The importance of diffusion in organisms =

Diffusion is used for transport of substances and molecules in many processes in living organisms. For example: Transport across cell membranes, synaptic transmission, gas exchange, respiration and translocation in plants.

Diffusion is important in transport across cell membranes for example in the phospholipid membrane only small, non-polar, lipid soluble molecules can pass through by simple diffusion, whereas bigger, polar molecules have to use facilitated diffusion with protein channels / carriers. Protein channels are intrinsic proteins that are water filled channels which open in response to specific ions, allowing them to move by facilitated diffusion from a high to low concentration down a concentration gradient across the membrane. This is important for organisms as it allows molecules to be transported throughout the body and into cells for biological processes to occur. ^ Relevance.

Diffusion is used in Nervous Coordination in the process of synaptic transmission. The action potential arrives at the presynaptic membrane. This causes $Ca^{2+}$ channels to open and $Ca^{2+}$ diffuse into

the presynaptic neurone by facilitated diffusion which causes a vesicle containing a neurotransmitter to move and fuse with the presynaptic neurone. The neurotransmitter is released by exocytosis and diffuses across the synaptic cleft, then binds to complementary receptors on the surface of the post synaptic membrane. This causes Sodium channels to open and theres an influx of sodium ions into the membrane causing depolarisation. Acetylcholinesterase hydrolyses Acetylcholine into Acetyl and Choline which diffuse back into the post synaptic membrane and recombine using ATP. This is important in organisms as it enables action potentials to be produced between neurones. transmitting signals to the brain and around the body so we survive.

Diffusion is used in gas exchange as for gas exchange to be efficient, it is required that there is a large surface area ( increases rate of diffusion ), the exchange surface is thin ( short diffusion pathway), steep concentration gradient ( increases rate of diffusion, and movement of internal and external medium to maintain concentration

(Flattened cells - squamous) ✓BS

gradient. For example, in humans, capillaries and alveoli have walls that are only one cell thick, this increases diffusion as no cell is far from a source of oxygen and the diffusion pathway is short. This is useful in organisms as it allows for efficient ventilation and circulation.

How does this set up the conc gradient?

Diffusion is used in respiration, for example in oxidative phosphorylation. Hydrogens from reduced NAD and reduced FAD are captured by hydrogen carriers in the electron transport chain then broken down into $e^-$ and $H^+$. The $e^-$ pass down the electron transport chain releasing energy used to actively transport $H^+$ from the matrix into the intermembranal space. This sets up a ✓R diffusion gradient for $H^+$ to diffuse back into the matrix using ATPase. (ATP synthase)

The movement of $H^+$ through the ATPase provides enough energy for ATPase to turn, smashing ADP & Pi together ✓R producing ATP (30.6 kJ). At the end of the electron transport chain, $e^-$ & $H^+$ recombine, then combine with $O_2$ producing $H_2O$. This is required in living organisms as respiration is required to produce ATP for movement and many other processes.

why? Whats special about ATP?

Why can't $H^+$ diffuse through membrane anywhere?

Diffusion is used in translocation in plants. Firstly, sucrose is actively transported into the ~~Phloem~~ phloem using companion cells. This reduces the water potential in the sieve tube element causing water to enter by osmosis down a water potential gradient. This increases the hydrostatic pressure and is called mass flow. The ~~sucrose~~ sucrose? then diffuses out at the sink, because reducing the $\psi$ and hydrostatic pressure at the sink. Hydrostatic pressure gradient produces flow along phloem. This shows how diffusion is important for translocation and transport in plants.

why?

VMP.

T-✓✓
(15) NS-✓✓*
R-✓✓*
MP-✓✗

B-✓✓
E-✓
QWC-✓✓ (21)