

LESSON PLAN 1 [2019 - 2020]



DLF Public School

THE LEARNING ACADEMY

Managed By Darbari Lal Foundation

Teacher Name	Class	Subject	Time slot	Date	Lesson	Topic
	IX	Physics	35 min	July	Force & laws of motion.	Introduction to force, effect of force and concept of balanced and unbalanced force

Expected Learning Outcome:

Students will be able to

- ⇒ Define force, its SI unit and its nature.
- ⇒ Predict and evaluate the different effects of force using daily life examples
- ⇒ Estimate the two types of forces.

Expected skill development:

Comprehension, estimation, observation, visual thinking.

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

WARM UP AND INTRODUCTION

Will review the previous knowledge with the following question.

- ⇒ What do you think what is the force?
- ⇒ What happens when a force is applied to any object?

CONTENT (Discussion method and Demonstration method)

(20 min)

- ⇒ Define force along with its SI unit and its nature.
 - ⇒ Evaluate and predict the 5 major effects of force by giving one example as a hint like
 - a) change the state of rest of any object (when any ball is kicked)
 - b) change the state of motion of any object (goal keeper stopped the goal)
 - c) change the direction of motion of any object (while playing cricket)
 - d) change the size and shape of an object (squeezing the duster in the class)
 - e) changes the speed of an object (while pushing an already moving man)
- then two students will be called and asked to apply force on the teachers table in 2 different ways:
- (a) In the same direction
 - (b) Equal force in the opposite direction

Then students are asked to observe the motion of table and the two types of forces namely balanced and unbalanced force is introduced.

THINK-LINE: Is force a scalar or a vector?

CLOSURE:

(5min)

1. Define force.
2. Summarizing the effects of force with examples

- Proposed Questions (must include the questions asked in the classroom <u>and</u> the ones given as class-work in the notebook) ⇒ What do you think what is the force? ⇒ What happen when a force is applied to any object? ⇒ What are the effects of force after completion of the activity? ⇒ On which basis the two types of forces have been distinguished? ⇒ Define balanced and unbalanced forces on the basis of the activity?	
Evaluation/Assessment: Oral questionnaire What are the effects of force On book kept on a table and when it is made to slide down an inclined plane?	
DIFFERENTIATED CLASSROOM	

Learners on the way	Advanced Learners
➤ Give an example of a balanced force	Define balanced and unbalanced forces on the basis of the activity? Eg. Force on a spring.
Materials needed/Resources:	
Chalk, duster, NCERT, blackboard, notebook, daily life examples, teacher table.	
Common Misconceptions:	Addressing the misconceptions:
Force is just a pull or push	By adding the concept of effects of force, force is a pull or push which can do so many things

Home assignments-

Write at least 3 examples for balanced and unbalanced forces that you can see in a day to day life?



LESSON PLAN 2 [2019 - 2020]

Teacher Name	Class	Subject	Time slot	Date	Lesson	Topic
	IX	Physics	35 min	July 2019	Force & laws of motion.	Daily life example of balanced and unbalanced forces. introduction to the concept of inertia and types of inertia

Expected Learning Outcome:

Students will be able to

- ⇒ Relate various day to day life activities to the concept of balanced and unbalanced forces.
- ⇒ Understand and estimate the concept of inertia and its dependence on mass through daily life examples.
- ⇒ Define inertia and predict the 3 types of inertia.

Expected skill development:

Observation, interpretation, explanation, visual thinking.

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

WARM UP AND INTRODUCTION

Will review the previous knowledge with the following question.

- ⇒ What do we mean by balanced and unbalanced forces?
- ⇒ Which force can bring change to the state of a body?
- ⇒ Which force can bring change to the direction of a body?

CONTENT (Discussion and questionnaire method)

(20 min)

- ⇒ Students will give various examples of daily life activities where the concept of balanced and unbalanced forces is applied along with the explanation.
- ⇒ Let the students observe what happens when a very little amount of force is applied by the teacher to a duster sponge and the teachers table in terms of their movement.
- ⇒ As a result of the activity, define inertia.
- ⇒ Let them evaluate whether inertia is directly or inversely proportional to the mass of the body by giving various other simple examples like before.

⇒ Predict the types of inertia by the body as

- (a) Inertia of rest
- (b) Inertia of motion
- (c) Inertia of direction

THINK-LINE: When we stop pedaling a bicycle. Which types of forces are acting on it?

CLOSURE:

(5min)

Recapitulation of the concept taught by the students and home assignment given will be given.

- Proposed Questions (must include the questions asked in the classroom <u>and</u> the ones given as class-work in the notebook) ➤ Define inertia. ➤ How many types of inertia are there? ➤ Which is having more inertia a one-rupee coin or a five-rupee coin? ➤ Which force is responsible for the change in the state of the body?
Evaluation/Assessment: Written assignment Define balanced and unbalanced forces.
DIFFERENTIATED CLASSROOM

Learners on the way	Advanced Learners
➤ Which force is responsible for the change in the state of the body?	➤ Explain the forces acting on a suitcase while holding a it.
Materials needed/Resources: Chalk, duster, NCERT, daily life examples	
Common Misconceptions: Inertia is the weight of the body, any relation.	Addressing the misconceptions: Inertia is an inherent property which is dependent on the mass of the body

Home assignments:

Define inertia of rest, motion and direction?

LESSON PLAN 3 [2019- 2020]



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Teacher Name	Class	Subject	Time slot	Date	Lesson	Topic
	IX	Physics	35 min	July 2019	Force & laws of motion.	Inertia of rest and inertia of motion.
Expected Learning Outcome: Students will be able to ⇒ Define inertia of rest and inertia of motion. ⇒ Explain and understand the various examples of inertia of rest and motion.						
Expected skill development: Comprehension, explanation, critical thinking						

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

WARM UP AND INTRODUCTION

(5 min)

Will review the previous knowledge with the following question.

- ⇒ Define inertia?
- ⇒ On what factor does it depend?
- ⇒ What kind of dependence is there?

CONTENT (Discussion and demonstration method)

(20 min)

- ⇒ Define inertia of rest.
- ⇒ Explanation of following examples for inertia of rest:
 - (a) Falling of fruits and leaves when the branch of tree is shaken.
 - (b) Backward jerk felt by a person standing inside a bus which suddenly starts.
 - (c) Dust particle falling from the carpet when beaten with a stick.
- ⇒ Define inertia of rest.
- ⇒ Explanation of following examples for inertia of rest:
 - (a) Forward jerk felt by a person standing inside a bus which suddenly stopped.
 - (b) Luggage kept at the roof of the bus is tied
 - (c) The athlete runs for some more time even after completing the race.

THINK-LINE: Why some of the leaves may get detached from a tree if we vigorously shake its branch?

CLOSURE:

(5min)

Recapitulation of the concept by asking them:

Why do we jerk wet clothes before spreading them on string?

- Proposed Questions (must include the questions asked in the classroom <u>and</u> the ones given as class-work in the notebook) ⇒ Define inertia of rest. ⇒ Define inertia of motion. ⇒ Why do we jerk wet clothes before spreading them on string? ⇒ It is dangerous to jump out of a moving bus. Why? ⇒ A bowler tends to run from a long distance before he bowls from the take off line. Which inertia is acting there? ⇒ Why are seatbelts provided in automobiles and airplanes?
Evaluation/Assessment: Oral Questionnaire Define inertia. Differentiate between inertia of rest, motion with the help of different examples.
DIFFERENTIATED CLASSROOM

Learners on the way	Advanced Learners
➤ A bowler tends to run from a long distance before he bowls from the take off line. Which inertia is acting there?	➤ It is dangerous to jump out of a moving bus. Why?
Materials needed/Resources: Chalk, duster, NCERT, blackboard, notebook, daily life examples	
Common Misconceptions: Students get confused in different examples that which situation is for “inertia of rest” and “inertia of motion”	Addressing the misconceptions: Student will be explained that the original state of body which represents which kind of inertia it will be having.

Home assignments:

Why are seatbelts provided in automobiles and airplanes?



LESSON PLAN 4 [2019 - 2020]

Teacher Name	Class	Subject	Time slot	Date	Lesson	Topic
	IX	Physics	35 min	July 2019	Force & law of motion.	Inertia Of direction and law of inertia
Expected Learning Outcome: Students will be able to ⇒ Define of inertia of direction. ⇒ Explain the various daily life examples of inertia of direction. ⇒ Interpret the various experiments of Galileo's & hence infer the law of motion.						
Expected skill development: Comprehension, explanation, interpretation, inferential						

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

WARM UP AND INTRODUCTION

Will review the previous knowledge with the following question.

- ⇒ What is inertia of rest?
- ⇒ What is inertia of motion?
- ⇒ How can you infer which type of inertia is acting there in any situation?
- ⇒ What do you mean by internal and external force?

CONTENT (Activity and discussion method)

(20 min)

- ⇒ Define inertia of direction.
- ⇒ Explanation of following examples for inertia of direction:
 - (d) Passenger sitting inside a bus/car is thrown outwards when the bus/car takes a sharp turn.
 - (e) A stone tied to the finger with the help of string, moves in a straight line when the string suddenly breaks while whirling it.
- ⇒ Students will be asked to observe the change in the motion of marble/ball when
 - (i) it is moved on flat surface
 - (ii) it is moved on an inclined plane.

(d) In downward direction.

(e) In upward direction.

⇒ Define law of inertia of Galileo.

THINK-LINE: Name the property of bodies due to which they resist change in their state of rest or state of rest or state of uniform motion along a straight line.

CLOSURE:

(5min)

1. Why is it advised to tie any luggage kept on the roof of a bus with a rope?

- Proposed Questions (must include the questions asked in the classroom <u>and</u> the ones given as class-work in the notebook) ➤ Define inertia of direction. ➤ Define law of inertia of Galileo. ➤ Why the ball is getting stopped on its own, on flat surface? ➤ What will be the observation if the surface is frictionless? ➤ When a vehicle passes through the collected water during rainy season the water always moves outwards. Justify it.
Evaluation/Assessment: Written assignment Why does a person tend to fall forward when a bus stops suddenly.
DIFFERENTIATED CLASSROOM

Learners on the way	Advanced Learners
➤ Why the ball is getting stopped on its own, on flat surface? ➤ What will be the observation if the surface is frictionless?	➤ When a vehicle passes through the collected water during rainy season the water always moves outwards. Justify it.
Materials needed/Resources: Chalk, duster, NCERT, blackboard, notebook, daily life examples, inclined planes(drawing boards), marbles.	
Common Misconceptions: Law of inertia is same as inertia of rest, motion and direction.	Addressing the misconceptions: By making them understand through demonstrations that it has nothing to do with the tendency to resist.

Home assignments:

1. When a car rounds a curve suddenly, the person inside is pushed outwards. Why?
2. It is easier to push an empty box than to push the box full of books. Why?



LESSON PLAN 5 [2019 - 2020]

Teacher Name	Class	Subject	Time slot	Date	Lesson	Topic
	IX	Physics	35 min	July 2019	Force & laws of motion.	Newton's 1 st law of motion
Expected Learning Outcome: Students will be able to ⇒ Define Newton's 1st law of motion. ⇒ Define linear momentum along with its expression & plot the graphs related to it.						
Expected skill development: Comprehension, interpretation.						

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

WARM UP AND INTRODUCTION

Will review the previous knowledge with the following question.

- ⇒ What is inertia of direction?
- ⇒ What is law of inertia?
- ⇒ Give 1 example for inertia of direction.

CONTENT (Discussion and questionnaire method)

(20 min)

- ⇒ Define Newton's 1st law of motion (which is nothing but the Galileo's law of inertia).
- ⇒ Define linear momentum
- ⇒ Its expression as $p=mv$
- ⇒ Its SI unit as kg m/s & nature of quantity.
- ⇒ Students will be explained the general graphs for directly and inversely proportional relationship between any two quantities.
- ⇒ Following graphs will be drawn one by one after discussing with them:
 - a) p vs m
 - b) p vs v
 - c) m vs v

Think-LINE: A ball is thrown vertically upwards. What is its momentum at the highest point?

CLOSURE:

(5min)

What is the momentum of an object of mass m , moving with a velocity v ?

- Proposed Questions (must include the questions asked in the classroom <u>and</u> the ones given as class-work in the notebook) ➤ What do we mean when we say (in terms of directly and inversely proportional) (i) $X \propto Y$ (ii) $X \propto 1/Y$ ➤ Give 1eg in which we can see that impact produced by a moving body depends on mass and velocity. ➤ Draw the following graphs: - momentum vs mass - momentum vs velocity - mass vs velocity
Evaluation/Assessment: Written assignment State Newton's first laws. Why is it called as law of inertia?
DIFFERENTIATED CLASSROOM

Learners on the way ➤ What do we mean when we say (iii) $X \propto Y$ (iv) $X \propto 1/Y$	Advanced Learners Give 1eg in which we can see that impact produced by a moving body depends on mass and velocity.
Materials needed/Resources: Chalk, duster, NCERT, daily life examples,	
Common Misconceptions: Momentum is equivalent to motion or movement understanding the relationship between p & v or m & v	Addressing the misconceptions: It is defined as potential to move.

Home assignments: A batsman hits a cricket ball which then rolls on a level ground. After covering a short distance, the ball comes to rest. The ball slows to a stop because-

(a) The batsman did not hit the ball hard enough, (b) Velocity is proportional to the force exerted on the ball, (c) There is a force on the ball opposing the motion, (d) there is no unbalanced force on the ball, so the ball would want to come to rest

LESSON PLAN 6 [2019 - 2020]



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Teacher Name	Class	Subject	Time slot	Date	Lesson	Topic
	IX	Physics	35 min	July 2019	Force & law of motion.	Newton's 2nd law of motion and 3 rd law of motion. Impulse

Expected Learning Outcome:

Students will be able to

- ⇒ Define Newton's 2nd law of motion
- ⇒ Derive the expression $F=ma$ from the 2nd law of motion.

Expected skill development:

Comprehension, derivation, observation, interpretation.

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

WARM UP AND INTRODUCTION

Will review the previous knowledge with the following question.

- ⇒ What is linear momentum?
- ⇒ What is 1st law of motion?
- ⇒ What are the factors on which linear momentum of a body depends?

CONTENT (Discussion and questionnaire, Demonstration method)

(20 min)

- ⇒ Students will be called to perform 2 activities in front of entire class & the class has to observe it.

Activity 1 : The teacher's chair is dragged slowly from one point to another within 10s

Activity2: the teacher's chair is dragged suddenly between the two same points within 1 second.

Then, students will be asked to compare the magnitude of forces applied in 2 activities.

- ⇒ On the basis of it, state Newton's 2nd law of motion
 $F \propto \text{change in momentum/time}$

- ⇒ Derivation of $f=ma$

$$F \propto p_f - p_i/t$$

$$F = k(p_f - p_i)/t$$

$$F = (mv - mu)/t \Rightarrow F = ma$$

Define impulse.

State Newton's third law of motion.

Some examples of third law (a) Walking (b) Swimming (c) Recoiling of the gun (d) man and boat (e) Flying of rockets (f) Hose pipes

THINK-LINE: Two identical bullets are fired one by a light rifle and another by a heavy rifle with the same force. Which rifle will hurt the shoulder more and why?

CLOSURE:

(5min)

State Newton's second and third law of motion.

- Proposed Questions (must include the questions asked in the classroom and the ones given as class-work in the notebook)
 - In which of the 2 activities force used will be more?
 - Define 1N using Newton's 2nd law of motion.
 - Show that force acting on a body is directly proportional to acceleration using Newton's 2nd law of motion.

- Evaluation/Assessment: Oral questionnaire
Is momentum a scalar or vector quantity?

DIFFERENTIATED CLASSROOM

Learners on the way	Advanced Learners
➤ In which of the 2 activities force used will be more? (Done in the class)	➤ Define 1N using Newton's 2 nd law of motion.
Materials needed/Resources:	
Chalk, duster, NCERT , chair ,2students as volunteers	
Common Misconceptions: Students get confused that impulse & 2 nd law of motion is exactly the same	Addressing the misconceptions: By telling them that 2 nd law gives the magnitude of force applied whereas impulse gives the effect of force applied for shorter time.

Home assignments

1. Show that force acting on a body is directly proportional to acceleration using Newton's 2nd law of motion.
2. Explain some examples of Newton's third law of motion.

(a) Walking (b) Swimming (c) Recoiling of the gun (d) man and boat (e) Flying of rockets (f) Hose pipes

LESSON PLAN 7 [2019 - 2020]



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Teacher Name	Class	Subject	Time slot	Date	Lesson	Topic
	IX	Physics	35 min	July 2019	Force & laws of motion.	Numerical on 2 nd law & linear momentum. Impulse

Expected Learning Outcome:

Students will be able to

- ⇒ Comprehend analyze and evaluate the numerical related to Newton's 2nd law of motion & linear momentum.

Expected skill development:

Comprehension, computation, analytical, evaluation, problem solving.

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

WARM UP AND INTRODUCTION

Will review the previous knowledge with the following question.

- ⇒ Define Newton's 2nd law of motion?
- ⇒ What is the expression deduced through Newton's 2nd law?
- ⇒ What is the expression for linear momentum?

CONTENT (Discussion method) Individual attention.

(20 min)

The following numerical will be done one by one on the blackboard by the students:

- ⇒ What is the momentum of a man of mass 75 kg, when he walks with a uniform velocity of 2m/s?
- ⇒ Calculate the force required to impart to a car a velocity of 30m/s in 10s. mass of the cars 1500kg.
- ⇒ A driver accelerates his car first at the rate of 1.8m/s^2 and then at the rate of 1.2m/s^2 . calculate the ratio of force exerted by the engine.
- ⇒ A car of mass 2400kg moving with a velocity of 20m/s is stopped in 10s on applying brakes. Calculate the retardation.
- ⇒ Two blocks made up of different metals acted upon by equal forces which cause them to slide on a horizontal surface. The acceleration of 2nd block is 5 times that of first, what is the ratio of the mass of the 2nd to that the 1st block.

CLOSURE:

(5min)

A truck starts from rest and rolls down a hill with a constant acceleration. It travels a distance of 400m in 20s. Find the acceleration. Find the force acting on it if its mass is 7 metric tonnes (1metric tonne=1000Kg)

- Proposed Questions (must include the questions asked in the classroom <u>and</u> the ones given as class-work in the notebook) ➤ Define Newton's 2nd law of motion? ➤ What is the expression deduced through Newton's 2nd law? ➤ What is the expression for linear momentum? ➤ Which would require a greater force –accelerating a 1kg mass at 10m/s^2 or a 2kg mass at 4m/s^2? ➤ A cricket ball of mass 70kg moving with a velocity of 5m/s is stopped in 5s. Calculate the force required to stop it? - Evaluation/Assessment: Derive an expression for force with the help of Newton's second law.
DIFFERENTIATED CLASSROOM

Learners on the way ➤ Which would require a greater force – accelerating a 1kg mass at 10m/s^2 or a 2kg mass at 4m/s^2?	Advanced Learners A man pushes a box of mass 50kg with a force of 30N, what will be an acceleration of box due to this force? What would be acceleration if mass is halved?
Materials needed/Resources: Chalk, duster, NCERT.	
Common Misconceptions: Students get confused in converting the units given into their S.I units.	Addressing the misconceptions: grams $\times 1/1000 = \text{kg}$ $\text{cm/s} \times 1/100 = \text{m/s}$

Home assignments:

- A cricket ball of mass 70kg moving with a velocity of 5m/s is stopped in 5s. Calculate the force required to stop it?
- A stone of 1Kg is thrown with a velocity of 20m/s across the frozen surface of a lake and comes to rest after travelling a distance of 50m. What is the force of friction between the stone and the ice?

**LESSON PLAN 8 [2019 - 2020]**

Teacher Name	Class	Subject	Time slot	Date	Lesson	Topic
	IX	Physics	35 min	August 2019	Force & laws of motion.	Numerical on 2 nd law & momentum(continued)

Expected Learning Outcome:

Students will be able to

- ⇒ Comprehend analyze and evaluate the numerical related to Newton's 2nd law of motion and linear momentum

Expected skill development:

Comprehension, computation, analytical, evaluation.

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

WARM UP AND INTRODUCTION

Will review the previous knowledge with the following question.

- ⇒ What is 1st equation of motion?
- ⇒ What is the 2nd equation of motion?
- ⇒ What is the 3rd equation of motion?
- ⇒ What is the slope of a v-t graph?
- ⇒ What is the area of a v-t graph denotes?

CONTENT (Demonstration by students and discussion method)

(20 min)

The following numerical will be solved one by one on the blackboard by the students:

- ⇒ For how much time should the force of 400N be exerted on a body of mass 8 kg to increase its velocity from 150m/s to 300m/s?
- ⇒ A body of mass 4 kg is moving with a uniform velocity of 5m/s it is acted upon by a force of N. What will be its velocity after 1s?
- ⇒ The velocity time graph of a car is shown. the car weighs 1000kg
 - (a) What is the distance travelled by the car in the 1st two seconds?
 - (b) What is the braking force applied at the end of 5s to bring the car to a stop within one second.

CLOSURE:

(5min)

1. A bullet of mass 10g travelling horizontally with a velocity of 150m/s strikes a

stationary wooden block and comes to rest in 0.03s. Calculate the distance of penetration of the bullet into the block. Also, calculate the magnitude of the force exerted by the wooden block on the bullet.

- Proposed Questions (must include the questions asked in the classroom and the ones given as class-work in the notebook)
 - ⇒ What is 1st equation of motion?
 - ⇒ What is the 2nd equation of motion?
 - ⇒ What is the 3rd equation of motion?
 - ⇒ What is the slope of a v-t graph?
 - ⇒ What is the area of a v-t graph denotes?

- Evaluation/Assessment: What is the relation between momentum and force?

DIFFERENTIATED CLASSROOM

Learners on the way	Advanced Learners
➤ Calculate the change in momentum of a car of mass 1000kg when its speed increases from 36km/h to 108km/h uniformly.	A large truck and a car, both, moving with a velocity of magnitude v, have a head on collision and both of them come to a halt after that. If the collision lasts for 1s: (a) Which vehicle experiences the greater force of impact? (b) Which vehicle experiences the greater change in momentum?
Materials needed/Resources: Chalk, duster, NCERT.	
Common Misconceptions: Students get confused that how to relate the slope and area concept of graphs to concept of linear momentum and 2nd law.	Addressing the misconceptions: By doing numerical relating to slope & area concept of graphs with linear momentum & 2nd law.

Home assignments:

- A hammer of mass 500g, moving at 50m/s, strikes a nail. The nail stops the hammer in a very short time of 0.01s. What is the force of the nail on the hammer?
- A motor of mass 1200Kg is moving along a straight line with a uniform velocity of 90km/hr. Its velocity is slowed down to 18km/hr in 4s by an unbalanced external force. Calculate the acceleration and change in momentum. Also, calculate the magnitude of the force required.

LESSON PLAN 9 [2019 - 2020]



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Teacher Name	Class	Subject	Time slot	Date	Lesson	Topic
	IX	Physics	35 min	August 2019	Force & laws of motion.	Solving NCERT numerical
Expected Learning Outcome: Students will be able to ⇒ Comprehend analyze and evaluate the numerical given in NCERT Textbook						
Expected skill development: Comprehension, computation.						

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

WARM UP AND INTRODUCTION

Will review the previous knowledge with the following question.

- ⇒ What is the expression for Newton's 2nd law?
- ⇒ What is linear momentum & its expression?
- ⇒ What are the 3 equation of motion & in which situation do we use which equation.

CONTENT (Demonstration by students and Discussion method)

(20 min)

The following numerical will be solved one by one on the blackboard by the students:

- ⇒ A 8000 kg engine pulls a train of 5 wagons each of 200kg, along a horizontal track. If the engine exerts a force of 40000N and the track offers a friction force of 5000N , then calculate:
 - (a) Net accelerating force
 - (b) Acceleration of the train
 - (c) Force of wagon 1 on wagon 2.
- ⇒ A bullet of mass 10kg travelling horizontally with a velocity of 15m/s strikes a stationary wooden block and comes to rest in 0.03s. Calculate the distance of penetration of the bullet into the block. Also calculate the magnitude of force exerted.
- ⇒ A stone of 1kg is thrown with a velocity of 20 m/s across the frozen surface of a lake and come to rest after travelling a distance of m. What is the frictional force?

Using a horizontal force of 200N, we intend to move a wooden cabinet across a floor at a constant velocity. What is the frictional force that will be exerted on the cabinet?

- 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 Newton's 2nd law? ➤ What is linear momentum & its expression? ➤ What are the 3 equation of motion & in which situation do we use which equation?
Evaluation/Assessment: State Newton's second and third laws of motion.
DIFFERENTIATED CLASSROOM

Learners on the way ➤ An automatic vehicle has a mass of 1500kg. What must be the force between the vehicle and road if the vehicle is stopped with negative acceleration of 1.7m/s^2	Advanced Learners How much momentum will a dumb bell of mass 10kg transfer to the floor if it falls from a height of 80cm?
Materials needed/Resources: Chalk, duster, NCERT Book	
Common Misconceptions: Students sometimes get confused with a language/comprehension part of numerical.	Addressing the misconceptions: Students will comprehend the numerical themselves in the classroom & will be helped by the peers when required.

Home assignments:

An automobile vehicle has a mass of 1500Kg. What must be the force between the vehicle and road if the vehicle is to be stopped with a negative acceleration of 1.7m/s^2 ?



LESSON PLAN 10 [2019- 2020]

Teacher Name	Class	Subject	Time slot	Date	Lesson	Topic
	IX	Physics	35 min	August 2019	Force & laws of motion.	Law of conservation of linear momentum & its equation.
Expected Learning Outcome: Students will be able to						
⇒ State Law of conservation of linear momentum						
⇒ Write the 2 equation for 2 situations in case of collision						
⇒ Comprehend and write the equation for recoiling of the gun case.						
Expected skill development: Comprehension, derivation.						

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

WARM UP AND INTRODUCTION

Will review the previous knowledge with the following question.

- ⇒ What is linear momentum?
- ⇒ What is the expression for linear momentum?
- ⇒ What is the law of conservation of energy?

CONTENT (Discussion method)

(20 min)

- ⇒ Define law of conservation of linear momentum.
- ⇒ Expression for law of conservation of linear momentum.
Total linear momentum = total linear momentum
Before collision after collision.
- ⇒ Explanation of equations of law of conservation of linear momentum in the following cases of collision:

1. When the 2 bodies split and start moving with different velocities after the collision

$$m_1 u_1 + m_2 u_2 = m_1 v_1 + m_2 v_2$$

2. When the 2 bodies stick to each other and start moving with a common velocity after the collision

$$m_1 u_1 + m_2 u_2 = (m_1 + m_2) v$$

⇒ Explanation of the concept of recoiling of gun

Total linear momentum of gun and Bullet before collision = total linear momentum of gun and bullet after collision.

CLOSURE:

(5min)

Explain recoiling of the gun with the help of conservation of momentum.

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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)<ul style="list-style-type: none">➤ State law of conservation of linear momentum?➤ Describe the recoiling of gun in terms of law of conservation of linear momentum using equation.➤ A body at rest explodes into pieces which fly away in all directions. What is the total momentum of all the pieces immediately after explosion?➤ Deduce the law of conservation of linear momentum using Newton's 2nd law of motion• Evaluation/Assessment: Deduce the law of conservation of linear momentum using Newton's 2nd law of motion |
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DIFFERENTIATED CLASSROOM

Learners on the way A body at rest explodes into pieces which fly away in all directions. What is the total momentum of all the pieces immediately after explosion?	Advanced Learners Deduce the law of conservation of linear momentum using Newton's 2nd law of motion
Materials needed/Resources: Chalk, duster, NCERT	
Common Misconceptions: Students get confused regarding the concept of recoiling of gun that is its application for Newton's 3rd law also.	Addressing the misconceptions: They will be realized with this fact that when we talk in terms of force, Newton's 3rd law is applicable there & when in terms of momentum, law of conservation will work.

Home assignments:

Describe the recoiling of gun in terms of law of conservation of linear momentum using equation.

**LESSON PLAN 11 [2019 - 2020]**

Teacher Name	Class	Subject	Time slot	Date	Lesson	Topic
	IX	Physics	35 min	August 2019	Force & laws of motion.	Numerical on law conservation of linear momentum.
Expected Learning Outcome: Students will be able to ⇒ Comprehend and calculate the various numerical related to law conservation of linear momentum.						
Expected skill development: Comprehension, computation.						

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

WARM UP AND INTRODUCTION

Will review the previous knowledge with the following question.

What is the equation for 2 bodies such that they are

- ⇒ First moving with velocities u_1 & u_2 & after collision moving with v_1 & v_2 ?
- ⇒ First body moving with u_1 & 2nd body at rest and after collision both moving together as a single body.

CONTENT (Discussion method)

(20 min)

The following numerical will be solved one by one on the blackboard by the students:

- ⇒ A bullet of mass 10 kg is moving with the velocity of 400m/s gets embedded in a freely suspended wooden block of mass 900g. What is the velocity acquired by the block?
- ⇒ A rifle of mass 3kg fires a bullet of mass 0.03 kg. The bullet leaves the barrel of the rifle at a velocity of 100m/s .If the bullet takes 0.003 s to move through the barrel, calculate the force experienced by the rifle due to its recoils?
- ⇒ A bullet of mass 5 kg on hitting a sand bag suspended in air gets embedded in it. If the velocity of the bullet be 900m/s just before it hits the bag , find out the speed with which the sand bag will move due to the impact of the bullet. The mass of the sand bag is 50kg.

CLOSURE:

(5min)

Two objects of masses 100gm and 200gm are moving along, the same line in the

same direction with velocities of 2m/s and 1m/s respectively. They collide and after the collision, the first object moves at a velocity of 1.67m/s in the same direction. Determine the velocity of the second object

- 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 equation for 2 bodies such that they are ⇒ First moving with velocities u_1 & u_2 & after collision moving with v_1 & v_2? ⇒ First body moving with u_1 & 2nd body at rest and after collision both moving together as a single body. - Evaluation/Assessment: Written assignment State law of conservation of momentum.
DIFFERENTIATED CLASSROOM

Learners on the way	Advanced Learners
➤ A body of mass 7kg, initially moving with a velocity of 10m/s collides with another body of mass 5 kg at rest. After collision velocity of 1st body is 1m/s .find the velocity of 2nd body.	A bullet of mass 20kg is fired with a velocity of 150m/s from a gun of mass 2kg.What is the recoil velocity of gun?
Materials needed/Resources: Chalk, duster, NCERT.	
Common Misconceptions: Student get confused in recognizing u_1, u_2, v_1, v_2 & V	Addressing the misconceptions: By giving them a lot of situational problems & letting them to recognizing the parameter themselves.

Home assignments:

A bullet of mass 10g is fired at a speed of 400m/s from a gun of mass 4 kg. What is recoils velocity of gun?

**LESSON PLAN 12 [2019 - 2020]**

Teacher Name	Class	Subject	Time slot	Date	Lesson	Topic
	IX	Physics	35 min	August 2019	Force & laws of motion.	NCERT numerical on conservation of linear momentum.
Expected Learning Outcome: Students will be able to						
⇒ Comprehend and solve step by step each numerical related to law of conservation of linear momentum in back question of NCERT						
Expected skill development: Comprehension, computation.						

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

WARM UP AND INTRODUCTION

Will review the previous knowledge with the following question.

- ⇒ What is the equation for 2 bodies first moving with velocities u_1 & u_2 & after collision moving with v_1 & v_2 ?
- ⇒ What is the equation for 2 bodies, which first moving with different velocity u_1 & u_2 after collision moving as a single body with velocity v ?

CONTENT (discussion method)

(20 min)

The following numerical will be solved one by one on the blackboard by the students:

- ⇒ Two bodies each of mass 1.5 kg are moving in the straight line but in opposite direction. The velocity of each object is 2.5m/s before the collision during which they stick together. What will be the velocity of the combined object after collision.
- ⇒ An object of mass 1kg travelling in a straight line with a velocity of 10m/s collides with, and sticks to a stationary wooden block of mass 5kg. then they both move off together in the same straight line. Calculate the total momentum just before the impact and just after the impact. Also calculate the velocity of the combined object.

CLOSURE:

(5min)

A hockey ball of mass 200g travelling at 10m/s is struck by a hockey stick so as to return it along its original path with a velocity of 5m/s. Calculate the change in momentum of the hockey ball by the force applied by the hockey stick.

- 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 equation for 2 bodies first moving with velocities u_1 & u_2 & after collision moving with v_1 & v_2? ⇒ What is the equation for 2 bodies, which first moving with different velocity u_1 & u_2 after collision moving as a single body with velocity v?
Evaluation/Assessment: Written assignment What is the total linear momentum of a bullet and the gun on firing?
DIFFERENTIATED CLASSROOM

Learners on the way	Advanced Learners
➤ An object of mass 100kg is accelerated uniformly from a velocity of 5 m/s to 8m/s in 6s. Calculate the initial & final momentum of the object. Also find the force exerted.	How much momentum will a dumb bell of mass 10kg transfer to the floor if it falls from a height of 80cm?
Materials needed/Resources: Chalk, duster, NCERT book	
Common Misconceptions: Students get confused which equation will be used in which type of situation of collision	Addressing the misconceptions: By giving them numerical of each of the 3 types to comprehend & solve themselves.

Home assignment

1. Which principle is involved in the working of a jet plane?
2. In collision between a heavier body and a lighter body, which body experiences grater force?