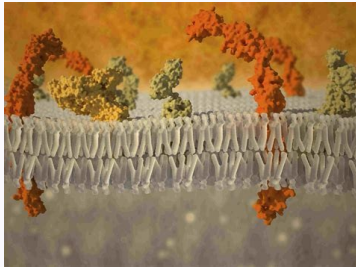
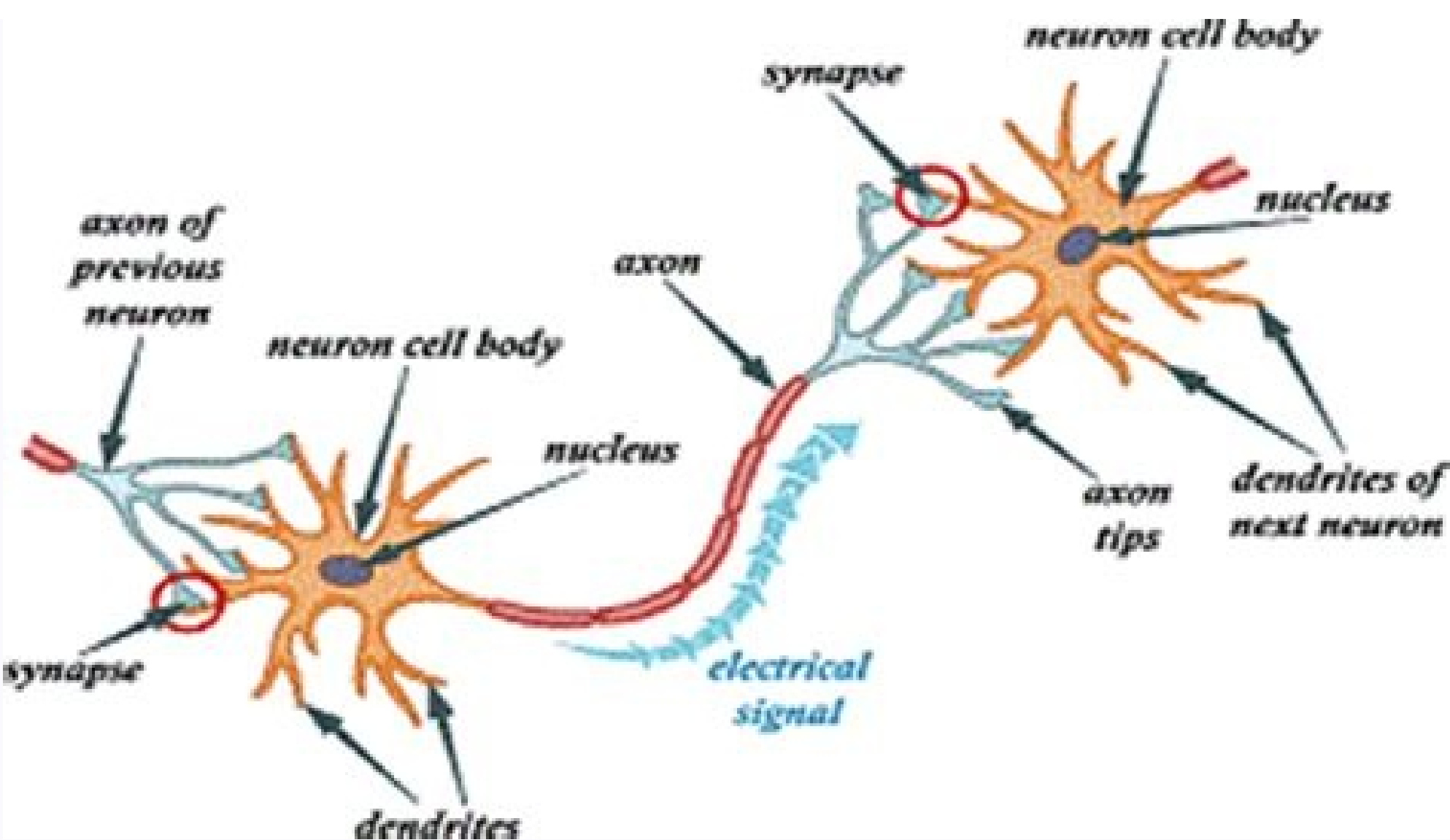


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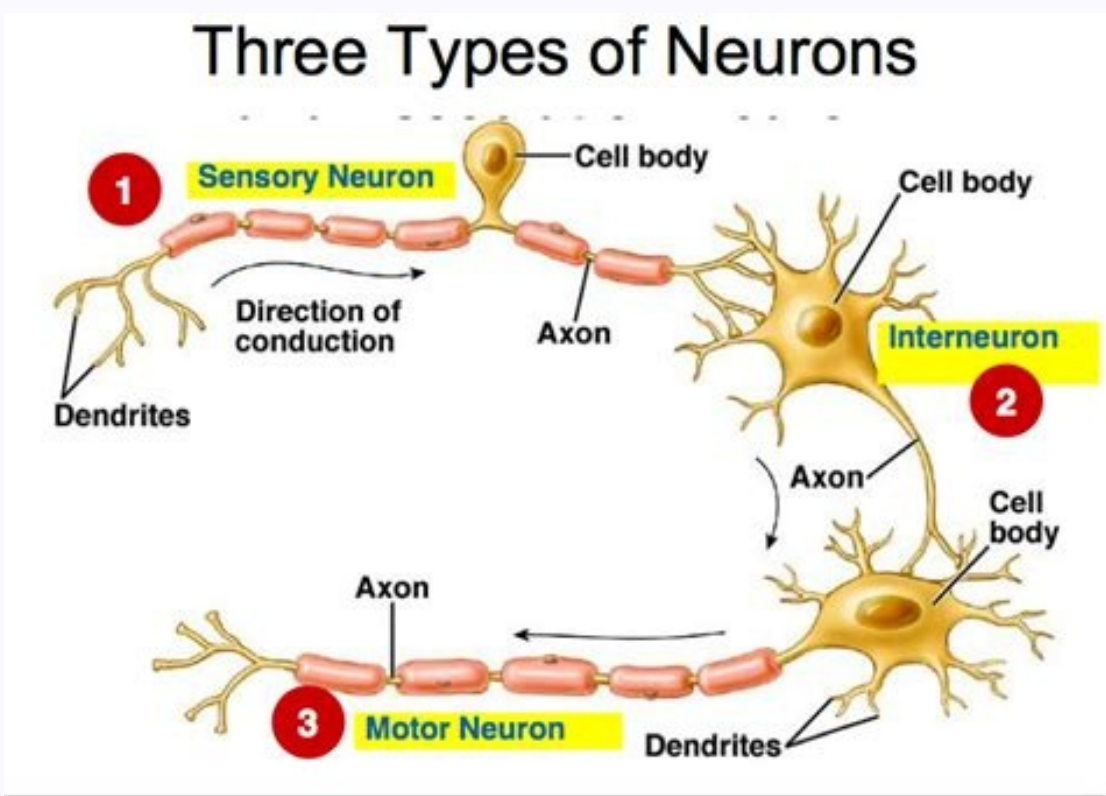
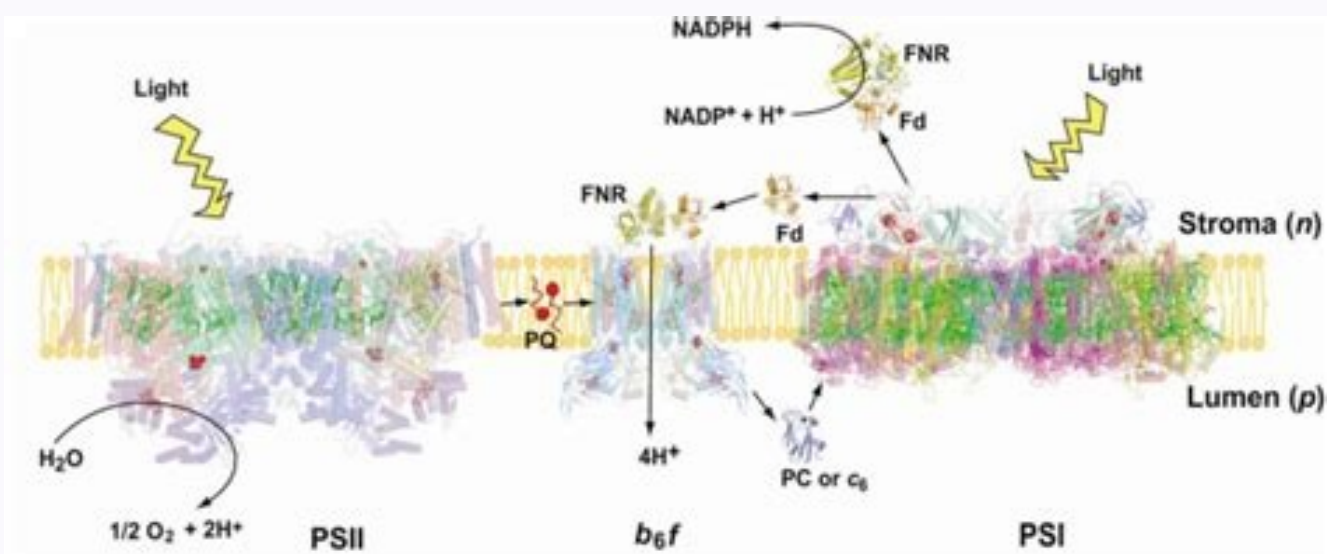
ACTIVITY ■ Cells, Tissues, and Organ Systems

Can You Identify These Cell Structures?

Read each description and then identify the cell structure. Write your answer on the line provided.

1. I'm a real "powerhouse." That's plain to see. I break down food To release energy. What am I? _____	6. I'm a series of tubes Found throughout the cell. I transport proteins And other things as well. What am I? _____
2. I'm strong and stiff Getting through me is tough. I'm found only in plants, But I guess that's enough. What am I? _____	7. I'm full of holes, Flexible, and thin. I control what gets out As well as what comes in. What am I? _____
3. My name means "colored bodies," And I contain DNA. I pass on traits to new cells In a systematic way. What am I? _____	8. Proteins are made here Even though I'm quite small. You can find me in the cytoplasm Or attached to E.R.'s wall. What am I? _____
4. I'm the "brain" of the cell Or so they say. I regulate activities From day to day. What am I? _____	9. I've been called a "storage tank" By those with little taste. I'm a sac filled with water, Food, enzymes, or waste. What am I? _____
5. Found only in plant cells, I'm green as can be. I make food for the plant Using the sun's energy. What am I? _____	10. Since I contain many enzymes, I can digest an injured cell; And can break down a large molecule Into a smaller one as well. What am I? _____

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Quizlet membrane structure and function. Membrane structure and function questions. Membrane structure and functions answers.

In the Cell Membrane unit you will learn about cell size and the structure and function of cell membranes. Cell membranes protect and organize cells. All cells have an outer plasma membrane that regulates not only what enters the cell, but also how much of any given substance comes in. Like all other cellular membranes, the plasma membrane consists of both lipids and proteins. The fundamental structure of the membrane is the phospholipid bilayer, which forms a stable barrier between the compartments inside and outside of the cell. Proteins embedded within the phospholipid bilayer carry out the specific functions of the plasma membrane, including selective transport of molecules and cell-cell recognition. The unit is planned to take 2 school days. Essential Ideas: The structure of biological membranes makes them fluid and dynamic. Nature of Science Using models as representations of the real world—there are alternative models of membrane structure. (1.1.1) Falsification of theories with one theory being superseded by another—evidence falsified the Davson-Danielli model. (1.9) Explain what models are and their purposes in science. Describe the observations and conclusions drawn by Gorter and Grendel in discovering the structure of cell membranes. Describe why the understanding of cell membrane structure has changed over time. Understandings 1.3.U.1 Phospholipids form bilayers in water due to the amphipathic properties of phospholipid molecules. (Oxford Biology Course Companion page 26). [Amphipathic phospholipids have hydrophilic and hydrophobic properties.] Draw a simplified diagram of the structure of the phospholipid, including a phosphate-glycerol head and two fatty acid tails. Define hydrophilic and hydrophobic. Define amphipathic and outline the amphipathic properties of phospholipids. Explain why phospholipids form bilayers in water, with reference to hydrophilic phosphate heads and two hydrophobic hydrocarbon tails. Phospholipids are one of the principal components of cell membranes (in conjunction with membrane proteins). Phospholipids typically share a common basic structure that includes: A polar organic molecule (e.g. choline, serine) A phosphate group A glycerol molecule (replaced by sphingosine in sphingomyelin) Two fatty acid tails (may be saturated or unsaturated) Hydrophilic and Hydrophobic Properties Cell membranes are composed of phospholipids that consist of a hydrophilic (attracted to water) head and a hydrophobic (repelled by water) tail. This property is described as Amphipathic. phospholipid-web The phospholipid head contains a negatively charged phosphate group which because of its charge is attracted to water because of its polarity. The fatty acid hydrocarbon tail has no charge and is therefore repelled by water. When placed in water, the phospholipids naturally form a double layer with the heads facing outwards towards the water and the tails facing each other inwards. This forms a very stable structure that surrounds the cell because of the attractions and bonds that are formed between the heads to the water and to each other, and the hydrophobic interactions between the tails. Even though it is a very stable structure, it is still fluid, as the phospholipids can move along the horizontal plane to increase stability. Many cells have cholesterol imbedded between the phospholipids. Phospholipids may vary in the length and relative saturation of the fatty acid tails. Shorter fatty acid tails will increase fluidity as they are less viscous and more susceptible to changes in kinetic energy. Lipid chains with double bonds (unsaturated fatty acids) have kinked hydrocarbon tails that are harder to pack together. Image from www.boundless.com 1.3.U.2 Membrane proteins are diverse in terms of structure, position in the membrane and function. (Oxford Biology Course Companion page 30). State the primary function of the cell membrane. Contrast the structure of integral and peripheral proteins. List at least four functions (with example) of membrane bound proteins. Contrast the two types of transport proteins: pumps and channels. Hormone binding sites (receptor proteins) Proteins embedded in the membrane, which bind to specific hormones. When the hormone binds, it causes the receptor protein to undergo a conformational change, which signals the cell to perform a function. For example, insulin receptors. Immobilized Enzymes Integral proteins that catalyze specific chemical reactions. Many of these enzymes catalyze metabolic reactions or are a part of a metabolic pathway, such as ATP Synthase in aerobic respiration. Cell Adhesion Proteins that form tight bonds between adjacent cells in tissues and organs. For example, gap junctions. Cell-to-cell communication Receptors for neurotransmitters at synapses between two nerve cells. Glycoproteins on the surface can also be used for cell identification purposes. Channels for passive transport Integral proteins that span the membrane and provide a passageway for molecules to move from an area of high concentration to low concentration. Specific proteins are also used for facilitated diffusion. Pumps for active transport Proteins that use ATP to move substances from a low concentration to a high concentration across the membrane. For example, Sodium/Potassium (Na⁺/K⁺) pumps and the proton (H⁺) pumps. The extracellular matrix typically provides structural and biochemical support to surrounding cells, including: Providing sites for anchorage by cells within a tissue and segregating separate tissues from one another. Sequencing and storing growth factors until receipt of a chemical signal (thereby regulating intercellular communication). In plant cells the extracellular matrix includes cell wall components (like cellulose) and hence plays an important role in: Regulating water uptake (maintenance of cell turgor) Providing mechanical strength and rigidity to the cell (maintains cell shape) 1.3.U.3 Cholesterol is a component of animal cell membranes. (Oxford Biology Course Companion page 32) Identify the structure of cholesterol in molecular diagrams. Describe the structural placement of cholesterol within the cell membrane. Cholesterol is able to stop the hydrocarbon from crystallizing and behaving as a solid, but the cholesterol also restricts molecular motion, which reduces the fluidity of the membrane. Also reduces the permeability to the hydrophilic particles like sodium ions and hydrogen ions. It is absent in plant cells, as these plasma membranes are surrounded and supported by a rigid cell wall made of cellulose. Most of the cholesterol molecule is hydrophobic and therefore embeds within the tails of the bilayer. A small portion (hydroxyl -OH group) is hydrophilic and is attracted to the phospholipid head. Applications: 1.3.A.1 Cholesterol in mammalian membranes reduces membrane fluidity and permeability to some solutes. (Oxford Biology Course Companion page 33). Describe the function of cholesterol molecules in the cell membrane. Cholesterol embedded in the membrane will reduce the fluidity making the membrane more stable by the hydrophilic interactions with the phospholipid heads. Cholesterol adds firmness and integrity to the plasma membrane and prevents it from becoming overly fluid, it also helps maintain its fluidity by disrupting the regular packing of the hydrocarbon tails. At the high concentrations it is found in our cell's plasma membranes (close to 50 percent, molecule for molecule) cholesterol helps separate the phospholipids so that the fatty acid chains can't come together and crystallize. Therefore, cholesterol helps prevent extremes—whether too fluid, or too firm—in the consistency of the cell membrane. Skills: 1.3.S.1 Drawing of the fluid mosaic model (Oxford Biology Course Companion page 31). [Drawings of the fluid mosaic model of membrane structure can be two dimensional rather than three dimensional. Individual phospholipid molecules should be shown using the symbol of a circle with two

parallel lines attached. A range of membrane proteins should be shown including glycoproteins. JDraw and label the structure of membranes. IncludePhospholipid bilayerIntegral proteins shown spanning the membranePeripheral proteinsIntegral proteins are embedded in the phospholipid of the membrane, whereas peripheral proteins are attached to its surface. Glycoproteins are carbohydrates attached to surface proteins.NOTE: When you draw a peripheral protein for the IB exam, the peripheral protein must not be embedded into the membrane in order to score the point. Also, you should label the whole phospholipid bilayer not just the individual phospholipid on the majority of mark schemes

Construction of a Cell Membrane 1.3.S.2 Analysis of evidence from electron microscopy that led to the proposal of the Davson-Danielli model. (Oxford Biology Course Companion page 28).Describe the observations and conclusions drawn by Davson and Danielli in discovering the structure of cell membranes The fluid-mosaic model was not the first scientifically accepted paradigm to describe membrane structure. The first model that attempted to describe the position of proteins within the bilayer was proposed by Hugh Davson and James Danielli in 1935. Davson and Danielli proposed that the lipid bilayer was coated on either side with a layer of globular proteins. The hydrophobic tails of the lipids are orientated towards each other, while the hydrophilic heads are oriented to the outside. Although the membrane composition is correct, there are some problems with the proposed model:Membranes are not identical. The differ in thickness and the ratio of proteins:lipids.Membranes have distinct inside and outside layers (defined by the membrane proteins which are present on the surface of the membrane)Other than predicted by the model, the membrane proteins do not have a very good solubility in water - in fact they have hydrophilic and hydrophobic regions. The hydrophobic side is anchored inside the membrane.When the membrane proteins would cover the lipid bilayer, their hydrophobic regions would be in contact with water, which destabilizes this construct. Even if they would be oriented towards the membrane, they would face towards the hydrophilic heads of the phospholipids causing the same effect. Additionally the proteins would also separate the hydrophilic phospholipid heads from the water. So there is no real stable solution in embedding the membrane with proteins.The model was described as a 'lipo-protein sandwich', as the lipid layer was sandwiched between two protein layersThe dark segments seen under electron microscope were identified (wrongly) as representing the two protein layers When viewed under a transmission electron microscope, membranes exhibit a characteristic 'trilaminar' appearanceTrilaminar = 3 layers (two dark outer layers and a lighter inner region) 1.3.S.3 Analysis of the falsification of the Davson-Danielli model that led to the Singer-Nicolson model. (Oxford Biology Course Companion page 29).Describe conclusions about cell membrane structure drawn from freeze-etched electron micrograph images of the cell membrane.Describe conclusions about cell membrane structure drawn from cell fusion experiments.Describe conclusions about cell membrane structure drawn from improvements in techniques for determining the structure of membrane proteins. Compare the Davson-Danielli model of membrane structure with the Singer-Nicolson model. There were a number of problems with the lipo-protein sandwich model proposed by Davson and Danielli:It assumed all membranes were of a uniform thickness and would have a constant lipid-protein ratio It assumed all membranes would have symmetrical internal and external surfaces (i.e. not bifacial)It did not account for the permeability of certain substances (did not recognise the need for hydrophilic pores) The temperatures at which membranes solidified did not correlate with those expected under the proposed model Falsification Evidence:Membrane proteins were discovered to be insoluble in water (indicating hydrophobic surfaces) and varied in sizeSuch proteins would not be able to form a uniform and continuous layer around the outer surface of a membraneFluorescent antibody tagging of membrane proteins showed they were mobile and not fixed in placeMembrane proteins from two different cells were tagged with red and green fluorescent markers respectivelyWhen the two cells were fused, the markers became mixed throughout the membrane of the fused cellThis demonstrated that the membrane proteins could move and did not form a static layer (as per Davson-Danielli)Freeze fracturing was used to split open the membrane and revealed irregular rough surfaces within the membrane These rough surfaces were interpreted as being transmembrane proteins, demonstrating that proteins were not solely localised to the outside of the membrane structureNew Model:In light of these limitations, a new model was proposed by Seymour Singer and Garth Nicolson in 1972According to this model, proteins were embedded within the lipid bilayer rather than existing as separate layersThis model, known as the fluid-mosaic model, remains the model preferred by scientists today (with refinements) Key Terms: adhesioncholesterolenzymefatty acidfluid mosaicglycerolfacilitated diffusionhyperosmotichydrophobicintegral proteinglycoproteinspartially permeablehypo-osmoticintracellulartrans- peripheral proteinphospholipidreceptorrecognitionssurface areapolaron polariso-osmoticextracellularphagocytosis transportvolumeratioidfusionosmosisproteinphosphorylated alcoholATPpinocytosis passive transportactive transportvesiclesendocytosisexocytosisbinding siteequilibriumprotein pumpphosphatesaturatedunsaturated PowerPoint Presentation Topic 1.3 by Chris Paine Correct use of terminology is a key skill in Biology. It is essential to use key terms correctly when communicating your understanding, particularly in assessments. Use the quizlet flashcards or other tools such as learn, scatter, space race, speller and test to help you master the vocabulary. TOK The explanation of the structure of the plasma membrane has changed over the years as new evidence and ways of analysis have come to light. Under what circumstances is it important to learn about theories that were later discredited? Video Clips: Cell membranes are structures of contradictions. These oily films are hundreds of times thinner than a strand of spider silk, yet strong enough to protect the delicate contents of life: the cell's watery cytoplasm, genetic material, organelles, and all the molecules it needs to survive. The cell membrane, like a good jacket, protects the cell from everything outside of it. How is it simultaneously sturdy, flexible, and capable of allowing the right things to pass through? Ethan Peristein rediscovers the scientists and their research that have changed the way we study the membrane and the cell as a whole. Paul Andersen gives you a brief introduction to the cell membrane. He starts by describing amphipathic nature of a phospholipid and how it assembles into a membrane. He gives an overview of the fluid mosaic model inside cells. He also discusses the movement of material across a membrane and the role of proteins in movement and function. Full version of inner life of the cell, Hank describes how cells regulate their contents and communicate with one another via mechanisms within the cell membrane. The Davson-Danielli model is an idea proposed on how cells regulate their environment. The proteins are on the outside of the bi-layer membrane. However, membranes need to allow for solute particles to pass back and forth. When proteins are on the outside, it blocks the solutes from passing through, preventing homeostasis. Therefore, we have to reject this model. In the Singer-Nicolson Fluid Mosaic Model, the integral proteins are embedded in the bi-layer. They have the ability to open up and let particles move back and forth.

Study with Quizlet and memorize flashcards containing terms like homeostasis, receptors, control center (and set point) and more. ... Basic unit of structure and function. tissues. Groups of cells organized into layers or masses that have specific functions. ... Body cavity membrane: which is a serous membrane that lines the lungs. Which structure is found separating the renal pyramids? ... What is the primary function of the highlighted structures? ... _____, like other blood proteins, is/are too large to pass through the glomerular filtration membrane and is/are normally NOT found in urine. Hematuria _____, the appearance of red blood cells in the urine, almost always ...

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