NOTES: CBSE 10th

BIOLOGY: Life Processes

POINTS TO REMEMBER

1. Diaphragm becomes flat during inspiration and becomes convex during expiration.
2. **Tidal volume :** Volume of air inspired or expired in relaxed position. It is around 500 ml.
3. **Residual volume** : Air left in the whole respiratory tract after forceful expiration. It is 1.5 liters.
4. **Total lung capacity :** Maximum amount of air the lungs can hold after forceful inspiration. It is about 5-6.0 litres.
5. **Vital capacity :** Maximum amount of air which can be breathed out through forceful expiration after a forceful inspiration. It is 3.4-4.8 litres.
6. Vital Capacity is more in athletes, mountain dwellers, non smokers.
7. The total area for gas exchange provided by our 750 million alveoli in two lungs in 100 S. m.
8. In the cycle of inhalation and exhalation, repeated 15 to 18 times in a minutes about 500 ml of air is breathed in and out. In 24 hours, we breath in 1500 litres of air.
9. Blood is the medium for the transport of oxygen from the respiratory organ to the different tissues and carbon dioxide from tissues to the respiratory organs. As much as 97 percent of the oxygen is transported from the lungs to the tissues in combination with hemoglobin and only 2 percent is transported in dissolved condition by the plasma.
10. A normal person has about 15 grams of hemoglobin per 100 ml of blood. One gram of hemoglobin binds about 1.34 ml of O_2. Thus, 100 ml of blood carries about 20 ml of oxygen.
11. Carbon dioxide is also transported by hemoglobin. When a respiring tissue release carbon-dioxide, it is first diffused in the plasma. From here it diffuses into the red blood cells. Carbon-dioxide is transported from the tissues to the lungs in the form of bicarbonates dissolved in water.
12. About 23% of carbon dioxide entering into the erythrocytes combines with the globin (protein) part of haemoglobin to form carbaminohaemoglobin, which is transported to the lungs.
13. Carbon monoxide binds with hemoglobin about 230 times more readily than oxygen. When a person inhales carbon monoxide, it diffuses from the alveolar air to the blood and binds to haemoglobin forming carboxyhemoglobin. The latter is a relatively stable compound and cannot bind with oxygen molecules. So, the amount of hemoglobin available for oxygen transport is reduced. The resulting deficiency of oxygen cases headache, dizziness, nausea and even death.
14. **Mountain sickness :** It is also known as altitude sickness. At sea level the concentration of oxygen is about 21% and the barometric pressure averages 760 mm Hg. As altitude increases, the concentration remains the same but the number of oxygen molecules per breath is reduced. AT 12,000 feet the barometric pressure is only 483 mm Hg, so there are roughly 40% fewer oxygen molecules per breath. In order to oxygenate the body effectively, breathing rate (even while at rest) has to be increased. This extra ventilation increases the oxygen content in the blood, but not sea level concentration. The fall in oxygenation of blood produced the symptoms of mountain sickness. These symptoms include breathlessness, headache, dizziness, nausea, vomiting, mental fatigue and a bluish tinge on the skin, nails and lips.
15. The ability to perform the basic life processes distinguishes a living organism from a nonliving one.
16. Life processes are the vital processes carried out by living organisms in order to maintain and sustain life. Molecular movements are essential to carry out the various life processes.

17. Specialised body parts perform the various life processes in multicellular organisms. No such organs are present in unicellular organisms.
18. Energy required to carry out the different life processes, is obtained from carbon-based food sources through nutrition.
19. Depending on the mode of obtaining nutrition, organisms are classified as autotrophs or heterotrophs.
    a. Autotrophs can prepare their own food from simple inorganic sources like carbon dioxide and water. (eg- green plants, some bacteria)
    b. Heterotrophs cannot synthesize their own food and is dependent on the autotrophs for obtaining complex organic substances for nutrition. (eg. – animals)
20. Green plants prepare their food by the process of photosynthesis. Here, they utilize CO_2, H_2O and sunlight, with the help of chlorophyll, giving out O_2 as a byproduct.
21. In the light reaction of photosynthesis, light energy is absorbed and converted to chemical energy in the form of ATP. Also water molecules are split into hydrogen and oxygen.
22. Photosynthesis involves light-dependent reaction having non-cyclic and cyclic photophosphorylation and dark reaction where energy is utilised.
23. In 1941, by using Van Niel's hypothesis and the rare isotope of oxygen ^{18}O, water labelled with ^{I8}O was used. The experiment proved that **all oxygen evolved comes from water only** and hence the modified equation of photosynthesis is written as given.

$$6CO_2 + 12\,H_2{}^{18}O \xrightarrow[\text{Chlorophyll}]{\text{Light energy}} C_6H_{12}O_6 + 6{}^{18}O_2 + 6H_2O$$

24. In sulphur bacteria, he found that sulphur was released, not oxygen meaning that CO_2 was not split rather H_2S was broken down, and hydrogen reduced the CO_2.

$$6CO_2 + 12H_2S \xrightarrow[\text{Chlorophyll}]{\text{Light energy}} C_6H_{12}O_6 + 12S + H_2O$$

25. By 1950 it was well established that both the reactions occur in separate areas, the light reaction takes place on the chloroplast membranes and the dark reaction in the stroma region.
26. Desert plants as an exception, opens stomata in night to absorb CO_2 and form intermediate compound i.e. malate which is stored in vacuole. During day it is converted into sugar.
27. The parasite, the one that draws nourishment often lacks digestive system as it feeds on nutrients already in solution form or digested form, from the host as in the case of gut parasites like tapeworm and round worm.
28. Commercially for curdling of milk the **Rennet tablets** are used which contain renin extracted from the calf gastric mucosa.
29. Carbon dioxide is reduced to carbohydrates in the dark phase of photosynthesis.
30. Plants carry out gaseous exchange with surrounding through stomata.
31. Heterotrophs may be herbivores, carnivores, parasites or saprophytes.
32. In Amoeba, digestion occurs in the food vacuole, formed by the engulfing of food by its pseudopodia.
33. In humans, digestion of food takes place in the alimentary canal, made up of various organs and glands.
34. In mouth, food is crushed into small particles through chewing and mixed with saliva, which contains amylase for digesting starch.

35. On swallowing, food passes through pharynx and oesophagus to reach stomach. The gastric juice contains pepsin (for digesting proteins), HCl and mucus.
36. Liver secretes bile which emulsifies fat.
37. Pancreatic juice contains enzymes amylase, trypsin and lipase for digesting starch, proteins and fats respectively.
38. In the small intestine, carbohydrate, proteins and fats are completely digested into glucose, amino acids, and fatty acids and glycerol respectively.
39. The villi of small intestine absorb the digested food and supply it to every cell of the body.
40. The undigested food is egested from the body through anus.
41. During respiration, the digested food materials are broken down to release energy in the form of ATP.
42. Depending on the requirement of oxygen, respiration may be

    a. Aerobic - occurring in presence of oxygen or

    b. Anaerobic – occurring in absence of oxygen.
43. The end-products are lactic acid or ethanol + CO_2, in anaerobic respiration or CO_2 and water in aerobic respiration. Large amount of energy is released in aerobic respiration as compared to anaerobic respiration.
44. Plants release CO_2 at night and oxygen during the day.
45. Terrestrial organisms use atmospheric oxygen for respiration whereas aquatic organisms use the dissolved oxygen in water.
46. In humans, air takes the following path on entering the nostrils.

    Nostrils → Nasal passage → Pharynx → Larynx → Trachea → Bronchus → Bronchiole → Alveolus.
47. The alveoli of lungs are richly supplied with blood and are the sites where exchange of gases (O_2 and CO_2) occurs between blood and atmosphere.
48. In humans, the respiratory pigment haemoglobin, carry oxygen from lungs to different tissues of the body.
49. Acetyl Co-A is a important molecule in metabolism. It main function is to convey the carbon atom with in acetyl group to the citric acid cycle to be oxidized to produced energy.
50. In humans, the circulatory system transports various materials throughout the body and is composed of the heart, blood and blood vessels.
51. Human heart has 4 chambers – 2 atria (right and left) and 2 ventricles (right and left). Right half of the heart receives deoxygenated blood whereas the left half receives oxygenated blood.
52. Cockroach has 13 hearts.
53. Ventricular walls are much thicker than atrial walls.
54. Arteries carry blood from heart to different parts of the body whereas veins deliver the blood back to the heart. Arteries are connected to veins by thin capillaries, wherein materials are exchanged between blood and cells.
55. Humans show double circulation and complete separation of oxygenated and deoxygenated blood.
56. Blood platelets are essential for clotting of blood at the place of injury and thus preventing blood loss.
57. Lymphatic system consists of lymph, lymph nodes, lymphatic capillaries and lymph vessels which drain into larger veins. Lymph is also important in the process of transportation.

58. In plants, water is transported through the xylem tissue, from roots to the aerial parts of the plant. Root pressure and transpiration pull are the major forces involved in pulling water up the xylem.

59. Translocation of food is carried out through phloem tissue from leaves and storage organs to other parts of the plant. This process requires energy from ATP.

60. During excretion, the harmful metabolic nitrogenous wastes generated are removed from the body.

61. In humans, a pair of kidneys, a pair of ureters, urinary bladder and urethra constitutes the excretory system.

62. Nephrons are the basic filtration units of kidneys. They carry out filtration, selective reabsorption and tubular secretion to form urine in kidney, which is then passed out through the urethra, via the ureters and urinary bladder.

63. Plants do not have an excretory system and carries out excretion in various ways like transpiration, releasing wastes into surrounding soil, losing the leaves and storing in cell vacuoles and in old xylem.

64. **Ornithine cycle** – Ornithine cycle is the process of converting ammonia into urea by combining with CO_2 in liver.

CONCEPT APPLICATION LEVEL - I [NCERT Questions]

Q.1 Why is diffusion insufficient to meet the oxygen requirements of multi-cellular organisms like humans?

Ans. Multicellular organisms such as humans possess complex body designs. They have specialised cells and tissues for performing various necessary functions of the body such as intake of food and oxygen. Unlike unicellular organisms, multicellular cells are not in direct contact with the outside environment. Therefore, diffusion cannot meet their oxygen requirements.

Q.2 What criteria do we use to decide whether something is alive?

Ans. Any visible movement such as walking, breathing, or growing is generally used to decide whether something is alive or not. However, a living organism can also have movements, which are not visible to the naked eye. Therefore, the presence of life processes is a fundamental criterion that can be used to decide whether something is alive or not.

Q.3 What are outside raw materials used for by an organism?

Ans. An organism uses outside raw materials mostly in the form of food and oxygen. The raw materials required by an organism can be quite varied depending on the complexity of the organism and its environment.

Q.4 What processes would you consider essential for maintaining life?

Ans. Life processes such as nutrition, respiration, transportation, excretion, etc. are essential for maintaining life.

Q.5 What are the differences between autotrophic nutrition and heterotrophic nutrition?

Ans.

	Autotrophic nutrition	Heterotrophic nutrition
(i)	Food is synthesised from simple inorganic raw materials such as CO_2 and water.	Food is obtained directly or indirectly from autotrophs. This food is broken down with the help of enzymes.
(ii)	Presence of green pigment (chlorophyll) is necessary.	No pigment is required in this type of nutrition.
(iii)	Food is generally prepared during day time.	Food can be prepared at all times.
(iv)	All green plants and some bacteria have this type of nutrition.	All animals and fungi have this type of nutrition.

Q.6 Where do plants get each of the raw materials required for photosynthesis?

Ans. The following raw materials are required for photosynthesis :

- The raw material CO_2 enters from the atmosphere through stomata.
- Water is absorbed from the soil by the plant roots.
- Sunlight, an important component to manufacture food, is absorbed by the chlorophyll and other green parts of the plants.

Q.7 What is the role of the acid in our stomach?

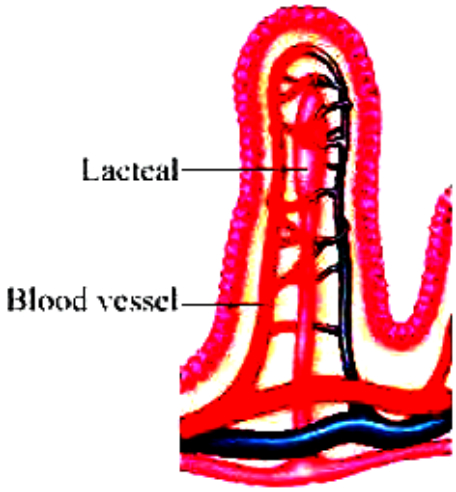
Ans. The hydrochloric acid present in our stomach dissolves bits of food and creates an acidic medium. In this acidic medium, enzyme pepsinogen is converted to pepsin, which is a protein-digesting enzyme.

Q.8 What is the function of digestive enzymes?

Ans. Digestive enzymes such as amylase, lipase, pepsin, trypsin, etc. help in the breaking down of complex food particles into simple ones. These simple particles can be easily absorbed by the blood and thus transported to all the cells of the body.

Q.9 How is the small intestine designed to absorb digested food?

Ans. The small intestine has millions of tiny finger-like projections called villi. These villi increase the surface area for more efficient food absorption. Within these villi, many blood vessels are present that absorb the digested food and carry it to the blood stream. From the blood stream, the absorbed food is delivered to each and every cell of the body.



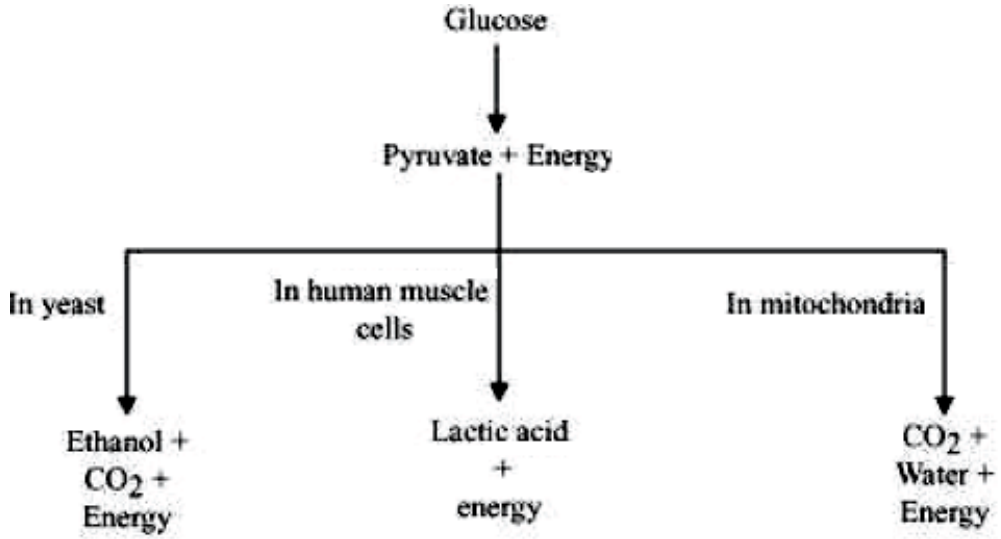
Enlarged view of a villus

Q.10 What advantage over an aquatic organism does a terrestrial organism have with regard to obtaining oxygen for respiration?

Ans. Terrestrial organisms take up oxygen from the atmosphere whereas aquatic animals need to utilize oxygen present in the water. Air contains more O_2 as compared to water. Since the content of O_2 in air is high, the terrestrial animals do not have to breathe faster to get more oxygen. Therefore, unlike aquatic animals, terrestrial animals do not have to show various adaptations for better gaseous exchange.

Q.11 What are the different ways in which glucose is oxidized to provide energy in various organisms?

Ans. Glucose is first broken down in the cell cytoplasm into a three carbon molecule called pyruvate.
Pyruvate is further broken down by different ways to provide energy.
The breakdown of glucose by different pathways can be illustrated as follows.

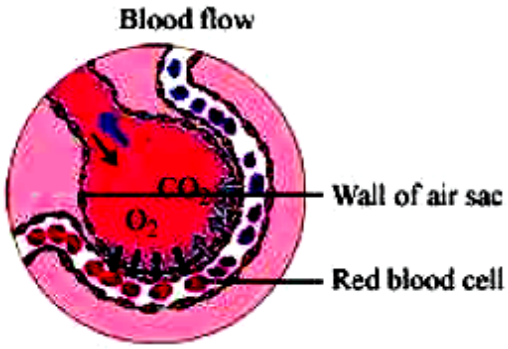


In yeast and human muscle cells, the breakdown of pyruvate occurs in the absence of oxygen whereas in mitochondria, the breakdown of pyruvate occurs in the presence of oxygen.

Q.12 How is oxygen and carbon dioxide transported in human beings?

Ans. Haemoglobin transports oxygen molecule to all the body cells for cellular respiration. The haemoglobin pigment present in the blood gets attached to four O_2 molecules that are obtained from breathing. It thus forms oxyhaemoglobin and the blood becomes oxygenated. This oxygenated blood is then distributed to all the body cells by the heart. After giving away O_2 to the body cells, blood takes away CO_2 which is the end product of cellular respiration. Now the blood becomes de-oxygenated.

Since haemoglobin pigment has less affinity for CO_2, CO_2 is mainly transported in the dissolved form. This de-oxygenated blood gives CO_2 to lung alveoli and takes O_2 in return.



Transportation of O_2 and CO_2 in blood.

Q.13 How are the lungs designed in human beings to maximize the area for exchange of gases?

Ans. The exchange of gases takes place between the blood of the capillaries that surround the alveoli and the gases present in the alveoli. Thus, alveoli are the site for exchange of gases. The lungs get filled up with air during the process of inhalation as ribs are lifted up and diaphragm is flattened. The air that is rushed inside the lungs fills the numerous alveoli present in the lungs. Each lung contains 300-350 million alveoli. These numerous alveoli increase the surface area for gaseous exchange making the process of respiration more efficient.

Q.14 What are the components of the transport system in human beings? What are the functions of these components?

Ans. The main components of the transport system in human beings are the heart, blood, and blood vessels.

- Heart pumps oxygenated blood throughout the body. It receives deoxygenated blood from the various body parts and sends this impure blood to the lungs for oxygenation.
- Being a fluid connective tissue, blood helps in the transport of oxygen, nutrients, CO_2, and nitrogenous wastes.
- The blood vessels (arteries, veins, and capillaries) carry blood either away from the heart to various organs or from various organs back to the heart.

Q.15 Why is it necessary to separate oxygenated and deoxygenated blood in mammals and birds?

Ans. Warm-blooded animals such as birds and mammals maintain a constant body temperature by cooling themselves when they are in a hotter environment and by warming their bodies when they are in a cooler environment. Hence, these animals require more oxygen (O_2) for more cellular respiration so that they can produce more energy to maintain their body temperature.

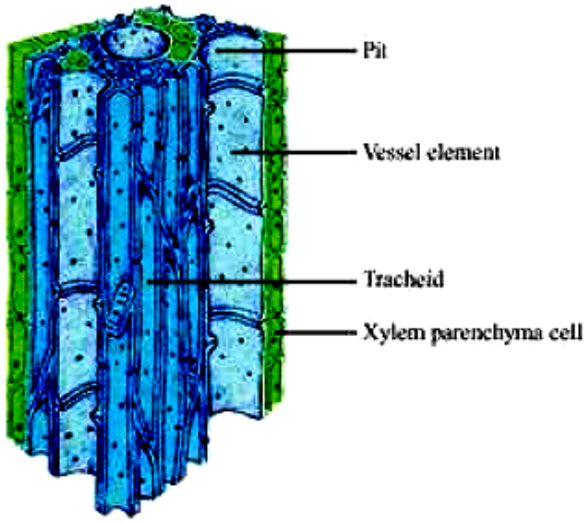
Thus, it is necessary for them to separate oxygenated and de-oxygenated blood, so that their circulatory system is more efficient and can maintain their constant body temperature.

Q.16 What are the components of the transport system in highly organised plants?

Ans. In highly organised plants, there are two different types of conducting tissues - xylem and phloem. Xylem conducts water and minerals obtained from the soil (via roots) to the rest of the plant. Phloem transports food materials from the leaves to different parts of the plant body.

Q.17 How are water and minerals transported in plants?

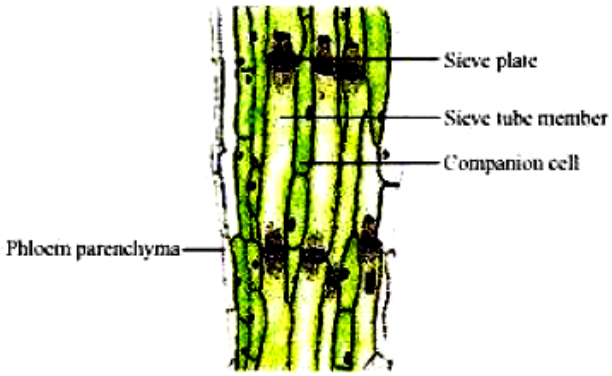
Ans. The components of xylem tissue (tracheids and vessels) of roots, stems, and leaves are interconnected to form a continuous system of water-conducting channels that reaches all parts of the plant. Transpiration creates a suction pressure, as a result of which water is forced into the xylem cells of the roots. Then there is a steady movement of water from the root xylem to all the plant parts through the interconnected water-conducting channels.



Components of xylem tissue

Q.18 How is food transported in plants?

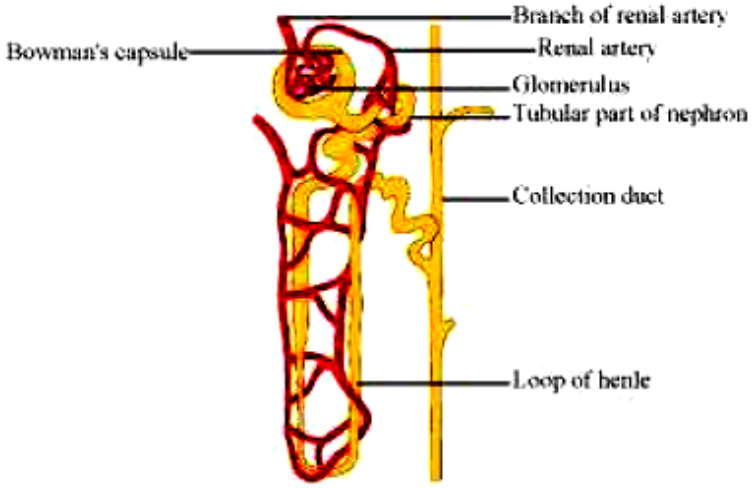
Ans. Phloem transports food materials from the leaves to different parts of the plant body. The transportation of food in phloem is achieved by utilizing energy from ATP. As a result of this, the osmotic pressure in the tissue increases causing water to move into it. This pressure moves the material in the phloem to the tissues which have less pressure. This is helpful in moving materials according to the needs of the plant. For example, the food material, such as sucrose, is transported into the phloem tissue using ATP energy.



Components of phloem tissue

Q.19 Describe the structure and functioning of nephrons.

Ans. Nephrons are the basic filtering units of kidneys. Each kidney possesses large number of nephrons, approximately 1-1.5 million. The main components of the nephron are glomerulus, Bowman's capsule, and a long renal tubule.



Structure of a nephron

Functioning of a nephron :

- The blood enters the kidney through the renal artery, which branches into many capillaries associated with glomerulus.
- The water and solute are transferred to the nephron at Bowman's capsule.
- In the proximal tubule, some substances such as amino acids, glucose, and salts are selectively reabsorbed and unwanted molecules are added in the urine.
- The filtrate then moves down into the loop of Henle, where more water is absorbed.
- From here, the filtrate moves upwards into the distal tubule and finally to the collecting duct. Collecting duct collects urine from many nephrons.
- The urine formed in each kidney enters a long tube called ureter. From ureter, it gets transported to the urinary bladder and then into the urethra.

Q.20 What are the methods used by plants to get rid of excretory products?

Ans. Plants can get rid of excess of water by transpiration. Waste materials may be stored in the cell vacuoles or as gum and resin, especially in old xylem. It is also stored in the leaves that later fall off.

Q.21 How is the amount of urine produced regulated?

Ans. The amount of urine produced depends on the amount of excess water and dissolved wastes present in the body. Some other factors such as habitat of an organism and hormone such as Antidiuretic hormone (ADH) also regulates the amount of urine produced.

Q.22 The kidneys in human beings are a part of the system for

(a) nutrition. (b) respiration. (c) excretion. (d) transportation.

Ans. **(c)** In human beings, the kidneys are a part of the system for excretion.

Q.23 The xylem in plants are responsible for

(a) transport of water. (b) transport of food.
(c) transport of amino acids. (d) transport of oxygen.

Ans. **(a)** In a plant, the xylem is responsible for transport of water.

Q.24 The autotrophic mode of nutrition requires

(a) carbon dioxide and water. (b) chlorophyll.
(c) sunlight. (d) all of the above.

Ans. **(d)** The autotrophic mode of nutrition requires carbon dioxide, water, chlorophyll and sunlight.

Q.25 The breakdown of pyruvate to give carbon dioxide, water and energy takes place in

(a) cytoplasm. (b) mitochondria. (c) chloroplast. (d) nucleus.

Ans. **(b)** The breakdown of pyruvate to give carbon dioxide, water and energy takes place in mitochondria.

Q.26 How are fats digested in our bodies? Where does this process take place?

Ans. Fats are present in the form of large globules in the small intestine. The small intestine gets the secretions in the form of bile juice and pancreatic juice respectively from the liver and the pancreas. The bile salts (from the liver) break down the large fat globules into smaller globules so that the pancreatic enzymes can easily act on them. This is referred to as emulsification of fats. It takes place in the small intestine.

Q.27 What is the role of saliva in the digestion of food?

Ans. Saliva is secreted by the salivary glands, located under the tongue. It moistens the food for easy swallowing. It contains a digestive enzyme called salivary amylase, which breaks down starch into sugar.

Q.28 What are the necessary conditions for autotrophic nutrition and what are its by-products?

Ans. Autotrophic nutrition takes place through the process of photosynthesis. Carbon dioxide, water, chlorophyll pigment, and sunlight are the necessary conditions required for autotrophic nutrition. Carbohydrates (food) and O_2 are the by-products of photosynthesis.

Q.29 What are the differences between aerobic and anaerobic respiration? Name some organisms that use the anaerobic mode of respiration.

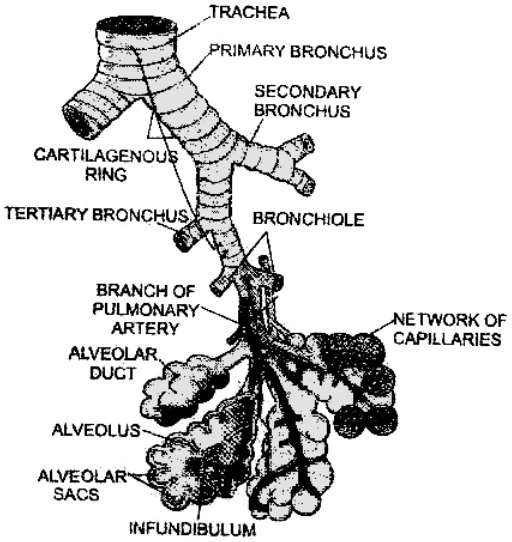
Ans.

Aerobic Respiration	Anaerobic Respiration
1. **Method.** It is the common method of respiration.	It occurs permanently only in a few organism. In others it may occur as a temporary measure to overcome shortage of oxygen.
2. **Steps.** It is completed in 3 steps – glycolysis, Krebs cycle and terminal oxidation.	There are two steps – glycolysis and anaerobic breakdown of pyruvic acid.
3. **Oxygen.** It requires oxygen.	Oxygen is not required.
4. **Breakdown.** Respiratory substrate is completely broken down.	Respiratory substrate is incompletely broken down.
5. **End Products.** They are inorganic.	Atleast one end product is organic. Inorganic products may or may not be present.
6. **Toxicity.** End products show little toxicity.	The organic end product is generally toxic.
7. **Occurance.** It occurs partly in cytoplasm and partly in mitochondria.	Anaerobic respiration is carried out entirely in cytoplasm. Mitochondria are not required.
8. **E.T.C.** An electron transport chain is required.	ETC is not required.
9. **Energy.** In release 686 kcal or 2870 kJ of energy per mole of glucose.	Energy liberated is 36-50 kcal or 150-210 kJ per mole of glucose.
10. ATP. The liberated energy issued in forming 36-38 ATP molecule per mole of glucose.	The liberate energy is used in synthesis of 2ATP mole.

Anaerobic respiration occurs in the roots of some waterlogged plants, some parasitic worms, animal muscles, and some micro-organisms such as yeasts.

Q.30 How are the alveoli designed to maximise the exchange of gases?

Ans. The alveoli are the small balloon-like structures present in the lungs. The walls of the alveoli consist of extensive network of blood vessels. Each lung contains 300-350 million alveoli, making it a total of approximately 700 million in both the lungs. The alveolar surface when spread out covers about 80 m^2 area. This large surface area makes the gaseous exchange more efficient.



Alveoli and capillaries

Q.31 What would be the consequences of a deficiency of haemoglobin in our bodies?

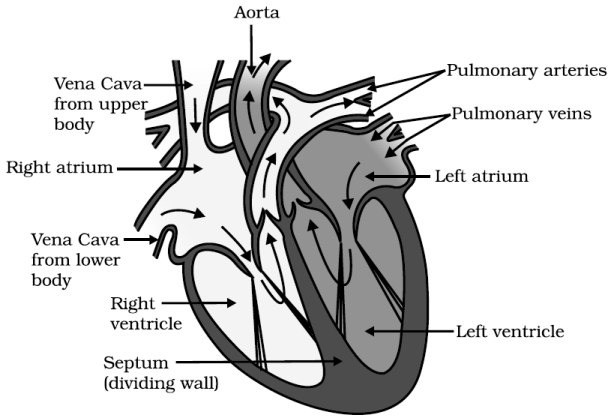
Ans. Haemoglobin is the respiratory pigment that transports oxygen to the body cells for cellular respiration. Therefore, deficiency of haemoglobin in blood can affect the oxygen supplying capacity of blood. This can lead to deficiency of oxygen in the body cells. It can also lead to a disease called anaemia.

Q.32 Describe double circulation in human beings. Why is it necessary?

Ans. The human heart is divided into four chambers - the right atrium, the right ventricle, the left atrium, and the left ventricle.

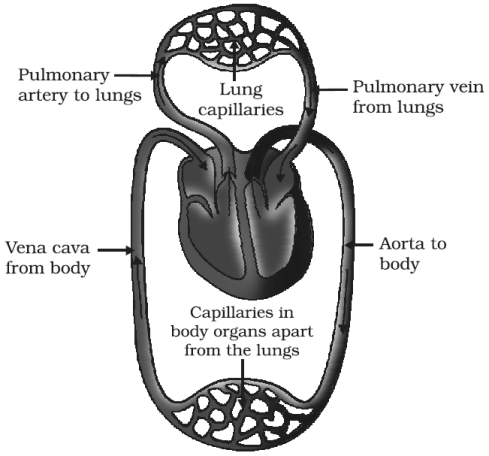
Flow of blood in the heart

- The heart has superior and inferior vena cava, which carries de-oxygenated blood from the upper and lower regions of the body respectively and supplies this de-oxygenated blood to the right atrium of the heart.



Flow of blood in the heart

- The right atrium then contracts and passes the de-oxygenated blood to the right ventricle, through an auriculo-ventricular aperture.
- Then the right ventricle contracts and passes the de-oxygenated blood into the two pulmonary arteries, which pumps it to the lungs where the blood becomes oxygenated. From the lungs, the pulmonary veins transport the oxygenated blood to the left atrium of the heart.
- Then the left atrium contracts and through the auriculo-ventricular aperture, the oxygenated blood enters the left ventricle.
- The blood passes to aorta from the left ventricle. The aorta gives rise to many arteries that distribute the oxygenated blood to all the regions of the body.



Schematic diagram of blood circulation in humans

- Therefore, the blood goes twice through the heart. This is known as double circulation.

Importance of double circulation :

- The separation of oxygenated and de-oxygenated blood allows a more efficient supply of oxygen to the body cells. This efficient system of oxygen supply is very useful in warm-blooded animals such as human beings.
- As we know, warm-blooded animals have to maintain a constant body temperature by cooling themselves when they are in a hotter environment and by warming their bodies when they are in a cooler environment. Hence, they require more O2 for more respiration so that they can produce more energy to maintain their body temperature. Thus, the circulatory system of humans is more efficient because of the double circulatory heart.

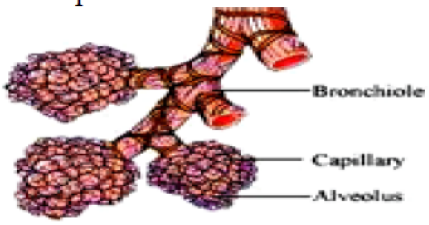
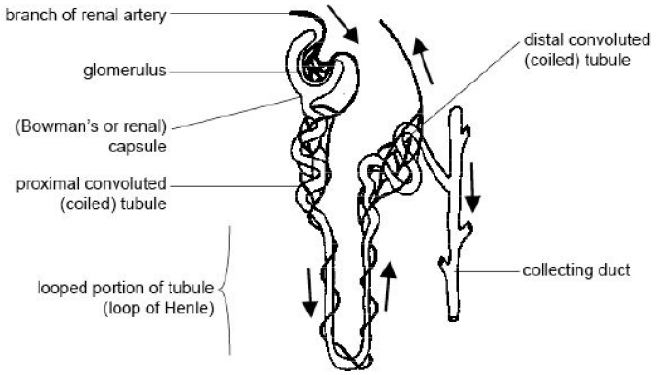
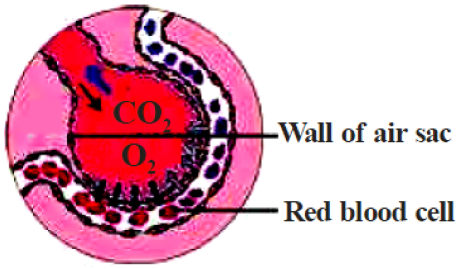
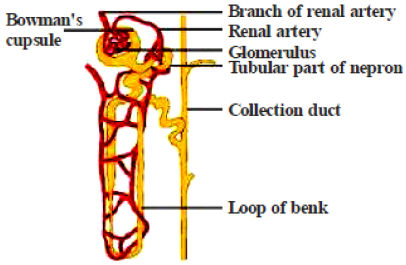
Q.33 What are the differences between the transport of materials in xylem and phloem?

Ans.

	Transport of materials in xylem	**Transport of materials in phloem**
(i)	Xylem tissue helps in the transport of water and minerals.	Phloem tissue helps in the transport of food.
(ii)	Water is transported upwards from roots to all	Food is transported in both upward and downward directions.
(iii)	Transport in xylem occurs with the help of simple physical forces such as transpiration pull.	Transport of food in phloem requires energy in the form of ATP.

Q.34 Compare the functioning of alveoli in the lungs and nephrons in the kidneys with respect to their structure and functioning.

Ans.

Alveoli	Nephron
Structure (i) Alveoli are tiny balloon-like structures present inside the lungs. (ii) The walls of the alveoli are one cell thick and it contains an extensive network of blood capillaries.  	**Structure** (i) Nephrons are tubular structures present inside the kidneys. (ii) Nephrons are made of glomerulus, bowman's capsule, and a long renal tube. It also contains a cluster of thin walled capillaries. 
Function (i) The exchange of O_2 and CO_2 takes place between the blood of the capillaries that surround the alveoli and the gases present in the alveoli. **Blood flow**  (ii) Alveoli are the site of gaseous exchange.	**Function** (i) The blood enters the kidneys through the renal artery which branches into many capillaries in the glomerulus. The water and solute are transferred to the nephron at Bowman's capsule. Then the filtrate moves through the proximal tubule and then down into the loop of henle. From henle's loop, filtrate passes into the distal tubule and then to the collecting duct. The collecting duct collects the urine from many nephrons and passes it to the ureter. During the flow of filtrate, some substances such as glucose, amino acids, and water are selectively reabsorbed.  (ii) Nephrons are the basic filtration unit.

CONCEPT APPLICATION LEVEL - II

SECTION–A

1. Artifical removal of metabolic wastes from the body is called as –
(A) Ultra filteration (B) Dialysis (C) Osmoregulation (D) None of these

2. Human kidney resembles contractile vacuole of Amoeba in expelling out –
(A) Excess H_2O (B) Salts (C) Glucose (D) Urea

3. The units of a mammalian kidney are –
(A) Nephrons (B) Seminiferous tubules
(C) Uriniferous tubules (D) Ureters

4. NH_3 converted to urea in –
(A) Kidney (B) Liver (C) Spleen (D) Heart

5. Glomerular filtrate normally contain –
(A) Glucose (B) NaCl (C) Amino acids (D) All of these

6. Man is –
(A) Uricotelic (B) Ureotelic (C) Ammonotelic (D) None of these

7. Which is not excretory organ?
(A) Skin (B) Kidney (C) Liver (D) Pancreas

8. Special excretory organ is lacking in :
(A) Earthworm (B) Amoeba (C) Man (D) Insects

9. Which of the following is not a excretory product in plant –
(A) Terpentine oil (B) Latex
(C) Glucose produced during photosynthesis (D) Oxygen

10. Sweat is an excretory waste because it contains
(A) N_2 waste (B) excess H_2O (C) Salts (D) All of the above

11. Urea cycle occur in
(A) Nephron (B) Spleen (C) Pancreas (D) Liver

12. Henle's loop is short or absent in
(A) Fresh water fish (B) Birds (C) Mammals (D) All of the above

13. The white matter in a bird's dropping is
(A) $CaCO_3$ (B) $CaSO_4$ (C) Uric acid (D) Urea

14. Identify the uricotelic animal
(A) Pisces (B) Amphibia (C) Man (D) Aves

15. Organic acids which may be poisnous to a plant are stored in –
(A) Vacuoles (B) Palisade cell (C) Mesophyll (D) Xylem vassels

16. The urinary bladder of a man empties outside by means of
(A) Ureter (B) Urethra (C) Vagina (D) Glands

17. Which of the following needs large amount of water for excretion?
(A) Urea (B) Ammonia (C) Uric acid (D) Amino acids

18. Photosynthesis is maximum in which light
(A) Red light (B) Green light (C) Low light intensity (D) High light intensity

19. Cell organelle associated with conversion of light energy to chemical energy.
(A) Chloroplast (B) Mitochondria (C) Ribosome (D) ER

20. Stomata of desert plant/succulant plant are
(A) always open
(B) open during the day and close during the night
(C) Open during the night and close during the day
(D) Never open

SECTION-B

Fill in the blanks :

1. Glucose is broken down to provide energy in the form of _____.
2. The circulatory system consist of the _____, _____ and _____.
3. Plant store waste in the form of _____ and _____.
4. _____ help in ultrafilteration in kidney.

Multiple blanks :

5. Double circulatory system of blood flow includes two distinct and separate systems. This distinction is shared by most vertebrates including amphibians, _____ and mammals.In contrast, fish have a single circulation system because they lacks_____.
(A) Birds, Lungs (B) Reptiles, lungs (C) Artropoda, Lungs (D)Birds, Gills

SECTION–C
CHECK YOUR COMPATIBILITY

1. What is the importance of HCl? From where it is secreted?
2. Where & how the acidic food turns alkaline?
3. Why fishes have single circulation?
4. Why right kidney is slightly lower in position?
5. Describe the step of respiration that take place in cytoplasm.
6. What is fermentation?
7. What is the significance of large inter-cellular spaces in the plants?
8. Why cramps relieve on treatment with hot water?
9. What is residual volume? How does it helps in exchange of oxygen.
10. What is the respiratory pigment in human? What is its function?

SECTION – D
PREVIOUS YEAR'S QUESTIONS

Very Short Answer Type Questions : (One Mark)

Q.1 Write other names of the following:
(a) Alveolar sac (b) Voice box **[SAI-2015]**

Ans. (a) Air-sacs (b) Larynx.

Q.2 What is transpiration ? **[SAI-2015]**

Ans. The loss of water in the form of vapour from the aerial parts of the plant is known as transpiration.

Q.3 What is the function of valves present in auricles and ventricles ? **[SAI-2013, 20I4]**

Ans. The presence of these valves ensure that blood does not flow backward when the atria or ventricles contract.

Q.4 What is meant by double circulation? **[SAI-2012, 2014]**

Ans. The circulation of blood through the heart twice during each cycle of blood circulation is known as double circulation.

Q.5 What is the function of pancreas in the human digestive system? **[SAI-2012, 2010, 2014]**

Ans. Pancreas is a large gland whose exocrine region secretes digestive enzymes (trypsin for digesting protein and pancreatic amylase for the breakdown of starch) and the endocrine region secretes hormone, insulin and glucagon.

Short Answer Type Questions : (Two Marks)

Q.6 (i) Name any two substances that are selectively reabsorbed as the urine flows along the tube.
(ii) Name the part of the excretory system in which urine is stored for sometime. **[SAI-2015]**

Ans. (i) Glucose, amino acids, salts and major amount of water.
(ii) Urinary bladder.

Q.7 Give functions of all four chambers of human heart. **[SAI-2011, 2014]**

Ans. **Functions:**
Left atrium - Receives oxygenated blood from pulmonary vein.
Right atrium - Receives deoxygenated blood from vena cava
Left ventricle - Pumps oxygenated blood to all parts of body.
Right ventricle - Pumps deoxygenated blood to lungs.

Q.8 What is the significance of residual volume of air in the lungs? **[SAI-2014]**

Ans. During the breathing cycle, when air is taken in and let out, the lungs always contain a residual volume of air so that there is sufficient time for oxygen to be absorbed and for the carbon dioxide to be released.

Q.9 What causes movement of food inside the alimentary canal? **[SAI-2014]**

Ans. The walls of alimentary canal contain muscle layers. Rhythmic contraction and relaxation of these muscles pushes the food forward. This is called peristalsis, which occurs all along the gut.

Q.10 Name the components of excretory system of human beings. **[SAI-2014]**

Ans. The excretory system of human beings includes a pair of kidney, a pair of ureters; a urinary bladder and a urethra.

Short Answer Type Questions : (Three Marks)

Q.11 Name three life processes which are essential for maintaining life and briefly explain the functioning of any one of them. **[SAI-2015]**

Ans. (a) Nutrition (b) Respiration (c) Excretion (d) Transportation (Any three)
Nutrition : It is a process of obtaining and utilising the food (nutrients), which are the source of energy. The food is needed for growth, development, synthesis of proteins and other substances needed for the maintenance of life (Metabolism).

Q.12 Define the term enzyme. State the role of saliva in human digestive system. **[SAI-2015]**

Ans. Enzymes are biological catalysts which convert complex organic food materials into smaller molecules. Saliva contains an enzyme called salivary amylase that breaks down starch which is a complex molecule to give sugar. It moistens the food, lubricates it and helps to move the food forward into alimentary canal.

Q.13 What do the following transport ?
(i) Xylem (ii) Phloem (iii) Pulmonary vein (iv) Vena cava
(v) Pulmonary artery (vi) Aorta **[SAI-2015]**

Ans. (i) Water and minerals.
(ii) Food prepared in the leaves.
(iii) Oxygenated blood from lungs to heart.
(iv) Deoxygenated blood from cells and tissues of body to heart.
(v) Deoxygenated blood from heart to lungs.
(vi) Oxygenated blood from heart to different body parts / organs.

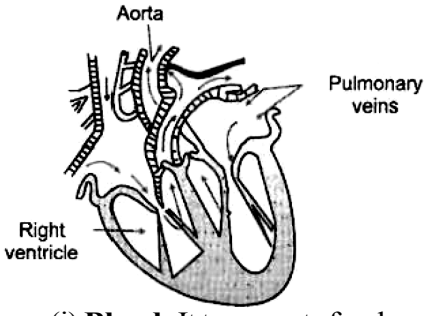
Q.14 List the events that occur during the process of photosynthesis. **[SAI-2011, 2012]**

Ans. (a) Absorption of light energy by chlorophyll.
(b) Conversion of light energy to chemical energy and splitting of water molecules into hydrogen and oxygen.
(c) Reduction of carbon dioxide to carbohydrates.

Long Answer Type Questions : (Five Marks)

Q.15 (a) Draw a sectional view of the human heart and label on it Aorta, Right ventricle and Pulmonary veins.
(b) State the functions of the following components of transport system?
(i) Blood (ii) Lymph **[SAI-2014, 2015]**

Ans. (a)

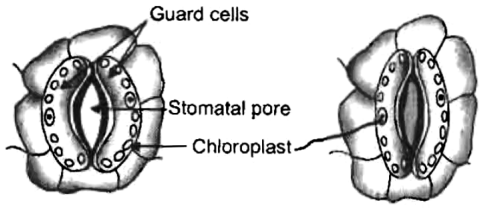


(b) (i) **Blood:** It transports food, oxygen and waste materials in human body.
(ii) **Lymph:** It carries digested and absorbed fat from intestine and drains excess fluid from extracellular space back into the blood.

Q.16 What are stomata? What functions do they perform? With the help of a diagram explain opening and closing of stomata. **[SAI-2014, 2015]**

Ans. Stomata are the tiny pores present on the surface of leaves.
Functions of stomata: (i) Exchange of gases, (ii) Transpiration

- Opening and closing of stomata occurs due to turgor changes in guard cells. When guard cells are turgid, stomatal pore is open while in flaccid conditions, the aperture closes.



(*a*) Open stomatal pore (*b*) Closed stomatal pore

SECTION – E
UNDERSTANDING BASED QUESTIONS

Q.1 When we breathe out, why does the air passage not collapse? **[SAI-2014, 2015]**

Ans. Because trachea (wind pipe) is lined by rings of cartilage which ensure that the air passage does not collapse.

Q.2 Why is it necessary to separate oxygenated and deoxygenated blood in mammals and birds ? **[SAI-2014]**

Ans. They have high energy requirement for maintaining their body temperature. This is possible only if oxygenated and deoxygenated blood remain separated.

Q.3 Why is diffusion insufficient to meet the oxygen requirements of multicellular organisms like humans ? **[SAI-2015]**

Ans. In the multicellular organisms, all the cells may not be in direct contact with the surrounding environment. Therefore, the diffusion is insufficient to meet the oxygen requirements in them. Instead, they need specialised organs for breathing and exchange of gases.

Q.4 (a) In which forms nitrogen is taken by plants ?
(b) Which type of nutrition is present in bread mould? **[SAI-2013, 2014]**

Ans. (a) Nitrogen is taken-up from the soil in the form of inorganic nitrates or nitrites. Or it is taken-up as organic compounds which have been prepared by bacteria from atmospheric nitrogen.
(b) Saprophytic (Heterotrophic) nutrition : They breakdown the food material outside the body and then absorb it.

Q.5 How does aerobic respiration differ from anaerobic respiration? **[SAI-2015]**

Ans.

Aerobic respiration	Anaerobic respiration
1. Oxygen is utilised for the breakdown of respiratory substrate.	1. Oxygen is not required.
2. It takes place in cytoplasm (glycolysis) and inside mitochondria (Krebs cycle).	2. It takes place in cytoplasm only.
3. End products are carbon dioxide and water.	3. End products are lactic acid or ethanol and carbon dioxide.
4. More energy is released.	4. Less energy is released.

Q.6 Why do fishes have two chambered heart and reptiles have three chambered heart? **[SAI-2014]**

Ans. Division of heart depends on the energy needs by an organism. Since these animals do not require high energy to maintain their body temperature thus, they have two and three chambers respectively to meet their minimum energy requirements. These animals tolerate some mixing of the oxygenated and deoxygenated blood streams. Due to these reasons, the body temperature of these animals depends on the temperature of the environment.

CONCEPT APPLICATION LEVEL - III

SECTION-A

Multiple choice question with one correct answers :

1. Which among them is not correct equation of an anabolic process in plants
   (A) $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$
   (B) $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$
   (C) $6CO_2 + 12H_2O \rightarrow C_6H_{12}O_6 + 6O_2 + 6H_2O$
   (D) All of these

2. Organelle responsible for anabolic process of food production in plant.
   (A) Mitochondria (B) Peroxisome (C) Ribosome (D) Plastids

3. A major metabolic process taking place in germinating seed to
   (A) Photosynthesis (B) Absorption of water
   (C) Absorption of mineral (D) Respiration

4. Catabolism is
   (A) Anabolism first than metabolism (B) Breakdown of the product of anabolism
   (C) Formation of the product in a cell (D) All of the above

5. Growth in a plant is because of
   (A) More anabolism than catabolism (B) More catabolism than anabolism
   (C) Equal amount of anabolism and catabolism (D) More energy consumption

6. Photosynthetically active radiation (PAR) represents the following range of wavelength
   (A) 400 – 700 nm (B) 500 – 600 nm (C) 450 – 950 nm (D) 340–450 nm

7. In chlorophyll which metal is present?
   (A) Mn (B) Mo (C) Mg (D) S

8. Photolysis of water take place in
   (A) Absorption (B) Transpiration (C) Respiration (D) Photosynthesis

9. Photolysis is
   (A) Another name for photosynthesis (B) Another name for respiration
   (C) Breakdown of glucose (D) Breakdown of water

10. During light reactions the following molecules are formation
    (A) ATP (B) ATP & NADPH (C) NADPH (D) None

11. Dark reaction of photosynthesis
(A) Takes place in dim light
(B) Takes place both in light and dark
(C) Is termed as dark reaction because it is inhibited by light
(D) Utilizes the assimilatory power formed in light reaction

12. In which form is food transported in plants
(A) Sucrose (B) Fructose (C) Glucose (D) Lactose

13. Some plant absorb CO_2 at night. They are
(A) Water plant (B) Land plant (C) Desert plant (D) Both (A)&(B)

14. Magnesium is constituent of which pigment?
(A) Florigen (B) Chlorophyll (C) Haemoglobin (D) Enzyme

15. In photosynthesis
(A) CO_2 is reduced while H_2O oxidized (B) CO_2 is oxidized white H_2O reduced
(C) CO_2 and H_2O are oxidized (D) CO_2 & H_2O are reduced

16. In chloroplast, chlorophyll is present in the
(A) Stroma (B) Outer membrane (C) Inner membrane (D) Thylakoids

17. Phenomenon which converts light energy into chemical energy is
(A) Respiration (B) Photosynthesis (C) Transpiration (D) None of these

18. Chlorophyll is found in the chloroplast
(A) Grana (B) Pyrenoid (C) Stroma (D) None of these

SECTION-B

Assertion & Reason :

Instructions: In the following questions as Assertion (A) is given followed by a Reason (R). Mark your responses from the following options.

(A) Both Assertion and Reason are true and Reason is the correct explanation of 'Assertion'
(B) Both Assertion and Reason are true and Reason is not the correct explanation of 'Assertion'
(C) Assertion is true but Reason is false
(D) Assertion is false but Reason is true

1. **Assertion :** Oxygen is absorbed by different organs in different organism.
Reason : All these organs have structure that increase surface area.

2. **Assertion :** It would take 3 year for a molecule of oxygen to get to our toes from our lungs.
Reason : Diffusion is movement from high to low concentration.

SECTION-C

Match the following (one to one) :

Column-I and **column-II** contains **four** entries each. Entries of column-I are to be matched with some entries of column-II. Only One entries of column-I may have the matching with the some entries of column-II and one entry of column-II Only one matching with entries of column-I

1.

Column I		**Column II**
(A)	Bronchiole	(P) Circulation
(B)	Vena cava	(Q) Absorption
(C)	Glomerulus	(R) Respiration
(D)	Villi	(S) Excretion

Match the following (one to many) :

Column-I and **column-II** contains **four** entries each. Entries of column-I are to be matched with some entries of column-II. One or more than one entries of column-I may have the matching with the some entries of column-II and one entry of column-II may have one or more than one matching with entries of column-I

2.

Column I		**Column II**
(A)	Lactic acid	(P) Aerobic respiration
(B)	Ethanol	(Q) Anaerobic respiration
(C)	CO_2	(R) Photosynthesis
(D)	O_2	(S) Transpiration

SECTION-D

Comprehension :

Photosynthesis is a process by which green plant make there own food in the presence of sunlight, water, CO_2 and chlorophyll. If we keep a water plant in a beaker, inverted by a funnel and a test tube placed over having water than we can see bubble of gas accumulated at the bottom of the test tube. This gas down ward displaces water.

Q.1 Name the process by which this gas is produced

(A) Respiration (B) Transpiration (C) Photolysis (D) None

Q.2 Which among them is not an aquatic plant?

(A) Hydrilla (B) Hydra (C) Vallisneria (D) Lotus

Q.3 Gas that helps in formation of ozone comes out during.

(A) Respiration (B) Photosynthesis (C) Absorption (D) Translocation

ANSWER KEY

Try yourself :

1.	B	2.	C	3.	B	4.	B	5.	A
6.	C	7.	B	8.	C	9.	B	10.	A
11.	D	12.	A	13.	B	14.	A	15.	A
16.	B	17.	B	18.	D	19.	B	20.	D
21.	A	22.	D	23.	B	24.	C	25.	A
26.	A	27.	A	28.	B	29.	C	30.	A
31.	A	32.	D						

CONCEPT APPLICATION LEVEL - II

SECTION–A

1.	B	2.	A	3.	A	4.	B	5.	D
6.	B	7.	D	8.	B	9.	C	10.	D
11.	D	12.	A	13.	C	14.	D	15.	A
16.	B	17.	B	18.	A	19.	A	20.	C

SECTION-B

1. ATP
2. Heart, Blood & blood vessel
3. Gum and resin
4. Bowman capsules
5. (A) Birds, Lungs

CONCEPT APPLICATION LEVEL - III

SECTION-A

1.	A	2.	D	3.	D	4.	B	5.	A
6.	A	7.	C	8.	D	9.	D	10.	B
11.	D	12.	A	13.	C	14.	B	15.	A
16.	D	17.	B	18.	A				

SECTION-B

1. B
2. B

SECTION-C

1. A–R, B–P, C–S, D–Q
2. A–Q, B–Q, C–PQR, D–PR

SECTION-D

1. C
2. B
3. B