CELLULAR TRANSPORT QUESTIONS

Lesson 1

1. State the 2 different types of Cellular Transport   
   Passive and active
2. Define Diffusion .  
   Diffusion is a process of passive transport and involves the movement of molecules along a concentration gradient (from areas of high concentration to areas of low concentration).
3. Explain the factors that affect Diffusion.  
   Concentration gradient: Diffusion rates will be higher when there is a greater difference in concentration between the two regions  
   Diffusion distance: Diffusion over shorter distances occurs faster than diffusion over long distances  
   Surface area: A larger surface area increases the rate of diffusion  
   Physical barriers: Thick barriers slow the rate of diffusion. Pores in a barrier enhance diffusion.
4. Describe how the concentration gradient affects Diffusion.   
   The concentration gradient can affect the rate of diffusion, as it influences the rate that molecules move from area to area, with a larger difference in concentration between the two areas increasing the diffusion rate. Diffusion will continue until there is no difference in concentration between the two regions.
5. Define Osmosis   
   Osmosis is defined as the net movement of water molecules across a partially permeable membrane from a region of higher to lower concentration (of water molecules). Water molecules always move towards regions of more negative water potential (=higher concentration of solute molecules).
6. Describe how the concentration gradient affects Osmosis  
    A steeper concentration gradient (a larger difference in solute molecule concentration between two regions) means a faster rate of osmosis, as the gradient is inversely proportional to the concentration of solute molecules. Osmosis will continue until the concentration gradient of water goes to zero.
7. Define facilitated Diffusion

Facilitated diffusion occurs when a substance is aided across a membrane by channel proteins (also known as ionophores). Ionophores act as channel formers that introduce a hydrophilic pore in the membrane through which ions may pass. Facilitated diffusion selectively increases the diffusion rate of specific molecules (e.g. glucose, amino acids). It does not require energy because the molecules are not moving against their concentration gradient.

Lesson 2

1. Define Active Transport  
   Active transport is a type of cellular transport in which substances are transported across a biological membrane. Unlike passive transport, active transport involves substances being moved against their concentration gradient (from regions of lower concentration into regions of higher concentration), meaning active transport processes require energy expenditure to carry out functions. Active transport is performed by specific carrier proteins in the membrane. Transport proteins harness the energy of ATP to pump molecules against the concentration gradient (the reverse of diffusion).
2. Explain what membrane pumps are  
   Membrane pumps are proteins, which require energy (often as ATP) to transport molecules across the cell membrane.
3. Describe the 3 main types of membrane pumps and explain how they work   
   The first type, sodium-potassium pumps, are proteins in the cell membrane that exchange sodium ions (Na+) for potassium ions (K+) across the membrane, using ATP as the energy source. The unequal balance of Na+ and K+ across the membrane creates large gradients in ion concentration. These pumps drive several facilitated transport proteins and the cotransport of molecules, create an osmotic gradient that drives water absorption, and establish & maintain the resting potential in nerve and muscle cells.  
   Proton pumps use the energy from ATP to move hydrogen ions (H+) from inside the cell to the outside. This creates a large difference in the proton concentration on either side of the membrane, leaving the inside of the plasma membrane negatively charged. The potential difference created can be coupled to transport other molecules across the membrane.
4. Name the 2 types of cytosis  
   Exocytosis and endocytosis.
5. Explain in detail how they work and specifically the substances they move in or out of the cell.   
   During exocytosis the plasma membrane evaginates (folds out) to transport molecules out of the cell. Exocytosis occurs by fusion of a vesicle membrane with the plasma membrane. In multicellular organisms, various types of cells are specialized to manufacture and export products from the cell to elsewhere in the body or outside it. Exocytosis may be used to remove indigestible material from a cell.

Endocytosis is a type of active transport that moves particles, such as large molecules, parts of cells, and even whole cells into a cell. There are different variations of endocytosis, but all share a common characteristic: the plasma membrane of the cell invaginates (folds in on itself), forming a pocket around the target particle. The pocket pinches off, resulting in the particle being contained in a newly created intracellular vesicle formed from the plasma membrane. There are three forms of endocytosis: phagocytosis (the engulfment of solid particles), pinocytosis (the engulfment of liquid particles), and receptor mediated (engulfment of specific particles according to membrane receptors).