DEPARTMENT OF EDUCATION (S)
Government of Manipur

CHAPTER 16
TRANSPORTATION OF SUBSTANCES INSIDE THE BODY

SOLUTIONS

TEXTUAL QUESTIONS AND ANSWERS

1. Define diffusion. Explain it by citing some common examples.

Ans: The tendency of molecules of solid, liquid and gases to get evenly distributed in the available space is known as diffusion.

(a) When we put a few drops of blue ink into clean water in a tumbler, the entire water in the tumbler turn blue after a few minutes.

(b) The smell of perfume from a bottle kept open in the room reaches us.

2. What is the importance of diffusion in the living system?

Ans: The importance of diffusion in the living system:

(a) It is the main form of transport within cells and across cell membranes.

(b) Means of gaseous exchange for respiration and metabolism.

3. What are the different ways in which diffusion occurs in the living system?

Ans: It occurs in the following three ways: **simple diffusion, osmosis** and **active transport**.

4. Explain how diffusion occurs in the following ways:

a) Simple diffusion. b) Osmosis

Ans:

(a) **Simple diffusion** is the random movement of substances (from regions of higher concentration to regions of lower concentration) **or** across a membrane without the help of any membrane protein. It occurs along a concentration gradient without the expenditure of energy which is driven by the force of diffusion. (It can explain the movement of hydrophobic substance such as **CO_2, O_2** and **ethanol**).

(b) **Osmosis** is the spontaneous movement of water molecules across a **semi-permeable membrane** from regions of low solute concentration to regions of high solute concentration without inputs of energy.

The diffusion of water across a semi-permeable membrane is also known as Osmosis.

5. **What are polar and non-polar solvents? Give examples.**

Ans: Solvents that can dissolve and split solute molecule into charged ions are **polar solvents.** e.g. Water, liquid ammonia (NH_3)

Solvents that can dissolve only non-polar covalent compounds are called **non-polar solvents.** e.g. Benzene.

6. **What is a semi-permeable membrane? Explain the process of osmosis across a semi-permeable membrane.**

Ans: A membrane which allows the passage of certain small molecules or water only by diffusion and prevents movement of larger molecules across it is called **semi-permeable membrane.**

When a solution is separated from its solvent or less concentrated solution by a semi-permeable membrane water molecules enter from less concentrated region to more concentrated region without inputs of energy and thereby increasing the level of more concentrated solution.

7. **Write on the importance of osmosis in the living systems.**

Ans: The importance of osmosis in the living systems are:

(a) Primary means of transport of water into and out of cell through biological membranes.

(b) Can be made to do work as well as maintenance of turgor pressure.

8. **Write on the role of diffusion in nutrition.**

Ans: The most important step in nutrition is absorption that occurs by diffusion mainly through the wall of small intestine (though certain items such as mustard, pepper, condiments and alcoholic drinks may be absorbed in the stomach). The digested carbohydrates are absorbed by active transport, amino acids are absorbed by active transport and fatty acids are absorbed by simple diffusion while water soluble vitamins are also absorbed by simple diffusion. The digested food absorbed by the cells of small intestine either enter into blood capillaries or lymphatic vessels.

9. **Write on the role of diffusion in excretion.**

Ans: Excretion is the elimination of waste products from the body and involves filtration of blood in the Bowman’s capsule. Some of the useful substances like water, sodium chloride, glucose and amino acids that enter the nephron by passive diffusion are actively transported into the intercellular spaces from where they are reabsorbed into the blood capillaries by active transport (while chloride moves out by passive diffusion). The re-absorption of water from the filtrate occurs by osmosis.

10. **Write on the role of diffusion in respiratory gaseous exchange.**

Ans: During respiration oxygen is taken up and CO_2 is released out by diffusion across respiratory membrane. The transported gases are again exchanged between circulatory fluid and tissue. Thus, oxygen diffuses into the cell by osmosis while CO_2 also diffuses out due to the differences in osmotic concentration.

EXTRA QUESTIONS AND ANSWERS

1. **Define Brownian movement?**

Ans: The perpetual motion of the molecules of the solids, liquids and gases to get distributed throughout the available space due to the kinetic energy present in the particles is known as **Brownian movement.**

2. **State the meaning of term diffusion.**

Ans: The term **diffusion** means "to spread apart".

3. **Why is simple diffusion known as passive transport?**

Ans: It occurs along a concentration gradient without the expenditure of energy, hence it is also known as **passive transport.**

4. **Name four substances that can readily cross the plasma membrane by simple diffusion.**

Ans: Water, oxygen, ethanol and urea.

5. **What are the factors on which the rate of diffusion depends? Give two points only.**

Ans: The factors on which the rate of diffusion depends are:

(a) Concentration gradient across the membrane.

(b) Lipid solubility or hydrophobicity of that molecule.

6. **Water is lipid insoluble. How can water diffuse through the lipid bilayer with minimal interference?**

Ans: Water molecule is small enough and has sufficient kinetic energy that it can diffuse through the lipid bilayer with minimal interference.

7. **Give one example in which osmosis is made to do work.**

Ans: Osmosis releases energy and can be made to do work as when growing tree-root splits a stone.

8. What is active transport?

Ans: The movement of molecules across a membrane against the concentration gradient is called **active transport.**

9. Differentiate between a. Passive diffusion and Active diffusion

b. Simple diffusion and Facilitated transport

(a) Ans:

DIFFERENCES	
PASSIVE DIFFUSION	**ACTIVE DIFFUSSION**
1. It occurs along a concentration gradient. **2.** It doesn't require expenditure of energy. **3.** Diffusion of oxygen across alveolar membrane is an example.	**1.** It occurs against a concentration gradient. **2.** It requires expenditure of energy. **3.** Na^+- K^+ pump.is an example.

(b) Ans:

DIFFERENCES	
SIMPLE DIFFUSION	**FACILITATED TRANSPORT**
1. It is not selective **2.** It does not require any special membrane protein	**1.** It is highly selective. **2.** It requires special membrane protein

10. Give one example of active transport mechanism in our body.

Ans: Sodium-potassium pump, which pump sodium out of cell in exchange with potassium ions.

11. What is facilitated diffusion?

Ans: The transport of molecules across a plasma membrane which is facilitated by special membrane proteins that provide an alternate route or bypass is called **facilitated diffusion**.

12. Define the term digestion.

Ans: The breaking down of complex food particles into simple soluble form so that they can be absorbed or taken inside the cells lining the gut is called **digestion.**

13. Describe the role of diffusion in metabolism.

Ans: The process of **diffusion** plays important role in nutrition, particularly in transport of water and food materials into every cell in the body.

The roles of diffusion in metabolism include: nutrition, excretion and in gaseous exchange.

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