Essential Biology: Standards Correlations

Below is a list of the laboratory investigations in the *Essential Biology Lab Manual*. The Next Generation Science Standards (NGSS)* dimensions supported by each investigation are listed below. The investigations are grouped into three categories: Cell Biology, Ecology, and Physiology.

Activity Number	Activity Name and Description	NGSS Dimensions Supported		
		Disciplinary Core Ideas	Crosscutting Concepts	Science & Engineering Practices
Cell Biology				
1A	Enzyme Action (Pressure Sensor) *Students use a pressure sensor to compare the rate of hydrogen peroxide decomposition with and without a catalyst.*	LS1.A	Energy & matter; Systems & system models	Analyzing & interpreting data; Using mathematics & computational thinking
1B	Enzyme Action (Oxygen Sensor) *Students use an oxygen sensor to compare the rate of hydrogen peroxide decomposition with and without a catalyst.*	LS1.A	Energy & matter; Systems & system models	Analyzing & interpreting data; Using mathematics & computational thinking
2	Membrane Permeability *Students use a pH sensor to explore which substances can and cannot pass through a cell membrane model.*	LS1.A	Energy & matter; Structure & function	Developing & using models
3	Organisms and pH *Students use a pH sensor to determine how effective various substances are at resisting large changes in pH.*	LS1.A	Stability & change	Planning & carrying out investigations
4	Osmosis *Students use a pressure sensor to study the movement of water through a cell membrane model by osmosis.*	LS1.A	Energy & matter; Stability & change	Analyzing & interpreting data
5	Plant Respiration and Photosynthesis *Students use a carbon dioxide gas sensor to measure the rates of photosynthesis and respiration in spinach leaves.*	LS1.C LS2.B	Energy & matter; Systems & system models	Analyzing & interpreting data
6	Respiration of Germinating Seeds *Students use a carbon dioxide gas sensor to explore the energy requirements of seeds moving from dormancy to germination.*	LS1.C	Energy & matter; Systems & system models	Analyzing & interpreting data; Planning & carrying out investigations
Ecology				
7	Buffers in Biological Systems *Students use a pH sensor to explore the effect buffers have on the ability of a cell to maintain homeostasis.*	LS1.A	Stability & change	Developing and using models; Engaging in argument from evidence
8	Acid Rain *Students use a pH sensor to measure the impact atmospheric pollutants have on rainfall and plant growth.*	LS2.C	Cause & Effect; Patterns; Stability & change	Obtaining, evaluating, & communicating information; Engaging in argument from evidence

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9	Cellular Respiration in Yeast *Students use an optical dissolved oxygen sensor and a fast response temperature probe to investigate the effect of temperature on the cellular respiration rate of yeast cells.*	LS1.C	Energy & matter	Analyzing & interpreting data; Using mathematical & computational thinking
10	Energy Content of Food *Students use a wireless temperature link and a fast response temperature probe to compare the amount of energy available from different food sources.*	LS1.C	Energy & matter; Systems & system models	Analyzing & interpreting data; Using mathematical & computational thinking
11	Metabolism of Yeast *Students use a carbon dioxide sensor to compare the metabolic rate of yeast in aerobic and anaerobic conditions.*	LS2.B	Energy & matter	Analyzing & interpreting data; Using mathematical & computational thinking
12	Photosynthesis of Aquatic Plants *Students use an optical dissolved oxygen sensor and a photosynthesis tank to study the photosynthetic rate of aquatic plants under different light conditions.*	LS2.B	Energy & matter; Systems & system models	Analyzing & interpreting data
13	Soil pH *Students use a pH sensor to investigate how local soil quality may impact the ability to support agricultural crops.*	LS2.A	Patterns; Cause & Effect; Proportion & Quantity	Analyzing & interpreting data; Constructing explanations & designing solutions
14	Transpiration *Students use a pressure sensor to explore how changing atmospheric conditions affect the transpiration rate of a plant.*	LS4.C	Stability & change	Planning & carrying out investigations
15	Water and pH *Students use a pH sensor and a conductivity sensor to investigate how an ecosystem could be susceptible to the effects of pollution.*	LS2.C	Patterns; Cause & effect; Proportion & quantity	Asking questions & defining problems
16	Water Purification *Students use a pH sensor and a conductivity sensor to evaluate the effectiveness of various water treatment processes.*	LS4.D	Cause & effect	Analyzing & interpreting data; Constructing explanations & designing solutions
17	Weather in a Terrarium *Students use a weather sensor in a terrarium to understand the relationship between the water cycle and energy within a microclimate.*	ESS2.C LS4.C	Energy & matter	Analyzing & interpreting data
Physiology				
18	EKG: Factors that Affect the Heart *Students use an EKG sensor to measure and interpret the electrical activity of the heart muscles.*	LS1.A	Patterns; Stability & change	Analyzing & interpreting data

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19	Exercise and Heart Rate *Students use a hand grip heart rate sensor to learn about the circulatory system by monitoring their heart rate while resting and while exercising.*	LS1.A	Patterns; Stability & change	Analyzing & interpreting data
20	Exercise and Blood Pressure *Students use a blood pressure sensor to learn how to measure blood pressure and understand how aerobic exercise affects blood pressure parameters.*	LS1.A	Patterns; Stability & change; Structure & function	Analyzing & interpreting data
21	Muscle Strength *Students use a pressure sensor to test grip strength and to investigate muscle fatigue.*	LS1.A	Structure & function	Analyzing & interpreting data
22	Regulation of Body Heat *Students use two fast response temperature probes to look for evidence of homeostasis while experiencing changes in external body temperature.*	LS1.A	Stability & change	Analyzing & interpreting data
23	Volume of Breath *Students use a spirometer to investigate how the amount of air moving in and out of the lungs changes with exercise.*	LS1.A	Systems & system models; Stability & change	Analyzing & interpreting data