**EMERALD ROYAL INTERNATIONAL SCHOOL, MPAPE ABUJA**

**LESSON PLAN AND NOTE FOR WEEK 7 ENDING FRIDAY: 24th FEBRUARY, 2023**

**TERM:** 2nd

**WEEK: 7**th

**DATE** : 20th – 24th February, 2023

**SUBJECT:** Physics

**CLASS :** SS 2

**TOPIC: Simple Machines**

**SUB - TOPIC:** 1. Defination of Simple Machine

1. Efficiency of a Machine

**PERIOD:** 3rd

**TIME:** 9: 30 - 10:10am

**DURATION:** 40 minutes

**AVERAGE AGE:** 16 years

**SEX:** Mixed

**SPECIFIC OBJECTIVES:** By the end of the lesson, students should:

1. Define simple machine
2. Explain the efficiency of a machine
3. Mechanical advantage and Velocity ratio

**RATIONALE:** To enables students understand the concept of simple machines

**PREVIOUS KNOWLEDGE:** Students have being taught Machines

**INSTRUCTIONAL RESOURCES:** Charts showing Simple Machines

**REFERENCE:** Senior Secondary School Physics by P.N. Okeke et al, New School Physics for Senior Secondary Schools by Anyakoha, M.W, Comprehensive Certificate Physics by Olumuyiwa Awe and Okunola, O.O, Science Teachers Association of Nigeria Physics for Senior Secondary School, Book 1. New Edition and Melrose Physics for Senior Secondary School, Book 1 by Akano, O and Onanuga, O.O.

**LESSON DEVELOPMENT**

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| **STEPS** | **TEACHER’S ACTIVITIES** | **STUDENTS’ACTIVITIES** | **LEARNING POINTS** |  |  |
| **INTRODUCTION** | The teacher introduces the lesson by asking the following questions::   1. What is Simple machine? 2. Give examples of simple machines 3. What is efficiency of a machine? | The students respond based on their previous knowledge | To arouse the students interest toward the lesion. |  |  |
| **STEP 1** | The teacher explains the concept of simple machines | The students pay attention. | To keep them focus. |  |  |
| **STEP 2** | The teacher explain the efficiency of a machine | The students pay rapt attention | To encourage critical thinking |  |  |
| **STEP 3** | The teacher explains Mechanical advantage and Velocity ratio | The students listen carefully | To ensure better understanding of the lesson |  |  |
| **BOARD SUMMARY** | **SIMPLE MACHINES**  An arrangement by which work can be done conveniently on a load or against a resistance is known as **machine.**    Simple machine is a machine in its simplest form. They are devices that use energy to do work. The work is being done by the machine when a small effort is used to overcome a large resistance.  A machine can be define as a tool or devices that allows a force (or effort) applied to one point to overcome a resisting force (or load) at another point.  Simple machine can be classified into different categories namely **the lever, the pulley, the inclined plane, the wedge, the wheel and axle, the screw, the** hydraulic **press.**  Some common examples of simple machines are, scissors, drill brace, the shovel (a form of lever), the pulley at the top of a flagpole, the steering wheel of an automobile (a form of wheel and axle), and the wheelchair ramp (a form of inclined plane). An everyday example of a complex machine is the can opener, which combines a lever (the hinged handle), a wheel and axle (the turning knob), and a wedge (the sharpened cutting disk).  SCISSORS    DRIL BRACE AND BITS    **Mechanical advantage/Force ratio** of a machine is defined as the ratio of the load to the effort.  If the laod is bigger than the effort, the mechanical Advantage is greater than one.  In pratice,all machines have some friction in them and this reduces the efficiency. Part of the work put into a machine is thus always wasted in overcoming friction and in moving some parts of the machine. Thus, no machine is hundred percent (100%) efficient.  **Velocity Ratio** of a machine is defined as the distance moved by the effort to the distance moved by the load.  **EFFICIENCY OF A MACHINE**  The efficiency of a machine is defined as the ratio of work obtained from the machine to work put into the machine expressed in percentage.  It also defined as the ratio of work output of the machine to the total work input expressed in percentage.  Efficiency = Work output X 100%  Workinput  **DERIVATION OF THE FORMULA -**  The efficiency of a machine can be determined by taking ratio of the work output to work input of the machine or its velocity ratio and mechanical advantage.  Therefore:  Efficiency (E) = Work output x 100%  Work input  Efficiency (E) = Work done in load x 100%  Work done in effort  Since Work = force x distance  (E) = Load(L) x distance moved by load(dL) x 100%  Effort(e) x distance moved by effort()  Therefore E    Therefore E  Mechanical advantage (M.A) =  Efficiency (E) = Mechanical Advantage x 100%  Velocity Ratio  Example 1:  A system of lever with velocity ratio 30 overcomes resistance of 2500 Newton when an effort of 125 Newton is applied to it, calculate   1. The mechanical advantage of the system. 2. It’s efficiency.   SOLUTION: | The students copy notes into their exercise book | For future reference. |  |  |
| **Evaluation** | The teacher evaluates the students with the following questions:   1. Define simple machine 2. Explain the efficiency of a machine 3. Mechanical advantage and Velocity ratio | The students attempt the questions. | To ascertain their level of understanding. |  |  |
| **Conclusion** | The teacher concludes the lesson by making corrections where necessary and go through their notes. | The students copy the note on the board. | For future use. |  |  |
| **Assignment** | The teacher gives the students assignment as follows:  a. Explain what is meant by a machine.  b. Define the terms: mechanical advantage, velocity ratio and efficiency as applied to a machine.  c. Show that the efficiency E, the force ratio M.A and the velocity ratio V.R of a machine are related by the equation.  d. Explain why the efficiency of a machine is usually less than 100%.  **WEEKEND ASSIGNMENT**  1. A machine has an efficiency of 60%. If the machine is required to overcome a load of 30N with a  force of 20N, calculate its mechanical advantage.  (A) 0.7 (B) 0.9 (C) 1.5  (D) 2.5 (E) 10.  2. Which of the following equations for the efficiency of a machine is correct?  [ E = efficiency, V = velocity ratio, M= mechanical Advantage].  (A) E = V/M x100% (B) E = input/output x 100%  (C) E = load distance/effort distance x 100% (D) E = M/V x 100%  3. A machine of velocity ratio 5 is used in lifting a load with effort of 500N. If the machine is 80%  efficient, determine the magnitude of the load.  (A) 2500N (B) 2000N (C) 900N (D) 625N  4. The velocity ratio and efficiency of a system of pulleys are 6 and 80%, respectively. How much effort  Is required to lift a load of mass 120kg with this system? [g = 10ms-1]  (A) 25N (B) 90N (C) 96N (D) 250N (E) 960N  5. Which of the following statements correctly defines a simple machine?  (A) that can produce electric current.  (B) which can only carry people from one place to another.  (C) with which work can be done easily.  (D) which changes the state of rest or uniform motion of an object  ESSAY  (a) A drum of mass 1000kg is rolled into the deck of a lorry 1.5m above a horizontal floor using a plank 4m long. calculate the work done against gravity during the process. ( g = 10m/s2 ).  (b) A stone of mass 1.0kg is thrown vertically upwards with a velocity of 10m/s. Find (i) the potential energy at the greatest height h and the value of h. (ii) the kinetic energy on reaching the ground again ( g = 10m/s2).  (c) The efficiency of a machine is 80%. Determine the work done by a person using this machine to raise a load of 200kg through a vertical distance of 3.0m (Takeg= 10m/s2 ). | The students copy assignment solve at home and submit for marking endorsement. | To encourage further studying at home. |  |  |



23/3/2023

Principal Head Instructor