CHEMISTRY ONLINE
TUITION

Phone: +442081445350

www.chemistryonlinetuition.com

Email:asherrana@chemistryonlinetuition.com

BIOLOGY

CELLS

Level & Board	AQA (A-LEVEL)
TOPIC:	TRANSPORT ACROSS CELL MEMBRANE
PAPER TYPE:	SOLUTION - 2
TOTAL QUESTIONS	6
TOTAL MARKS	54

Transport across Cell Membrane - 2

1.

(a) Too much water means the concentration of pigment in solution will be lower so, the results are comparable

(b) To monitor water temperature in each tube, the student can insert a thermometer through the pre-made holes in the tubes' caps. These readings can be observed through an incubator window, which aligns with the process of calorimetry.

(c) Point-to-point line drawn between co-ordinates with a ruler.

(d)

- Damage to cell surface membrane
- Membrane proteins denature
- Increased fluidity / damage to the phospholipid bilayer

2.

(a) Cells may be adapted for rapid transport across their internal or external membranes by an increase in surface area of, or by an increase in the number of protein channels and carrier molecules in their membranes.

OR

- Membrane folded so increased surface area
- Large number of channel/carrier proteins for facilitated diffusion

3.

(a)

- Co-transport
- Uses hydrolysis of ATP
- Sodium ion and proton bind to protein and protein changes shape

(b)

- There is a significant difference with Tenapanor
- There is a less than 0.05 probability that the difference is due to chance

- More salt in gut reduces water potential in gut contents so less water absorbed out of gut contents by osmosis

(c)

- Higher salt results in lower water potential of tissue fluid so, less water returns to capillary by osmosis at venule end.
  OR
- Higher salt results in higher blood pressure so more fluid pushed / forced out at arteriole end of capillary.

4.

(a)

Comparison 1: Both move down concentration gradient

Comparison 2: Both move through protein channels in membrane

Contrast: Ions can move against a concentration gradient by active transport

5.

(a)

- Facilitated diffusion involves channel or carrier proteins whereas active transport only involves carrier proteins
- Facilitated diffusion does not use ATP / is passive whereas active transport uses ATP
- Facilitated diffusion takes place down a concentration gradient whereas active transport can occur against a concentration gradient

(b)

360/60=6

470-360=110

110/60=1.8

I am Sorry !!!!!

6/1.8=3.3

Ratio=3.3:1

(c)

- **Group A:** Initial uptake slower because by diffusion only
- **Group A:** Levels off because same concentrations inside cells and outside cells / reached equilibrium;
- **Group B:** Uptake faster because by diffusion plus active transport
- **Group B** fails to level off because uptake against gradient / no equilibrium to be reached
- **Group B:** Rate slows because few / fewer chloride ions in external solution / respiratory substrate used up.

6.

(a)

Process of Diffusion and its importance in living organisms

Diffusion is the movement of molecules or ions down a concentration gradient i.e. from an area of high concentration to an area of low concentration. For a diffusion system to be efficient, it should have a large surface area so that high amount of substances can be exchanged at a time. It should also have a thin membrane and a continuous supply of substances, as a thin membrane means that the diffusion pathway would be short, and the continuous supply helps maintain a concentration gradient, which is essential for diffusion to take place. There are two main types of diffusion; simple and facilitated. Simple diffusion is when a small, non-polar molecule such as CO_2 and Oxygen passes through the phospholipid bilayer. A carrier protein is not needed for this type of diffusion to take place. Facilitated diffusion, however, requires carrier proteins transport molecules across the membrane, as the molecules are polar or are too large to pass through the lipid bilayer. Examples of these molecules are sodium and potassium ions, and glucose.

Diffusion is essential for living organisms as it is a feature of a number of processes which control and supply vital substances to the body. It occurs throughout the human body, and without it, cells and body tissue could not get important nutrients for survival. In humans and animals, diffusion is needed during respiration. It is the way oxygen travels from the lungs to the red blood cells in the blood and the way carbon dioxide travels from the blood to the lungs from where it can be exhaled. In the oxidative phosphorylation

stage of aerobic respiration, diffusion is vital in getting the protons across the potential gradient from the inter-membranal space to the inner membrane to phosphorylate ADP and an inorganic P to ATP which is the universal energy carrier. Without this, we will be unable release energy in respiration and therefore will die. Oxygen continues down the concentration gradient into mitochondria organelles as the final electron acceptor and is reduced to water. The cells in our body also take up nutrients from the blood by diffusion. Humans and animals cannot make nutrients, so they get the nutrients from the food they eat. Once a nutrient arrives at a cell, it is still inside a blood vessel while the cell lies outside. The lack of nutrients inside the cell, and between the cell and the blood vessel, creates a concentration gradient between the blood vessel and the cell. Due to the lower concentration in the cell, the nutrient diffuses through the blood vessel wall and into the cell. Diffusion is essential in water reabsorption in the kidney for the removal of excess Na and Cl ions. If this process is not done, the osmotic state would be affected.

Diffusion is also extremely important in excretory systems of human beings. For example, in a urinary system, if the body doesn't consume enough water, then water is diffused back in the body and vice versa. Diffusion is responsible for our nerves to function as the neurotransmitter diffuses across the synaptic cleft, so that the next nerve cell can pick up the signal and pass it along.

In the case of plants, diffusion is the very important process because plants transfer food particles from the phloem and water particles from the xylem through the process of diffusion and osmosis. When there's excess water in the plants, this water needs to be removed, and this is done by the process of transpiration, which requires diffusion. Also, diffusion is an essential process in exchange of gases. Plants get carbon dioxide and release oxygen through diffusion. Photosynthesis also requires diffusion in a number of steps. Moreover, roots absorb water and salts from the soil which is transferred from roots to leaves through the process of diffusion.

Diffusion is an important process in the lives of plants. Water is an important component of all cells, and water moves into plant cells by the process of osmosis. Osmosis is the diffusion of water across a semipermeable membrane. When there's excess water in the plants, this water needs to be

removed by transpiration. In this process, water vapour evaporates from the surface of a leaf by diffusion through the open stomata.

Many plant nutrients reach the root surface via diffusion through the soil solution.

Some nutrient molecules diffuse across root cell membranes into the cytoplasm or from the cytoplasm of the endodermal cells into the xylem tissue. Also, diffusion is an essential process in exchange of gases. During photosynthesis, carbon dioxide diffuses from the atmosphere through the stomata and into the air spaces of leaves and oxygen is also released via diffusion.

In photosynthesis water must diffuse into the plant or bacterial cell. It is then destroyed in what is commonly called the light dependent reactions. It is separated into Hydrogen ions and oxygen. The oxygen is released into the air via diffusion and the Hydrogen ions are used to produce ATP and reduced NADP. Since the water is used up, more is needed to keep the process up, so more water diffuses into the cell. In order for the plant to produce sugars from the carbon dioxide that has diffused into the cell as, it must enter the chloroplast. This is where the light independent reactions occur. The carbon dioxide is used up along with some of the ATP to make sugar. As the sugar is made and relocated this creates a carbon dioxide deficit in the chloroplast, causing more Carbon dioxide to diffuse into it.

Diffusion also plays a role in the movement of photosynthetic products such as sugars into the phloem for transport throughout the plant. Because cellular membranes are composed of a lipid bilayer, lipid-soluble materials use simple diffusion to cross the membrane surface.

Substances with low lipid solubility can move across membranes via facilitated diffusion. In this process, the substance binds to a transporter molecule, which transports the substance across the membrane and down its concentration gradient.

DR. ASHAR RANA

M.B.B.S / MS. CHEMISTRY

CHEMISTRY ONLINE TUITION

Phone: +442081445350
www.chemistryonlinetuition.com
Email: asherrana@chemistryonlinetuition.com

- Founder & CEO of Chemistry Online Tuition Ltd.
- Completed Medicine (M.B.B.S) in 2007
- Tutoring students in UK and worldwide since 2008
- CIE & EDEXCEL Examiner since 2015
- Chemistry, Physics, Math's and Biology Tutor

CONTACT INFORMATION FOR **CHEMISTRY ONLINE TUITION**

- UK Contact: 02081445350
- International Phone/WhatsApp: 00442081445350
- Website: www.chemistryonlinetuition.com
- Email: asherrana@chemistryonlinetuition.com

Address: 210-Old Brompton Road, London SW5 OBS, UK