

COMPETENCY GOAL 1: The learner will develop an understanding of the physical, chemical, and cellular basis of life.

Weight	Objective	Curriculum Support	Suggested Activities	References
4%	1.01 Analyze the matter-energy relationships of living and non-living things.	Living vs. non-living and the use of energy by living systems.		
	1.01a Chemical processes and regulatory mechanisms of cells.	Maintenance of homeostasis: temperature, pH, and salinity.	Inquiry Support Lab – How do Biological Materials Respond to Acids and Bases?	
	1.01b Bonding patterns.	Bonds- <ul style="list-style-type: none"> • Formed by attraction between atoms • Represented by lines between the chemical symbols • Potential to be stronger or weaker • Specific bonding patterns for H, O, C, N Bonds can be discussed when teaching enzymes, respiration, photosynthesis, digestion, hydrolysis, and DNA.	Use physical models.	
	1.01c Energy use and release in biochemical reactions.	1) Generally it takes energy to make or break chemical bonds but breaking bonds may also release net energy, which may be used by the cell to do other work. 2) Compare and contrast 4 main types of organic chemicals, listing functions and subunits <ul style="list-style-type: none"> • Proteins • Carbohydrates • Lipids • Nucleic Acids 3) Contrast with inorganics such as H ₂ O, O ₂ , CO ₂ , and NH ₃ .	1) Food tests for starch, fats, and sugars. 2) Temperature measurements during endothermic and exothermic reactions like those in a peanut calorimeter activity. 3) Glowing splint test for oxygen.	
4%	1.02 Describe the structure and function of cell organelles.	1) Structure and function of: nucleus, plasma membrane cell wall, mitochondria vacuoles, chloroplasts ribosomes <i>(The endoplasmic reticulum, Golgi apparatus, lysosomes, cytoskeleton have been deliberately excluded. Cell Theory is required in the 7th grade Standard Course of Study)</i> 2) Proficient use and understanding of light microscopes.	1) Use microscopes to view and measure different types of cells. 2) Provide opportunities for students to manipulate, create, or examine three dimensional models.	http://www.life.uiuc.edu/cgi-bin/plantbio/cell/cell.cgi virtual plant cell from a University of Illinois project. http://www.libfind.unl.edu/wglider/tutorial/animcell.html animal cell from a course at the University of Nebraska. http://www.unl.edu/wglider/tutorial/plant.htm plant cell tutorial from the University of Nebraska

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1%	1.03 Compare and contrast the structure and function of prokaryotic and eukaryotic cells.	To include: <ul style="list-style-type: none"> • Meaning of term "membrane bound organelles" • Contrasts in size • Contrasts in chromosome structure 	Use microscopes to view and measure different types of cells.	http://www.biology.arizona.edu/cell_bio/tutorials/pev/page2.html interesting, little known facts about bacteria, part of a tutorial from Arizona University's Biology Project
4%	1.04 Assess and explain the importance of water to cells, as well as transport into and out of cells.	<ol style="list-style-type: none"> 1) Assess and explain importance of water to cells. 2) Discuss active vs. passive transport, diffusion, osmosis, and semipermeable membranes. 3) Given solution concentrations and different types of cells, students should be able to predict any changes that may or may not occur. <p><i>Vocabulary such as hypertonic, isotonic, hypotonic, pinocytosis, phagocytosis, endocytosis, and exocytosis has been deliberately excluded.</i></p>	<ol style="list-style-type: none"> 1) Rate of diffusion experiments as in agar block and dialysis tubing activities. 2) Use of dialysis tubing (or cheap plastic baggies to inquire into what crosses the membrane. 3) Activities placing cells in different concentrations as with eggs and elodea. 	http://biology.arizona.edu/sciconn/lessons/mccandless/default.html lesson plans by a high school teacher including several osmosis/diffusion lab activities on the University of Arizona Science Education Connection site
2%	1.05 Describe the structure and function of enzymes and explain their importance in biological systems.	Enzymes are proteins, which control chemical reactions in organisms. Concepts to be covered include: <ul style="list-style-type: none"> • Enzymes as re-useable and specific • Effects of pH, temperature on enzymes and the denaturing of enzymes • Induced Fit theory • Many genetic metabolic disorders such as PKU are caused by defects in the genetic code for one or more enzymes. 	Inquiry Support Lab – Properties of Enzymes	
4%	1.06 Analyze the bioenergetic reactions:	The emphasis should be placed on overall equations and on design and analysis of experiments. Assessment should focus on understanding of the overall reaction, evaluating design of experiments, and interpreting data from these experiments.		
	1.06a Aerobic respiration and anaerobic respiration	Students should be able to list reactants and products, not memorize step-by-step details.	Inquiry Support Lab Cellular Respiration in Germinating Seeds <i>Recommended also for 3.03b.</i>	

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	1.06b Integrated: compare / contrast aerobic, anaerobic, photosynthesis and chemosynthesis	Discussion should include the function of ATP, the purpose of the reactions and which types of organisms do which type of reaction when. <i>Students are not required to distinguish between light dependent and light independent parts of photosynthesis, and only need minimum details and examples of chemosynthesis.</i>	Inquiry activities to determine the effects of conditions such as pH, temperature, light, and food availability on these reactions. Organisms like elodea and yeast are suitable for such experiments.	
	1.06c Photosynthesis	Students should be able to list reactants and products not memorize step-by -step details.		http://photoscience.la.asu.edu/photosyn/default.html many useful links and articles at varying levels from Arizona State University's Photosynthesis Center

**Total Weight for Goal 1
19%**