



# BIOLOGY PACING GUIDE

# 2024 - 2025

THE DEPARTMENT OF EDUCATION. CURRICULUM DIVISION. SCIENCES SECTION. HIGH SCHOOL SCIENCES UNIT.

NATIONAL PACING GUIDE

# BIOLOGY PACING GUIDE

## GRADE 10

	BIOLOGY STRAND	UNIT	OBJECTIVES	DURATION
<b>TERM ONE</b>	Introduction to Biology	Characteristics of living things and classification	<p>Explain what is biology.</p> <p>Research other branches of biology.</p> <p>Conduct a study on how does one test a hypothesis. Identify and describe the seven characteristics of life.</p> <p>Relate the seven properties of life to a living organism.</p> <p>Describe the binomial system of naming species, its purpose and its importance with emphasis on Bahamian examples.</p>	2 weeks
	Environmental Biology	Ecology	Review definitions for the terms ecology, ecosystem, habitat, niche, community, population, food chain, food web, producers, consumers, decomposers, detritivores, herbivores, carnivores, omnivores, predators, prey , parasites, saprophytes, biotic and abiotic factors	1 week
		Mangrove Ecosystem	<p>Make an annotated outline drawing of the profile of a mangrove ecosystem showing zonation and the features of each zone.</p> <p>Construct and use field equipment in an ecosystem.</p> <p>Identify and classify the biotic and abiotic factors in a mangrove ecosystem. Compare and contrast the features/adaptations of the types of mangroves.</p> <p>Explain the adaptations of the three types of mangroves and Buttonwood to the conditions in which they live.</p> <p>Illustrate the flow of energy through a mangrove food web.</p> <p>Predict how energy distribution and energy use will be altered through changes in the food web.</p> <p>Explain the role of mangroves in land-building. Research the importance of mangrove ecosystems.</p> <p>Research the natural and man-made threats to mangrove ecosystems.</p>	2 weeks
		Coral Reef	<p>Identify the locations of coral reefs on a map of the world and a map of The Bahamas.</p> <p>Show the relationship between locations of coral reefs and abiotic factors which are needed for coral reefs to thrive.</p> <p>Describe a coral polyp. Explain the role of coral polyps and other organisms in coral reef formation. Identify hard and soft coral found locally. Create a news article explaining the benefits of coral reefs. Explain the role of zooxanthellae.</p> <p>Observe the diversity of organisms in the coral reef ecosystem. LEARNER OUTCOMES</p> <p>Explain the role of zooxanthellae. Observe the diversity of organisms in the coral reef ecosystem.</p> <p>Construct a coral food web showing producers, primary, secondary and tertiary consumers. Identify the adaptations of reef fish to their environment. Research natural and man-made threats to coral reefs.</p>	2 weeks

# TERM ONE

		Rocky Shores	<p>Locate on a map of the island likely areas for rocky shoreline ecosystems to be located.</p> <p>Conduct field studies (or virtual) of a rocky shoreline. Measure temperature and wind speed. LEARNER OUTCOMES</p> <p>Locate on a map of the island likely areas for rocky shoreline ecosystems to be located.</p> <p>Conduct field studies (or virtual) of a rocky shoreline. Measure temperature and wind speed. Use tools and equipment to gather data. Collect and record data.</p>	1 ½ weeks
Environmental Biology	Rocky Shore	Rocky Shore	<p>Make an annotated outline drawing of the profile of a typical rocky shoreline ecosystem showing zonation and the features of each zone. Identify key organisms found in each zone. Describe the adaptations of the organisms to their habitat/zone.</p> <p>Conduct a survey of Citation pica (whelks, walks, West Indian Topshell) or other named mollusk on a rocky shore. Show the relationship between the features of the mollusk surveyed and its adaptations to the environment. Suggest benefits derived from the rocky shoreline. Conduct research to determine threats to the rocky shoreline ecosystems.</p>	
		Sandy Beach	<p>Locate on a map of the island likely areas for sandy shoreline ecosystems.</p> <p>Conduct field (or virtual) studies of a sandy beach. Make an annotated outline drawing of the profile of a sandy shoreline ecosystem showing zonation.</p> <p>Measure temperature and wind speed. Use tools and equipment to gather data. Collect and record data. Identify key organisms found in each zone. Conduct a survey of invertebrates on a sandy shore. Show the relationship between the features of the invertebrates surveyed and their adaptations to the environment/zone. Show the relationship between the features of plants observed and their adaptations to the environment/zone. Research the importance of the sandy shoreline. Research the threats to the sandy shoreline.</p>	1 week
		Forest Ecosystem	<p>Compare the abiotic conditions in the three geographical zones of The Bahamas.</p> <p>Describe the main flora and fauna found in each forest and their adaptations.</p> <p>Conduct field studies of a forest. Use a line transect or other appropriate method to survey organisms in the area. Use a line transect or other appropriate method to survey organisms in the area. Construct a possible food web for the ecosystem.</p> <p>Research the importance of the terrestrial ecosystem to man and wildlife.</p> <p>Suggest possible threats to the ecosystem.</p> <p>Persuade peers to value the terrestrial ecosystem.</p> <p>Show personal valuing of the local forest.</p>	1 week
Cell Biology and Genetics	Cells and Cell Organization	<p>Analyze and observe structures in plant and animal cells using a light microscope correctly.</p> <p>Observe detailed structures of plant and animal cells.</p> <p>Make a 3D model of a plant and animal cell. Explain the relationship of the cell parts to their function. Explain the relationship between cells, tissue, organs, organ systems and organisms and give examples.</p>	2 weeks	

	<b>BIOLOGY STRAND</b>	<b>UNIT</b>	Describe cell specialization, relate the structure of a root hair cell, xylem, muscle cell, red blood cell, ovum and sperm cell to their function.	<b>DURATION</b>
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**TERMS  
TWO AND THREE**

	Cell Biology and Genetics	Transport in Cells	<p>Use coloured substances to demonstrate diffusion. Observe diffusion of substances in air and liquids. Illustrate examples of diffusion in the human body. Design and conduct an experiment to determine the effects of temperature on the rate of diffusion. Observe the effects of temperature on the rate of diffusion. Describe the process of Facilitated diffusion. Perform an experiment to show osmosis. Use apparatus and materials to demonstrate osmosis. Measure materials needed for osmosis experiment. Make observations of osmosis.</p>	2 ½ weeks
	Cell Biology and Genetics	Transport in Cells	<p>Formulate a conclusion from the experiment on osmosis. Plan and perform an experiment to investigate the effects of temperature on rate of osmosis. Describe simply the process of active transport. Demonstrate the relationship between diffusion and osmosis. Compare and contrast the mechanisms of simple diffusion, facilitated diffusion osmosis and active transport. Classify each type of transport in cells as passive or active. Formulate a hypothesis on the direction in which iodine, starch and water will move through a plastic sandwich bag/visking tubing. Predict the outcome of an experiment using plastic sandwich bags/visking tubing, iodine and starch, to show selectivity of the cell membrane. Conduct an experiment to demonstrate selectivity of cell membrane using plastic sandwich bags. Use apparatus to demonstrate selectivity of the cell membrane. Make inferences and draw a logical conclusion on selectivity of the cell membrane. Formulate a hypothesis on the direction in which iodine, starch and water will move through a plastic sandwich bag/visking tubing. Predict the outcome of an experiment using plastic sandwich bags/visking tubing, iodine and starch, to show selectivity of the cell membrane. Conduct an experiment to demonstrate selectivity of cell membrane using plastic sandwich bags. Use apparatus to demonstrate selectivity of the cell membrane. Make inferences and draw a logical conclusion on selectivity of the cell membrane. Use materials to illustrate turgidity and plasmolysis in plant cells. Perform an investigation to determine the effects of varying concentration of sugar solutions on plant tissue. Observe the effects of varying the concentration of solutions on plant tissues. Measure length and width of potato/carrot strips. Show the change in length of plant strips.</p>	1 ½ weeks

			Explain the effects of solutions of different concentrations on plant tissue. Predict what would happen to a sample of red blood cells when placed in solutions of varying concentrations.	
<b>TERMS TWO &amp; THREE</b>		Animal Nutrition	Explain the importance of water to cells. Relate the properties of water to its functions in cells. Classify proteins in the cell. Demonstrate the relationship between amino acids and proteins. Relate the properties of protein to its function in cells. Identify fats as essential chemicals in cells. Make a diagram to show the chemical arrangement of a portion of a fat molecule. Make a model to represent a molecule of glucose. Relate the properties of carbohydrates to their function in cells. Compare and contrast the chemical composition of proteins, fats and carbohydrates. Describe inter-conversions of substances in cells.	1 week
	Nutrients and Food Supply	Nutrients in Food	Predict which nutrient(s) can be found in given foods. Use apparatus and materials safely in performing food tests Conduct food tests on the food samples to verify the predictions. Observe results of food tests on various food samples Draw conclusions to verify predictions on nutrients present in food samples. Conduct an experiment to compare the amount of Vitamin C in juices.	1 ½ weeks
<b>TERMS TWO &amp; THREE</b>	Animal Anatomy and Physiology	Digestion	Identify parts of the digestive system and explain the function of the various parts in relation to ingestion, digestion, absorption, assimilation and egestion of food. List properties of enzymes. Explain mechanism of how enzymes work.	2 weeks
	Cell Biology	Activity of Enzymes in Cells	Use materials to show enzyme action. Plan and conduct an experiment to determine the pH conditions under which the enzyme catalase works best. Plan and conduct an experiment to determine the effect of temperature on enzyme action. Measure the temperature of various solutions during an enzyme reaction using a thermometer.	1 ½ weeks
	Nutrition and Food Supply	Animal Nutrition	Observe dentitions of an omnivore, carnivore and herbivore. Compare the dentitions of omnivore, carnivore and herbivore. Explain the relationship between the dentitions of omnivore, carnivore and herbivore and their diet. Observe the digestive tracts of named mammalian omnivore, carnivore and herbivore. Compare and contrast the digestive tracts of a named herbivore, omnivore and carnivore. Explain the relationship between the digestive tracts of a named omnivore, carnivore and herbivore and their diet.	1 ½ weeks

	Plant Anatomy and Physiology	Structure and Function of Leaves, Stems and Roots	<p>Observe the external features of a maize and hibiscus or sea grape leaf.          Use the microscope correctly and safely to view a prepared slide of a cross-section of a monocotyledonous leaf          Observe a prepared slide of a dicotyledonous leaf under a microscope.          Observe the external features of a maize and hibiscus or sea grape leaf.          Use the microscope correctly and safely to view a prepared slide of a cross-section of a monocotyledonous leaf          Observe a prepared slide of a dicotyledonous leaf under a microscope. Compare the external appearance of the dicotyledonous leaf with modified leaves. Observe the internal features of a cross-section of a monocotyledonous stem. Observe the internal features of a cross-section of a dicotyledonous stem.          Compare the internal features of monocotyledonous and dicotyledonous stems. Observe the internal features of a longitudinal-section of a dicotyledonous stem.          Explain the advantage of bark on stems.          Compare the external appearance of the dicotyledonous stem with modified stems.          Observe the internal features of a cross-section of a monocotyledonous root          Observe the internal features of a cross-section of a dicotyledonous root. Compare the internal features of monocotyledonous and dicot roots.          Observe the internal features of a longitudinal-section of a dicotyledonous root.          the external appearance of the dicotyledonous root with modified roots.          Compare the internal structure of a dicot root with a dicot stem.</p>	2 ½ weeks
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# BIOLOGY PACING GUIDE

## GRADE 11

	BIOLOGY STRAND	UNIT	OBJECTIVES	DURATION
<b>TERM ONE</b>	ENVIRONMENTAL BIOLOGY	Air Pollution	<p>Explain the terms pollution and pollutant. Research main air pollutants.</p> <p>Conduct a sample survey to ascertain the extent to which CFCs are used in the community.</p> <p>Relate the use of CFCs to the depletion of the ozone layer.</p> <p>Conduct an investigation to compare dust pollution in different areas.</p> <p>Explain the greenhouse effect.</p> <p>Read a news article on “climate change” Formulate a hypothesis as to the aspects of climate change that will affect The Bahamas.</p> <p>Predict the decade in which The Bahamas would notice the change in climatic factors using scientific models. Identify the climatic factors in The Bahamas that would be most affected by climate change.</p> <p>Design and conduct an investigation to ascertain the knowledge and response level of persons to “climate change”.</p> <p>Analyze the efforts of government to reduce carbon dioxide emissions in the country. Investigate the use of alternative energy sources that would reduce greenhouse gas emissions.</p> <p>Analyze the efforts of schools to educate students towards reversing global warming factors.</p> <p>Research what may happen to small islands/ bays as a result of climate change/global warming.</p>	1 ½ weeks
		Land Pollution	<p>Formulate a personal commitment to become a good steward of the environment in utilizing “green” practices.</p> <p>Suggest “green” practices that every person could use. Classify main land pollutants.</p> <p>Suggest methods of controlling the main land pollutants. Promote the theme “Reduce, Reuse, Recycle”.</p> <p>Construct a model that may be used by householders or a small business to reuse or recycle one of the named land pollutants.</p> <p>Produce an anti-litter brochure.</p>	1 week
		Water Pollution	<p>Formulate a hypothesis as to the most common pollutant in the sea/beach.</p> <p>Conduct an investigation to determine the types of pollutants found on beaches.</p> <p>Investigate water pollutants from a suspected polluted source.</p> <p>Compare the pollutants found in inland water with those found in the sea. Classify water pollutants.</p> <p>Compare the sources and effects of common water pollutants.</p>	1 ½ weeks



			<p>Suggest methods of controlling common water pollutants.</p> <p>Describe the effects of “heavy” metals on marine food chains.</p> <p>Explain the effects of pesticides on the marine food chains.</p> <p>Design a product to contain an oil spill.</p> <p>Describe the threats to the marine environment caused by marine debris.</p> <p>Explain the process of eutrophication.</p>	
	Environmental Biology	Agriculture	<p>Relate challenges in subsistence farming to food security status.</p> <p>Compare the use of biological agents (organisms) and chemicals to control pests.</p> <p>Make a presentation on the use of technology in food production in The Bahamas.</p> <p>Compare the population of The Bahamas for each of the past three decades.</p> <p>Conduct research to compare the number of farms over 30 years. Conduct research to find out the percentage of foods consumed that are produced locally.</p> <p>Suggest staple crops to be grown (animals raised) in The Bahamas.</p> <p>Make a proposal to improve food security in The Bahamas using Biological principles and concepts.</p> <p>Classify the main threats to agriculture in The Bahamas.</p>	1 week
<b>TERM ONE</b>	Nutrition and Food Supply	Food and Nutrients	<p>Identify food contaminants.</p> <p>Suggest ways to prevent food contamination.</p> <p>Create a poster to educate the public of the importance of food safety.</p> <p>Design and conduct a small survey to determine the extent to which best food safety practices are used.</p> <p>Draw conclusions on the extent to which best food safety practices are carried out.</p> <p>State the guidelines that govern food imports to The Bahamas. Observe food labels to determine food additives in commonly used foods.</p> <p>Classify common food additives. Evaluate the use of common food additives.</p> <p>Research common food additives found on the labels of certain foods.</p> <p>Explain the role of microbes in the manufacture of foods.</p> <p>Compare the benefits of microbes with the harm caused.</p>	2 weeks
		Fishing	<p>Identify marine organisms that are commonly found in the Bahamian Diet.</p> <p>Locate major fishing grounds in The Bahamas.</p> <p>Research the annual catch for these organisms in Bahamian waters.</p> <p>Calculate the percentage catch of the marine organisms that is exported from The Bahamas.</p> <p>Show the percentage composition of nutrients in three marine foods.</p> <p>Account for the trends observed in graphs of the catches of commercially important fisheries resources in The Bahamas over the last three decades. Identify the main threats to the organisms.</p>	2 weeks

			<p>Create a five-minute infomercial on the short-term economic gain of overfishing vs. the long-term adverse effects.</p> <p>Advocate for sustainable harvesting of popular marine seafood. Research use of aquaculture/mariculture in The Bahamas or the Caribbean.</p> <p>Propose a plan for The Bahamas to have sustainable fisheries for one seafood.</p>	
	Animal Anatomy and Physiology	Respiration	<p>Trace the pathway of air into the leaf for respiration. Classify examples of respiration as aerobic or anaerobic.</p> <p>Design, and conduct an experiment to demonstrate aerobic respiration in plant parts.</p> <p>Design, and conduct an experiment to demonstrate aerobic respiration in animals.</p> <p>Use materials and apparatus to demonstrate the production of carbon dioxide during aerobic respiration.</p> <p>Predict the products of anaerobic respiration. Use materials and apparatus to demonstrate anaerobic respiration.</p> <p>Design and conduct an experiment to demonstrate anaerobic respiration in yeast.</p> <p>Observe and describe changes that take place when yeast respire anaerobically. Research the economic importance of yeast.</p> <p>Differentiate between aerobic and anaerobic respiration.</p> <p>Use a diagram to explain the role of ATP in cellular respiration.</p> <p>Summarize the processes of aerobic and anaerobic respiration in word equations.</p> <p>Summarize the processes of aerobic and anaerobic respiration in chemical equations.</p> <p>Describe what makes the internal features of a mitochondrion suitable for respiration.</p> <p>Make a model showing the internal structure of the mitochondrion.</p> <p>Infer why it is better to breathe through the nose than through the mouth.</p>	4 weeks

**TERM ONE**

Create a model of a human lung.  
Construct a model of the human respiratory system to demonstrate breathing.  
Draw pie graphs comparing the composition of inspired and expired air.  
Compare the colour of blood before and after passing alveoli.  
Compare relative amounts of carbon dioxide in inhaled and exhaled air.  
Describe the passage of an oxygen molecule from the air to a capillary in the lungs. Use a stopwatch to measure the number of breaths taken per minute.  
Calculate the average breathing rate for the class.  
Predict the effect specific factors/different types of exercise have on breathing rate.  
Explain how the process of breathing is controlled.  
Construct a bar graph comparing average breathing rates before and after exercise. Recognize and control variables when measuring breathing rates.  
Design and conduct an experiment to determine the effect of different types of exercise on the rate of breathing. Formulate a hypothesis about the effect of factors on the rate of breathing.  
Plan and perform an experiment to determine lung capacity. Use a balloon and measuring tape to investigate the capacity of the lungs.  
Measure the circumference of inflated balloons to compare the lung capacity of students.  
Recognize and explain the relationship between the structure of the alveolus and gas exchange.  
Predict the direction in which oxygen and carbon dioxide molecules move across gas exchange surfaces based on the principles of diffusion.  
Predict the effects of smoking on gas exchange.  
Observe photographs of the lungs of smokers and non-smokers.  
Explain the relationship between cigarette smoking and lung disease.

**TERMS  
TWO & THREE**

	<b>BIOLOGY STRAND</b>	<b>UNIT</b>	<b>OBJECTIVES</b>	<b>DURATION</b>
	Nutrition and Food Supply	Plant Nutrition	<p>Form a hypothesis on materials needed for <b>photosynthesis</b>. Identify sources of raw materials for photosynthesis.</p> <p>Justify leaves as the parts of plants best suited for photosynthesis.</p> <p>Summarize the process of photosynthesis.</p> <p>Suggest limiting factors of photosynthesis.</p> <p>Compose an equation to represent the process of photosynthesis</p> <p>Compare and contrast the light and dark stages of photosynthesis</p> <p>Describe the function of the chloroplast.</p> <p>Identify the main parts of the chloroplast and where the light dependent and dark independent stages occur.</p> <p>Compare and contrast the light and dark stages of photosynthesis Describe the function of the chloroplast.</p> <p>Identify the main parts of the chloroplast and where the light dependent and dark independent stages occur.</p> <p>Perform an investigation to determine the form in which food is stored in leaves of a plant.</p> <p>Control variables in an investigation.</p> <p>Use apparatus and materials correctly and safely in an investigation to determine the form in which food is stored in leaves of a plant. Observe change in the colour of reagents.</p> <p>Form a conclusion on the form in which food is stored in leaves of a plant.</p> <p>Design an investigation to determine whether light is necessary for photosynthesis. Conduct an experiment to investigate whether light is needed in the production of starch by photosynthesis.</p> <p>Control variables in an investigation.</p> <p>Use apparatus and materials correctly and safely to investigate whether light is needed in the production of starch by photosynthesis.</p> <p>Observe the colour in both leaves tested. Form a conclusion on whether light is needed in the production of starch by photosynthesis.</p> <p>Formulate a hypothesis on whether chlorophyll is necessary for photosynthesis.</p> <p>Conduct an experiment to show that chlorophyll is essential for the production of starch.</p> <p>Control variables in an investigation. Use apparatus and materials correctly and safely to determine whether chlorophyll is needed in the production of starch by photosynthesis.</p> <p>Form a conclusion on whether chlorophyll is needed for the production of starch by photosynthesis.</p> <p>Observe the colour in leaves tested. Compare the processes of photosynthesis and respiration.</p> <p>Compare and contrast seedlings, plants and fruits with named mineral deficiencies.</p> <p>Draw conclusions on the function of named minerals in plant nutrition and physiology.</p>	2 ½ weeks

<b>TERMS TWO &amp; THREE</b>	Animal Anatomy and Physiology	The human Heart	<p>Observe the external and internal appearance of the human heart.</p> <p>Draw and label the external features of a mammalian heart. Use a scalpel or other cutting utensil to dissect the heart of a mammal.</p> <p>Use a magnifying lens to observe the structure of the heart.</p> <p>Observe the internal structure of a mammalian heart.</p> <p>Relate the structures of the heart to their function.</p> <p>Construct a model of the human heart.</p> <p>Show the direction through which blood flows through the heart.</p> <p>Use a stethoscope to investigate the heartbeat</p> <p>Design investigations to determine the effects of external factors on heartbeat. Show the direction through which blood flows through the heart. Use a stethoscope to investigate the heartbeat.</p> <p>Design investigations to determine the effects of external factors on heartbeat.</p> <p>Show the direction through which blood flows through the heart.</p> <p>Research the common causes and effects of heart disease.</p> <p>Describe the relationship between intake of dietary cholesterol and fatty deposits on artery walls</p> <p>Use sphygmomanometer to measure blood pressure.</p> <p>Record results of class/group blood pressure in a suitable manner.</p> <p>Construct a histogram to show the class' blood pressure data.</p> <p>Draw a conclusion on the blood pressure range for the class.</p> <p>Research cardiovascular diseases. Research how artificial pacemakers stimulate heart contractions.</p>	2 weeks
<b>TERMS TWO &amp; THREE</b>	Animal Anatomy and Physiology	Circulatory System & Blood Vessels	<p>Create a life-size model or display illustrating the circulation of blood through the human body.</p> <p>Identify major blood vessels. Observe cross sections of blood vessels.</p> <p>Explain the difference in the composition of blood in the pulmonary artery compared with blood in other arteries.</p> <p>Differentiate between veins and arteries.</p>	1 week
		Blood	<p>Use a microscope to view prepared slides of blood.</p> <p>Observe prepared slide of blood smear to identify the components of blood. Compare blood cells.</p> <p>Describe how the features of each type of blood cell are adapted for their functions.</p> <p>Relate the composition and state of blood to its functions. Research the significance of blood groups in transfusions.</p>	1 week
		Lymphatic System	<p>Identify the parts of the Lymphatic System.</p> <p>Compare blood plasma, lymph, and tissue fluid.</p> <p>Describe the functions of the lymphatic system.</p> <p>Describe the relationship between the Lymphatic and Circulatory Systems.</p>	½ week

	Plant Anatomy and Physiology	Transport in Plants Transpiration and Translocation	<p>Design, conduct and evaluate an experiment to prove that transpiration mainly occurs through the leaves of a plant. Use a potometer or the weighing method to determine the transpiration rate of a plant. Measure the water level or weight of experiment. Calculate the rate of transpiration.</p> <p>Control variables in an investigation to show transpiration mainly occurs through the leaves of a plant. Conduct an investigation to determine from which surface of the leaf more water vapour lost. Control variables in an investigation to determine from which surface of the leaf is more water vapour lost. Use materials correctly and safely to determine from which surface of the leaf transpiration occurs faster. . Formulate a conclusion on which surface allows a faster rate of transpiration. Suggest factors that would affect the rate of transpiration.</p> <p>Design an experiment to investigate the effect of a given environmental factor on the rate of transpiration. Conduct and evaluate an experiment that investigates how the rate of transpiration is affected by a given environmental factor.</p> <p>Predict the effect should a plant lose too much water. Suggest how leaves of certain plants are adapted to prevent excessive water loss by transpiration.</p> <p>Observe the part of the vascular bundle which is responsible for the movement of water through a celery stalk.</p>	2 weeks
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<b>TERMS TWO &amp; THREE</b>	Plant Anatomy and Physiology	Transport in Plants	<p>Observe what occurs when the bark is ringed / removed from the stem region of a tree trunk.</p> <p>Suggest the part of the vascular bundle that is responsible for food transport. Suggest the destination and use of food manufactured in leaves.</p> <p>Design, conduct and evaluate an experiment to prove that transpiration mainly occurs through the leaves of a plant.</p> <p>Use a potometer or the weighing method to determine the transpiration rate of a plant.</p> <p>Measure mass and observe and measure water uptake in a stem.</p> <p>Calculate the rate of transpiration. Control variables in an investigation to show transpiration mainly occurs through the leaves of a plant.</p> <p>Conduct an investigation to determine from which surface of the leaf more water vapour lost. Control variables in an investigation to determine from which surface of the leaf is more water vapour lost.</p> <p>Use materials correctly and safely to determine from which surface of the leaf transpiration occurs faster.</p> <p>Suggest factors that would affect the rate of transpiration.</p> <p>Design an experiment to investigate the effect of a given environmental factor on the rate of transpiration.</p> <p>Conduct and evaluate an experiment that investigates how the rate of transpiration is affected by a given environmental factor.</p> <p>Predict the effect should a plant lose too much water.</p> <p>Suggest how leaves of certain plants are adapted to prevent excessive water loss by transpiration.</p> <p>Observe the part of the vascular bundle which is responsible for the movement of water through a celery stalk.</p> <p>Observe what occurs when the bark is ringed / removed from the stem region of a tree trunk.</p> <p>Suggest the part of the vascular bundle that is responsible for food transport.</p> <p>Suggest the destination and use of food manufactured in leaves.</p>	2 weeks
<b>TERMS TWO &amp; THREE</b>	Plant Anatomy and Physiology	Excretion in Plants	<p>Formulate a hypothesis as to how plants excrete waste.</p> <p>Research how plants excrete waste.</p> <p>Formulate a hypothesis as to how plants excrete waste. Research how plants excrete waste.</p>	½ week
	Animal Anatomy and Physiology	Excretion in Humans	<p>Match the excretory organs of the human body to their metabolic waste.</p> <p>Make an annotated diagram of the urinary system of Man.</p> <p>Make inferences about the functions of the kidney based on the composition of blood in the renal artery and renal vein.</p> <p>Use a scalpel or other cutting utensil to dissect a kidney.</p> <p>Use a hand lens and/or microscope to observe the internal structure of a dissected kidney.</p> <p>Create an annotated line drawing showing the internal features of a dissected kidney.</p> <p>Construct a model representing a nephron to demonstrate ultrafiltration.</p> <p>Describe the mechanism for the selective reabsorption of glucose and ions by diffusion and active transport.</p>	2 weeks

			<p>Use model of a nephron to explain its role in osmoregulation.          Make an annotated diagram of the nephron. Describe how the principle of the nephron is used in dialysis.          Compare and contrast excretion in plants and humans.          Formulate a hypothesis on the effect of named factors on the volume and composition of urine.          Design an investigation to determine whether a sample of urine is from a diabetic or non-diabetic.          Research dietary practices necessary for maintaining healthy kidneys.</p>	
<b>TERMS TWO &amp; THREE</b>		Homeostasis	<p>Predict the meaning of homeostasis. Explain how the kidneys and hypothalamus control the water content of the blood.          Make a diagram or model of a nephron to show its role in osmo-regulation.          Make predictions about the effect of insufficient/excess ADH on urine production.          Create a flow diagram to explain how the liver and pancreas control the sugar content of the blood.          Recognize and describe the relationship between diet and blood glucose levels.          Make predictions about the effect of insufficient or excess insulin secretion on blood-glucose concentration.          Describe the role of the skin in homeostasis.          Create a flow diagram to explain the role of the skin in controlling body temperature. Formulate a hypothesis on whether insulation affects the rate at which organisms lose heat.          Design an experiment to determine the effect of insulation on heat loss          Conduct, and evaluate an experiment to determine the effect of insulation on heat loss.          Use a thermometer to accurately measure temperature of water in insulated and non-insulated flasks to 0.5° C.          To investigate the effect of insulators on heat loss.          Compare temperature change of an insulated and a non-insulated flask.          Relate the results from the investigation on the effects of insulation on heat loss to the ability of one's skin to maintain body temperature.          Suggest reasons to support "body size affects the rate at which an organism loses heat."</p>	3 weeks



# BIOLOGY PACING GUIDE

## GRADE 12

	BIOLOGY STRAND	UNIT	OBJECTIVES	DURATION
<b>TERM ONE</b>	Response in Plants and Simple Organisms	Tropism and Tactic Movements	<p>Classify plant growth responses. Observe various types of tropisms.</p> <p>Design an experiment to investigate the response(s) of a plant to sunlight.</p> <p>Conduct an experiment to investigate the response(s) of a plant to sunlight.</p> <p>Design an experiment to investigate a seedling's response to gravity.</p> <p>Explain the role of auxins in tropic responses. Design an experiment to verify the role of root and shoot tips in tropisms.</p> <p>Observe what happens when the tip of the shoot is cut off.</p> <p>Define taxis and give named examples of specific tactic responses in invertebrates.</p>	1 week
	Response in Humans	Endocrine system	<p>Distinguish between exocrine and endocrine glands. Identify the major endocrine glands.</p> <p>Match hormones to the glands that secrete them.</p> <p>Describe the role of Thyroid Stimulating Hormone and Follicle Stimulating Hormone.</p> <p>Make a visual presentation to describe the importance of maintaining a specific amount of a hormone in the body.</p> <p>Rate the importance of the pancreas and adrenal glands compared with two other organs.</p> <p>Compare the nervous and endocrine systems.</p>	1 week
		Central Nervous System	<p>Observe the appearance of the brain.</p> <p>Relate the external parts of the brain to their function(s).</p> <p>Identify the functions of the main internal parts of the brain.</p> <p>Compare the structure of the brain and spinal cord.</p>	1 week
		The Nervous System	<p>Compare the appearance and functions of three types of neurons.</p> <p>Make a model to show the relationship between the Central Nervous System and Peripheral Nervous System.</p> <p>Use a ruler to measure reaction time of classmates to stimuli.</p> <p>Observe responses in an experiment to investigate reaction of classmates to stimuli.</p> <p>Identify simple reflex actions</p> <p>Describe the operation of a reflex arc. Compare simple and conditioned reflex actions.</p>	
		The Skin	<p>Use a table to summarize the parts of the skin and their functions.</p> <p>Use equipment to investigate reaction time of classmates to various temperatures.</p>	½ week

<b>TERM ONE</b>			Identify the parts of the skin. Compare the skin's sensitivity to touch in various locations on the bodies.	
		The Human Eye	Use a ruler and stop watch to investigate reaction time of classmates to various stimuli. Identify the parts of the eye. Relate the parts of the eye to their function(s). Observe what happens to the pupil of the eye when in bright light. Explain the process of seeing. Justify the statement that the structure of the eye concentrates light on the fovea. Describe common visual disorders.	1 week
		The Ear	Design and conduct an experiment to test the sensitivity of the ears to sounds. Identify the parts of the ear. Relate the parts of the ear to their function(s). Explain the process of hearing. Justify the statement that the structure of the ear concentrates sound on the oval window. Relate the structure of the semi-circular canals to their function in orientation. Describe the role of the ear in maintaining balance.	
	Response in Humans	The Effector Organs	Explain the functions of skeletal muscles. Make an annotated diagram of the elbow joint. Make a model of the knee joint to show movement of the leg. Explain how nerves cause muscles to contract.	1 week
	Cell Biology	Simple Organisms	Describe budding in simple organisms. Observe growth and development of Mucor. Describe spore formation in simple organisms.	1 week
		Asexual Reproduction	Define the term asexual reproduction. Classify reproductive structures in plants as sexual or vegetative. Compare the processes of natural vegetative reproduction. Evaluate methods of artificial vegetative propagation. Prepare a brochure to encourage persons to use vegetative propagation for home-gardening. Compare and contrast methods of natural vegetative propagation with methods of artificial propagation. Evaluate the advantages and disadvantages of vegetative reproduction.	1 week
		Sexual Reproduction in Plants	Identify flowers as reproductive structures. Use a scalpel, razor blade or scissors to dissect various types of flowers. Observe the dissected parts of flowers. Use a microscope to observe pollen and ovules of a dissected flower. Relate the structure of the floral parts of a named flower to their function. Create a mnemonic device for the parts of flowers and their functions. Use materials to investigate what makes pollen grains produce a tube. Observe a variety of flowers to determine the agent responsible for pollination. Classify a variety of flowers according to the type of pollination.	1 week

		Describe the sequence of events from pollination to fruit and seed formation. Observe local fruits and seeds to determine method of dispersal. Classify local fruits and seeds according to dispersal methods. Describe dispersal methods and adaptations of local fruits and seeds. Plan an experiment to identify the conditions necessary for germination. Conduct an experiment to determine the rate of growth for a seedling.	
	Asexual Vs. Sexual Reproduction	Tabulate the differences between sexual and asexual reproduction, highlighting the advantages and disadvantages.	
	Human Impact on the Environment	Justify the importance of biodiversity. Investigate how human activities can influence and modify the biodiversity in natural systems. Predict the effects of decreasing biodiversity in local ecosystems, after researching its importance to the stability and resiliency of ecosystems. Suggest ways to minimize the impact of human activities on the environment. Read a published report on the state of marine ecosystems in the Bahamas and write an article summarizing its findings.	½ week
	National Parks & Protected Areas	Estimate the size of a bead (representing fish) population. Explain the role and importance of methods of measuring populations of organisms. Distinguish between a national park and a protected area. Explain the functions of National Parks. Identify terrestrial national parks and marine reserves in The Bahamas. Assess critically the value of national parks and protected areas in The Bahamas.	½ week
	Human Impact on the Grouper, Lobster, Conch, Bonefish, Land Crab	Use data to form a conclusion on the capture of juvenile, berried and adult <b>groupers</b> . Analyze the trends of catches of commercially important grouper in The Bahamas over the last 3 decades. Identify the major challenges faced by the local grouper fishermen and vendors. Identify threats to the local grouper population. Suggests measures for the conservation of the local grouper populations. Use data to form a conclusion on the capture of juvenile and adult <b>lobster</b> . Analyze the trends of catches of commercially important lobster in The Bahamas over the last three decades. Identify the major challenges faced by the local lobster fishermen and vendors. Identify threats to the local lobster population. Suggest measures for conservation of the local lobster populations. Use data to form a conclusion on the capture of juvenile and adult <b>conchs</b> . Analyze the trends of catches of commercially important Conch in The Bahamas over the last three decades. Identify the major challenges faced by the local conch fishermen and vendors. Identify threats to the local conch population. Suggests measures for conservation of the local conch populations.	1 week

			Use data to form a conclusion on the capture of juvenile and adult <b>bonefish</b> . Analyze the trends of catches of commercially important bonefish in The Bahamas over the last three decades. Identify the major challenges faced by the local bone fishermen and vendors. Identify threats to the local bonefish population. Suggest measures for the conservation of the local bonefish populations. Identify threats to the local <b>land crab</b> population. Suggests measures for the conservation of the local land crab populations.	
	<b>BIOLOGY STRAND</b>	<b>UNIT</b>	<b>OBJECTIVES</b>	<b>DURATION</b>
<b>TERM TWO</b>	Cell biology and Genetics	Nucleic Acids	Formulate a hypothesis about what makes a person unique. Classify molecules that are components of DNA and RNA. Create a model of the double helix structure of DNA. Make an oral presentation describing the structure of DNA. Relate the DNA molecule to chromosome structure. Conduct an investigation to extract DNA. Measure materials for the investigation to extract DNA. Use equipment for the investigation to extract DNA. Conduct research to find out the relationship between the structure of DNA and mutations. Suggest benefits that have been derived from knowledge of the structure of DNA.	1 week
		Cell Division Mitosis and Meiosis	Compare the appearance of a cell that is reproducing with the appearance of one that is not. Identify the cell structures that are involved in reproduction. Observe diagrams showing stages in mitosis. Summarize what happens in each stage of mitosis. Observe prepared slides of the cross-section of an ovary/testis. Observe diagrams showing stages in meiosis. Suggest how processes in meiosis contribute to genetic variation in a species. Compare and contrast mitosis and meiosis.	2 week
	Reproduction	Human Reproductive System  Growth and Development	Compare and contrast the structures and functions of the male and female reproductive systems. Compare and contrast the structure of an ovum and a spermatozoon. Compare the processes by which sperm and ova are produced. Relate the events in the ovary during a menstrual cycle to the differences in hormone levels during a cycle. Outline the route taken by a spermatozoon from its site of production to its release from the male's body. Outline the route taken by a spermatozoon after it is ejaculated into the vagina until it fertilizes an ovum. Make an annotated diagram of the pathway taken by an ovum after it is released from the ovary until it is implanted into the uterine lining. Summarize the events of fertilization. Observe a diagram of the placenta and umbilical cord, examining their special features. Relate the structure of the placenta to its role in absorption, gas exchange, and excretion. Compare the features of a fetus in the three trimesters. Classify contraceptive methods as being: man-made, natural, hormonal, barrier, or surgical.	3 weeks

<b>TERM TWO</b>			<p>Explain how some contraceptives work to reduce the spread of STI's and STD's.</p> <p>Compare the features of the main developmental stages in humans. Formulate a hypothesis as to the rate of population growth on the island.</p> <p>Suggest factors that influence the growth rate in humans.</p> <p>Interpret percentile graphs showing height or weight. Suggest social implications of rapidly growing populations.</p> <p>Research the scientific and economic impact of bio-technology on human reproduction.</p> <p>Classify sexually transmitted diseases in a tabular format by the causative agents.</p> <p>Research the scientific and economic impact of cloning and summarize the findings in a news bulletin.</p> <p>Defend the legality and morality of cloning.</p>	
	Cell Biology and Genetics	Monohybrid Inheritance	<p>Formulate a hypothesis as to traits that are inherited.</p> <p>Observe inherited monohybrid traits of students in the classroom.</p> <p>Observe inherited traits of plants and animals in the schoolyard. Use correct terminology in solving genetics problems.</p> <p>Solve problems based on information given for monohybrid inheritance, and complete dominance.</p> <p>Design, conduct, and evaluate a survey of an inherited phenotypic trait in humans.</p> <p>Distinguish between the sex and other homologous chromosomes in humans.</p> <p>Explain how the gender of a baby is determined.</p> <p>Identify examples of sex-linked traits. Solve monohybrid inheritance problems for sex-linked traits.</p> <p>Apply the principles of monohybrid inheritance to the inheritance of A, B Blood Grouping.</p>	3 weeks
	Cell Biology and Genetics	Variation	<p>Research how changes in chromosomes cause variations.</p> <p>Describe how random assortment of chromosomes contribute to variations of features in species.</p> <p>Explain how sexual reproduction leads to variation in a population.</p> <p>Identify examples of continuous variation.</p> <p>Identify examples of discontinuous variation. Suggest how natural selection changes the phenotypic ratio of a population.</p>	1 week
		Bio-Technology	<p>List the advantages and disadvantages of using tissue culture as a means of producing plants.</p> <p>Critically assess the advantages and disadvantages of cloning animal embryos. Describe simply fusion (adult) cell cloning.</p> <p>Compare and contrast methods of cloning.</p> <p>Suggest ways in which cloning might benefit humans.</p> <p>Describe simply the process of genetic engineering.</p> <p>Compare the advantages and disadvantages of genetically modified crops/food. Identify example(s) of gene transfer between animal and plant tissue.</p>	2 weeks

		<p>Analyze the advantage and disadvantage of gene transfer between animal and plant tissues.</p> <p>Compare the advantages and disadvantages of genetic engineering.</p> <p>Conduct a survey to determine the extent to which food, plants and animals in the community are products of biotechnology.</p> <p>Prepare a proposal for the education of adults in the community on the basis of biotechnology and bioethics.</p> <p>Form an inference as to the meaning of the term “genetically modified crops”.</p> <p>Observe pictures or samples of genetically modified foods.</p> <p>Produce a poster or pamphlet which promotes genetically modified foods.</p> <p>Compare the advantages and disadvantages of genetically modified foods.</p> <p>Predict what a “fruit stand” will look like in 2050.</p> <p>Debate the use of human embryos for stem cell research. Predict the likely outcome of stem cell research on some illnesses.</p>	
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