plenty, therefore their breathing rate is much less. Where as aquatic organisms make use of dissolved oxygen from water for their respiration purpose. The concentration of oxygen in dissolved form is very less in the water, therefor rate of breathing in aquatic organisms is much faster compare to terrestrial organisms

Answer2: First step of break-down of glucose, a six-carbon molecule, takes place in the cytoplasm of cells of all organisms. This process results into a three-carbon molecule called pyruvate.
Further, the pyruvate may be broken down in different manners in different organisms

1. *Anaerobic respiration : This process takes place in the absence of oxygen. This process takes place in yeast during fermentation and results in formation of ethanol and carbon dioxide*
2. *Aerobic respiration : In aerobic respiration, breakdown of pyruvate takes place in presence of oxygen to give rise of three molecules of carbon dioxide and water. The release of energy in aerobic respiration is much more than anaerobic respiration.*
3. *Lack of oxygen : Sometimes, when there is lack of oxygen, especially during vigorous activity, in our muscles, pyruvate is converted into lactic acid which is also a three-carbon molecule. This build-up of lactic acid in our muscles during sudden activity causes cramps.*

Answer3:. (a) Transportation of oxygen : The respiratory pigment is haemoglobin, which is present in the red blood corpuscles and has a very high affinity for oxygen. It take up oxygen from the air in the lungs and carry it to tissues which are deficient in oxygen
(b) Transportation of carbon dioxide : Carbon dioxide is more soluble in water than oxygen is and hence is mostly transported from body tissues in the dissolved form in our blood plasma to lugs where it diffuses from blood to air in the lungs and then exhaled out through mouth and nose.

Answer4:. In the lungs, the wind pipe divides into smaller and smaller tubes, called bronchi, which in turn form bronchioles. The bronchioles, which finally terminate in balloon-like structures , called alveoli. The alveoli provide a enlarged surface where the exchange of gases can take place. The walls of the alveoli are very thin and contain an extensive network of blood-vessels to facilitate exchange of gases.

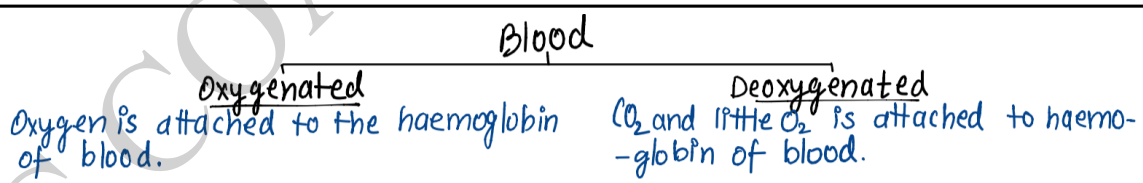
TRANSPORTATION

It is a life process in which a substance absorbed is transported from one body part to it's other parts.

In Human Beings

Blood- it is red coloured fluid connective tissue, which circulates in our body.

- Its red colour is due to presence of a pigment called haemoglobin in it's red cells.
- The deficiency of haemoglobin in our body is referred to as anaemia.



Maintenance by Platelets:
In case of any injury when bleeding occurs, the loss of blood from the system has to be minimised as it leads to loss of pressure of pumping system. To prevent this, the platelets circulates around the body help in clotting of blood at site of injury.

Functions of blood

1. Transport of excretory products- nitrogenous wastes like urea, uric acid and ammonia are collected from the tissue and are transported to kidney for their removal.
2. Transport of O2- Haemoglobin present in RBCs combines with O2 from lungs and transports to all tissues of body for respiration.
3. Transport of CO2- CO2 generated as waste products during respiration is transported by blood and haemoglobin attached to it to lungs where it is eliminated.
4. Clotting of blood- Platelets present in blood form a clot at site of the injury to prevent loss of blood.
5. Protection from disease- the WBCs engulfs disease causing microbes and is known as soldiers of body.

LP:- Difference between Artery, Vein and Capillary?

ans-

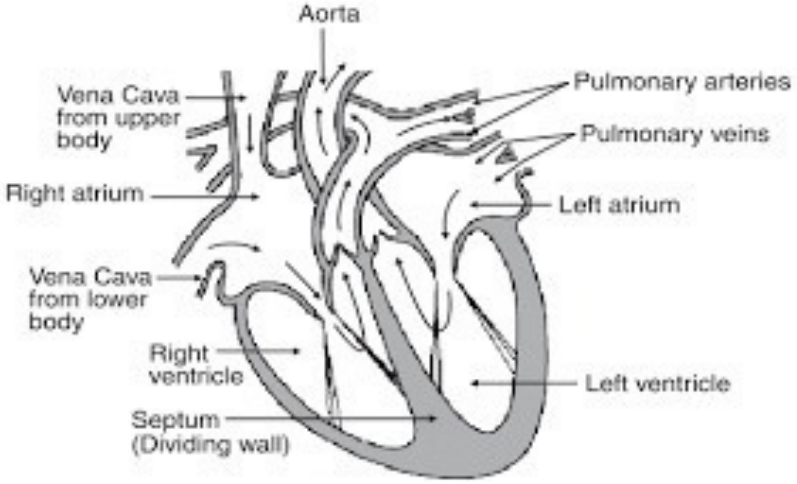
Arteries	Veins	Capillaries
(i) They are thick walled.	(i) They are thin walled and have valves	(i) They have walls that are only one cell thick.
(ii) Carries blood from heart to different organs of the body.	(ii) Carries blood from different organs to the heart.	(ii) Allows exchange of materials b/w blood and surrounding cells.
(iii) Situated very deep into the skin.	(iii) Situated superficially on skin.	(iii) Situated in the terminals of artery or veins.

Heart

It is pumping machine that pushes out the blood into the blood vessels and from these to different parts of the body. It has four chambers separated by septum which prevent mixing of pure and impure blood.

Chambers-

1. Atrium(upper chambers)- there are two atrium seperated by septum (dividing walls).
2. Ventricle(lower chambers)- The two inferior chambers of heart are right and left ventricle.



Flow of blood in Humans

Humans have double circulation, which means that blood goes through heart twice to supply blood once around the body.

Process-

1. Pulmonary Circulation- the movement of blood from heart to lungs and back to heart constitutes pulmonary circulation.

Right Ventricle pushes the blood to lungs for oxygenation via pulmonary arteries.

↓

The oxygenated blood comes back to left atrium of heart through pulmonary veins.

↓

The left atrium then pushes blood to left ventricle.

1. Systematic Circulation- The movement of blood from heart to various places of body except lungs and back to heart.

As the blood fills in the left ventricle, the blood is pushed out.

↓

The blood is pumped to whole body via aorta.

↓

The deoxygenated blood enters into right atrium via Vena Cava from lower body.

- Double circulated is considering as it prevents mixing of oxygenated and deoxygenated blood.

Lallu Problem (L.P.) : What would be consequences of deficiency of haemoglobin in our bodies?

Haemoglobin efficiently binds with O2 and transports to various parts of body. Deficiency of haemoglobin is referred to as anaemia. The consequences of such condition is that blood is unable to carry O2 required by body for respiration and produce energy. In anaemia, the person feels weak, skin becomes pale, etc.

Lallu Problem (L.P.) : Why is it necessary to separate oxygenated and de-oxygenated blood in mammals and birds?

As they are warm blooded so they need energy constantly to maintain their body temperature. Thus, it is important that their oxygenated blood should not get mixed with deoxygenated blood in order to make circulatory system more efficient.

Blood Pressure

- The pressure at which blood is pumped around the body by heart is called blood pressure.
- The maximum pressure at which blood leaves the heart through main artery during contraction phase, is called systolic pressure.
- The min. pressure in arteries during relaxation phase of heart is called diastolic pressure.

Normal systolic- 120 mm Hg
Diastolic- 80 mm Hg

It is measured by instrument called sphygmomanometer.

- High blood pressure is called Hypertension.

Lymph

It is another type of fluid found in our body, which is also involved in transportation.
Formation- it is formed when some amount of plasma proteins and blood cells escape into intracellular spaces through pores present in capillaries.
Functions- (i) it is involved in transportation of substances where blood vessels do not reach.
(ii)Lymph carries digested and absorbed fat from intestine and drains excess fluid from extracellular space back into the blood.
Lymph Capillaries- Lymph from intracellular spaces chains into lymph capillaries which further join to form large lymph vessels that finally opens into larger veins. They are thin walled.

Some differences between Blood and Lymph

Blood-
1. It is red in colour.
2. Haemoglobin is present.
3. It transports materials from one organ to another.

Lymph-
1. It is colourless.
2. Haemoglobin is Absent.
3. It transports materials from tissues into blood.

Some differences between Lymph capillaries and Blood Capillaries

Lymph Capillaries-
1. They are colourless.
2. They carry lymph.
3. They are wider.

Blood Capillaries-
1. They are red in colour.
2. They carry blood.
3. They are narrower.

Lallu Problem (L.P.) : What are component of transport system in human beings? Write function also.

The component of transport system in human are-

1.Heart- It pumps and receives blood.

2.Blood- It consists of two main components-

a)Plasma- It transport food, CO2 and nitrogenous waste, etc in dissolved form.

b)Blood Corpuscles- they constitute RBCs, WBCs and platelets. RBCs transports respiratory gases,WBCs protect body from harmful pathogens help in clot of blood at site of injury.

3.Blood Vessels- Three Types-

a)Arteries- these transport blood from heart to various organs of the body.

b)Veins- these transport blood from various body parts to heart.

c)Capillaries- These allows exchange between blood and tissues.

4.Lymph- It carries digested and absorbed fats from small intestine.

Lallu Problem (L.P.) : How are water and minerals transported in Plants?

Water and minerals are transported through xylem in plants. The cells in roots that are in contact with soil actively take up ions, creating a difference in concentration of ions between root and soil.

Water moves into root to eliminate this difference of concentration forming a steady movement of water in root xylem. This creates a column of water that is steadily pushed upwards. Further, transpiration of water from leaves creates a partial vacuum that pulls water from xylem of roots to leaves and other parts.

Lallu Problem (L.P.) : Explain why transportation of materials is necessary in animals?

The distribution of all necessary substances such as food, O2 and water throughout body is carried out through system of transportation. It also displaces wastes from where it is expelled out from body. Thus, it is very important.

Lallu Problem (L.P.) : How is food transported in plants?

The transportation of food is done by phloem by utilising energy (ATP). The transport of soluble products (sugar) of photosynthesis from leaves to other parts of plant is known as translocation. Pressure generated by osmotic pressure allows movement of food from phloem to tissue which have less pressure.

EXCRETION

It is biological process by which an organism removes harmful metabolic wastes from the body.

Types of Organisms

1. **Unicellular Organism-** these organism get rid of waste products by diffusing it into surrounding through general body. Eg- Amoeba, paramecium.
2. **Multicellular Organism-** these organism get rid of waste products by specialised organs for function of excretion.

Function of Kidneys

1. It helps in removing excess water from body and nitrogenous waste from blood in form of urine.
2. Maintaining the constant cone.
3. Regulates pH of blood.

Excretion in human beings

The main function of human excretory system is to remove nitrogenous wastes such as urea from the body.

Kidney- the main organ of excretory system. It is reddish brown and bean shaped structure. The left kidney is placed higher than right. It is caused by liver.

Nephrons- it is basic filtering unit found in kidney. It is long coiled tubular whose one end is connected to cup shaped structure called Bowman's capsule contain bundle of blood capillaries called glomerulus that is followed by tubular part of nephrons and loops at some places.

Functioning-

1. Glomerulus filters the blood passing through it.
2. It also ensures to remove only harmful substances from the body that include waste materials.
3. The useful substances like glucose, amino acids, salts, and major amount of water is selectively reabsorbed by tubular part of nephron.
4. Some substances like K+ are actively secreted into the urine through tubule.
5. The collecting dust collects the urine and passes it to ureter.

Lallu Problem (L.P.) : Differentiate between Alveoli in lung and Nephrons in kidneys

Alveoli in lungs-

1. These are balloon like structure found within lungs.
2. Diffusion is employed in exchange of gases can takes place.
3. A large no. of alveoli are present in lungs.

Nephrons in kidneys-

1. These are long, circled tubule-like structure present in kidney.
2. Nephrons apply selective re-absorption of useful substances in capillaries.
3. They are very small in size but are large in no. in each kidney.

Excretion in Plants

1. Gaseous wastes i.e. CO_2 and O_2 are removed through stomata in leaves and lenticles in stems to the air.
2. Plant get rid of excess water by transpiration.
3. Some waste products are stored as resins and gums.
4. Plants also excrete some waste into soil around them.
5. Waste products also stored in leaves which fall off.
6. **Useful Waste-** Essential oils,Gums, O_2(during daytime)

-- PREVIOUS YEAR QUESTIONS --

1 MARK QUESTIONS

Q1. How do autotrophs obtain CO2 and N2 to make their food? **[1M, 2008]**
Ans1. CO, is obtained from the environment and N, is obtained from the soil and environment.

Q2. Name the green dot like structures in some cells observed by a student when a leaf peel was viewed under a microscope. What is this green colour due to**?** **[1M, 2010]**
Ans 2. The green colour of the leaves of the plant is due to the presence of tiny green coloured organelles called chloroplasts which contain green pigment chlorophyll.

Q3. What will happen to a plant if its xylem is removed? **[1M, 2009]**
Ans 3. Xylem tissue conducts water and minerals from the soil to different parts of the plant. If the xylem tissue is removed, then the transport of water and mineral will not take place and the plant will die.

Q4. Name the green dot like structures in some cells observed by a student when a leaf peel was viewed under a microscope. What is this green colour due to? **[1M, 2010]**
Ans 4. The green dot-like structures are chloroplasts. This green colour is due to the presence of chlorophyll.

Q5. What will happen to a plant if its xylem is removed? [1M, Delhi 2009]
Ans 5. Xylem is the main water conducting tissue of plants. If it is removed then water and minerals absorbed by plant roots will not be able to reach different plant parts and the plant will wilt and ultimately die.

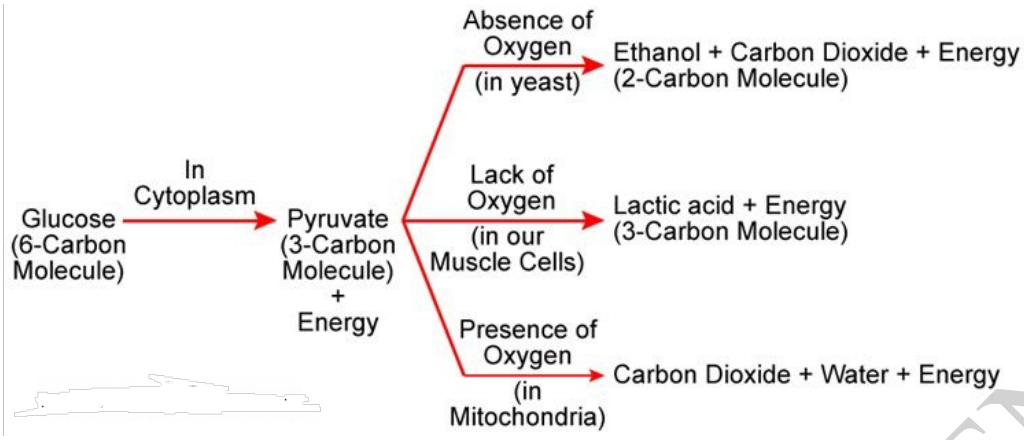
Q6. Name the tissue which transports soluble products of photosynthesis in a plant. [1M, Delhi 2008]
Ans 6. The phloem is a vascular tissue that transports soluble products of photosynthesis (food or sugar) to all the parts of plants.

2 MARKS QUESTIONS

Q7. Write one function each of the following components of the transport system in human beings:
(a) Blood vessels
(b) Blood platelets
(c) Lymph
(d) Heart [2M, 2008]
Ans 7.
(a) Blood vessels: Transport of blood.
(b) Blood platelets: Clotting of blood.
(c) Lymph: Carries digested fats.
(d) Heart: Helps to circulate blood in the whole body by acting as a pump.

Q8. Write two different ways in which glucose is oxidized to provide energy in human body. Write the products formed in each case. [2M, 2019]

Ans 8. Following are the two different ways in which glucose is oxidized to provide energy in human body:



Q9. In the experimental set up to show that "CO, is given out during respiration", name the substance taken in the small test tube kept in the conical flask. State its function and the consequence of its use. [2M, 2019]
Ans 9. The substance taken in the small test tube kept in the conical flask is KOH (potassium hydroxide) solution. The CO2 produced by germinating seeds is absorbed by KOH solution due to which the air from the bent tube moves into the conical flask, which eventually pulls the water up in the bent glass tube.

Q10. Why do herbivores have longer small intestine than carnivores? [2M, 2017]
Ans 10. Cellulose forms the largest part of the herbivore's food. Digestion of cellulose takes a longer time, because the enzymes are produced by the ruminant bacteria that live in the gut of the herbivore. Longer small intestines ensure that the food stays for a longer duration and proper digestion is possible. In the case of carnivores, cellulose is not present in the diet, thus the length of the small intestine is less.

Q11. How is small intestine designed to absorb digested food? [2M, 2017]
Ans 11. The design of the small intestine is such that it provides the maximum area for the absorption of digested food and its transportation to different parts of our body through blood vessels. For these purposes the inner lining of small intestine has finger like projections called villi providing a large surface area for absorption and the small intestine is supplied richly with blood vessels for the efficient transportation of the absorbed food.

Q12. How are fats digested in our bodies? Where does this process take place? [NCERT 2017]
Ans 12. Fat digestion takes place in the small intestine. The alkaline secretion of the liver, bile, is carried to the small intestine by the bile duct. The process starts with emulsification (break down) of large fat globules by the salt of bile into smaller micelles to facilitate further enzymatic reaction and digestion process. The fat-digesting lipase enzyme in pancreatic juice and intestinal juices digest the fat in micelles into triacylglycerols and then fatty acids and glycerol. These fat digestion products are then absorbed by the intestinal mucosa and are carried to tissues by the lymphatic system and blood where they either serve as energy fuel or are stored after re-esterification.

Q13. Explain the significance of peristaltic movement that occur all along the gut during digestion. [2M, 2010, 2011]
Ans 13. Peristaltic movement is the type of movement in which there is the constriction and relaxation of muscles of the oesophagus, intestine, and stomach. It is a wave-like structure, which starts in the oesophagus when the bolus of food is swallowed. The contraction and relaxation of the muscles during the peristaltic movement help in bringing down the food with the food pipe into the stomach. It is an important and automatic process which helps in movement of food.

3 MARKS QUESTIONS

Q14. State the necessary conditions for autotrophic nutrition and name the by product. Mention the source of this by product. [3M, 2015]
Ans 14. The autotrophic organisms are self-feeders that can synthesize the organic compounds using carbon dioxide as a source of carbon and water as an electron donor. Green plants are photoautotrophs that carry out photosynthesis, a process that requires atmospheric carbon dioxide, water, sunlight, and chlorophyll.
The energy of sunlight is trapped by chlorophyll and is used to fix carbon dioxide into organic compounds (glucose) in the presence of water. These organic compounds are used by plants for their own growth and maintenance and stored in the form of starch that serves as a source of energy when required. Since water molecules serve as an electron donor, oxygen is produced during the process of photosynthesis as a by-product and is released into the air.

Q15. In human alimentary canal, name the site of complete digestion of various components of food. Explain the process of digestion. [3M, 2012]
Ans 15. In the small intestine, complete digestion of various components of food take place. The process of digestion of food in mouth, stomach and small intestine in human body are as follows:

- Mouth: Digestion of food begins in the mouth. Saliva present in mouth contains a digestive enzyme, called salivary amylase, maltose and dextrin, which breaks down starch into sugar.
- Stomach: Stomach stores and mixes the food received from the oesophagus with gastric juices. The main components of gastric juice are hydrochloric acid, mucus and pepsinogen. Hydrochloric acid dissolves bits of food and creates an acidic medium. In this medium, pepsinogen is converted to pepsin which is a protein-digesting enzyme. Mucus protects the inner lining of the stomach from the action of HCl.
- Small Intestine: Small intestine is the site of complete digestion of carbohydrates, proteins and fats. Small intestine produces intestinal juice from the glands present in its wall. The intestinal juice helps in further digestion of food. Small intestine also obtains digestive juices from liver and pancreas. The liver produces bile juice that causes emulsification of fats and the pancreas produces pancreatic juice for digesting proteins and emulsified fats. This digested food is finally absorbed through the intestinal walls.

Q16. How are oxygen and carbon dioxide transported in human beings? How are lungs designed to maximize the area for exchange of gases? [3M,2008]
Ans 16. (i) Respiratory pigment haemoglobin takes up O, from the air in the lungs and carries it to tissues.
(ii) CO_2 is being transported from various tissues into the alveoli by blood and is released during exhalation.

Within the lungs, the trachea divides into smaller and smaller tubes which finally terminate in balloon-like structures called alveoli. These alveoli increase the surface area for the exchange of gases.

Q17. Write three types of blood vessels. Give one important feature of each. [3M,2019]
Ans 17. Features:

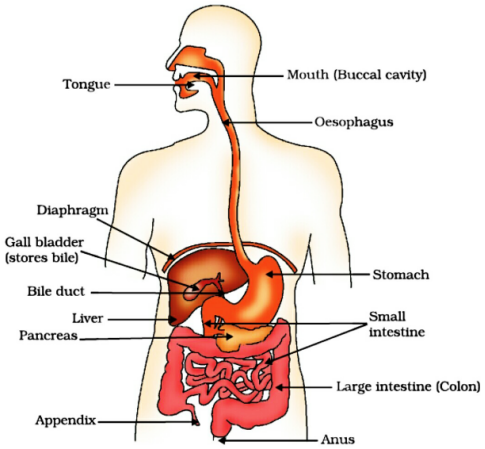
(a) Arteries are the vessels which carry blood away from the heart to various organs of the body. Since the blood emerges from the heart under high pressure, the arteries have thick, elastic walls.
(b) Veins collect the blood from different organs and bring it back to the heart. They do not need thick walls because the blood is no longer under pressure, instead they have valves that ensure that the blood flows only in one direction.
(c) Capillaries are the smallest vessels which have walls and are one-cell thick. Exchange of material between the blood and surrounding cells takes place across this thin wall.

Q18. Write any three differences between aerobic and anaerobic respiration. [3M, 2008]
Ans 18.

Aerobic respiration	Anaerobic respiration
1) It takes place in the presence of oxygen.	1) It takes place in the absence of oxygen.
2) In aerobic respiration, complete oxidation of glucose takes place.	2) In anaerobic respiration, the glucose molecule is incompletely oxidised.
3) End products are CO_2 and water.	3) End products are either ethyl alcohol or lactic acid and CO_2.
4) Lot of energy is liberated (38 ATP).	4) Relatively small energy is liberated (2 ATP).
5) It occurs in plant's and animal's cells.	5) Occurs in many anaerobic bacteria and human muscle cells.
6) $C_6H_{12}O_6 + 6O_2 \rightarrow 6\,CO_2 + 6H_2O + 686$ K.cal	6) $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2 + 56$ K.cal

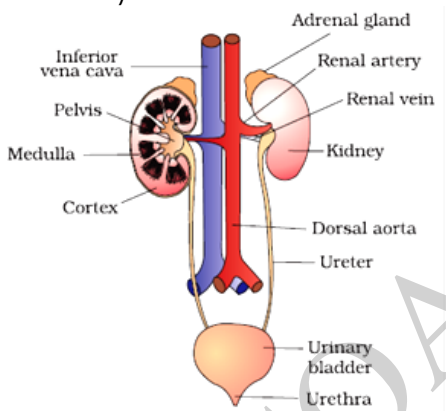
5 MARKS QUESTIONS

Q19. (a) Draw a diagram of human alimentary canal and label on it :
Oesophagus, Gall bladder , Liver and Pancreas
(b) Explain the statement, 'Bile does not contain any enzyme but it is essential for digestion.
[5M, 2009]
Ans 19. a)



(b) Bile does not contain any enzyme, but it plays an important role in digestion because:
(i) The bile salts emulsify fat by acting on large fat globules to break them into smaller globules. This increases the efficiency of pancreatic enzymes.
(ii) The food entering the small intestine is acidic. It is made alkaline by the action of bile juice so as to facilitate the action of pancreatic enzymes.

Q20. (a) Draw a diagram of excretory system in human beings and label on it:
Aorta, vena cava, urinary bladder, urethra
(b) List two vital functions of the kidney.
Ans 20. a)



(b) The two vital functions of kidney are:
(i) It filters out the nitrogenous wastes from the blood and forms urine.
(ii) It also regulates the water balance and levels of mineral ions in the body.

Q21. Explain the process of digestion of food in mouth, stomach and small intestine in human body. [5M, 2010]
Ans 21. (i) Mouth : In mouth, large food pieces are crushed with the help of our teeth and mixed with saliva secreted by the salivary glands, using the tongue. Salivary amylase, the enzyme present in saliva, breaks down starch to give sugar.
(ii) Stomach : The muscular walls of the stomach help in mixing the food thoroughly with the digestive juices secreted by the gastric glands present in the wall of the stomach. These glands release hydrochloric acid, a protein digesting enzyme called pepsin, and mucus, which protects the inner lining of the stomach. The hydrochloric acid creates an acidic medium which facilitates the action of the enzyme pepsin.

(iii) Small intestine : The small intestine is the site of the complete digestion of carbohydrates, proteins and fats. It receives the secretions of the liver and pancreas for this purpose. Bile juice from liver makes the acidic food coming from stomach alkaline for facilitating the action of pancreatic enzymes. Bile also emulsifies fats so as to increase the efficiency of enzyme action. The pancreas secretes pancreatic juice which contains enzymes like trypsin for digesting proteins and lipase for breaking down emulsified fats.
The walls of the small intestine contain glands which secrete intestinal juice. The enzymes present in it finally convert the proteins into amino acids, complex carbohydrates into glucose and fats into fatty acids and glycerol.

Q22. (a) List the three events that occur during the process of photosynthesis. Explain the role of stomata in this process.
(b) Describe an experiment to show that "sunlight is essential for photosynthesis." [5M, 2010]
Ans 22. (a) The three events that occur during the process of photosynthesis are:

(i) Absorption of light energy by chlorophyll.
(ii) Conversion of light energy to chemical energy and splitting of water molecules into hydrogen and oxygen.
(iii) Reduction of carbon dioxide to carbohydrates.

Stomata help in exchange of gases (carbon dioxide and oxygen) for the purpose of photosynthesis.
(b) Select a healthy potted plant and destarch the plant by placing it in complete darkness for at least 48 hours.

1. After 48 hours, using clips or cello tape cover a part of the leaf of the plant from both upper and lower sides with black paper strips.
2. Now, keep the potted plant in sunlight for at least 3-4 hours.
3. After 3-4 hours, pluck the leaf and remove black paper strips.
4. Boil the leaf in water for about 2 minutes.
5. Now, to decolourise the leaf, transfer the leaf from boiling water to a beaker containing ethanol and boil the leaf in a water bath.
6. Remove the leaf from beaker and wash it in water at room temperature.
7. Place this leaf in petri dish and add few drops of iodine solution over the decolourised leaf.
8. The area of the leaf that was uncovered performed photosynthesis and will have starch, therefore turned blue-black with iodine solution.
9. The covered portion of the leaf remains yellow as it does not perform photosynthesis.

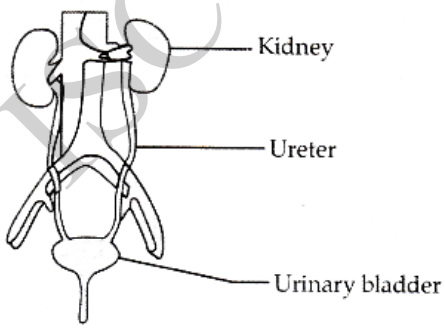
OBSERVATIONS:

1. The uncovered part of the leaf turns blue-black. This confirms the presence of starch.
2. The covered portion of the leaf remains yellow showing that no starch synthesis occurred in this region.

Q23. (a) Mention any two components of blood.
(b) Trace the movement of oxygenated blood in the body.

(c) Write the function of valves present in between atria and ventricles.
(d) Write one structural difference between the composition of arteries and veins. [5M, 2018]
Ans 23.
(a) Two components of blood are
(i) Blood plasma
(ii) Blood cells
(b) Movement of oxygenated blood in the body as follows
Pulmonary veins -› Left atrium -› Left ventricle -› Systemic aorta -› All part of the blood
(c) The valves in the heart are to prevent the backflow of blood when the atria or ventricles contract.
(d) Arteries are thick walled whereas veins are thin walled.

Q24. (a) Define excretion.
(b) Name the basic filtration unit present in the kidney.
(c) Draw excretory system in human beings and label the following organs of excretory system which perform following functions:
(i) Form urine
(ii) Is long tube which collects urine from kidney
(iii) Store urine until it is passed out. [5M,2018]
Ans 24.
(a) The biological process involved in the removal of these harmful metabolic wastes from the body is called excretion.
(b) The nephron is the filtration units present in the kidney.
(c)



i. Kidney form urine.
ii. The ureter is the long tube which collects the urine from Kidney.

iii. The urinary bladder is a structure which stores the urine until it is passed.

Q25. Explain the process of digestion of food in the mouth, stomach and small intestine in the human body. [5M, 2016]
Digestion of food occurs in following ways in:
(i) Mouth (Buccal cavity) - The mouth contains teeth, which crushes the food into small particles. Salivary glands present in the mouth secretes saliva which moistens the food. It also contains enzyme salivary amylase, that acts as

$$\underset{\text{(Complex sugar)}}{\text{Starch}} \xrightarrow[\text{or ptyalin}]{\text{Salivary amylase}} \underset{\text{(Simpler sugar)}}{\text{Maltose}}$$

(ii) Stomach - Gastric glands are present in the wall of the stomach which releases the following secretions:
(a) Hydrochloric acid - To make the medium acidic for the action of enzyme pepsin.
(b) Mucus - To protect the inner lining of the stomach from the action of acid
(c) Pepsin A protein digesting enzyme.

$$\text{Proteins} \xrightarrow{\text{Pepsin}} \underset{\text{(Simple proteins)}}{\text{Peptones and proteoses}}$$

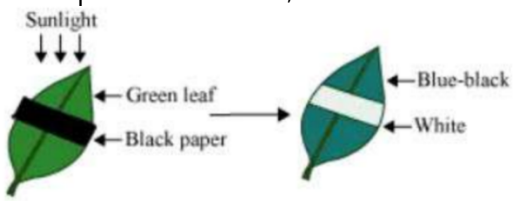
(iii) Small intestine - It is the site of complete digestion of carbohydrates, proteins and fats. It receives secretions from liver and pancreas.
(a) Bile juice - It is secreted by liver and performs the following functions :
It makes the medium alkaline for the pancreatic enzymes to act and also breaks down large fat globules into smaller globules.
(b) Pancreatic juice - It is secreted by pancreas. Contains enzymes like amylase for digesting starch, trypsin for digesting proteins and lipase for breaking down emulsified fats.
(c) Intestinal juice - It is secreted by the walls of the small intestine. Contains a number of enzymes such as maltase, lipase etc., for complete digestion.

Q26. (a) List the three events that occur during the process of photosynthesis. Explain the role of stomata in this process.
(b) Describe an experiment to show that "sunlight is essential for photosynthesis."
[5M, Delhi 2010]
Ans 26. (a) The three events that occur during the process of photosynthesis are:

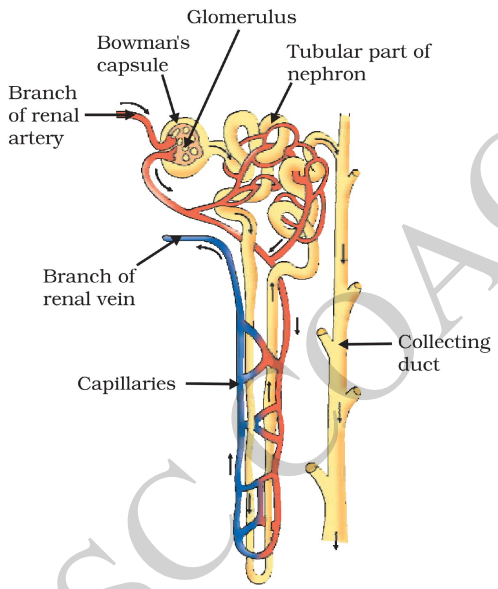
(i) Absorption of light energy by the green pigment chlorophyll.
(ii) Conversion of light energy into chemical energy and the splitting of water molecule into hydrogen and oxygen.
(iii) Reduction of carbon dioxide into carbohydrate. Role of Stomata are tiny pores present on the surface of leaves. They are also present on the surface of young stems. Stomata mainly engaged in the exchange of gases (entry of CO, and release of Oz) associated with photosynthesis. Plant closes the stomata when it does not need CO, for photosynthesis.

(b) Sunlight is essential for photosynthesis

Procedure: (i) Place a healthy green potted plant in a dark room for 1-2 days. This is done to ensure that the plant consumes all its reserve food and the leaves do not contain any starch.
(ii) Then, cover a portion of a leaf of this plant on both sides with two uniform pieces of black paper, fixed in position with two paper clips.
(iii) Now, expose this plant to bright light. After a few hours, remove the leaf and decolorize it with alcohol and test the presence of food (starch) with iodine solution. Observation: It can be observed that the portion of the leaf covered with black paper does not (food), Conclusion: This is because the food prepared by plants through the process of photosynthesis is stored as starch. Starch reacts with the iodine solution to give blue-black colour. Only those portions of the leaf that were exposed to sunlight could photosynthesis. Hence, gives blue-black colour when tested with iodine. The portion of the leaf covered with black paper did not receive sunlight. Hence, starch was not produced. Thus, it can be concluded that the sunlight is essential for photosynthesis.

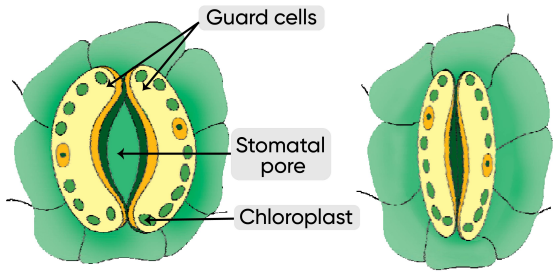


Q27. (a) Draw the structure of a nephron and label the following on it: glomerulus, Bowman's capsule, renal artery, collecting duct.
(b) What happens to glucose that enters the nephron a long with filtrate? [5M, 2009]
Ans 27. a)



b) The molecules of glucose are very small. Hence, when it enters the nephron along with the filtrate during excretion, it is passed into the nephron tubule along with urea. However, by tubular reabsorption, the glucose along with some water and other important ions are reabsorbed and are used by the body.

Q28. (a) Draw a labelled diagram of stomata. List two functions of stomata.
(b) What are the raw materials used during photosynthesis? Write a chemical equation for photosynthesis. [5M, 2011]
Ans 28. a)



(a) Open pore (b) Closed pore

Two functions of stomata are:

(i) Exchange of gases
(ii) Transpiration

(b) Carbon dioxide, water, chlorophyll in the presence of sunlight are the essential raw materials for photosynthesis.

Q29. (a) Explain how does the exchange of gases occur in plants across the surface of stems, roots and leaves.
(b) How are water and minerals transported in plants ? [5M, 2015]
Ans 29. (a) In plants there are tiny pores called stomata on leaves and lenticels in the stem which facilitate the exchange of gases. Carbon dioxide is taken in and oxygen given out {during photosynthesis} and vice versa during respiration.
(b) Water and minerals are transported within the plant by the Xylem vessels mainly in an upward direction; these are part of the vascular system which also
includes Phloem vessels.
Phloem transports the products of photosynthesis within the plant, to all parts like the stem, roots, fruits etc. in all directions.

ASSERTION AND REASONING QUESTIONS
Rule : Assertion is labelled as (A) and the Reason is labelled as (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below :
(a) Both (A) and (R) are true and (R) is the correct explanation of the assertion (A).
(b) Both (A) and (R) are true, but (R) is not the correct explanation of the assertion (A).
(c) (A) is true, but (R) is false.
(d) (A) is false, but (R) is true

Q30. Assertion: Leaves are flat
Reason: It places chlorophyll molecules in a way to receive more light.
Ans 30. (a) Both assertion (A) and reason (R) are correct and reason is the correct explanation of assertion.

Q31. Assertion: In human heart, there is no mixing of oxygenated and deoxygenated blood.
Reason: Valves are present in the heart which allow the flow of blood in one direction only.
Ans 31. (b) Both assertion (A) and reason (R) are correct but reason is not the correct explanation of assertion.

Q32. Assertion: Autotrophic nutrition occurs in green plants
Reason: Green plants self-manufacture their food.
Ans 32. (a) Both assertion (A) and reason (R) are correct and reason is the correct explanation of assertion.