GRADE 8 – SCIENCE
LESSON 1: FORCES AND MOTION
LESSON 2: WORK AND ENERGY
LESSON 3 : HEAT AND TEMPERATURE
LESSON 4: Electricity

LESSON: FORCES AND MOTION

Gravitational force is the attraction between any two objects or bodies with mass. If the mass of either object increases, the gravitational force between them also increases.

- As the Earth attracts objects around it, these objects also attract the Earth. But the Earth is much more massive than them that is why their attraction is not as great as the gravitational pull of the Earth.
- All things on Earth fall (or are attracted) towards the center of the Earth.

If two forces acting on an object are equal in magnitude but opposite in direction, they are considered as **balanced forces.** These forces must lie along the same line.

- If the forces acting on an object are balanced, the object either stays at rest or continues to move at constant velocity.
- If the forces acting on an object are unbalanced, the state of motion of the object will change. (This concept was discussed in the module using the rolling ball as an example). Emphasize that the ball slowed down and eventually stopped not because its force is already used up (misconception).
- The ball slowed down and stopped because an unbalanced force **(friction)** caused it to change its motion.

Newton's First Law of Motion: Law of Inertia
This is described through Newton's First Law of Motion, also referred to as Law of Inertia.

Newton's Second Law of Motion: Law of Acceleration

- To introduce the second law of motion, refer the students back to the discussion on the effects of unbalanced forces on the motion of objects by saying: If the forces acting on an object are unbalanced (Fnet>0), the object accelerates. But how is the acceleration of the object related to the amount of the net force acting on it?

The Newton's third law of motion, or sometimes called as Law of Action
Reaction, describes the relationship between the forces that two bodies exert on each other.

LESSON: WORK AND ENERGY

Work is a Method of Transferring Energy

- In Grade 7, students learned that there are different ways by which energy can be transferred from one place to another. This time, they will learn that work is a means of transferring energy from one object to another.

- Is there work done on the ball? In the bowling game described in the student's material, the work is done by the person on the ball to just start it moving. Because of the work done to the ball, it gained 'something' that enables it to move. That 'something' that was transferred to the ball is called energy. The energy became energy of motion of the ball.

- What can a moving ball do? A moving ball has energy. When it strikes the empty plastic bottle, it can push it through a distance. Thus, work is done by the ball on the empty plastic bottle. Since work is done on the bottle, energy is transferred to it.

- If energy can be transferred, what happens to the energy of the one doing the work and to the object on which work is done? The one doing the work loses energy and the object on which work is done gains energy. When work is done by an object, the object loses energy; when work is done on an object, the object gains energy. In the bowling game the students played, the one rolling the ball loses energy while the ball gains energy. When the moving ball strikes the empty plastic bottle it loses energy while the plastic bottle gains energy.

- Clarify to the students that it is energy and not force that is transferred when work is done.

Kinetic Energy

- The energy of a moving object is called energy of motion or kinetic energy (KE). How the equation of KE is derived is shown in the student's module**.**

Potential Energy

- Work is done in lifting an object. When work is done on an object, energy is transferred to it. Thus, an object lifted from the ground gains energy. Since the work is done against the force of gravity, it is called gravitational potential energy or simply potential energy (PE).

- The force of gravity also acts on objects falling to the ground. As an object falls, the potential energy decreases because it is transformed to become the kinetic energy of the object.

- The **gravitational potential energy** is the energy due to its position. This energy depends on the mass and height of the object. The height can be measured relative to an assigned level. But usually, the common reference level is the ground.

LESSONS: HEAT AND TEMPERATURE

- Heat is a transfer of (thermal) energy between objects or places due to temperature difference.
- Heat transfers from an object of higher temperature to an object of lower temperature.

MISCONCEPTION

1. Heat is a substance.

2. Heat is not energy.

3. Heat and temperature are one and the same.

4. The temperature of an object depends on its size or volume.

5. The amount of heat transferred is determined always by the change in temperature.

- The word heat in the module is written in italic form to emphasize that it represents the quantity of thermal energy that is transferred to or from an object.
- The hotness or coldness of water in terms of its temperature. They will also compare the amount of heat transferred to the water in terms of the changes in its temperature and come up with a relationship between these two variables.
- After students learned about the relationship between the temperature of the object and the amount of heat it can transfer, this time they will try to investigate on their own the relationship between the mass of the object and the amount heat it can transfer. In this activity, students are asked to plan and design their own investigation, including the steps on how they will gather and analyze data to come up with an answer to this question: How does the mass of an object affect the amount of heat it can transfer.

LESSONS: ELECTRICITY

Current and Voltage

- Electric charges can be made to move through a conducting material. The electric charges are the electrons of the conducting materials. Materials such as copper, steel, and aluminum have a lot of loosely held electrons which made them good conductors of electricity. Current is a measure of the number of charges passing through a cross-section of a conductor in a given time.
- What is the direction of current? A battery has terminal marks “+”and “-“. The plus (+) sign indicates surplus, or excess of charge and the negative (-) sign means deficiency. The movement of charges from the positive side of the battery to the negative side is called conventional current or simply current. However, this is not the actual motion of electrons in a circuit. The direction of the flow of electrons is from the negative terminal to the positive terminal. This is called electron current. The direction of current does not affect what the current does. An

ammeter measures electric current. Because the device measures how much charges flow in a certain cross section at a given time, it must be connected in series. Take note how the positive and negative signs of the ammeter and the terminals of the battery are oriented as shown.

- Energy is needed to make the charges move. In Module 2, the students learned that when work is done on an object, energy is transferred. The voltage of a battery does the work on charges to make them move. Batteries are energy sources. The chemical energy in the battery is transformed to electrical energy. This electrical energy moves the charges in a circuit. The work done on the charges as it passes through a load is measured as the voltage across the load.
- Another variable that can affect current is the resistance. As the term implies, the resistance of the material opposes the flow of charges. Resistance can also be measured, and they are expressed in units called Ohms. A lower resistance would mean that there is less opposition in the flow of charges and therefore bigger current.
- Different materials have different amounts of resistance. Conductors have very little resistance and therefore allow more charges to pass through. Insulators are materials that have very high resistance and therefore flow of charges would be difficult.
- Fires can happen when the wires start heating up causing combustible parts of the house to be set on fire. The wires heat up when the current passing is more than what the wires can carry. In this case there is an overloading of the circuit. An example of how the circuit gets overloaded is by plugging a lot of appliances in a common outlet like an extension cord.