53. There is no mixing of deoxygenated and oxygenated bloods in human heart due to the presence of inter-ventricular septum. This septa completely divides the ventricle into right and left to avoid mixing of blood.

54. The left ventricle possess a thicker wall than the right ventricle because it has to pump oxygenated blood all around the entire body via the aorta.

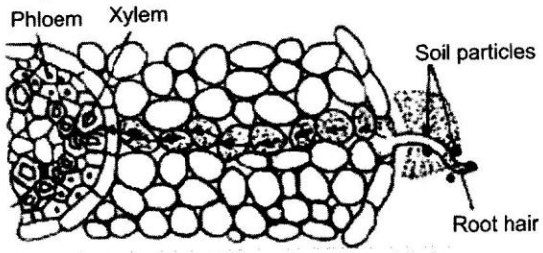
55. The walls of ventricles are thicker than the auricles because ventricles have to pump the blood to all the parts of the body during their contraction. To counteract the backward pressure exerted by the blood, the walls of the ventricles have to be thicker otherwise it may lead to bursting of heart.

56. The structural difference between auricles and ventricles are–
Auricles are thin-walled chambers completely separated from each other by a septum. The inner lining of the auricular wall forms a network of low muscular ridges.
Ventricles are very thick muscular walled chambers separated from each other by a thick oblique septum.

57. Food materials produced in the leaves are translocated in downward direction to the roots as well as in upward direction to the developing fruits, flowers, growing stem tips, etc., through phloem tissues, *i.e.*, sieve tubes and companion cells.

58. Tracheids are the conducting cells of non-flowering plants. They are long, thin, spindle-shaped cells having pits in their thick cell walls. In them, water flows from one tracheid to other through these pits.

59.



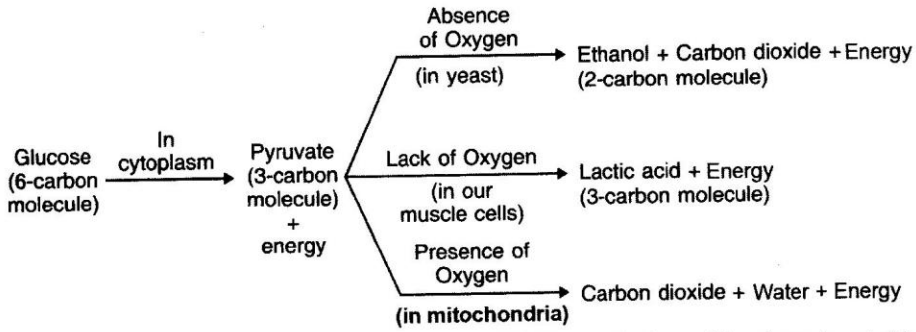
Absorption of water through root hair

NCERT Questions

60. The inner wall of small intestine is thrown into folds called villi. Villi are finger-like projections which increase the surface area for the absorption of food.

61. The amount of oxygen dissolved in water is very low, as compared to amount of oxygen in air. Thus, terrestrial organism have to make less efforts to obtain oxygen than an aquatic organism to obtain oxygen for respiration.

62. **Breakdown of Glucose by Various Pathways.**



63. In the lungs, the air passage (*i.e*, Trachea or wind pipe), divides into smaller tubes called bronchi which form bronchioles. The bronchioles terminate in balloon-like structures called alveoli. The alveoli present in the lungs provide maximum surface for exchange of gases. The alveoli have very thin walls and contain an extensive network of blood vessels to facilitate exchange of gases.

64. The main components of the transport system in highly organised plants are xylem and phloem.
- Xylem consists of vessels and tracheids; it helps to conduct water and minerals from soil to the leaves.
- Phloem consists of sieve tubes and companion cell; it helps to transport food materials from leaves to various parts of the plant.

65. The methods used by plants to get rid of excretory products are as follows :
(*i*) Plants get rid of dead tissue to eliminate waste.
(*ii*) Waste products are stored in large cellular vacuoles.
(*iii*) Waste products are stored in the leaves and are removed as the leaves fall off.
(*iv*) Resins and gums are stored in non-functional old xylem.
(*v*) Plants excrete wastes through roots into the soil.

66. The amount of urine produced in each kidney enters a long tube of the ureter and moves upto the urinary bladder. The urine is stored in it and passes out when needed.

SHORT ANSWER TYPE QUESTIONS (II) [3 MARKS]

Previous Years' Questions

1. In 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, 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

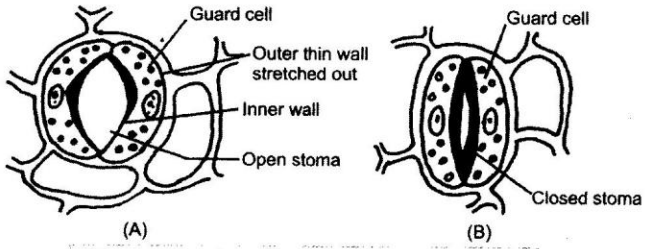
34. **Hill Reaction** is a photochemical phase which starts with the absorption of light by the chlorophyll molecules. This solar energy which is trapped by chlorophyll is stored as chemical energy (ATP) and reducing power (NADPH). In light reactions, photolysis of water, *i.e.*, splitting up of water in presence of light takes place.

$$H_2O \longrightarrow 2H^+ + O_2 + 2e^-$$

35. (*i*) Leaf has a flattened structure to increase the surface area for absorption of light.
(*ii*) Presence of stomata and intercellular spaces for the efficient exchange of CO_2 and O_2.

36. Bile is a yellowish thick green liquid secreted by the liver. It is alkaline in nature and bitter in taste.
It contains 89-98% water and four types of chemicals, *i.e.*, organic salts, bile salts, bile pigments and fatty substances.

37.



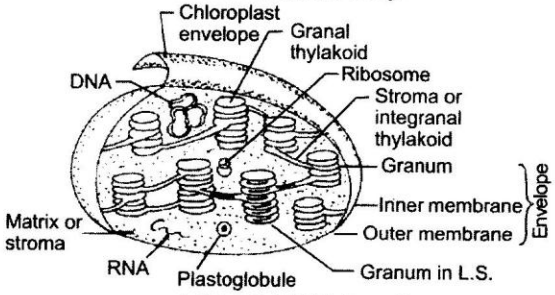
Showing Opening (A) and Closing (B) of Stoma

38. The enzyme gastric pepsin initiates the digestion of proteins. The other enzyme produced by the stomach is gastric lipase.

39. (*a*) Aquatic plants take up carbon dioxide dissolved in water.
(*b*) Terrestrial plants use carbon dioxide present in air.

40. **Excretion** is the biological process involved in the removal of toxic wastes from the body.
Osmoregulation is the process of maintaining the right amount of water and ionic balance in the body.

41.



Structure of Chloroplast

42. The first digestive organ in humans is the stomach. It releases proteolytic enzymes, HCl and mucus.

43. A pigment etiolin is developed in plants instead of chlorophyll in absence of light. Thus, the leaves become yellow and the plants of this condition are said to have become etiolated.

44. **Inspiration** is brought about by contraction of diaphragm muscles and some intercostal muscles. The diaphragm moves downward and the intercostal muscles move the lateral walls of thorax outward and upward. The volume of thorax increases and the air pressure is decreased. So, air is drawn into the lungs.
Expiration is brought about when the contracted muscles of diaphragm and intercostal muscles relax, the diaphragm moves upward and the lateral walls, move inward and downward. This decreases the volume of thorax and increases the air pressure. So, air is sent out of lungs.

45. The exchange of gases will continue. Even after forceful expiration, some volume of air remains in the lungs, which is called residual volume. Exchange of gases continues because of this air.

46. Bile juice has no enzymes, but bile salts are important for digestion and absorption of fats. The bile salts reduce the surface tension of fat droplets, causing their breakdown into smaller ones. Thus, a fine emulsion is formed, which increases area for lipase action. Bile salts are also needed for absorption of products of fat digestion from the intestinal lumen.

47. The two proteases present in pancreatic juice are :
(*i*) **Trypsin :** It acts upon peptones and converts them into peptides.
(*ii*) **Carboxypeptidase :** It converts peptides into smaller peptides and amino acids.

48. White blood corpuscles can fight with the disease germs present in the body carried by blood and help to maintain a healthy body. So, they are called as 'soldiers' of the body.

49. The fluid part of the filtrate is diffused into the uriniferous tubule while the useful part like glucose remains there which is again carried to renal veins.

50. Sino-atrial node of the human heart is considered as pacemaker.
Sino-atrial node is also called as pacemaker because it determines the rate of heartbeat by determining the rate of discharge of cardiac impulse.

51. **Differences between :**

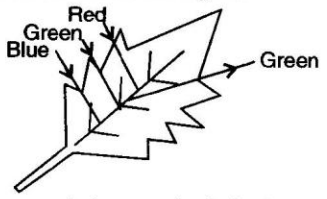
Ureter	Urethra
(*i*) Ureters are tube like structures that conduct urine from the kidneys to the bladder.	(*i*) It is a membranous tube that arises from the neck of urinary bladder and conducts urine to the exterior.
(*ii*) They become closed due to compression by the contracting bladder muscles.	(*ii*) They are closed by the urethral sphincters.

52. **Functions of Circulatory System :**
(*i*) It transports respiratory gases from lungs to tissues and back to lungs.
(*ii*) It transports excretory materials from different tissues to the kidneys for excretion.
(*iii*) It transports digested food from small intestine to the different tissues and organs.
(*iv*) It distributes hormones from their sites of origin to the tissues.

14. **Differences between :**

Respiration in Plants	Respiration in Animals
(*i*) Plants do not have respiratory system.	(*i*) Animals have respiratory system.
(*ii*) Direct diffusion of respiratory gas takes place into the cells.	(*ii*) The respiratory gases are transported upto the tissue cells.

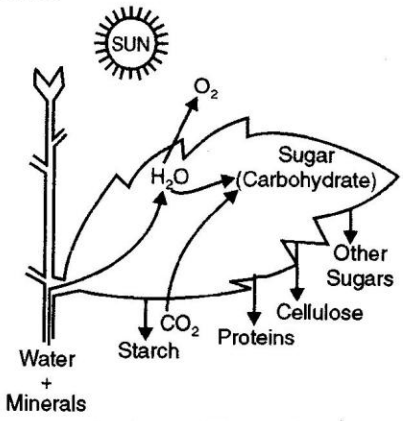
15. HCl activates pepsinogen into active pepsin, which is a protease.
16. Kidneys → ureters → urinary bladder → urethra to the outside. Urine is prevented from flowing back into the ureters because the terminal part of each ureter passes obliquely through the bladder wall and so becomes closed due to compression by the contracting bladder muscles.
17. If the bile duct is completely blocked, bile juice will not reach the small intestine and the digestion of fats will be affected.
18. If there is a blockage in the pancreatic duct, the pancreatic juice which contains enzymes for the digestion of carbohydrates and proteins will not reach the small intestine.
19. The walls of trachea does not collapse when there is less air in it as it is supported by rings of cartilage.
20. Exchange of respiratory gases, *i.e.,* oxygen and carbon dioxide occurs between the blood and tissues.
    In tissues, oxygen is used up for their activities and carbon dioxide is released. The blood from lungs has high concentration of oxygen and low concentration of carbon dioxide. Due to this, difference in concentration of oxygen and carbon dioxide, the exchange of gases takes place between tissue and blood.
21. The leaf appears green because chlorophyll reflects away the green wavelength of light and absorbs mainly the red and blue wavelengths as shown in the figure.



22. The significance of photosynthesis is that :
    (*i*) It is the only natural process that releases life supporting oxygen into the atmosphere and helps to maintain the oxygen-carbon dioxide cycle in nature.
    (*ii*) Green plants are the primary food producers due to their ability to photosynthesis.
23. The inner wall of alimentary canal is not digested because it has the following protective mechanisms :
    (*i*) The gastric mucin secreted by the gastric mucosa acts as buffer, which reduces high gastric acidity and prevents injury to the inner wall of the alimentary canal.
    (*ii*) The enzymes are secreted only when food is present in the alimentary canal and they are in an inactive form.
24. **Differences between :**

Saprozoic Nutrition	Holozoic Nutrition
(*i*) It is an absorptive type of nutrition.	(*i*) It is an ingestive type of nutrition.
(*ii*) The food is obtained in the liquid state.	(*ii*) The food is taken in the solid state.
(*iii*) Digestion is external.	(*iii*) Digestion is internal.

25. There are four different types of teeth in human beings. The are :
    (*i*) **Incisors :** Situated in front of buccal cavity and are use for cutting and biting of food.
    (*ii*) **Canines.** Situated next to incisors on both sides and a used for tearing food.
    (*iii*) **Premolars :** Situated next to canines on both the sides an are used for crushing and grinding food.
    (*iv*) **Molars :** Situated in outermost position and are used fo crushing and grinding food.
26. The differences between ingestion and egestion is that **ingestio** refers to the process of intaking of food by the living organism through various means whereas, **egestion** refers to the proces by which unabsorbed and undigested remains of food are passe out from the alimentary canal.
27. Salivary glands are situated in the mouth of man and contain starch-digestive enzymes.
    Salivary glands secrete saliva and the mucin in saliva helps t lubricate the food for swallowing.
28. **Functions of large intestine in man are :**
    (*i*) It serves to store the unabsorbed food remnants temporarily
    (*ii*) It concentrates the contents by absorbing water.
    (*iii*) The movements of colon help to void the faeces through anus. (*any two*)
29. Alveoli are more permeable and vascular than the skin. The total exchange area is far more than general body surface, hence lungs have replaced skin for gaseous exchange.
30. Aerobic respiration :
    $C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O + 38$ ATP energy
    Anaerobic respiration :
    $C_6H_{12}O_6 \longrightarrow 2C_2H_5OH + 2CO_2 + 2$ATP energy
31. Frog and earthworm have cutaneous respiration. This respiration is effective because of presence of features like thin, moist and highly vascular skin which is also highly permeable to gases.
32. Alveoli is covered with blood capillaries for the easy diffusion of respiratory gases, since both alveoli and blood capillaries are thin walled.
33.



Products of Photosynthesis

68. In multicellular organisms, all the cells of the body may not be in direct contact with the surrounding environment, so simple diffusion will not meet the oxygen requirements of all the cells.

69. The outside raw materials used by an organism are **food**, which is the source of energy, **oxygen**, which is required for breathing and **water** for proper digestion of food and other functions inside the body.

70. (*i*) Nutrition (*ii*) Respiration
(*iii*) Transportation (*iv*) Excretion.

71. Plants get **carbon dioxide** from atmosphere through stomata and **water** from soil through roots and transport to leaves.

72. Deficiency of haemoglobin in our bodies will affect the supply of oxygen to tissues and cells because haemoglobin is a carrier of oxygen. Thus, a person shows symptoms of breathlessness, tiredness with indications of iron deficiency, *i.e.*, anaemia.

SHORT ANSWER TYPE QUESTIONS (I) [2 MARKS]

Previous Years' Questions

1. The final product produced after digestion of carbohydrates is glucose and proteins is amino acids.

2. Saliva is a watery fluid secreted by the salivary glands in the mouth. In the mouth, food gets mixed up with saliva secreted by salivary glands. Saliva contains an enzyme salivary amylase which breaks polysaccharide starch into disaccharide maltose (sugar).

3. The mode of nutrition in *Amoeba* is holozoic. It feeds on unicellular plant or animal. The various steps of nutrition are ingestion, digestion, assimilation and egestion. When *Amoeba* comes in contact with food particles, it sends out pseudopodia, which engulfs the prey by forming a food cup, which is known as ingestion. When the tips of the encircling pseudopodia touch each other, the food is encaptured into a bag called food vacuole, this step is known as digestion. The food vacuole serves as a temporary stomach secreting digestive juice. The digested food gets absorbed and diffuses into the cytoplasm and then assimilated. Egestion of undigested food takes place at any point on the surface of the body.

4.

Arteries	Veins
(*i*) They are vessels which carry blood away from the heart to various organs of the body.	(*i*) Veins collect the blood from different organs and bring it back to the heart.
(*ii*) Arteries have thick elastic walls; since the blood is under high pressure.	(*ii*) They do not have thick wall, because the blood is no longer under pressure.

5. In human beings, to maximise the area for exchange of gases, inner surface of lungs has smaller tubes that terminate into balloon-like structures called alveoli. The walls of alveoli have extensive network of blood vessels.

6. Physical forces (like transpiration pull and root pressure) help in transportation of water in xylem while translocation of food in phloem is achieved by utilizing energy. No energy required for water transport in xylem, energy required for translocation of food in phloem.

7. (*a*) CO_2 – Carbon dioxide is essential for photosynthesis.
(*b*) KOH is kept in the watch glass to absorb CO_2. It absorbs CO_2 to create an atmosphere which is devoid of CO_2.

8. In test tube A - carbon dioxide + alcohol
In test tube B - carbon dioxide + water

9. (*i*) carbohydrates/storage products
(*ii*) pigments/found in living organisms.
(*iii*) respiratory organs/for exchange of gases.
(*iv*) blood vessels, part of the circulatory system.

10. Function of the following components of the transport system in human beings are as follows :
(*a*) **Blood vessels :** There are three types of blood vessels of different sizes involved in blood circulation viz. arteries, veins and capillaries, which are all connected to form a continuous closed system.
(*b*) **Blood platelets :** They help in the coagulation of blood and are called thrombocytes.
(*c*) **Lymph :** It carries digested and absorbed fat from intestine and drains excess fluid from extra cellular space back into the blood.
(*d*) **Heart :** It is a pumping organ that receives blood from the veins and pumps it into the arteries.

11. Fats are digested in our body in the small intestine.
Fats entering the small intestine are in the form of large globules. The digestion of fats completes in the following steps :
(*i*) Bile salts break large globules into small globules.
(*ii*) Pancreatic juice secreted by pancreas has enzyme lipase which breaks down emulsified fats.
(*iii*) Enzymes secreted from the walls of small intestine finally converts fats into fatty acids.

$$\text{Fats} \xrightarrow[\text{by bile salts}]{\text{Emulsified}} \text{Emulsified fats}$$

$$\xrightarrow[\text{Lipase}]{\text{Pancreatic juice}} \text{Breakdown of fats}$$

$$\xrightarrow[\text{Lipase}]{\text{Intestinal juice}} \text{Fatty acids + Glycerol}$$

(Products obtained after digestion of fats.)

Important Questions

12. **Blood Clotting :** It is the mechanism that prevents the loss of blood at the site of an injury or wound by forming a 'blood clot'. The blood has platelet cells which circulate around the body and plug these leaks by helping to clot the blood at these points of injury to prevent it from excessive bleeding.

13. The two vital functions of the human kidney are that —
(*i*) It removes the poisonous wastes and excess water from the blood by excreting them in the form of urine.
(*ii*) It regulates the osmotic pressure/water balance of the blood.
The procedure used in the working of artificial kidney is dialysis.

12. Xylem in plant transports water and dissolved mineral nutrients from the roots to all other parts of the vascular plant. So, if xylem is removed from the plant, the water and mineral supply to the plant will stop and therefore, the plant will die.
13. Phloem transports soluble products of photosynthesis in a plant.
14. Digestion of fat takes place in the small intestine of our body.
15. Holozoic nutrition.
16. Digestive enzymes help to break complex food materials into simpler molecules. Proteins are converted into amino acids, fats into fatty acids and complex carbohydrates into glucose.
17. The amount of oxygen dissolved in water is very low, as compared to amount of oxygen in air. Thus, terrestrial organism has to make less efforts to obtain oxygen than an aquatic organism to obtain oxygen for respiration.
18. The two ways in which glucose is oxidised to provide energy in various organisms are **aerobic respiration pathway** which uses oxygen to break-down glucose completely into carbon dioxide and water and some use other pathways that do not involve oxygen which is called **anaerobic respiration pathway**.
19. A – Stomatal pore – Exchange of gases takes place.
    B – Guard cell – Controls opening and closing of stomata.
20. Plants get **carbon dioxide** from atmosphere through stomat and **water** from soil through roots and transport to leaves.
21. The process by which plants lose water in the form of vapou from aerial parts of the plant is known as transpiration.
22. Xylem transports water and minerals in a plant.
23. Autotrophs obtain CO_2 from atmosphere and N_2 from soil t make their food.
24. Trypsin is the pancreatic enzyme which is effective in digestin proteins.
25. The saliva contains an enzyme called salivary amylase that break down starch.
26. The role of acid in our stomach are as follows :
    (*i*) It makes an acidic medium in the stomach which necessary for activation of pepsin enzyme.
    (*ii*) It kills the germs present in the food.

Important Questions

27. Fats.
28. Accessory pigment – Carotene/Xanthophyll
    Essential pigment – Chlorophyll
29. Two structural features of small intestine are :
    (*i*) Villi is present to increase the absorptive surface area.
    (*ii*) Lacteals in the villi receive the products of fat digestion.
30. Diastole.
31. Hepatic portal vein, Hypophyseal portal vein.
32. Two conditions in which photorespiration may take place in green plants are :
    (*i*) High concentration of oxygen and
    (*ii*) High temperature
33. Aerobic respiration.
34. All living organisms need energy for the various metabolic activities. Respiration provides energy for this and so it is a vital process.
35. Photosynthesis releases oxygen which is a life supporting gas. Only in green plants photosynthesis takes place.
36. Pancreas.
37. Duodenum, Jejunum and Ileum.
38. Glucose
39. Haemoglobin
40. To produce voice in the presence of air.
41. Respiration.
42. In both aerobic and anaerobic respiration, the chemical used is glucose.
43. Anaerobic respiration is the incomplete breakdown of glucose and produces less energy, so it is less efficient.
44. Lungs are divided into small sacs or alveoli to increase the surface area through which respiratory exchange takes place.
45. Mammals need more oxygen to meet the requirement of the high metabolic rate. Therefore, they need extensive respirato surface.
46. Immediate death due to failure of respiration.
47. (*i*) Diaphragm, (*ii*) Malpighian corpuscles.
48. Alveoli.
49. Because the divers are air breathers and not water breathers
50. Thyroid.
51. 12 to 18 times per minute.
52. Fatty acids, monoglycerides and glycerol.
53. Because they catalyse the breakdown of larger organic molecu with the addition of water.
54. Because intensity and temperature is higher on a bright sun day.
55. Circulatory system.
56. Haemoglobin.
57. Dialysis.
58. Because red blood corpuscle is absent.
59. Urine contains urea, uric acid and ammonical salts which impo yellow colour.
60. To adjust liver in the right side of the abdominal cavity.
61. Renal artery, afferent arterioles, glomerulus, efferent arterio secondary capillaries, renal vein.
62. RBC transports oxygen to the tissues whereas, WBC fig against microorganisms (Phagocytosis).
63. Blood is 'liquid connective tissue' because its matrix is a fl substance called plasma.

NCERT Questions

64. (*c*) Nitrogenous waste such as urea are removed from blood in the kidneys.
65. (*a*) Xylem transports water and minerals from soil to leaves.
66. (*d*) Autotrophic mode of nutrition requires carbon dioxide, water, chlorophyll and sunlight for photosynthesis.
67. (*b*) Breakdown of pyruvate using oxygen takes place in mitochondria. This process breaks up the three-car pyruvate molecules to give three molecules of carbon dio and the other product is water. Since, the process t place in presence of oxygen is called aerobic respirati

SUMMATIVE ASSESSMENT

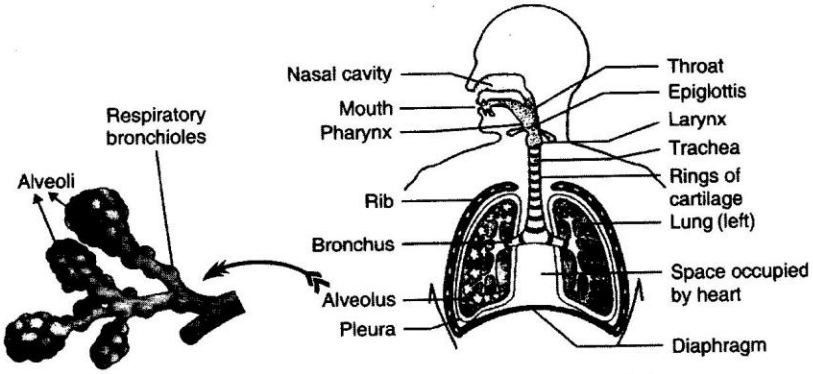
VERY SHORT ANSWER TYPE QUESTIONS [1 MARK]

Previous Years' Questions

1. The green dot-like structures in some cells observed by a student when a leaf peel was viewed under a microscope are chloroplasts. The green colour is due to the presence of green pigment, chlorophyll.
2. The difference is – In autotrophic nutrition, organisms obtain their food from inorganic substances. In heterotrophic nutrition, organisms derive their food from organic substances.
3. Multicellular organisms need more O_2 to perform various body functions. They therefore, have special organs for exchange of gases.
4. Transpiration.
5. Transport of soluble products of photosynthesis is known as translocation.
6. Respiration uses O_2 and releases CO_2 but in photosynthesis, CO_2 is used and O_2 is released.
7. Glucose $\longrightarrow$ Pyruvate + Energy

   $$\xrightarrow[\text{of } O_2]{\text{In presence}} CO_2 + H_2O + \text{Energy}$$
8. Starch is produced in the uncovered part of the leaf which turns blue-black in presence of iodine solution.
9. Platelet.
10. Organisms like bread moulds and mushrooms break down the food materials outside the body and then absorb it.
11. Because the dissolved oxygen is fairly low in water compared to the amount of oxygen in the air.

22.



Human Respiratory System

Process of Respiration : The inhalation and exhalation of the air take place continuously in the respiratory system.

- **Inspiration** or **inhalation** is concerned with the taking in of atmospheric air or oxygen into the thoracic cavity. It is possible only when the volume of the thoracic cavity increases and the pressure of the contained air in the thoracic cavity decreases.
- **Expiration** or **exhalation** is concerned with the expelling of carbon dioxide from lungs. It takes place when the volume of the thoracic cavity decreases and the pressure of the contained air in the thoracic cavity increases.

23. **Differences between :**

Left Lung of Humans	Right Lung of Humans
(*i*) It consists of two lobes.	(*i*) It consists of three lobes.
(*ii*) It is lighter in weight, smaller and narrower.	(*ii*) It is heavier in weight, larger and broader.
(*iii*) Cardiac notch is present along lining of inner border.	(*iii*) Cardiac notch is absent.

24. The digestion of food begins in the mouth. The salivary amylase is present in the saliva which is the digestive juice of the mouth. **Salivary amylase** works upon starch to produce maltose. Saliva is poured into the mouth by three pairs of salivary glands located at the base of the mouth.

25. The wall of the small intestine is provided with numerous long finger-like projections called **villi** which increase the surface area of the inner lining of intestine. This enhances the capacity of absorption by the wall of the intestine.

26. **Blood Pressure :** It is the force that blood exerts against the wall of a vessel. This pressure is much greater in arteries than in veins.

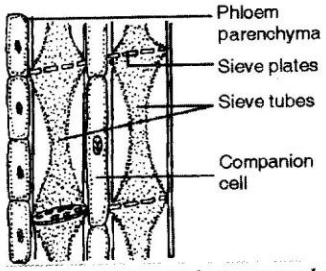
It is measured by using an instrument called **sphygmomanometer.** The pressure of blood inside artery during contraction or ventricular systole is called **systolic pressure** and pressure in artery during relaxation or ventricular diastole is called **diastolic pressure.** The normal systolic pressure is about 120 mm of Hg and diastolic pressure is 80 mm of Hg.

27. The special type of tissues or organs are necessary to perform special type of vital functions. Several functions like digestion, respiration and excretion are carried out by the living bodies. The cells in animals require oxygen, water and food, whereas in plants, carbon dioxide, water and oxygen are required. These substances required by living organisms are to be distributed throughout the body, thus there is a need for transportation system with special tissue or organs in plants and animals. In plants, there is a system of vascular channels, the xylem and phloem, while in animals, blood vascular system is present.

28. **Differences between :**

Lymphatic Capillaries	Blood Capillaries
(*i*) They are colourless.	(*i*) They are red in colour.
(*ii*) They carry lymph.	(*ii*) They carry blood.
(*iii*) They are wider than blood capillaries.	(*iii*) They are narrower than lymphatic capillaries.

29. The dead element of phloem is the phloem fibre.



Phloem tubes that conduct prepared food

30. **Differences between :**

Photosynthesis	Respiration
(*i*) It is an anabolic process in which food substances are synthesised.	(*i*) It is a catabolic process in which food substances are broken down.
(*ii*) It uses carbon dioxide to synthesise the food and releases oxygen.	(*ii*) It uses oxygen to oxidise the food substances and releases carbon dioxide and energy.
(*iii*) It occurs only in the presence of light.	(*iii*) It occurs at all times of day and night.
(*iv*) It occurs only in chlorophyllous cells.	(*iv*) It occurs in all living cells.

(*i*) **Pulmonary Circulation :** This circulation is maintained by the right side of the heart. It begins in the right ventricle which expels the blood into the pulmonary trunk. The blood flowing into the vascular system of the lungs becomes oxygenated and returns to the heart (left atrium) through pulmonary veins.

(*ii*) **Systemic Circulation :** This circulation is maintained by the left ventricle which sends the blood into the aorta. The aorta divides into arteries, arterioles and finally to capillaries and thereby supplies oxygenated blood to various parts of the body. From there deoxygenated blood is collected by venules which join to form veins and finally vena cava and pour blood back into the heart.

Necessity of Double Circulation : The right side and the left side of the human heart are useful to keep deoxygenated and oxygenated blood from mixing. This type of separation of oxygenated and deoxygenated blood ensures a highly efficient supply of oxygen to the body. This is useful in case of humans because it constantly gives energy to maintain their body temperature.

10. (*a*) The two different ways in which glucose is oxidised to provide energy in various organisms are as follows :
First set of breakdown of glucose (six carbon molecules) takes place in the cytoplasm of cells of all organisms. This process yields a three carbon molecule compound called pyruvate. Further breakdown of pyruvrate takes place in different manners in different organisms.

(*i*) **Anaerobic respiration** which takes place in absence of oxygen, *e.g.*, in yeast during fermentation. In this case, pyruvate is converted into ethanol and carbon dioxide.

(*ii*) **Aerobic respiration,** in which breakdown of pyruvate takes place in presence of oxygen to give rise to three molecules of carbon dioxide and water.

(*b*) The two differences between the two ways of oxidation of glucose in organisms are as follows :

Aerobic respiration	Anaerobic respiration
(*i*) When oxidation of food nutrients occurs in the presence of molecular oxygen, it is called aerobic respiration.	(*i*) When oxidation of nutrients occurs without the utilisation of molecular oxygen, it is called anaerobic respiration.
(*ii*) More energy is produced as oxidation is complete.	(*ii*) Less amount of energy is produced as oxidation is not complete.

11.

Aerobic respiration	Anaerobic respiration
(*i*) When oxidation of food nutrients occurs in the presence of molecular oxygen, it is called aerobic respiration.	(*i*) When oxidation of nutrients occurs without the utilisation of molecular oxygen, it is called anaerobic respiration.
(*ii*) More energy is produced as oxidation is complete.	(*ii*) Less amount of energy is produced as oxidation is not complete.
(*iii*) It occurs in higher organisms like plants and animals.	(*iii*) It occurs in lower organisms like bacteria, yeast.

12. (*a*) The process by which autotrophs prepare their own food is called photosynthesis.

(*b*) The three events which occur during the process of photosynthesis are as follows :

(*i*) Absorption of light energy by chlorophyll.

(*ii*) Conversion of light energy to chemical energy and splitting of water molecules into hydrogen and water.

(*iii*) Reduction of carbon dioxide to carbohydrates.

(*c*) The two sources from which plants obtain nitrogen for the synthesis of proteins and other compounds are—

(*i*) Inorganic nitrates or nitrites.

(*ii*) Organic compounds prepared by bacteria from atmospheric nitrogen.

Important Questions

13. (*a*) **Mechanism of breathing in Human :** Breathing is a complex mechanical process involving muscular movement that alters the volume of the thoracic cavity and thereby that of the lung.

- Breathing occurs involuntarily but its rate is controlled by the respiratory centre of brain.
- The space of thoracic cavity increases or decreases by outward and inward movements of the ribs caused by external intercostal and internal intercostal muscles.
- This action is also assisted by the contraction and expansion of the **diaphragm.**
- The floor of the thoracic cavity is completely closed by diaphragm. It is a thin muscular septum separating the abdominal and thoracic cavities.
- **Inspiration** or **inhalation** is concerned with the taking in of atmospheric air or oxygen into the thoracic cavity.
- **Expiration** or **exhalation** is concerned with the expelling of carbon dioxide from lungs. It takes place when the volume of the thoracic cavity decreases and the pressure of the contained air in the thoracic cavity increases.

(*b*) (*i*) Under normal conditions, the rate of breathing is 12 to 18 times per minute.

(*ii*) The rate of breathing during vigorous exercise increases by about 20 to 25 times per minute. It is because, during vigorous exercise, the demand for oxygen increases. Breathing occurs involuntarily but its rate is controlled by the respiratory centre of the brain.

14. Inhalation or inspiration is the process by which air is brought into the lungs during breathing in human beings. It involves the following steps :

(*i*) The external intercostal muscles contract causing ribs to pull out and chest cavity to expand.

(*ii*) Diaphragm contracts and is brought down a little. This also expands the chest cavity.

(*iii*) There is a contraction of the abdominal muscles. The expansion of chest cavity creates a partial vacuum and atmospheric air rushes the lung.

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 that helps in mixing of food.

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.

2. Differences between arteries and veins

Arteries	Veins
1. They carry oxygenated blood.	1. They carry deoxygenated blood.
2. They carry blood from heart to various organs.	2. They carry blood from various organs to heart.
3. They are thick walled.	3. They are thin walled.

3. Three types of blood vessels in human circulatory system are - Arteries, Veins and Capillaries. Their functions are tabulated below :

Arteries	Veins	Capillaries
(*i*) Arteries carry oxygenated blood from heart to various organs of the body.	(*i*) Veins carry deoxygenated blood from various organs to heart.	(*i*) Exchanges of materials between blood and surrounding cells take place in the capillaries.
(*ii*) They are thick walled.	(*ii*) They are thin walled.	(*ii*) They are thin walled and extremely narrow tubes or blood vessels which connect arteries to veins.

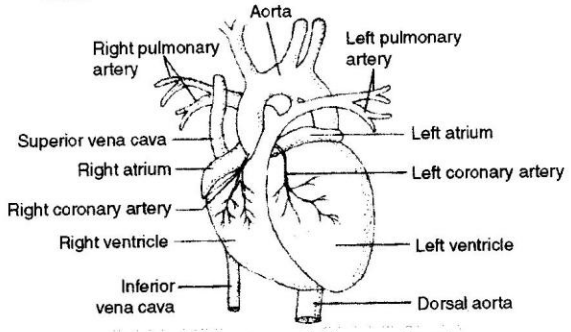
4. (*a*) Even though the breathing cycle is rhythmic, the lungs always contain a residual volume of air so that absorption of O_2 and release of CO_2 becomes continuous.

(*b*) The circulatory system will become inefficient if it develops a leak.

This could be avoided by maintaining a normal blood pressure.

(*c*) When water flows into the guard cells, the guard cells swell and the stomatal pore opens up. The guard cells shrinks when water moves out and the stomatal pore closes.

5.



External Structure of Human Heart

6. Functions of Kidneys

It removes the nitrogenous wastes such as urea and excess water from the blood. It regulates the osmotic pressure/water balance/ pH of the blood.

Functions of Ureters

Urine formed in each kidney is carried by the long tube called ureter to the urinary bladder. Some amount of glucose, amino acid, salt and a major amount of water are reabsorbed in ureter.

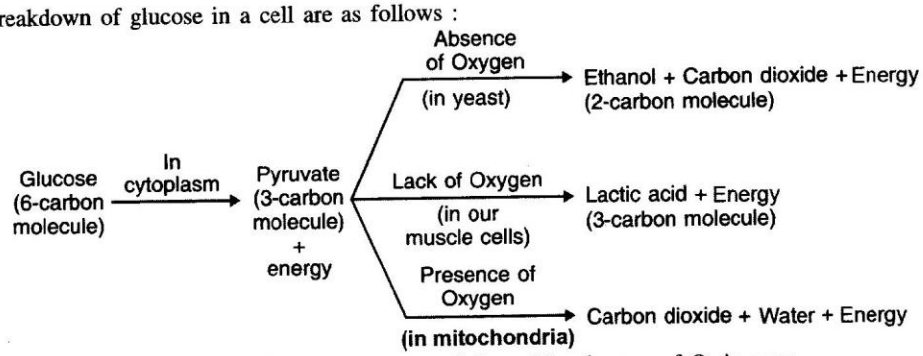
Functions of Urinary bladder

It acts as a reservoir that stores urine before being discharged to the outside.

Functions of Urethra

Urine is passed out from the body through the urethra.

7. The process of breakdown of glucose in a cell are as follows :



The first step in the breakdown of glucose both in presence of O_2 and in absence of O_2 is same.

In this step, glucose is broken down into pyruvate.

(*i*) **In presence of O_2 :** In presence of O_2, pyruvate is converted into CO_2 and water. Energy released during aerobic respiration is much greater than that released during an anaerobic respiration.

(*ii*) **In absence of O_2 :** In absence of O_2 in yeast, pyruvate is converted into ethanol and CO_2 and the process is called fermentation. In absence of O_2, in our muscle cells, pyruvate is converted into lactic acid. The build up of lactic acid in muscle cells causes cramps.

8. (*i*) (1) Pulmonary artery to lungs
(2) Lung capillaries
(3) Pulmonary vein from lungs
(4) Aorta to body
(5) Capillaries in body organs
(6) Vena cava from body. (*any four*)

(*ii*) The two functions represented are :
(*a*) Transport of oxygen and carbon dioxide
(*b*) Exchange of oxygen and carbon dioxide

9. The circulatory system of man is called double circulation as the blood passes through the heart twice in one complete cycle of the body. It involves two circulations :