**EMERALD ROYAL INTERNATIONAL SCHOOL, MPAPE ABUJA**

**LESSON PLAN AND NOTE FOR WEEK 9 ENDING FRIDAY: 10 MARCH, 2023**

**TERM:** 2nd

**WEEK:** 9th

**DATE** : 6th – 10th March, 2023

**SUBJECT:** Physics

**CLASS :** SS 1

**TOPIC: Work and Power**

**SUB - TOPIC:** 1. Work done in force field

1. Calculations on work and power

**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. Explain the concept work done in force field
2. Solve calculations of work and power

**RATIONALE:** To enables students understand the concept of work and power

**PREVIOUS KNOWLEDGE:** Students have being taught Energy, work and power

**INSTRUCTIONAL RESOURCES:** Charts showing energy, work and power

**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 work? 2. What is power? | The students respond based on their previous knowledge | To arouse the students interest toward the lesion. |  |
| **STEP 1** | The teacher explains the concept of work done in force field | The students pay attention. | To keep them focus. |  |
| **STEP 2** | The teacher solves examples on calculation on work and power | The students pay rapt attention during the solving | To encourage critical thinking |  |
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| **BOARD SUMMARY** | **Sub topic 1: Work done in a force field**  **Work done** in Physics is simply defined as the product of force and distance moved in the direction of the force. If work done is w, distance covered is s and force is f, then mathematically,  Work done = force x distance  W = f x s  the S.I unit of work done is Joules ( J ). Since unit of force ‘F’ is Newton (N), unit of distance ‘s’ is metre, the unit of work done is also Newton-Metre (Nm). Other units are kilojoules and megajoules. Note: If no distance is covered, work done is zero. Work done is a scalar quantity.  Every object on the earth’s surface is under the influence of the force of gravity. This force pulls the object towards its centre. The earth’s gravitational field is an example of force field. If a body is to be lifted vertically upwards, work has to be done against this force of gravity. The work done is given as  Work done = force x distance  = m x g x h  Where m = mass of the body in kilogram, g = acceleration due to gravity and h is height in metres. If on the other hand, the body falls freely from a vertical height h to the ground, the work done is also mgh.  Work is said to be done whenever a force moves a body over a distance in the direction of the force. i.e. work=force (F) x distance(d) moved in the direction of the force(fxd).  C:\Users\AUGUSTINE\Desktop\IMG_0007.jpg  **Mathematically**  W(d)=Fxd The unit of work is joules with symbol J.s  d  **Work = F x dcosθ**  Fcosθ  F  θ  Component of F along the direction of motion.  WD =  Cos  F  **POWER**  **Power** can be defined in a number of ways:   * 1. Power is the time rate at which work is done.   2. Power is energy expended with time.   3. Power is work done in a given time interval. Its S.I unit is watt. Larger units are horse power (hp), kilowatt (kw) and megawatt (mw).   Mathematically. Power (P) =  =  =  = f x v  Where f is force and v is velocity (i.es/ t). that means power can also be defined as the product of force and velocity. The instrument for measuring power is watt-metre.  ***One horse power is equal to 746watts (1h.p = 746W)***.  **Example**  A machine is rated 2500watts. Calculate the power in horse power  **Solution**  1 horse power = 746watts  Therefore 2500watts = (2500 / 746) horse power = 3.35 horse power  **Interchangeability of work and energy**  Energy and work can be used interchangeably because they are almost the same thing. They have the same unit which is Joule. For example, if someone has energy, it means he can do some work and if someone can do some work, it means he has some energy. Thus work and energy cannot be separated.  **Sub topic 2. Calculations on work and power**  **Example 1**  A body of weight 300N climbs to the top of a hill of height 20m. What is the work done by the body against the force of gravity?  **Solution**  Force F = 300N, distance s = 20m  Work done = force x distance  = F x s  = 300 x 20 = 6000J  **Example 2.**  An object of mass 12kg is held at a height of 10m above the ground for 15 minutes. Calculate the work done within this period.  **Solution**  Since the body is not falling freely under gravity, acceleration due to gravity is zero. Hence work done is also zero.  **Example 3**  A bag of rice of mass 50kg was pushed through a distance of 5m for 10seconds by a force of 500N. Calculate the work done.(g = 10ms-2)  **Solution**  m = 50.0kg, F= 500 N, s = 5m and t = 10 seconds.  Work done = force x distance  = F x s  = 500N x 5m  = 2500J  **Example 4**  Calculate the power of a pump which lifts 1000kg of water through a vertical height of 2m in 10 seconds. ( g = 10ms-2)  **Solution**  Mass (m) = 1000kg, distance (s) = 2m, time (t) = 10s  Power = Work done  Time taken  = force x distance  Time  = m x g x s  T  = 1000 x 10 x 2  10  = 2000W  **Example 5**  An engine develops a power of 750W while moving a car at constant velocity of 3ms-s. Calculate the force exerted on the car by the engine.  **Solution**  Power = 750W, velocity = 3m/s, F = ?  Power = force x velocity  Force = power  Velocity  = 750 / 3 = 250N  **Example 6**  A stone of mass 10kg falls from a height of 2.0m. Calculate the work done. (take g = 10ms2)  **Solution**  Mass (m) = 10kg, height (h) = 2.0m  Work done = mgh  = 10 x 10 x 2 = 200J | The students copy notes into their exercise book | For future reference. |  |
| **Evaluation** | The teacher evaluates the students with the following questions   1. Explain the concept of work and power 2. A girl applied a force of 20N on an object for 5s. if the object remains stationary, calculate the work done 3. A boy lifted up a bag of yam of weight 5N through a height of 2m in 10s. Calculate his power. | 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:   1. Define work, energy and power. State their S.I units. 2. Can energy and work be used interchangeably? Explain. 3. Differentiate between work done and power 4. What other unit is used in measuring work done?   **Weekend assignment**   1. A boy of mass 50kg runs a set of step of steps of total height 10cm. calculate the work done (take g = 10ms-2) 2. A 70kg man ascends a flight of stairs of height 4m in 7 seconds. Calculate the power expended by the man 3. A 40kg girl climbs up a stair and expends energy at the rate of 50W. calculate the time taken for her to reach a height of 20m | The students copy assignment solve at home and submit for marking endorsement. | To encourage further studying at home. |  |



23/3/2023

Principal Head Instructor