

Biology

C. P. Biology; Grade 9, 10, 11, 12

Learning Standards	Objectives	Resources	Time Allotment	SHS Student Expectations
Learning Standard #1 Introduction to Biology				
Learning Standard #1.1 Biology	The student will be able to: <ul style="list-style-type: none"> • Define biology • List seven characteristics of life 	Modern Biology; Albert Towle, 1993 ch. 1, p. 5, 11-12		1, 3, 5
Learning Standard #1.2 Scientific method	The student will be able to: <ul style="list-style-type: none"> • Describe the steps of a scientific method. • Distinguish the differences between hypothesis, theory and scientific law. 	Towle ch. 2, p. 23 Video: The Scientific method		1, 3, 5
Learning Standard #1.3 Tool and techniques	The student will be able to: <ul style="list-style-type: none"> • Compare light microscopes with electron microscopes. • Describe some of the tools biologists use. • Describe some of the techniques biologists use. 	Towle ch. 2, p. 25-28		1, 3, 5
Learning Standard #2 Basic chemistry				
Learning Standard #2.1 Composition of matter	The student will be able to: <ul style="list-style-type: none"> • Draw a model of an atom • Define element, isotope, and radioisotope 	Towle ch. 3, p. 33-35	3	1, 3, 5

Learning Standard #2.2 Compounds	The student will be able to: <ul style="list-style-type: none"> Recognize chemical compounds Contrast covalent and atomic bonds 	Towle ch.3, p.35-37		1, 3, 5
Learning Standard #2.3 Mixtures	The student will be able to: <ul style="list-style-type: none"> Compare and contrast compounds and mixtures Distinguish between solutions and other kind of mixtures 	Towle ch.3, p. 38-39		1, 3, 5
Learning Standard #2.4 Acids and bases	The student will be able to: <ul style="list-style-type: none"> Contrast the properties of acids and bases Determine acid and base on a pH scale 	Towle ch.3, p. 39-40		1, 3, 5
Learning Standard #2.4 Energy	The student will be able to: <ul style="list-style-type: none"> Contrast the differences between potential and kinetic energy Explain the need for activation energy to release kinetic energy 	Towle ch.3, p. 41-42		
Learning Standard #3 Chemistry of life-Biochemistry				
Learning Standard # 3.1 Organic compounds	The student will be able to: <ul style="list-style-type: none"> Explain the significance of carbon in organic molecules. Recognize the six most common elements in organic molecules (C, H, N, O, P, S) Describe the composition and functions of the four major categories of organic molecules (carbohydrates, lipids, proteins, and nucleic acids) 	Towle ch. 4, p. 48-54 Video: The Molecular Basis of Life		1, 3, 5
Learning Standard # 3.2 Chemical reactions in biology	The student will be able to: <ul style="list-style-type: none"> Describe how dehydration synthesis and hydrolysis relate to organic 	Towle ch. 4, p. 48		1, 3, 5

	<p>molecules.</p> <ul style="list-style-type: none"> Explain the role of enzymes in biochemical reactions. 			
<p>Learning Standard # 3.3 Enzymes</p>	<p>The student will be able to:</p> <ul style="list-style-type: none"> Explain the role of enzymes in biochemical reactions. 	Towle ch. 4, p. 53-54		1, 3, 5
<p>Learning Standard # 4 Structure and function of the cell</p>				
<p>Learning Standard # 4.1 Introduction to cells</p>	<p>The student will be able to:</p> <ul style="list-style-type: none"> Outline the discoveries that led to the development of the cell theory. State the cell theory. Identify the limitations of cell size. 	Towle ch. 5, p. 63-65 Video: The Cell		
<p>Learning Standard # 4.2 Parts of a cell</p>	<p>The student will be able to:</p> <ul style="list-style-type: none"> Relate cell parts/organelles to their function. Describe the processes of mitosis and meiosis, and their role in the cell cycle. 	Towle ch. 5, p. 66-74		1, 3, 5
<p>Learning Standard # 4.3 Prokaryotes and Eukaryotes</p>	<p>The student will be able to:</p> <ul style="list-style-type: none"> Differentiate between prokaryotic cells and eukaryotic cells, in terms of their general structures and degrees of complexity. 	Towle ch. 5, p. 65		1, 3, 5
<p>Learning Standard # 4.4 Plant and animal cells</p>	<p>The student will be able to:</p> <ul style="list-style-type: none"> Distinguish between plant and animal cells. 	Towle ch. 5, p. 72-74		1, 3, 5
<p>Learning Standard # 5 Diffusion, osmosis and cell transport</p>				
<p>Learning Standard # 5.1</p>	<p>The student will be able to:</p> <p>Differentiate between diffusion and</p>	Towle ch. 6, p. 81-83		

Diffusion, osmosis	osmosis. <ul style="list-style-type: none"> Explain the role of cell membranes as a highly selective barrier (diffusion, osmosis, and active transport, passive transport) 			
Learning Standard # 5.2 Homeostasis	The student will be able to: <ul style="list-style-type: none"> Define and explain homeostasis. 	Towle ch. 6, p. 81		1, 3, 5
Learning Standard # 5.3 Equilibrium	The student will be able to: <ul style="list-style-type: none"> Describe the movement of molecules across a system to achieve equilibrium. 	Towle ch. 6, p. 81		1, 3, 5
Learning Standard # 5.4 Osmosis	The student will be able to: <ul style="list-style-type: none"> Explain the process by which water moves across a membrane. 	Towle ch. 6, p. 81-83		1, 3, 5
Learning Standard # 5.5 Cell membranes	The student will be able to: <ul style="list-style-type: none"> Explain the role of cell membranes as a highly selective barrier (diffusion, osmosis, and active transport, passive transport) 	Towle ch. 6, p. 84		1, 3, 5
Learning Standard # 5.6 Other kinds of transport	The student will be able to: <ul style="list-style-type: none"> Explain how facilitated diffusion, sodium-potassium pump, gated channels, endocytosis and exocytosis occur in a cell. 	Towle ch. 6, p. 84-88		1, 3, 5
Learning Standard # 6 Photosynthesis, respiration, and ATP				

<p>Learning Standard # 6.1 Photosynthesis</p>	<p>The student will be able to:</p> <ul style="list-style-type: none"> • Identify the reactants and the products in the general reaction of photosynthesis. • Describe the use of isotopes in this identification. • Provide evidence the organic compounds produced by plants are the primary source of energy and nutrients for most living things. 	<p>Towle ch. 5, p. 96-99</p>		<p>1, 3, 5</p>
<p>Learning Standard # 6.2 Respiration and ATP</p>	<p>The student will be able to:</p> <ul style="list-style-type: none"> • Identify the reactants and the products in the general reaction of respiration. • Identify how cellular respiration is important for the production of ATP. • Explain the interrelated nature of photosynthesis and cellular respiration. 	<p>Towle ch. 6, p. 93-95, 103-108</p>		<p>1, 3, 5</p>
<p>Learning Standard # 7 Mitosis and Meiosis</p>				
<p>Learning Standard # 7.1 Chromosomes</p>	<p>The student will be able to:</p> <ul style="list-style-type: none"> • Identify the structures of a chromosome • Explain the difference between a diploid cell and a haploid cell 	<p>Towle ch. 9, p. 129-130</p>		<p>1, 3, 5</p>
<p>Learning Standard # 7.2 Mitosis</p>	<p>The student will be able to:</p> <ul style="list-style-type: none"> • Describe the processes of mitosis and its role in the cell cycle. 	<p>Towle ch. 9, p. 131-135</p>		<p>1, 3, 5</p>
<p>Learning Standard # 7.3 Meiosis</p>	<p>The student will be able to:</p> <ul style="list-style-type: none"> • Describe the processes of meiosis and its role in the cell cycle. 	<p>Towle ch. ,9 p. 136-138</p>		<p>1, 3, 5</p>

Learning Standard # 8 Nucleic acid and protein synthesis				
Learning Standard # 8.1 Structure of DNA	The student will be able to: <ul style="list-style-type: none"> Describe the structure and function of the nucleic acids, DNA and RNA Explain how zygotes are produced in the fertilization process. Recognize that while viruses lack cell structure, they have the genetic material to invade living cells 	Towle ch. 8, p. 113-119		1, 3, 5
Learning Standard # 8.2 Replication, transcription and translation	The student will be able to: <ul style="list-style-type: none"> Describe the process of replication, transcription, and translation and how they relate to each other in molecular biology. Describe the general pathway by which ribosomes synthesize proteins by using tRNAs to translate genetic information encoded in mRNAs. 	Towle ch. 8, p. 115-123		1, 3, 5
Learning Standard # 9 Fundamentals of genetics				
Learning Standard # 9.1 Mendel's laws	The student will be able to: <ul style="list-style-type: none"> State Mendel's laws of segregation and independent assortment. 	Towle ch. 10, p. 147-151		1, 3, 5
Learning Standard # 9.2 Genetic crosses	The student will be able to: <ul style="list-style-type: none"> Differentiate between dominant, recessive, codominant, polygenic, and sex-linked traits. Use a Punnett Square to determine the genotype and phenotype of monohybrid crosses. 	Towle ch. 10, p. 153-158		1, 3, 5
Learning Standard # 9.3 Fertilization	The student will be able to: <ul style="list-style-type: none"> Explain how zygotes are produced 	Towle ch. 9, p. 138		1, 3, 5

	in the fertilization process.			
Learning Standard # 9.4 Mutations	The student will be able to: <ul style="list-style-type: none"> • Explain how mutations in the DNA sequence of a gene may be silent or result in phenotypic changes in an organism and in its offspring. 	Towle ch. 11, p. 163-164		1, 3, 5
Learning Standard # 9.5 Genetic patterns	The student will be able to <ul style="list-style-type: none"> • Explain how sex chromosomes determine sex inheritance in fruit flies • Explain how sex chromosomes determine sex inheritance in humans • Define crossing-over and tell how it creates genetic variation. • Summarize the process of how to construct a chromosome map. 	Towle ch. 11, p. 165-168		1, 3, 5
Learning Standard # 10 Human genetics				
Learning Standard # 10.1 Twins	The student will be able to <ul style="list-style-type: none"> • Explain the difference between identical and fraternal twins 	Towle ch. , p.		1, 3, 5
Learning Standard # 10.2 Human genetic traits	The student will be able to <ul style="list-style-type: none"> • Describe an give an example of a single allele trait, polygenic trait, multiple-allele trait, sex-linked trait, sex-influenced trait, and nondisjunction 	Towle ch. 11, p. 170-175		1, 3, 5
Learning Standard # 10.3 Detecting genetic disorders	The student will be able to <ul style="list-style-type: none"> • Identify the methods a detecting genetic disorders during a pregnancy 	Towle ch. 11, p. 175-176		1, 3, 5

<p>Learning Standard # 11 Human anatomy and physiology</p>			
<p>Learning Standard # 11.1 Digestion</p>	<p>The student will be able to</p> <ul style="list-style-type: none"> • Define nutrient, vitamin and mineral and summarize the functions that they perform in the human body. • List some of the important functions of water in the human body • Define alimentary canal and name the major organs of the digestive system • Relate each structure in the digestive system to its function in mechanical and chemical aspects of digestion. • Identify the source of major enzymes of digestion and describe the function of the enzyme. • Summarize the process of absorption in both the small and large intestines. 	<p>Towle ch. 45, p. 687-699</p>	<p>1, 3, 5</p>
<p>Learning Standard # 11.2 Circulation</p>	<p>The student will be able to</p> <ul style="list-style-type: none"> • List the different types of vessels in the circulatory system • Describe the movement of blood through the heart • Distinguish among arteries, veins, and capillaries • List and describe the components of blood • Summarize blood clotting • Explain blood types • Explain what determines compatibility of bloods in transfusions • Describe the lymphatic system 	<p>Towle ch. 43, p. 654-661</p>	<p>1, 3, 5</p>

<p>Learning Standard # 11.3 Respiration</p>	<p>The student will be able to</p> <ul style="list-style-type: none"> • Name and describe the organs of respiration • Summarize the skeletal and muscular movements used in breathing. • Explain how the structure of alveoli is related to the function of diffusion of gases in the lungs • Describe what regulates the breathing rate 	<p>Towle ch. 43, p. 665-668</p>		<p>1, 3, 5</p>
<p>Learning Standard # 11.5 Excretion</p>	<p>The student will be able to</p> <ul style="list-style-type: none"> • Define the term excretion and list the functions of each of the major excretory organs • Identify the major parts of the kidney • Relate the structure of the nephron and the function it performs. • Explain how the process of filtration, reabsorption, and secretion help maintain homeostasis • Name the main parts of the urinary system. 	<p>Towle ch. 45, p. 700-702</p>		<p>1, 3, 5</p>

<p>Learning Standard # 11.6 Nervous system</p>	<p>The student will be able to</p> <ul style="list-style-type: none"> • Identify the primary divisions of the nervous system. • Describe the function of receptors, conductors, and effectors. • Summarize the function of the three areas of the brain • Relate the structure of the neuron to its function. • Summarize the electrical and chemical changes in a neuron in the transmission of an impulse through a nerve. 	<p>Towle ch. 46, p. 707-717</p>		<p>1, 3, 5</p>
<p>Learning Standard # 11.7 The senses</p>	<p>The student will be able to</p> <ul style="list-style-type: none"> • Describe a sense receptor and list the five primary sense receptors. • Identify the parts of the eye and describe the roles of the rods and cones • Identify the parts of the ear and describe how sound is transmitted to the brain • Describe how smell is detected and messages are sent to the brain. • Describe how taste is detected and messages are sent to the brain. • Describe the various receptors found in the skin 	<p>Towle ch. 46, p. 718-722</p>		<p>1, 3, 5</p>
<p>Learning Standard # 11.8 Endocrine system</p>	<p>The student will be able to</p> <ul style="list-style-type: none"> • Describe the difference between an exocrine and endocrine gland. • List the major endocrine glands and the function of each. • Describe a negative feedback mechanism. 	<p>Towle ch. 47, p. 727-734</p>		<p>1, 3, 5</p>

<p>Learning Standard # 11.9 Reproduction</p>	<p>The student will be able to</p> <ul style="list-style-type: none"> • Identify the major parts of the male and female reproductive systems and the function of each. • List similarities and differences between sperm and egg. • Summarize the role of hormones on regulating the menstrual cycle. 	<p>Towle ch. 47, p. 735-738</p>		<p>1, 3, 5</p>
<p>Learning Standard # 11.10 Immune system</p>	<p>The student will be able to</p> <ul style="list-style-type: none"> • Summarize the four steps of Koch's postulates • Describe four mechanisms of disease transmission • Describe the difference between a specific and a nonspecific response • Describe the difference between vaccination and immunity. 	<p>Towle ch. 44, p. 673-679</p>		<p>1, 3, 5</p>
<p>Learning Standard # 12 Evolution</p>				
<p>Learning Standard # 12.1 Evidence from the fossil record</p>	<p>The student will be able to</p> <ul style="list-style-type: none"> • Explain how the fossil record, comparative anatomy, and other evidence support the theory of evolution. • Describe how the taxonomic system classifies living things into domains (eubacteria, archaeobacteria, and eukaryotes) and kingdoms. 	<p>Towle ch. 15, p. 219-224</p>		<p>1, 3, 5</p>
<p>Learning Standard # 12.2 Darwin's theory of evolution</p>	<p>The student will be able to</p> <ul style="list-style-type: none"> • Illustrate how genetic variation is preserved or eliminated from a population through Darwinian natural selection (evolution) resulting in biodiversity. 	<p>Towle ch. 150, p. 225-230</p>		<p>1, 3, 5</p>
<p>Learning Standard # 12.3</p>	<p>The student will be able to</p> <ul style="list-style-type: none"> • Compare and contrast divergent and 	<p>Towle ch. 15, p. 231-232</p>		<p>1, 3, 5</p>

Patterns of evolution	<p>convergent evolution.</p> <ul style="list-style-type: none"> Define and give an example of coevolution. 			
Learning Standard # 12.4 Taxonomy	<p>The student will be able to</p> <ul style="list-style-type: none"> Describe how the taxonomic system classifies living things into domains (eubacteria, archaeobacteria, and eukaryotes) and kingdoms. 	Towle ch. 18, p. 267-274		1, 3, 5
Learning Standard # 13 Ecology				
Learning Standard # 13.1 The biosphere and biomes	<p>The student will be able to</p> <ul style="list-style-type: none"> Define the term biosphere Explain how biotic and abiotic factors cycle in the ecosystem. Distinguish between populations, communities, and ecosystems Define the term biome Describe the major terrestrial biomes Give example of adaptations of plants in a biome Give example of adaptations of animals in a biome 	Towle ch. 49, p. 765-766, 767-773		1, 3, 5
Learning Standard # 13.2 Ecosystems	<p>The student will be able to</p> <ul style="list-style-type: none"> Identify the factors in an ecosystem that influence fluctuations in population size. Analyze changes in an ecosystem resulting from natural causes, changes in climate, human activity, or introduction of non-native species. Explain how symbiotic behavior produces interactions within ecosystems. 	Towle ch. 50, p. 781-784		1, 3, 5

<p>Learning Standard # 13.3 Energy flow</p>	<p>The student will be able to</p> <ul style="list-style-type: none"> • Describe the flow of energy through a food chain. • Describe how food chains interact to form a food web • Use a food web to identify and distinguish producers, consumers and decomposers, and explain the transfer of energy through trophic levels. • Identify three types of ecological pyramids and explain what each measures. 	<p>Towle ch. ,50 p. 785-787</p>		<p>1, 3, 5</p>
<p>Learning Standard # 14 Dissections</p>				
<p>Learning Standard # 14.1 Worm</p>	<p>The student will be able to</p> <ul style="list-style-type: none"> • Follow a set of directions for dissection of the worm • Find and identify structures selected 			<p>1, 3, 5</p>
<p>Learning Standard # 14.2 Crayfish</p>	<p>The student will be able to</p> <ul style="list-style-type: none"> • Follow a set of directions for dissection of the crayfish • Find and identify structures selected 			<p>1, 3, 5</p>
<p>Learning Standard # 14.3 Frog</p>	<p>The student will be able to</p> <ul style="list-style-type: none"> • Follow a set of directions for dissection of the frog • Find and identify structures selected 			<p>1, 3, 5</p>
<p>Learning Standard # 15 Laboratory experience</p>		<p>All laboratory experiences listed should contain this standard.</p>		
<p>Learning Standard # 15.1 Observations</p>	<p>The student will be able to</p> <ul style="list-style-type: none"> • Make observations microscopically or macroscopically • Determine quantitative and qualitative observations • Collect accurate and precise data 	<p>All labs</p>		<p>1, 3, 5</p>
<p>Learning Standard # 15.2</p>	<p>The student will be able to</p>	<p>All labs</p>		<p>1, 3, 5</p>

Recording data	<ul style="list-style-type: none"> Record data in a suitable format according to the nature of the lab 			
Learning Standard # 15.3 Analysis and conclusions	The student will be able to <ul style="list-style-type: none"> Interpret results and observations to make conclusions. 	All labs		1, 3, 5