GRADE 9 – QUARTER 1: FORCE, MOTION, AND ENERGY

Content	**Content Standards** *The learners learn that:*	**Learning Competencies** *The learners…*
1. Newton's Laws 2. Force and energy 3. Electric current 4. Electrical circuits 5. Interpreting patterns in data 6. Electromagnetic waves	1. Newton's laws explain and predict how objects move due to the forces that act on them. 2. Electricity is a flow of electrons and can be measured and understood using current, voltage, and resistance in circuits. 3. Electromagnetic radiation travels using transverse waves of different wavelengths. 4. Scientists and engineers use electromagnetic radiation to design modern technologies that benefit people and society.	1. identify inertia as the tendency for an object to stay at rest or in motion unless acted on by an unbalanced net force; 2. demonstrate in practical situations and describe that acceleration is a change in speed and/or direction as the result of a net force; 3. investigate the relationship among force, acceleration, and mass; 4. explain that when any two objects interact, there are equal but opposite forces exerted between them, which is evident in many practical situations and applications; 5. observe and identify action-reaction pairs in everyday situations such as stepping off a boat, or a book on a table, and draw force diagrams to explain how the pairs affect the motion of objects; 6. identify that electricity is a flow of electrons and show appreciation for the need to observe safe measures in handling electricity; 7. participate in guided investigations to infer the relationship among current, voltage, and resistance in assembled series and parallel circuits with varying number of loads and battery; 8. draw diagrams of and assemble series and parallel circuits, showing switch, battery, loads/resistors, ammeter, and voltmeter; 9. collaborate in a class discussion to recognize the advantages and limitations of using series or parallel circuits; 10. describe electromagnetic radiation (EMR) as energy that is created by the vibrations of electrically charged particles which allows it to travel through materials or space as transverse waves; 11. compare the relative wavelengths and frequencies of different types of electromagnetic waves, including radio waves, microwaves, infrared, visible light, ultra-violet, x-rays, and gamma radiation; 12. identify practical applications of electromagnetic radiation, such as radio waves used in telecommunications, and x-rays and gamma rays in medicine; and 13. gather information from secondary sources to explain the harmful effects that EMR can have on living things.

Performance Standard

By the end of the Quarter, learners demonstrate a practical understanding of Newton's three laws of motion to describe relationships between variables and use these to explain everyday application of Newton's laws. Through practical investigations, learners demonstrate qualitative understanding of the features of electricity and apply their understanding of electrical circuitry in homes. Learners exhibit skills in gathering information from secondary sources to describe the frequencies across the electromagnetic spectrum and identify practical applications and detrimental effects that electromagnetic radiation may have on living things.

Suggested Performance Tasks

A. Design a model vehicle from recycled materials using the Law of action-reaction to carry a 15-gram payload over a 5-meter displacement. Describe the forces interacting and the motions evident when your vehicle is moving, including any vectors that are relevant.
B. Use secondary sources regarding problems associated with the distribution of electrical energy from power plants to homes. Use the findings to develop a system that can address the problems.
C. Develop a poster that identifies the useful and dangerous attributes of the 7 main energies of the EMS.

GRADE 9 – QUARTER 2: EARTH AND SPACE SCIENCE

Content	**Content Standards** *The learners learn that:*	**Learning Competencies** *The learners…*
1. Scale, proportion and quantity 2. Plate boundaries 3. Structure of the Earth 4. Geologic time 5. Origin of the Solar System 6. Space Technologies	1. Evidence for continents moving includes jig-saw matching of coastlines, rock types, and the presence of similar fossils in places separated by vast distance. 2. The movement of lithospheric plates provides a theory for understanding Earth's geological history. 3. The geological time scale organizes major stages in the history of the Earth over more than 4 billion years. 4. Radioactive decay of material inside the Earth since it was formed is its internal source of energy. 5. The Earth's interior is made up of layers of varying characteristics. 6. Models represent the size, structure, and relationship of components of the Solar System 7. Observable evidence and models help explain the nature and origin of the Solar System.	1. identify and explain evidence that current continents are separate parts of what was a single continent millions of years ago; 2. participate in a collaborative group or class task to examine and describe the topographical and geological evidence for plate boundaries occurring in the area where the Philippines is located; 3. describe the types of plate boundaries found around the Earth; 4. describe how fossils can be used for dating the age of rocks and sediments; 5. describe how relative and absolute dating techniques are used to determine the subdivisions of geologic time; 6. explain how the geologic time scale helps to recount the history of the Earth; 7. describe how seismic wave data has been used to develop a model for the internal structure and composition of the Earth; 8. create a scale drawing to represent relative thicknesses of the layers of Earth's interior, including the crust, lithosphere, asthenosphere, mantle, outer core, and inner core; 9. distinguish among comets, meteoroids, asteroids, and dwarf planets, and describe how they help us to understand the nature and formation of the Earth and the Solar System; 10. gather information from secondary sources to discuss the regular occurrence of meteor showers; and 11. explain how modern research about celestial objects uses new space technologies including telescopes and space probes.

Performance Standard

By the end of the Quarter, learners exhibit skills in evaluating information from secondary sources, and draw on their scientific understanding of the location and geological setting of the Philippines to explain its unique landforms and dynamic geologic activity in a global context. They demonstrate an appreciation of the size and scale of the Earth and describe evidence for a dynamic Earth over its long geological history as well as the evidence that is used to build a model for the internal structure of the Earth. Learners demonstrate curiosity and open-mindedness in extending their knowledge and

understanding of the dynamic Earth to evaluate evidence for theories for the formation of the Solar System. They describe modern scientific processes and technologies that are used by scientists to investigate the nature and evolution of the Solar System and Universe.

Suggested Performance Tasks

A. Design and build a 3D model of the features of the Earth including its interior structure.

B. Develop an information report to describe and explain how modern space technologies are used to conduct groundbreaking research about the nature and origin of the Solar System.

GRADE 9 – QUARTER 3: LIFE SCIENCE

Content	**Content Standards** *The learners learn that:*	**Learning Competencies** *The learners…*
1. DNA replication and mutations 2. Biodiversity and endangered species 3. Types of ecosystems in the Philippines	1. Transmission of traits is determined by DNA, genes, and chromosomes. 2. High biodiversity means populations are more likely to overcome adverse conditions. 3. Human activities can adversely affect animals and plants in a variety of ecosystems.	1. use models and labeled diagrams to represent the double helix structure of DNA (deoxyribonucleic acid); 2. explain the role of DNA, genes, and chromosomes in the transmission of traits; 3. describe mutations as changes in DNA or chromosomes and discuss some of the factors that cause mutations, such as infectious agents, radiation, and chemicals; 4. use information from secondary sources to explain the beneficial, harmful, and neutral effects of mutations; 5. explain the advantage of high biodiversity in maintaining the stability of an ecosystem during difficult conditions, such as food shortages, disease, and climate change; 6. use information from secondary resources to classify animals and plants of the Philippines as critically endangered, endangered, or vulnerable species; 7. discuss as a class how threats to biodiversity can lead to species extinction; 8. use information from secondary sources to research how to protect and conserve endangered and/or economically important species in the local community; 9. describe using labeled diagrams the biotic and abiotic features of tropical rainforests, swamps, estuaries, mangrove forests, and coral reefs; 10. use information from secondary sources to describe the possible effects of human activities, such as deforestation, pollution, and introduction of invasive species, on living things in an ecosystem; and 11. plan to conduct a survey to explore the possibilities for minimizing the negative impacts of human activities on an ecosystem.

Performance Standard

By the end of the Quarter, learners describe that the transmission of traits is determined by DNA, genes, and chromosomes. They explain that high levels of diversity help to maintain stability of an ecosystem. They research to classify critically endangered plants and animals of the Philippines and to identify strategies to protect and conserve them. They use drawings and diagrams to describe features of typical Philippine ecosystems and they conduct a survey to explore possibilities to minimize the impact of human activities.

Suggested Performance Task/s

A. Write a report on an environmental action group analyzing their principles and their actions or activities regarding the human impact on the biosphere.
B. Conduct a research project on a specific Philippine ecosystem and investigate its biodiversity, ecological interactions, and conservation challenges. Present your research findings through a scientific report or multimedia project.

GRADE 9 – QUARTER 4: SCIENCE OF MATERIALS

Content	**Content Standards** *The learners learn that:*	**Learning Competencies** *The learners…*
1. Valid and reliable investigations 2. Chemical bonding 3. Ionic compounds 4. Covalent compounds 5. Metallic bonds 6. Chemical formula	1. Valid and reliable scientific investigations include identification and control of variables. 2. Formation or breaking down of ionic or covalent bonds results in a chemical change. 3. Bonds are formed between atoms either by sharing or transferring of electrons. 4. The type of bond formed determines whether the result is a covalent or ionic compound. 5. Symbols for the elements are used as a basis for writing chemical formula of compounds. 6. The properties of pure substances depend on the type of bonding within them.	1. carry out a valid and reliable scientific investigation to show the formation of a new substance, such as formation of a carbonate (carbon dioxide in limewater), or formation of a precipitate (from silver nitrate solution); 2. explain that the formation of new bonds or the breaking of existing bonds constitutes a chemical change and the formation of a new substance; 3. describe a valence electron as an electron in the outer shell of an atom that can take part in formation of bonds; 4. identify the number of valence electrons of oxygen based on its position in the periodic table; 5. explain the formation of ions as either the loss or gain of electrons to produce ionic bonds, using examples, such as the formation of sodium chloride; 6. write the chemical formula and chemical names of some common ionic compounds, including sodium chloride (NaCl), magnesium oxide (MgO), potassium chloride (KCl) and magnesium chloride ($MgCl_2$); 7. explain the formation of covalent bonds using a molecule of water and a molecule of carbon dioxide; 8. write the chemical formula and chemical name of some common covalent compounds, including water (H_2O), carbon dioxide (CO_2), and ammonia (NH_3); 9. show by using models that ionic compounds form crystalline structures whereas covalent compounds form individual molecules; 10. explain properties of metals in terms of their structure and metallic bonding (sea of electrons model); and 11. investigate the properties of ionic, covalent, and metallic substances, such as melting point, hardness, electrical and thermal conductivity.

Performance Standard

By the end of the Quarter, learners carry out a valid and reliable scientific investigation showing the formation of a new substance. They demonstrate an understanding of the significance of the valence electron of an element in the formation of bonds and identify bonds as ionic, covalent, or metallic. They use their knowledge of the symbols of elements to write the formula for a number of common compounds. They draw models of possible structures of ionic compounds and research the properties of ionic, covalent, and metallic substances. They use cartoons/comic strips to create interesting learning tools.

Suggested Performance Task/s

Create a cartoon/comic strips portraying the main characters as “ionic”, “covalent”, and “metallic” bonds. The cartoon should communicate each character’s role in holding atoms and/or molecules together and may show what happens to them in the way the substances are used in everyday life.