SCIENCE

Grade 10

Three-Term Budget Of Work (BOW) for Learning Competencies

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Three-Term Budget Of Work
For Learning Competencies

First Term	
Content Standard	• Several simple observations indicate if a chemical reaction has taken place. • Chemical indicators produce color changes with acids, bases, and salts. • Valid and reliable scientific investigations identify the dependent and independent variables and control other variables. • Many types of chemical reactions are important in our daily lives and in the biotic and abiotic parts of the environment. • Atoms rearrange during chemical reactions but abide by the principle of conservation of mass as illustrated in balanced chemical equations. • Rates of chemical reactions are critical in production and preservation of many useful materials. • Homeostasis is a self-regulating process that allows an organism to maintain stability. • Several theories provide lines of evidence about how organisms evolve.
Performance Standard	By the end of the term, learners demonstrate an understanding that household products can act as indicators for important chemicals. They describe the indicators of a chemical reaction and identify important types of chemical reactions. They explain how some important chemical reactions impact the natural and built environment. They write balanced chemical equations using formula and apply the principles of conservation of mass. They explain factors that affect the rate of a reaction and that some reactions are exothermic, and some are endothermic. They demonstrate skills to plan and conduct valid and reliable scientific investigations and record them appropriately. Also, learners describe homeostasis as a process that allows an organism to maintain stability. They describe and discuss in small groups that natural selection is the driving mechanism of evolutionary change. Learners also describe homeostasis as a process that allows an organism to maintain

	stability. They describe and discuss in small groups that natural selection is the driving mechanism of evolutionary change.

Week	Learning Competency
1	**Chemical Reactions** • Describe the indicators for a chemical reaction as color change, the formation of a precipitate, the release of gas, and or odor, or a change in temperature.
	Acids, Bases, and Salts • Identify common acids, bases, and salts (e.g., hydrochloric acid, sodium hydroxide, and saline solution) using different indicators.
1 to 2	**Types of Chemical Reactions and Chemical Reactions in the Environment** • Describe important types of chemical reactions (combination, decomposition, single replacement, double replacement). • Explain how important types of chemical reactions, such as combustion, acids on metals, acids on carbonates, photosynthesis, and respiration, relate to or impact the natural and built environments using information from secondary sources.
3 to 5	**Chemical Equations** • Recognize that scientists: a. use chemical equations to describe chemical reactions, and b. write equations in word form and use formulas for common chemical reactions. • Explain that chemical equations demonstrate a rearrangement of atoms but the total mass of the system remains the same during a chemical reaction. • Apply the principles of conservation of mass to balance chemical equations.
6 to 7	**Rates of Reactions** • Explain the factors affecting the rates of chemical reactions as applied in food preservation and materials production, control of fire, pollution, and corrosion. • Identify that chemical reactions may be exothermic or endothermic.

8	**Homeostasis** • Describe homeostasis as a state of balance among all the body systems in humans that needs to be maintained for survival and proper functioning; its indicators include body temperature, glucose level, and blood pressure. • Explain how homeostasis is maintained through various feedback mechanisms, both positive and negative.
9 to 11	**Mechanisms of Evolution** • Use information from secondary sources to describe natural selection as the primary mechanism driving evolutionary change. • Discuss in small groups important concepts in the theories of evolution, such as variation, heredity, isolation, selection, and adaptation. • Use information from secondary sources to explain how lines of evidence, such as fossils, biogeography, and comparative morphology, support the occurrence of evolution.
Suggested Activities	• **Evidence of Chemical Change Micro-Lab** – Learners conduct 3–4 safe, small-scale reactions using locally available materials (e.g., vinegar/suka, baking soda, soap solution, yeast) and record observable indicators (gas, precipitate, temperature change, odor, color change) in a simple results table. • **Local Household Indicator Testing Lab** – Learners prepare and use natural indicators common in the Philippines (e.g., turmeric/luyang dilaw, red cabbage if available, or bougainvillea/tsitsirika petals) to test labeled household solutions (suka, calamansi, softdrink, baking soda solution, soap solution, saline/tubig-alat) and classify samples as acid/base/salt based on consistent color patterns. • **Reaction Type Sorting Using Local Scenarios** – Learners classify reaction situations drawn from Filipino daily life (rusting of gate/yero, burning uling/wood, cooking using LPG, antacid neutralizing stomach acid, vinegar with baking soda, limewater/cloudiness) into combination/decomposition/single replacement/double replacement using reactant–product descriptions. • **Chemical Reaction and Environment Case Investigation** – Learners use short readings/infographics about Philippine-relevant issues (corrosion in coastal

	communities, air pollution from vehicle emissions, acid rain risk, composting/biodegradation, burning of basura) and connect each to a specific reaction type and its impact on the natural and built environment. • **Word-to-Formula Equation Practice Using Familiar Substances** – Learners translate word equations based on familiar materials (e.g., vinegar + baking soda; iron + oxygen; propane + oxygen) into chemical formulas, then balance the equations to show conservation of mass. • **Conservation of Mass "Closed Setup" Activity** – Learners measure the mass of a sealed reaction setup before and after (teacher-prepared using safe materials) and describe what the unchanged mass implies about atoms rearranging in chemical reactions. • **Rate of Reaction Investigation Using Safe Local Materials** – Learners test one factor affecting reaction rate (temperature OR concentration OR surface area) using an accessible reaction (e.g., effervescence from vinegar + baking soda; dissolving sugar/salt in warm vs room-temp water) and compare times/results using a simple data table and graph. • **Exothermic vs Endothermic Temperature Change Lab** – Learners measure temperature changes in common processes (e.g., dissolving salt vs dissolving sugar; warm water vs room temperature effects) and classify each as exothermic or endothermic based on observed temperature direction. • **Traditional Biotechnology Mini-Inquiry** – Learners investigate Filipino fermentation products (e.g., bagoong, patis, suka, toyo, kesong puti, buro, nata de coco) by documenting ingredients, process steps, and purpose, using teacher-provided secondary sources and/or product labels. • **Homeostasis Quick Modeling Activity** – Learners use simple scenarios and basic measurements (pulse rate before/after light exercise, body temperature discussion, "sweating when hot" situations) to explain how the body maintains stability through feedback mechanisms. • **Natural Selection Simulation (Local Context)** - Learners run a simple "survival" simulation using paper "organisms" on different backgrounds (e.g., newspaper vs green paper) to model how environment affects survival, then track trait frequency

	changes across rounds. • **Evidence for Evolution Stations Using Philippine Examples** - Learners rotate through stations with datasets/images: fossils and timeline examples (Philippine/SE Asia references where possible), biogeography maps (islands and species distribution), and comparative morphology (vertebrate limb structures), then write short explanations linking evidence to evolution.
Suggested Performance Tasks	• **Vegetable Indicator Investigation** – Conduct a valid and reliable investigation to test vegetables (e.g., carrots, red cabbage) to determine their usefulness as indicators for common acids and bases (e.g., vinegar, lemon juice, bleach). • **Home Chemical Reactions Exploration** – Explore materials in the home to produce specific chemical reactions (e.g., washing powder solution mixed with baking powder solution). • **Biotechnology Critical Analysis** – Write a critical analysis of the use of biotechnology and its impacts on society or the environment.

Second Term	
Content Standard	• Population growth influences the carrying capacity of an ecosystem • The products and processes of biotechnology can have both beneficial and harmful effects on society and the environment. • Climate change and its impacts on the environment and people pose serious challenges which require solutions and action at local and global levels. • The rich natural resources of the Philippines require sustainable management.
Performance Standard	By the end of the term, learners explain the meaning of the term biotechnology and debate the societal, environmental, and ethical implications of utilizing biotechnological products and methods. They discuss the factors that limit the ecosystem's carrying capacity and the role of population growth. Also, learners gather information from secondary sources to describe rapid changes that are occurring in local and global climate patterns and propose solutions to address these changes at the local and global levels by drawing on awareness, responsible personal behavior to conserve materials and energy, and through the better societal management of the natural resources of the country.

Week	Learning Competency
1 to 2	**Ecosystem's Carrying Capacity and Population Growth** • Discuss the factors that limit the ecosystem's carrying capacity, such as adequate food, shelter, water, and mates. • Explain that the ecosystem's population growth slows down as it gets closer to the carrying capacity.
3 to 6	**Biotechnology** • Explain the term biotechnology and provide examples. • Use information from secondary sources to identify the products of traditional biotechnology through fermentation (e.g. cheese, soy sauce, vinegar, nata de coco). • Use information from secondary sources to identify examples of modern biotechnology, such as

	genetically modified organisms and processes (e.g. in vitro fertilization). • Participate in a class debate on the societal, environmental, and ethical implications of using biotechnological products and methods.
7 to 8	**Global Climate** • Identify evidence of global warming and climate change. • Identify the role of greenhouse gases in enhanced global warming and climate change.
9	**Global Interactions** • Describe how global climatic phenomena, such as the El Niño Southern Oscillation, may impact weather systems.
10 to 11	**Global and Local Sustainability** • Identify local impacts of global climate change and suggest ways that individuals can do to reduce the impact of global warming. • Explain how increased societal uses of renewable energies could mitigate the effects of global climate change, including how the Philippines could make better use of its plentiful natural resources.
Suggested Activities	• **Natural Selection Simulation (Local Context)** – Learners run a simple "survival" simulation using paper "organisms" on different backgrounds (e.g., newspaper vs green paper) to model how environment affects survival, then track trait frequency changes across rounds. • **Evidence for Evolution Stations Using Philippine Examples** – Learners rotate through stations with datasets/images: fossils and timeline examples (Philippine/SE Asia references where possible), biogeography maps (islands and species distribution), and comparative morphology (vertebrate limb structures), then write short explanations linking evidence to evolution. • **Carrying Capacity Resource-Limit Modeling** – Learners model population growth using limited "resource tokens" (food, water, space) and observe how growth slows as resources become scarce; connect results to real-life local examples (fish catch limits, community water supply, land use).

	• **Climate Change Evidence Analysis for the Philippines** – Learners analyze teacher-provided graphs/maps/news summaries about Philippine climate patterns (stronger typhoons risk, rainfall variability, sea level rise effects on coastal areas, drought impacts on agriculture) and identify clear evidence and local impacts. • **Greenhouse Effect Mini-Model Lab** – Learners compare temperature changes in covered vs uncovered containers under a lamp or sunlight to model heat trapping, keeping variables controlled as much as possible in class. • **ENSO Impact Scenario Activity** – Learners examine short Philippine-based scenarios (water shortage, crop yield changes, heat index advisories, flooding risks) and explain how El Niño/La Niña can influence local weather systems and daily life. • **Electricity From Plant to Home Flow Investigation** – Learners build a simple model/diagram of how electricity reaches Filipino homes (generation, transmission, substations, distribution lines, electric meter) using local examples (MERALCO/cooperative systems), then identify where safety precautions matter. • **Household Electrical Safety Check (With Adult Guidance)** – Learners use a checklist to observe common home risks (overloaded extension cords, damaged wires, wet hands near outlets, improper chargers) and propose practical safety actions appropriate to typical Filipino households. • **Renewable vs Non-renewable Energy Comparison (PH Power Mix)** – Learners compare local energy sources (geothermal, hydro, solar, wind, coal, natural gas) using a simple matrix (availability, cost, reliability, environmental impact) based on teacher-provided secondary sources. • **Community Energy-Saving Action Planning** – Learners identify realistic ways Filipino households and communities can reduce electricity use (lighting, cooling, appliance habits), then explain local and global benefits (cost savings, reduced emissions, grid stability).
Suggested Performance Tasks	• **Biotechnology Critical Analysis –** Write a critical analysis of the use of biotechnology and its impacts on society or the environment. • **Community Education Strategy on Natural Resources and Sustainability –** Plan and enact a community education strategy highlighting the importance of

	natural resources and sustainable management of resources. • **Green Metals Discussion Paper –** Develop a discussion paper about the need for "green metals" (e.g., cobalt, nickel) for the electrification of vehicles and possible impacts of mining for these metals.

Third Term	
Content Standard	• Current models explain tectonic plate movement as part of a gravity-driven convection system that pushes young hot plates away from spreading ridges and pulls old cold plates down into subduction zones. • Plate movements and continental evolution account for the major surface features of the Earth. • Newton's laws can be used to explain projectile motion and collisions. • Momentum in collisions increases as mass or velocity increases. • The electric companies provide high voltage electricity through power generation, transmission, and distribution to many parts of the archipelago. • Responsible planning and innovation lead to efficient generation and distribution of electricity in the Philippines.
Performance Standard	By the end of the term, learners describe and explain geologically dynamic nature of the Philippine Archipelago in relation to its plate tectonic setting and use models to explain the earth structures, movements, and natural events that occur. They use critical thinking and modeling to explain mechanisms that have contributed to the current distributions of continents and make predictions about changes that can be expected in the future. Also, learners display critical thinking in describing the factors that affect the trajectory of projectiles. They distinguish between different types of collisions and describe the impacts on the motion of objects. They carry out investigations using models to identify relationships that affect the motion of objects and apply their understanding to real-life situations. Learners gather information from secondary sources to identify, describe, and explain how science impacts human activities and the environment.
Week	**Learning Competency**
1 to 6	**Plate Tectonics** • Identify modern scientific processes used to detect and measure the displacement of tectonic plates.

	• Describe the structures, movements and events that occur at each type of plate boundary. • Identify the locations of major mountains, faults, volcanos, and ocean trenches using a map of the Philippine Archipelago, and interpret the features in relation to plate tectonics. • Predict the position and shape of the Philippine Archipelago in 50 million years, based on the current velocity of the Philippine Plate. • Gather information from secondary sources to describe and explain what mechanisms that drive the movement of tectonic plates including the role of the asthenosphere. • Explain how the subduction of an oceanic plate impacts on the plate above it. • Explain how plate tectonics can be used to explain the formation of the largest mountain ranges on Earth including the Himalayas and the Andes mountains.
6	**Projectile Motion** • Investigate and describe the relationship among the projectile variables including the angle and velocity of release, and projectile height and range, using everyday activities such as shooting basketballs or kicking footballs.
7 to 9	**Momentum and Collisions** • Describe different types of collisions as elastic or inelastic by providing some examples. • Use models to investigate elastic or inelastic collisions and describe the forces involved and their effects. • Explain that momentum depends on the mass and the velocity of a moving object that can be used to predict the impact the object will have if it hits another object. • Carry out guided investigations using different objects to describe momentum-related relationships, such as the more momentum an object has, the harder for it to stop. • Identify and explain that to change the momentum of an object, it is necessary to apply a force on the object over a period of time. • Gather information from secondary sources to identify ways to reduce the impact of collisions such as seatbelts, airbags, and crumple zones in vehicles. • Identify that momentum is conserved before and after the collision of objects.
10 to 11	**Large-scale Generation and Distribution of Electricity**

	• Describe how high voltage electricity from power plants is generated and safely distributed to industries, businesses, and homes, including the role of substations (grid stations), and electric meters. • Describe and explain the need for safety precautions in handling household electrical devices. • Describe the similarities and differences between electric motors and electric generators. • Collaborate in a class discussion to identify ways to reduce the use of electrical energy in Filipino houses and communities and explain what local and global benefits can be achieved. **Renewable and non-renewable energy** • Gather information from secondary sources to evaluate how renewable and nonrenewable generation of electricity in the Philippines impacts human activities and the environment.
Suggested Activities	• **Plate Boundary Modeling Lab** – Learners use simple materials (paper strips, cardboard, sponge/foam) to model divergent, convergent, and transform boundaries and record the structures/events each boundary produces (ridges, trenches, faults, earthquakes). • **Philippine Plate Setting Map Investigation** – Learners use a map of the Philippine Archipelago to locate major faults, volcanoes, trenches, and mountain ranges and interpret patterns in relation to plate boundaries. • **Modern Plate Motion Measurement Profile** – Learners create a short profile of one modern method (GPS, seismic monitoring, satellite-based measurements) and explain what it measures and how it shows plate movement, using teacher-provided sources. • **"Philippines in 50 Million Years" Prediction Using Given Plate Velocity** – Learners use a provided plate velocity value to estimate displacement over time, then sketch a predicted map position/shape and explain the assumptions behind their prediction. • **Mechanisms Driving Plate Movement Concept Model** – Learners build a labeled diagram/model showing convection, ridge push, slab pull, and the role of the asthenosphere, using a guided template and short source readings. • **Subduction Impact Model and Explanation** – Learners use a simple subduction

	model to explain how trenches and volcanoes form, then relate this to Philippine hazards (earthquakes, volcanic activity) in specific locations. • **Projectile Motion Field Investigation (Everyday Context)** – Learners investigate how angle and launch strength affect range using safe objects and familiar contexts (paper ball toss, soft foam ball throw, "shooting" into a box), then record and compare data. • **Elastic vs Inelastic Collision Lab Using Improvised Materials** – Learners compare collisions using marbles/balls/clay or toy cars, observe rebound vs deformation, and classify collisions using evidence from what they observed. • **Momentum Investigation with Local Safety Connections** – Learners test how mass and speed affect stopping difficulty using ramps and improvised carts/objects, then connect the idea to real-life Philippine road safety devices (seatbelts, helmets, speed bumps). • **Collision Impact Reduction Research (Secondary Sources)** – Learners gather information on vehicle safety features common in the Philippines (seatbelts, airbags, crumple zones, child restraints) and explain how each reduces injury during collisions. • **Electricity From Plant to Home Flow Investigation –** Learners build a simple model/diagram of how electricity reaches Filipino homes (generation, transmission, substations, distribution lines, electric meter) using local examples (MERALCO/cooperative systems), then identify where safety precautions matter. • **Household Electrical Safety Check (With Adult Guidance)** – Learners use a checklist to observe common home risks (overloaded extension cords, damaged wires, wet hands near outlets, improper chargers) and propose practical safety actions appropriate to typical Filipino households. • **Renewable vs Non-renewable Energy Comparison (PH Power Mix)** – Learners compare local energy sources (geothermal, hydro, solar, wind, coal, natural gas) using a simple matrix (availability, cost, reliability, environmental impact) based on teacher-provided secondary sources.
Suggested Performance	• **Local Vehicular Accident Risk Survey and Road-Safety Recommendations** –

Tasks	Conduct a survey of recent vehicular accidents in a local area and identify a high-risk spot; suggest ways to minimize or avoid collisions in that area. • **Egg Protection Vehicle Drop Challenge** – Design and build a vehicle and use it to save a raw egg from breaking after falling from a height of 3 meters.