# Week 6

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| **Learning Planner** |
| **Subject** | Physics | **Week** | 6 | **Duration** | 240 minutes | **Form** |  1 |
| **Strand** | Mechanics and Matter | **Sub-Strand** | Dynamics |
| **Content Standard** | Demonstrate knowledge and understanding of Newton's laws of motion. |
| **Learning Outcome(s)** | Apply the laws of motion to explain how bodies move to change their positions |
| **Learning****Indicator(s)** | 1. State Newton’s laws of Motion
2. Apply Newton’s second law to establish the relationship between force, mass and acceleration.
3. Identify daily applications of Newton’s laws of motion.
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| **Essential Question(s)**  | 1.what real – life examples or scenarios can be used to illustrate the relevance of Newton’s laws of motion?2. How can the concept of inertia be demonstrated?3.What mathematical concepts are required to establish the relationship between force, mass and acceleration? |
| **Pedagogical Strategies** | Talk for learning, Experiential Learning, inquiry – based, thin – pair share, demonstration, discussion. |
| **Teaching & Learning Resources** | Audio-visuals, PhET interactive simulations, Trolley, tennis ball, soccer ball |
| **Key Notes on Differentiation** |
| **Learning Tasks****Lesson 1:****1.** State Newton’s first law of motion and explain the concept of inertia.**2.** State Newton’s second law of motion.**3.** Explain Newton’s third law of motion.**Lesson 2:****4.** Identify application of Newton’s first, second and third laws in daily life**5.** State Newton’s second law of motion.**6.** Represent Newton’s second law of motion mathematically.**7.** Combine Newton’s second law with the equation of motion v = u + at to establish F = ma.**Pedagogical Examplars****1.** Using talk for learning in a collaborative and inclusive manner, let learners discuss the situations below to establish a) what forces are acting on the object and b) the motion of the object. They should draw diagrams to represent the magnitude and direction of the forces that they identify, and also the direction of motion of the object (if any). They should then share their ideas with the class.a. A vehicle has broken down and as responsible citizens, you know that the vehicle needs tobe moved off the road to prevent other cars from crashing into it. (1st and 2nd laws)b. Learners build simple paper boats and place them in a bowl of water and using made-uppaddles, try to move the paper boats. (3rd law)**2.** The teacher should then summarise the laws of motion for the class to be able to answerquestions about the factors that affect inertia.**Lesson 2:****1.** Watch videos (a good example is on YouTube: Veritasium - Best Film on Newton’s ThirdLaw. Ever.) or use interactive simulations (a good example is the PHeT simulation: Forces andMotion) to observe the effect on an object when it is a) already in motion and then experiencesa resultant force, b) already in motion and experiences no resultant force, c) is stationary andexperiences a resultant force and d) is stationary and experiences no resultant force.**2.** Learners should research and discuss various situations in daily life where Newton’s laws ofmotion are applied. Allow students to leave the classroom and take photos of nature/objectswhich they can then present to the class and describe/explain the forces at play.3. Show learners a range of examples of force diagrams and ask them to establish whethera. there is a resultant forceb. the direction and size of the resultant force.**Key Assessment****Level 1:** Explain inertia and state the factors that affect the inertia of a body.**Level 2:** Account for changes that will occur in the motion of bodies of different masses that experience the same force.**Level 2**: Identify some daily activities and explain how at least two of the 3 laws of motion is applied in each situation. |
| **Keywords** | Newton’s laws, applications, inertia, action and reaction, resultant force |

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| **Lesson 1: NEWTONS’S LAWS OF MOTION** |
| **Main Lesson drawing on Concepts, Skills and Competencies to reinforce as in the Subject Teacher Manual** |
| ***Teacher Activity***  | ***Learner Activity*** |
| **Starter *Activity (10 minutes)*** Start lesson by demonstrating the following activities to the class;1. A tennis ball lies on the table for a while and then kicked.2. A car being towed from the roadside (from video) |
| ***Introductory Activity (15minutes)***I. In their mixed ability groupings, task learners to discuss and write down a description of their observations from the first demonstration and use their answer to answer the following questions;**a**. what will have happened to the tennis ball had it not been kicked? What name is given to such a situation? b. In what way(s) is/are the first activity similar to the second?***Activity 1 (40 minutes)***I. Guide the groups to present their answers to the class for discussion and reconciliation of answers***Activity 2 (40 minutes)***I. Based on the outcome of the discussion, guide the learners to state Newton’s first law of motion II. Task each group to discuss at least three daily applications of the law. | ***Introductory Activity (15minutes)***I. In your groups, discuss and write down a description of your observations from the first demonstration and use your answer to answer the following questions;**a**. what will have happened to the tennis ball had it not been kicked? What name is given to such a situation? b. In what way(s) is/are the second activity similar to the first?***Activity 1***Participate in the presentation and discussion of the observations.***Activity 2 (40 minutes)***State Newton’s first law of motion and discuss at least three daily applications of the law in your groups. |
| **Assessment DoK aligned to the Curriculum and Subject Teacher Manual** |
| ***Level 3*****1.** A car is traveling at a constant speed on a straight road. Suddenly, the driver slams on the brakes, bringing the car to a sudden stop.**Question:** Explain what happens to the passengers inside the car when the brakes are suddenly applied in terms of Newton's First Law of Motion. Discuss the role of seatbelts in this scenario and how they affect the passengers' inertia. |
| **Lesson Closure**  |
| ***Activity (15 minutes)*** 1. *End lesson by summarizing main points of the lesson*
2. *Students asks questions to clarify as misunderstanding and consolidate what is learnt*
3. *Give learners assignment*
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| **Reflection & Remarks** |
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| **Lesson 2: RELATIONSHIP BETWEEN FORCE, MASS AND ACCELERATION FROM THE SECOND LAW OF MOTION** |
| **Main Lesson drawing on Concepts, Skills and Competencies to reinforce as in the Subject Teacher Manual** |
| ***Teacher Activity***  | ***Learner Activity*** |
| **Starter *Activity (10 minutes)*** Start lesson by playing a video the demonstrate the following activities to the class;1. A football kicked to reach a spot.2. A canoe being paddled. |
| ***Introductory activity (25 minutes)***I. In their mixed ability groupings, task learners to discuss their observation(s) to answer the following questions from the first demonstration; **a**. what will have been observed if the ball had been kicked with a less or greater force than it was?b. what is/are the implication(s) of your answer(s)?***Activity 1 (25 minutes)***I. Guide the groups to present their answers to the class for discussion and reconciliation of answers.II. Based on the outcome of the discussion, guide the learners to state Newton’s second law of motion and show that F = maII. Task each group to discuss at least three daily applications of the law.***Activity 2 (25 minutes)***I. In their mixed ability groupings, task learners to discuss their observation(s) to answer the following questions from the second demonstration; **a**. why does the canoe move forward while its being paddled backwards?**b**. what direction will the canoe move if the direction of paddle is reversed? Explain your answer.***Activity 3 (25 minutes)***I. Guide the groups to present their answers to the class for discussion and reconciliation of answers.II. Based on the outcome of the discussion, guide the learners to state Newton’s third law of motion. II. Task each group to discuss at least three daily applications of the law. | ***Introductory activity (25 minutes)***I. In your groups, use your answer to answer the following questions;**a**. what will have been observed if the ball had been kicked with a less or greater force than it was?b. what is\are the implication(s) of your answer(s)?***Activity1***I. Present your answers to the class for discussion and reconciliation of answers.II. State Newton’s second law of motion. II. In your groups, discuss at least three daily applications of the law.***Activity 2 (25 minutes)***I. Discuss your observation(s) to answer the following questions from the second demonstration; **a**. why does the canoe move forward while its being paddled backwards?**b**. what direction will the canoe move if the direction of paddle is reversed? Explain your answer.***Activity 3 (25 minutes)***I. Present your answers to the class for discussion and reconciliation of answers.II. Based on the outcome of the discussion, state Newton’s third law of motion. II. In your groups discuss at least three daily applications of the law. |
| **Assessment DoK aligned to the Curriculum and Subject Teacher Manual** |
| ***Level 3****A car has mass of 2000 kg and an acceleration of 2.3 m s-2* ***a.*** *What resultant force is causing this?****b.*** *If the car is at rest what is its velocity after 7 s?****c.*** *If the car experiences a resistive force of 2.4 N, what is the driving force? How far does the car travel after 7 s*  |
| **Lesson Closure**  |
| ***Activity (15 minutes)*** 1. *End lesson by summarizing main points of the lesson*
2. *Students asks questions to clarify as misunderstanding and consolidate what is learnt*
3. *Give learners assignment*
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| **Reflection & Remarks** |