



Biology - Unit 3 - Cellular Transport

Unit Focus

This unit aims to deepen students' understanding of the vital role played by cell transport in the functioning of living organisms. Through an exploration of cell structure and function, students will gain a grasp of the intricate physiological processes that occur within and between cells. They will come to appreciate how the interactions and communication between cells form the basis of higher levels of organization, from tissues to organs to whole organisms. By delving into topics such as the regulatory function of the cell membrane and the concept of solubility, students will gain a deeper understanding of the fundamental importance of cell transport in sustaining life. Ultimately, this unit will extend students' learning in unit 1 and 2 to demonstrate the intimate connection between cellular interactions and the broader interactions and communication among and between organisms.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
Next Generation Science Standards Disciplinary Core Ideas: Middle School - Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (MS-LS1-2) (MS.LS1.A.2) Performance Expectations: High School Life Sciences - Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (HS-LS1-2) - Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (HSL1-3) Next Generation Science Standards (DCI) Science: 9 - Systems of specialized cells within organisms help them perform the essential functions of life. (LS1.9.A1) - Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (LS1.9.A3) - Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through	<i>Students will be able to independently use their learning to...</i> T1 Make observations and ask questions to define a problem based on prior knowledge and curiosity that stimulates further exploration, analysis, and discovery. T2 Use the scientific process to generate evidence that addresses the original questions. T3 Analyze qualitative and quantitative data to interpret patterns, draw conclusions, and/or make predictions. T4 Create models to explore complex systems, show mastery of key science concepts, and/or develop solutions through creation of a product open to testing and redesign.	
	Meaning	
	Understanding(s)	Essential Question(s)
	<i>Students will understand that...</i> U1 All cells receive information, send signals, and exchange materials with their surroundings to maintain their functions and survival. U2 All cells possess internal structures which regulate the movement of substances into and out of the cell. U3 Cells can develop in diverse ways to perform various functions. U4 Cells can combine to form structures, increasing the complexity of an organism. U5 All organisms strive to maintain a balance between the internal and external environments through positive and negative feedback loops.	<i>Students will keep considering...</i> Q1 How does a cell regulate the movement of substances into and out of the cell? Q2 How can cells be organized to form complex organisms? Q3 How do cells maintain balance with their external environments?

Stage 1: Desired Results - Key Understandings

positive feedback) or discourage (negative feedback) what is going on inside the living system. (LS1.9.A4) - The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms. (PS1.9.A2) - Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects. (PS2.9.B1) Madison Public Schools Profile of a Graduate - Analyzing: Examining information/data/ evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2) - Product Creation: Effectively use a medium to communicate important information. (POG.3.2)	Acquisition of Knowledge and Skill	
	Knowledge	Skill(s)
	<i>Students will know...</i> K1 Homeostasis is the process by which organisms keep internal conditions relatively constant despite changes in external environments K2 Every living cell exists in a liquid environment that it needs to survive K3 The cell membrane, composed of a phospholipid bilayer regulates what dissolved molecules enter and leave the cell and also provides protection and support K4 Because diffusion depends upon random particle movements, dissolved molecules move along a concentration gradient across the cell membrane without requiring energy. K5 The movement of particles down a concentration gradient does not require energy K6 Osmosis is the diffusion of water through a selectively permeable membrane K7 Cells also move dissolved molecules against a concentration gradient, and across the cell membrane in a process called active transport. K8 The movement of particles against the concentration gradient requires energy K9 Cell specialization is the process by which cells develop in different ways to perform specific tasks K10 Specialized cells interact and coordinate through signal transmission and transport mechanisms that regulate physiological processes across organ systems. K11 Vocabulary: Active Transport, Atom, Cell Membrane, Cell Wall, Concentration, Concentration Gradient, Covalent bond, Diffusion, Electron, Endocytosis, Equilibrium, Exocytosis, Facilitated Diffusion, Feedback Loops, Homeostasis, Hydrogen Bonding, Hypertonic, Hypotonic, Ion, Ionic Bond, Isotonic, Mixture, Neutron, Osmosis, Passive Transport, Permeable, Phagocytosis, Polar Molecule, Proton, Semi-Permeable, Solute, Solution, Solvent, Suspension	<i>Students will be skilled at...</i> S1 Use a model to illustrate how interacting systems of specialized cells coordinate and communicate across organ systems to perform specific functions and maintain homeostasis within a multicellular organism. S2 Apply the principles of scientific concepts to novel, real-world situations.