



LESSON PLAN 1 [2019 - 2020]

Teacher Name	Class	Subject	Time slot	Date	Lesson	Topic
	IX	Physics	35 min	October 2019	Work and energy	Work and types of work done.
Expected Learning Outcome: Students will be able to ⇒ Define and write the expression for work ⇒ Understand and analyze the various life examples under different types of work						
Expected skill development: Critical thinking, analytical, communicative, visual thinking and imagination.						

FLOW OF LESSON WITH RESPECT TO TIME (Introduction/warm-up, Content, Think Line, Closure)

WARM UP AND INTRODUCTION

Discussion of hw questions given in the last class

(5 min)

Will review the previous knowledge with the following questions:

- What is a force?
- Is displacement and distance the same ?

CONTENT (Discussion method) (Look around)

(20 min)

- ⇒ Define work, its SI unit and its nature.
- ⇒ Derivation of its expression
 $W = f \times s$
- ⇒ Define 1 J
- ⇒ Types of work done(positive, negative or zero work)
- ⇒ In order to explain the dependence of types of work done on the angle between F & s;
Following examples will be discussed:
 - (a) a body falling down
 - (b) A body which is thrown up
 - (c) A potter with load on his head moves in forward direction
 - (d) Pressing of a football
 - (e) Pushing of a table
 - (f) A person carrying a hand bag & walks on a road

CLOSURE:

- ⇒ Student will recapitulate the concept by writing at least 1 example for each type of work done on their own. (LOOK AROUND)
(5 min)

- Proposed Questions (must include the questions asked in the classroom <u>and</u> the ones given as class-work in the notebook) ➤ Define work ➤ Define 1 J ➤ what should be the angle both force and displacement for doing (a) max work (b) min work ➤ Is there any work done on a body in uniform circular motion?
Evaluation/Assessment: Oral questionnaire Define 1J. Explain different type of work done.
DIFFERENTIATED CLASSROOM

Learners on the way	Advanced Learners
what should be the angle both force and displacement for doing (a) max work (b) min work	Is there any work done on a body in uniform circular motion (on the basis of angle between f & s).
Materials needed/Resources: Chalk, duster, NCERT book.	
Common Misconceptions: In different daily life examples the students get confused while determining the angle between F & s .	Addressing the misconceptions: By giving them different situations & let them try on their own to determine the angle between F & s

Home assignments:

(5 min)

- Write 3 examples for 3 types of work.
- When do we say that work is done.

LESSON PLAN 2 [2019 - 2020]



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Teacher Name	Class	Subject	Time slot	Date	Lesson	Topic
	IX	Physics	35 min	October 2019	Work and energy	Numerical on work done
Expected Learning Outcome: Students will be able to ⇒ Comprehend and evaluate the amount of work done by doing numerical related to it.						
Expected skill development: Analysis, critical thinking, collaboration.						

FLOW OF LESSON WITH RESPECT TO TIME (Introduction/warm-up, Content, Think Line, Closure)

WARM UP AND INTRODUCTION

Discussion of homework questions given in the previous class
(5 min)

Will review the previous knowledge with the following questions:

- What is the expression for work done?
- What is the expression for force in terms of acceleration?

CONTENT (GROUP ACTIVITY)

(20 min)

Students will solve the following numerical one by one:

1. How much work is done by a force of 1N in moving an object through a distance of 1m in the direction of force?
2. Calculate the work done in moving a body of mass 20 kg from rest through a distance of 2m with the acceleration of 5m/s^2 .
3. A porter lifts a luggage of 15 kg from the ground and puts it on his head 1.5 m above the ground. Calculate the height through which the body is lifted.
4. A pair of bullocks exert a force of 140N on a plough. The field being ploughed is 15m long. How much work is done in ploughing the length of the field?

THINK-LINE: What is the work done by the force of gravity on a satellite moving round the Earth? Justify your answer.

CLOSURE:

(5 min)

Can there be displacement of an object in the absence of any force acting on it? Think.

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| <ul style="list-style-type: none">• Proposed Questions (must include the questions asked in the classroom <u>and</u> the ones |
|---|

given as class-work in the notebook) ➤ What is the expression for work done? ➤ What is the expression for force in terms of acceleration?
• Evaluation/Assessment: Written- Derivation Relation of work done, displacement and force applied.
DIFFERENTIATED CLASSROOM

Learners on the way	Advanced Learners
Seema tried to push a heavy rock of 100kg for 200s but could not move it. Find the work done by Seema at the end of 200s?	A car weighing 100 kg and travelling at 30 m/s stops a distance of 50m decelerating uniformly. What is the force & work done on it by the brakes?
Materials needed/Resources: Chalk, duster, NCERT book.	
Common Misconceptions: Difference between a and g.	Addressing the misconceptions: That can be done by using $F=mg$ formula

Home assignments:

(5 min)

An object thrown at a certain angle to the ground moves in a curved path and falls back to the ground. The initial and the final points of the path of the object lie on the same horizontal line. What is the work done by the force of gravity on the object?

**LESSON PLAN 3[2019 - 2020]**

Teacher Name	Class	Subject	Time slot	Date	Lesson	Topic
	IX	Physics	35 min	October 2019	Work and energy	Concept of Kinetic Energy & its expression.
Expected Learning Outcome: Students will be able to ⇒ Comprehend the concept of kinetic energy along with its SI unit. ⇒ Derive the expression of K.E. using 3rd equation of motion.						
Expected skill development: Critical thinking, problem solving.						

FLOW OF LESSON WITH RESPECT TO TIME (Introduction/warm-up, Content, Think Line, Closure)

WARM UP AND INTRODUCTION

Discussion of home work questions given in the last class

Will review the previous knowledge with the following questions: (5 min)

- What is energy?
- What is its SI unit?
- How many types of energy you have heard about?

CONTENT (Derivational method) (20 min)

Define kinetic energy along with SI unit & type of quantity.

Derivation of expression of kinetic energy

$$KE = W = F \times s = m a s$$

$$\text{But } v^2 = u^2 + 2as.$$

$$v^2 = 0 + 2as$$

$$v^2 = 2as$$

$$as = v^2/2$$

KE = W = $mv^2/2$ of a body depends:

(1) Mass of body

(2) Velocity of body

THINK-LINE: Is work a scalar quantity or a vector quantity.

CLOSURE:

(5 min)

Students will review the concept by writing the derivation again themselves.
Derive an expression for kinetic energy.

- Proposed Questions (must include the questions asked in the classroom <u>and</u> the ones given as class-work in the notebook) ➤ Define kinetic energy? ➤ Which will have more impact on kinetic energy: doubling mass or velocity? ➤ A car and a truck are moving with the same speed of 60km/h. Which one has more kinetic energy? mass of truck > mass of car - Evaluation/Assessment: Derive an expression for kinetic energy.
DIFFERENTIATED CLASSROOM

Learners on the way	Advanced Learners
Which will have more impact on kinetic energy: doubling mass or velocity?	A car and a truck are moving with the same speed of 60km/h Which one has more kinetic energy? mass of truck > mass of car
Materials needed/Resources:	
Chalk, duster, NCERT book.	
Common Misconceptions:	Addressing the misconceptions:
Students get confused while deriving the expression for kinetic energy.	By doing the expression step by step in the class

Home assignments: (5 min)

- Write the derivation of expression of KE.
- The kinetic energy of an object of mass, m moving with a velocity of 5m/s is 25J. What will be its kinetic energy when its velocity is doubled? What will be its kinetic energy when its velocity is increased three times?
- Certain force acting on a 20Kg mass changes its velocity from 5m/s to 2m/s. Calculate the work done by the force.

**LESSON PLAN 4[2019 - 2020]**

Teacher Name	Class	Subject	Time slot	Date	Lesson	Topic
	IX	Physics	35 min	October 2019	Work and energy	Concept of PE & its expression.
Expected Learning Outcome: Students will be able to ⇒ Comprehend the concept of potential energy along with its SI unit. ⇒ Derive the expression of P.E.						
Expected skill development: Critical thinking, problem solving						

FLOW OF LESSON WITH RESPECT TO TIME (Introduction/warm-up, Content, Think Line, Closure)

WARM UP AND INTRODUCTION

Discussion of homework questions given in the last class
(5 min)

Will review the previous knowledge with the following questions: (5 min)

- What is energy?
- What is its SI unit?
- How many types of energy you have heard about?

CONTENT (Derivational method) (20 min)

Define potential energy along with SI unit & type of quantity.

Derivation of expression of potential energy

$$PE = W = F \times s = m a s$$

$$PE = mgh$$

PE depends upon.

Mass of body

Height at which the object is placed.

CLOSURE: (5 min)

Students will review the concept by writing the derivation again themselves.

Derive an expression for Potential energy.

- Proposed Questions (must include the questions asked in the classroom <u>and</u> the ones given as class-work in the notebook) ➤ Define potential energy? ➤ Which will have more impact on potential energy: doubling mass or height?
Evaluation/Assessment: Written- Derivation Derive an expression for potential energy.
DIFFERENTIATED CLASSROOM

Learners on the way Which will have more impact on potential energy: doubling mass or height?	Advanced Learners Differentiate between KE and PE.
Materials needed/Resources: Chalk, duster, NCERT book.	
Common Misconceptions: Students get confused while deriving the expression for Potential energy.	Addressing the misconceptions: By facilitating to derive the expression step by step in the class.

Home assignments:

(5 min)

- An object of mass 40Kg is raised to a height of 5m above the ground. What is its potential energy? If the object is allowed to fall, Find its KE when it is half-way down.
- A 5Kg ball is thrown upwards with a speed of 10m/s.
 - Find the PE when it reaches the highest point.
 - Calculate the maximum height attained by it.

LESSON PLAN 5 [2019 - 2020]



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Teacher Name	Class	Subject	Time slot	Date	Lesson	Topic
	IX	Physics	35 min	Nov 2019	Work and energy	Law of conservation of mechanical energy
Expected Learning Outcome: Students will be able to ⇒ Able to illustrate and derive the law of mechanical energy in case of a falling body						
Expected skill development: Collaborative, creative, critical thinking, derivation.						

FLOW OF LESSON WITH RESPECT TO TIME (Introduction/warm-up, Content, Think Line, Closure)

WARM UP AND INTRODUCTION

Discussion of home work questions given in the last class

Will review the previous knowledge with the following questions: (5 min)

- What is kinetic energy
- What is potential energy?
- What are their expressions?

CONTENT (discussion method and derivation method)

- ⇒ Define mechanical energy, its SI unit and its nature.
- ⇒ Define law of conservation of mechanical energy.
- ⇒ illustration of this law in case of freely falling body (20 min)

At point A

$$PE = mgh$$

$$KE = 0$$

$$T.E = mgh \text{ ----- (1)}$$

At point B

$$PE = mg(h - x)$$

$$KE = \frac{1}{2} M v_1^2 \quad (v_1^2 - (0) = 2gx)$$

$$KE = \frac{1}{2} M \times 2gx$$

$$KE = mgx$$

$$TE = mgh - \cancel{mgx} + \cancel{mgx}$$

$$TE = mgh \text{ ----- (2)}$$

At point C

$$P.E. = 0$$

$$KE = \frac{1}{2} M v_2^2$$

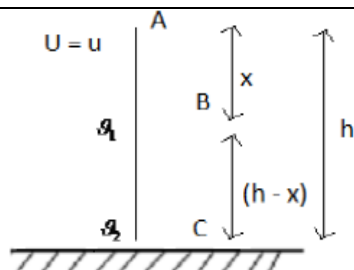
$$(v_2^2 - (0) = 2g(h))$$

$$KE = \frac{1}{2} M (2hg)$$

$$KE = mgh$$

$$\text{Thus } T.E = mgh \text{ --- (3)}$$

Concluding from equation (1), (2) and (3) energy remains conserved.



THINK-LINE: The potential energy of a freely object decreases progressively. Does this violate the law of conservation of energy? Why?

CLOSURE:

1. Discussion of steps of the derivation by the students (5 min)
2. Illustrate the law of conservation of energy by discussing the energy changes which occur when we draw a pendulum bob to one side and allow it to oscillate. Why does the bob eventually come to rest? What happens to its energy eventually? Is it a violation of the law of conservation of energy?

- Proposed Questions (must include the questions asked in the classroom and the ones given as class-work in the notebook)
 - What is law of conservation of mechanical energy?
 - What is mechanical energy?

➤ What is kinetic energy and potential energy at the highest point of the building? ➤ What is kinetic energy and potential energy at the lowest point of the building?
• Evaluation/Assessment: Written- Derivation Relation of PE and KE in the concept of conservation of energy.
DIFFERENTIATED CLASSROOM

Learners on the way ➤ What is mechanical energy? ➤ How it can be conserved? ➤ Give one example for conservation of energy forms.	Advanced Learners ➤ What is kinetic energy and potential energy at the highest point of the building? ➤ What is kinetic energy and potential energy at the lowest point of the building?
Materials needed/Resources: Chalk, duster, NCERT book.	
Common Misconceptions: Students get confused while calculating the mechanical energy at any point in between the highest and lowest point of the building.	Addressing the misconceptions: By doing it stepwise again and again to clear all their doubts.

Home assignments:

(5 min)

1. Derive and illustrate the law of conservations of mechanical energy in case of freely falling body.
2. An object of mass 40Kg is raised to a height of 5m above the ground. What is its potential energy? If the object is allowed to fall, find its kinetic energy when it is half-way down.

LESSON PLAN 6 [2019 - 2020]



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THE LEARNING ACADEMY

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Teacher Name	Class	Subject	Time slot	Date	Lesson	Topic
	IX	Physics	35 min	November 2019	Work and energy	Concept of power of a body
Expected Learning Outcome: Students will be able to ⇒ Define the power of a body, its SI unit and its nature. ⇒ Derive the expression of power for a body in motion. ⇒ Derive the expression of power of a body in terms of force and velocity						
Expected skill development: Creativity, critical thinking, Analysis and problem solving.						

FLOW OF LESSON WITH RESPECT TO TIME (Introduction/warm-up, Content, Think Line, Closure)

WARM UP AND INTRODUCTION

Discussion of home work questions given in the last class

Will review the previous knowledge with the following questions: (5min)

- What do you understand if somebody is said to be powerful?
- What do you think is there any relation between power of a body and the amount of work done by that body?

CONTENT (Discussion and questionnaire method) (20min)

- ⇒ Define power of a body
- ⇒ Power of a body = rate of work done
- ⇒ Power = work done/ time taken
- ⇒ SI unit of power is Watt(W))
- ⇒ Define 1W
- ⇒ Nature of the parameter work
- ⇒ Derivation of its expression
$$p = w/t$$
$$= mgh / t \text{ (as the motion of the body is along y axis)}$$
- ⇒ Derivation of power in terms of force and velocity
- ⇒ Commercial unit of electrical energy
$$1 \text{ Kilo-watt-hour} = 1 \text{ unit} = 1 \text{ Kw} \times 1 \text{ Hr} = 1000 \text{ J/s} \times 3600 \text{ s} = 3.6 \times 10^6 \text{ J}$$

THINK-LINE: What would have happened if nature had not allowed the

transformation of energy?

CLOSURE:

(5 min)

Recapitulation of the concept by asking them questions like:

- What is power of a body
- Define 1 W
- What is its expression in terms of force and velocity

• Proposed Questions (must include the questions asked in the classroom <u>and</u> the ones given as class-work in the notebook) • What is power of a body • Define 1 W • What is its expression in terms of force and velocity
• Evaluation/Assessment: Oral Questionnaire Define power and 1W.
DIFFERENTIATED CLASSROOM

Learners on the way • Define 1 W • Write the expression of power in terms of K.E. and P.E.	Advanced Learner ➤ What will be 1 kW? ➤ What will be the energy consumed if power of a body is given in terms of force and velocity?
Materials needed/Resources: Chalk, duster, NCERT book.	
Common Misconceptions: Students get confused when to use the concept of power and energy	Addressing the misconceptions: By giving them questions to practice in both the situations

Home assignments:

(5min)

Two girls do the same work in 5 minutes and 10 minutes resp. which of these two has more power and why?

LESSON PLAN 7 [2019 - 2020]



Teacher Name	Class	Subject	Time slot	Date	Lesson	Topic
	IX	Physics	35 min	NOV 2019	Work and energy	Numerical on power (based on SI unit)
Expected Learning Outcome: Students will be able to ⇒ Comprehend and solve numerical based on the concept of power in terms of its SI unit.						
Expected skill development: Collaborative, critical thinking, problem solving.						

FLOW OF LESSON WITH RESPECT TO TIME (Introduction/warm-up, Content, Think Line, Closure)

WARM UP AND INTRODUCTION

Discussion of homework questions given in the last class

(5 min)

Will review the previous knowledge with the following questions:

- What is power of a body?
- What is expression for power of a body?
- What is its SI unit?

CONTENT (Discussion method and demonstration by students)

Students will solve following numerical related to it one by one on the board: (15min)

- A man does 50 J of work in 5 s. what is its power?
 - A woman pulls a bucket of water of mass 5 kg from a well which is 10 m deep in 10 s. calculate the power used by her?
 - An electric bulb is rated 15W. What does it mean? How much energy in J is consumed if it is used for 10 min?
 - An elevator weighing 500 kg is to be lifted up at a constant velocity of 0.4m/s. what should be the minimum power of the motor to be used?
- ⇒ Problem-solving
1. An electric heater is rated 1500W. How much energy does it use in 10hours?
 2. A certain household has consumed 250units of energy during a month. How much energy is this in joules?

CLOSURE:

Recapitulation of the numerical by discussion of the following questions step wise (10 min)

- Proposed Questions (must include the questions asked in the classroom <u>and</u> the ones given as class-work in the notebook) ➤ What is power? ➤ When to use the kinetic energy formula in place of work done? ➤ When to use the potential energy formula in place of work done? ➤ What will be formula of power in terms of force and velocity?
Evaluation/Assessment: Written questionnaire Relate power, PE and KE.
DIFFERENTIATED CLASSROOM

Learners on the way ➤ When to use the kinetic energy formula in place of work done? ➤ When to use the potential energy formula in place of work done?	Advanced Learners ➤ What will be formula of power in terms of force and velocity? ➤ A horse exerts a pull on a cart of 150N so that the horse cart system moves with a uniform speed of 18km/h on a level road. Calculate the power developed?
Materials needed/Resources: Chalk, duster, NCERT book.	
Common Misconceptions: Students get confused while comprehending the various situations given in numerical	Addressing the misconceptions: By giving them different situations in the form of numerical to practice.

Home assignments:

(5 min)

- The power of a motor pump is 5kW. How much water per minute the pump can raise to a height of 20 m?
- Find the energy in Kwh consumed in 10hours by four devices of power 500W each.
- Calculate the work required to be done to stop a car 1500Kg moving at a velocity 60Km/ hr.?