



**Q1.** How do carbohydrates, fats and proteins get digested in human beings?

**Ans:**

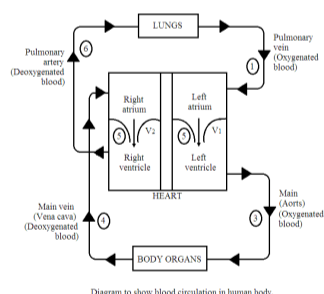
- 1. Carbohydrates:** The digestion of carbohydrates begins in the mouth. The human saliva contains an enzyme called salivary amylase which digests the starch present in the food into maltose sugar. The slightly digested carbohydrates when reaches the small intestine, pancreatic amylase present in the pancreatic juice breaks down the starch. The intestinal juice of the small intestine completes the digestion of carbohydrates and finally coverts it into glucose.
- 2. Fats:** The process of digestion of fats begins in the stomach. The glands of stomach secrete a small amount of gastric lipase that breaks down the fats present in the food. From the stomach the partially digested food goes into small intestine where the pancreatic lipase breaks down the emulsified fats. The walls of small intestine secrete intestinal juice which converts the fats into fatty acids and glycerol.
- 3. Proteins:** The digestion of proteins begins in the stomach. The glands of the stomach secrete gastric juice which contains an enzyme called pepsin. Pepsin converts the proteins into peptones. Pancreatic juice contains trypsin which digests the proteins into peptides and the intestinal juice completes the process of digestion of proteins thus converting it into amino acids.

**Q2.** Describe the working of human blood circulatory system with the help of a suitable diagram which shows all the steps involved.

**Ans:**

Working of Human blood circulatory system takes place in the steps below:

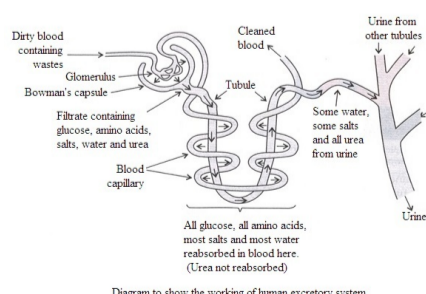
1. When the muscles of all the four chambers are relaxed, the pulmonary vein brings the oxygenated blood from the lungs in the left atrium of the heart.
2. When the left atrium contracts, the oxygenated blood is pushed into the left ventricle through valve V .
3. When the left ventricle contracts, the oxygenated blood enters the main artery called aorta from which it goes to the different body organs through small branches called arterioles and capillaries.
4. The main artery carries the blood to all the organs of the body head, arms etc except the lungs. The oxygenated blood gives off oxygen, digested food and dissolved materials to the body cells. The carbon-dioxide produced in the cells enters the blood. The deoxygenated blood enters main vein called vena cava which carried it to the right atrium of the heart.
5. When the right atrium contracts, the deoxygenated blood enters right ventricle through valve V .
6. When the right ventricle contracts, the deoxygenated blood enters the lungs through pulmonary artery and releases carbon-dioxide and absorbs fresh oxygen from air. The blood becomes oxygenated again and is sent to the left atrium of heart by pulmonary vein for circulation in the body. This whole process is repeated continuously.



**Q3.** Describe the mechanism of urine formation in human excretory system. Draw a labelled diagram to illustrate your answer.

**Ans:**

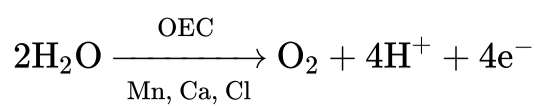
**Urine formation:** The dirty blood containing waste like urea enters the glomerulus which filters the blood. During filtration, the substance like glucose, amino acids, salts, water, urea etc present in the blood pass into Bowman's capsule and then enter the tubule of nephron. When the filtrate containing useful substances as well as the waste substances passes through the tubule, the useful substances like glucose, amino acids, most salts and water are reabsorbed into the blood through blood capillaries surrounding the tubule. Only the waste substances like urea, some unwanted salts and excess water remains behind in the tubule. This yellowish liquid is called urine.



**Q4.** Mention the major events during photosynthesis.

**Ans:**

- 1. Photolysis:** With the help of light energy, oxygen evolving Z-complex splits up water into its components- protons ( $H^+$ ), electrons ( $e^-$ ) and oxygen.

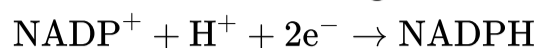


2. **Absorption of Light Energy:** Chlorophyll absorbs light energy.

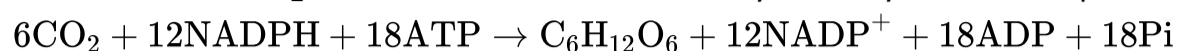
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3. **Primary Reaction:** Chlorophyll converts the absorbed light energy into chemical energy. It is called primary reaction of photosynthesis. It builds up ATP with the help of excited electrons.

4. **Formation of Reducing Power:** Coenzyme  $\text{NADP}^+$  is changed to reduced form of NADPH.



5. **Reduction of  $\text{CO}_2$ :** Carbon dioxide is reduced enzymatically with the help of NADPH and ATP to form carbohydrates.



Q5. Read the following and answer any four questions from (i) to (v).

The small intestine is a tubular structure within the abdominal cavity that carries the food in continuation with the stomach up to the colon from where the large intestine carries it to the rectum and out of the body. The main function of this organ is to aid in digestion. All nutrients are usually absorbed into blood across the mucosa of the small intestine. In addition, the small intestine absorbs water and electrolytes, thus playing critical role in maintenance of body water and acid-base balance.

1. Which of the following is incorrect regarding intestinal villi?

1. They possess microvilli.
2. They increase the surface area.
3. They are supplied with capillaries and the lacteal vessels.
4. They only participate in digestion of fats.

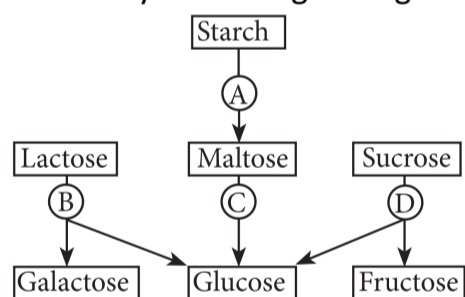
2. Which enzymes are likely to act on the baked potatoes eaten by a man, starting from the mouth as they move down the alimentary canal?

1. Pancreatic amylase  $\rightarrow$  Salivary amylase  $\rightarrow$  Lipases
2. Disaccharidase like maltase  $\rightarrow$  Lipases  $\rightarrow$  Nucleases
3. Salivary amylase  $\rightarrow$  Pancreatic amylase  $\rightarrow$  Disaccharidases
4. Salivary maltase  $\rightarrow$  Carboxypeptidase  $\rightarrow$  Trypsinogen

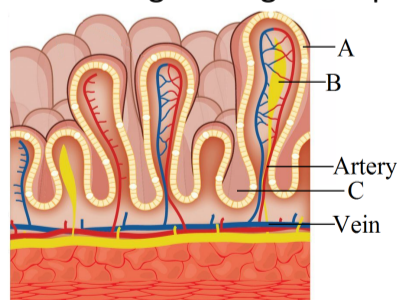
3. After surgical removal of an infected gall bladder, a person must be especially careful to restrict dietary intake of?

1. Starch
2. Protein
3. Sugar
4. Fat.

4. The given flow chart shows the fate of carbohydrates during digestion in the human alimentary canal. Identify the enzymes acting at stages indicated as A, B, C and D and select the correct option:



1. A - Amylase, B - Maltase, C - Lactase, D - Invertase.
2. A - Amylase, B - Maltase, C - Invertase, D - Lactase.
3. A - Amylase, B - Invertase, C - Maltase, D - Lactase.
4. A - Amylase, B - Lactase, C - Maltase, D - Invertase.
5. The given diagram represents a section of small intestinal mucosa identify AB and C.



1. A-Villi, B-Lacteal, C-Capillaries.
2. A-Lacteal, B-Villi, C-Capillaries.
3. A-Villi, B-Lacteal, C-Crypts.
4. A-Crypts, B-Lacteal, C-Capillaries.

Ans:

1. (d) They only participate in digestion of fats.
2. (c) Salivary amylase  $\rightarrow$  Pancreatic amylase  $\rightarrow$  Disaccharidases

**Explanation:**

Baked potatoes consist of starch, which is a polysaccharide. In oral cavity, the food is mixed with saliva that contains an enzyme salivary amylase which converts starch into maltose, isomaltose and small dextrins. The pancreatic juice (present in small intestine) contains pancreatic amylase which converts starch into maltose, isomaltose and n-dextrins.

Starch  $\xrightarrow[\alpha \text{ amylase}]{\text{Pancreatic}}$  Maltose + Isomaltose + n - Dextrins Further, disaccharidases such as maltase (present in intestinal juice in small intestine) break down disaccharides such as maltose into monosaccharides or simpler sugars

3. (d) Fat.

**Explanation:**

After removal of gall bladder, bile could no longer to be stored and hence fat metabolism would be affected. Therefore, fat intake should be restricted.

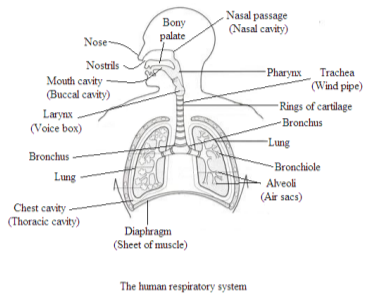
4. (d) A - Amylase, B - Lactase, C - Maltase, D - Invertase.

5. (c) A-Villi, B-Lacteal, C-Crypts.

**Q6.** Draw a labelled diagram of the human respiratory system.

**Ans:**

**Human Respiratory System:**

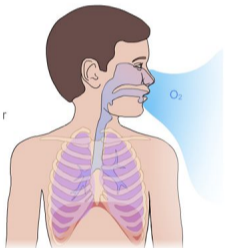


**Q7.** What is the difference between external and internal respiration.

**Ans:**

**EXTERNAL RESPIRATION:**

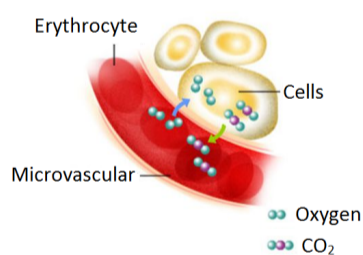
**External**



- It is a physiological process.
- It takes place along the respiratory surface along the lungs.
- also known as breathing.
- It is a process during which oxygen is taken up by capillaries of lung alveoli and carbon dioxide is released from blood.

**INTERNAL RESPIRATION:**

**Internal**



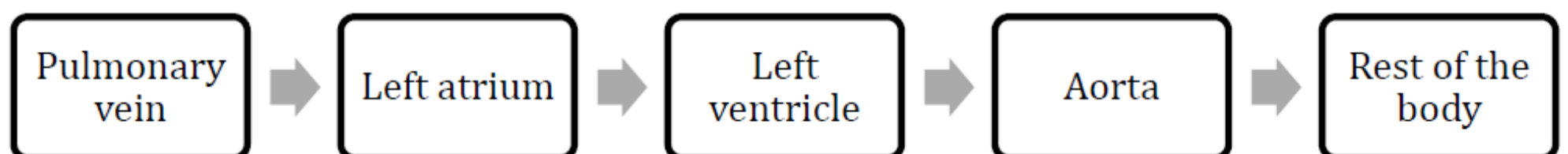
- It is a biological process.
- takes place within the cells( i.e., at cellular level).
- It is the process in which oxygen is released to tissues or living cells and carbon dioxide is absorbed by the blood.

- Q8.**
1. Mention any two components of blood.
  2. Trace the movement of oxygenated blood in the body.
  3. Write the function of valves present in between atria and ventricles.
  4. Write one structural difference between the composition of artery and veins.

**Ans:**

1. Components of blood: Plasma and blood cells (corpuscles)

2. Movement of oxygenated blood in the body:



3. Valves present in between atria and ventricles help to restrict the backflow of the blood from the ventricle to the atrium when the ventricle contracts.

#### 4. Differences between artery and vein:

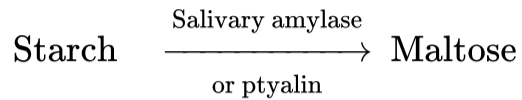
	Artery	Vein
1.	It has thick elastic muscular walls.	It has thin, non-elastic walls.
2.	It does not contain valves.	It contains valves to prevent the backflow of blood.
3.	Blood flows under high pressure.	Blood flows under low pressure.

Q9. Explain the process of digestion of food in mouth, stomach and small intestine in human body.

Ans:

#### Digestion of food occurs in following ways:

1. **Mouth (Buccal cavity):** The mouth contains teeth, which crushes the food into small particles. Salivary glands present in the mouth secrete saliva which moistens the food. It also contains enzyme salivary amylase, that acts as



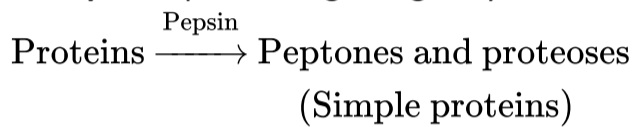
(Complex sugar) (Simpler sugar)

2. **Stomach:** Gastric glands are present in the wall of the stomach which releases the following secretions:

1. **Hydrochloric acid** To make the medium acidic for the action of enzyme pepsin.

2. **Mucus** To protect the inner lining of the stomach from the action of acid.

3. **Pepsin** A protein digesting enzyme.



3. **Small intestine:** It is the site of complete digestion of carbohydrates, proteins and fats. It receives secretions from liver and pancreas.

1. **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.

2. **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.

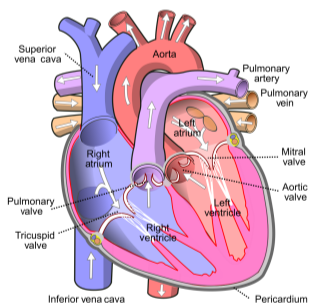
3. **Intestinal juice:** It is secreted by the walls of small intestine. Contains a number of enzymes such as maltase, lipase etc., for complete digestion.

Q10. 1. Draw a sectional view of the human heart and label on it, Aorta, Right Ventricle and Pulmonary Veins.  
2. State the functions of the following components of transport system:

1. Blood.
2. Lymph.

Ans:

1.



2.

#### Function of Blood:

- Transport of nutrients, food, O<sub>2</sub>, CO<sub>2</sub>, Urea, waste materials and hormones.
- WBC present in blood kills germs.
- Bringing waste products to the kidneys and liver, which filter and clean the blood.
- Regulates body temperature.

#### Function of Lymph:

- It Carries digested fats from intestine.
- Lymph contains lymphocyte cells which fight against infection.

Q11. Read the following and answer any four questions from (i) to (v).

Our body needs to remove the wastes that build up from cell activities and from digestion. If these wastes are not removed, then our cells can stop working and we can get very sick. The organs of our excretory system help to release wastes from our body. The excretory system consists of a pair of kidney, a pair of ureters, a urinary bladder and a urethra. Each kidney is made up of nearly one million complex tubular structures called nephrons. The formation of urine involves various processes that takes place in the different parts of the nephron. Each nephron consists of a cup-shaped upper end called Bowman's capsule containing a bunch of capillaries called glomerulus. Bowman's capsule leads to tubular structure-proximal convoluted tubule, loop of Henle and distal convoluted tubule which ultimately joins the collecting tubule.

1. The following substances are the excretory products in animals. Choose the least toxic form.

1. Urea
2. Uric acid
3. Ammonia
4. CO<sup>2</sup>

2. The outline of principal events of urination is given below in random manner.

1. Stretch receptors on the wall of urinary bladder send signals to the CNS.
2. The bladder fills with urine and becomes distended.
3. Micturition.
4. CNS passes on motor messages to initiate the contraction of smooth muscles of bladder and simultaneous relaxation of urethral sphincter.

The correct sequence of the events is:

1. (I) → (II) → (III) → (IV)
2. (IV) → (III) → (II) → (I)
3. (II) → (I) → (IV) → (III)
4. (III) → (II) → (I) → (IV).

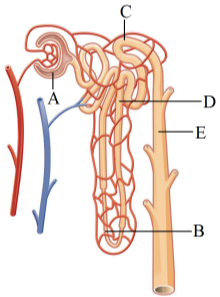
3. A person who is not taking food or beverages will have in urine.

1. Little glucose.
2. Less urea.
3. Excess urea.
4. Little fat.

4. Glomerular filtrate is first collected by:

1. Distal convoluted tubule.
2. proximal convoluted tubule.
3. Bowman's capsule.
4. Loop of Henle.

5. The given figure represents a single nephron from a mammalian kidney. Identify the labelled parts, match them with the options (i-iv) and select the correct answer.



1. The site of ultrafiltration
2. Collect the urine and make it more concentrated
3. The main site for the reabsorption of glucose and amino acids
4. Largely responsible for the maintenance of blood p<sub>H</sub>

1. (I)-A, (II)-E, (III)-C, (IV)-D
2. (I)-A, (II)-B, (III)-C, (IV)-D
3. (I)-B, (II)-A, (III)-C, (IV)-E
4. (I)-E, (II)-B, (III)-D, (IV)-A

**Ans:**

1. (B) Uric acid

**Explanation:**

Nitrogenous waste substances such as ammonia, urea or uric acid are produced during protein metabolism. Ammonia is the most toxic, followed by urea and uric acid. Uric acid is least toxic.

2. (c) (II) → (I) → (IV) → (III)
3. (b) Less urea.

**Explanation:**

Urea is a nitrogenous waste formed as a result of metabolism of various food/beverages in the body and is excreted in the urine. So, if a person is not taking food/beverages he will have less urea in his urine.

4. (c) Bowman's capsule.
5. (a) (I)-A, (II)-E, (III)-C, (IV)-D

**Explanation:**

Malpighian corpuscle (A) is the site of ultrafiltration. A considerable amount of water is reabsorbed in the collecting duct (E) under the influence of ADH. Proximal convoluted tubule (C) is the main site for the reabsorption of glucose and amino acids. In distal convoluted tubule (D), both hydrogen ions and ammonium ions are secreted, thus it maintains blood pH.

**Q12.** With a schematic diagram, explain the overall process of respiration in animals.

**Ans:**

Respiration is a cellular process which occurs in each and every cell of body. It starts with glycolysis- a reaction in which breakdown of glucose occurs. Glucose gets converted into pyruvic acid. The process of glycolysis takes place in cytoplasm.

Now this pyruvic acid enters into mitochondria via link reaction in which it gets converted into acetyl-CoA. Now this acetyl-CoA enters in the mitochondria where it performs kreb's cycle in mitochondrial matrix. All the ATP and NADH<sub>2</sub> and FADH<sub>2</sub> produced till now performs ETS cycle (Electron transport chain) which is located in the mitochondrial membranes. Finally it undergoes oxidative phosphorylation and ATPs are released.

GLYCOLYSIS(in cytoplasm) → LINK REACTION(in cytoplasm) → KREB

CYCLE(mitochondrial matrix) → ELECTRON TRANSPORT SYSTEM

(mitochondrial membrane) → OXIDATIVE PHOSPHORYLATION(mitochondrial membrane).

**Q13.** Read the following and answer any four questions from (i) to (v).

Digestion is a catabolic process in which complex and large components of food are broken down into their respective simpler and smaller forms with the help of various hydrolytic enzymes. In human, the process of intake of essential nutrients in the form of food takes place through an entire system known as digestive system. The digestive system in human includes alimentary canal and its associated digestive glands.

1. Identify the cells whose secretion protects the lining of gastro-intestinal tract from various enzymes.

1. Duodenal cells
2. Chief cells
3. Goblet cells
4. Oxyntic cells

2. Digestion of proteins is incomplete in the absence of enterokinase, because.

1. Trypsinogen is not converted into trypsin.
2. Pepsinogen is not converted into pepsin.
3. prorennin is not converted into rennin.
4. chymotrypsinogen is not converted into chymotrypsin.

3. Match the column I with column II and column III. Choose the correct option.

	Column I (Substrate)		Column II (Enzyme)		Column III (Product)
1.	Lactose	A.	Lipase	I	Galactose
2.	Fatty acid	B.	Trypsin	II	Maltose
3.	Starch	C.	Lactase	III	Glycerol
4.	Proteins	D.	Amylase	IV	Dipeptides

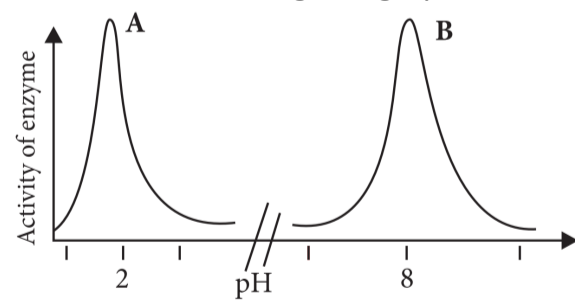
1. (1-A-I), (2-C-II), (3-B-III), (4-D-IV)

2. (1-D-I), (2-A-II), (3-B-III), (4-C-IV)

3. (1-C-I), (2-A-III), (3-D-II), (4-B-IV)

4. (1-C-I), (2-A-II), (3-D-III), (4-B-IV)

4. A and Bin the given graph are the action spectra of the two enzymes. The two enzymes are:



(a)	A: amylase	B : trypsin
(b)	A : pepsin	B : trypsin
(c)	A: chymotrypsin	B : rennin
(d)	A: lactate dehydrogenase	B : amylase.

5. If the inner surface of the ileum in the human small intestine was smooth, rather than being folded and subdivided into villi, which of the following statements would be true?

1. The rate of absorption of digested food molecules would be higher, because the digested food would pass more easily through the digestive tract.
2. Digestion would not be as effective, because there would be fewer cells secreting trypsin (a protein digesting enzyme).
3. Humans would have needed to evolve a much longer small intestine to absorb sufficient nutrients from their food.
4. Humans would not be able to survive, because the digestive tract would be more susceptible to damage.

**Ans:**

1. (c) Goblet cells

**Explanation:**

Goblet cells or mucous cells are present throughout the epithelium of gastric glands and secrete mucus, which protects gastrointestinal lining from enzymatic action.

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2. (a) Trypsinogen is not converted into trypsin.
3. (c) (1-C-I), (2-A-III), (3-D-II), (4-B-IV)
4. (b)

(b)	A : pepsin	B : trypsin
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**Explanation:**

Pepsin and trypsin both are protein digesting enzymes, but they work at different locations and different pH in alimentary canal. Pepsin, which is most active at pH of 1.5 to 2.5, is an important peptic enzyme in stomach. Trypsin, which is a pancreatic protease, acts mostly in upper small intestine (duodenum and jejunum), works at an optimum pH of 7.5 - 8.5.

5. (c) Humans would have needed to evolve a much longer small intestine to absorb sufficient nutrients from their food.

**Explanation:**

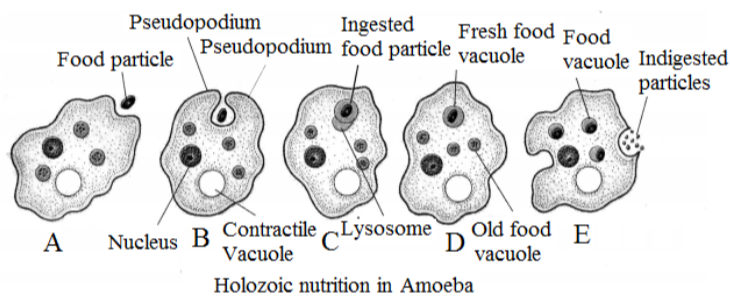
The absorptive surface of small intestinal mucosa have many folds, which increase its surface area. Also located on epithelial surface of small intestine are millions of small villi. Intestinal epithelial cell on each villus is characterised by a brush-border which further increases the surface area. Thus, to compensate for this and to have effective absorption of nutrients, intestine would need to be much longer in length.

**Q14.** Explain the process of nutrition in Amoeba.

**Ans:**

1. **Ingestion:** (*L. ingestus* - taken in). It is taking in of solid food with the help of temporary or permanent mouth. Amoeba can ingest food particles from any point on its surface. Paramecium (another unicellular organism) has fixed point for the same. Amoeba captures food with the help of temporary finger-like processes called pseudopodia. Paramecium has small hair-like processes called cilia. Beating of cilia creates current in water that pushes food particle through cytostome or cell mouth. The process of ingestion of solid food particle by a cell or unicellular organism is called phagocytosis.

As soon as Amoeba comes in contact with a food particle or prey, it throws pseudopodia all around the same. The tips of encircling pseudopodia fuse and the prey comes to lie in a vesicle or phagosome.



2. **Digestion:** It is conversion of complex insoluble food ingredients into simple absorbable form. Digestion can be intracellular or intercellular. Intercellular digestion occurs in a digestive tract. Intracellular digestion takes place in the cytoplasm of cells. Here, a lysosome fuses with phagosome to produce a food vacuole, also called gastricle or temporary stomach. Reaction of food vacuole is acidic at first and alkaline later on. Digestion of food occurs with the help of digestive enzymes brought by lysosome. It changes complex insoluble substances of food into simpler absorbable substances.
3. **Absorption:** The digested simple and soluble substances pass out of food vacuole into the surrounding cytoplasm.
4. The absorbed food materials are converted into various constituents of protoplasm including food reserve.
5. (***L. egestus* - discharge**): It is throwing of undigested components of food out of the body. In Amoeba, the old food vacuole with heavier undigested material reaches the rear end, passes to the surface, fuses with surface membrane and throws out the undigested materials. The process is called egestion. Paramecium has a definite cytopyge or cell anus.

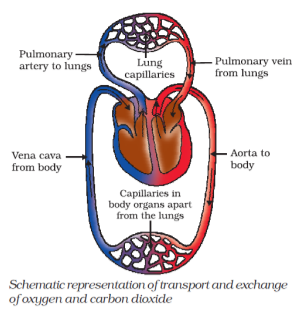
**Q15.** Describe the flow of blood through the heart of human beings.

**Ans:**

Human heart has four completely separated chambers which allow two completely separated circuits of oxygenated and deoxygenated blood; hence the name, double circulation.

The pulmonary circuit includes flow of blood through heart-lung-heart while systemic circuit includes heart-rest of the body-heart. This ensures that left side of heart receives and pumps only oxygenated blood while the right side receives and pumps only deoxygenated blood.

Two pulmonary veins come from each lung and pass O<sub>2</sub>-rich blood to left atrium. The left ventricle pumps blood into the aorta which in turn branches and delivers blood to the major body regions and organs. The anterior vena cava collects deoxygenated blood from the head, chest, and arms and enters the right atrium while the inferior vena cava collects blood from the lower body regions. Both venae cavae pass the deoxygenated blood to the right atrium. Blood from right atrium enters right ventricle and pulmonary arteries carry deoxygenated blood from right ventricle to lungs for oxygenation.



**Q16.** Distinguish between photosynthesis and respiration.

**Ans:**

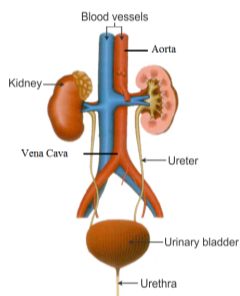
Differences between Cellular Respiration and Photosynthesis:

Cellular Respiration	Photosynthesis
1. Occurs in all living organisms.	Occurs only in all green plants, algae, and in some bacteria.
2. The entire process occurs in Mitochondria.	The entire process occurs in Chloroplasts.
3. Glucose and oxygen are the reactants of this process.	Carbon dioxide, water, and light energy are the reactants of this process.
4. In this process, food particles are broken down to release energy.	In this process, food is synthesized by capturing the energy.
5. It is an exergonic reaction as energy is released.	It is an endothermic reaction as it requires energy.
6. This process does not require sunlight since cellular respiration occurs all the time.	This process requires sunlight since photosynthesis occurs only in the presence of sunlight.
7. The chemical reaction of cellular Respiration is: $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$	The chemical reaction of photosynthesis is: $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

**Q17.** 1. Draw a diagram of excretory system in human beings and label on it: Aorta, Vena cava, Urinary bladder, Urethra.  
2. List two vital functions of the kidney.

**Ans:**

1.



**2. Functions of the kidney:**

- Maintaining overall fluid balance.
- Regulating and filtering minerals from blood.
- Filtering waste materials from food, medications, and toxic substances.
- Creating hormones that help produce red blood cells, promote bone health, and regulate blood pressure.

**Q18.** X is a wild animal which eats only the flesh of other animals whereas Y is a domestic animal which feeds mainly on green grass.

- What are animals like X known as?
- What are animals Y known as?
- Which animal, X or Y, has a longer small intestine? Why?
- Name one animal which is like X.
- Name one animal which is like Y.

**Ans:**

- Animals like X are known as carnivores.
- Animals like Y are known as herbivores.
- Animals like X have longer small intestine as they are grass eating animals and they need long intestine to digest the cellulose present in the grass.
- Lion is a carnivore.
- Cow is an herbivore.

**Q19.** Match the organisms given in column I with the processes given in column II:

Column I	Column II
i. Leech	a. Holozoic nutrition
ii. Amoeba	b. Autotrophic nutrition
iii. Mushroom	c. Parasitic nutrition
iv. Green plant	d. Saprophytic nutrition



Ans:

	Column I		Column II
i.	Leech	c.	Parasitic nutrition
ii.	Amoeba	a.	Holozoic nutrition
iii.	Mushroom	d.	Saprophytic nutrition
iv.	Green plant	b.	Autotrophic nutrition

ATUL CLASSES

**Q20.** Describe the structure and functioning of nephrons.

Ans:

Each nephron is a cluster of very thin-walled blood capillaries. Each capillary cluster in the kidney called glomerulus is associated with the cup shaped Bowman's capsule that collects the filtered urine. Nephron filters the blood in order to remove nitrogenous waste. They also absorb some useful substance such as glucose, amino acids, minerals and major amount of water from filtrate.

