LESSON PLAN CLASS 11

SUBJECT--PHYSICS

TERM --1

TOPIC—DIMENSIONAL ANALYSIS AND ERROR ANALYSIS

MONTH--AUGUST

LEARNING OBJECTIVES

#The students will understand

. how to write the dimensional formula of physical quantities

. uses of dimensional formula

. to calculate the error by different formula

.apply the knowledge of error analysis and dimensional analysis in other physics concepts

PREVIOUS KNOWLEDGE TESTING

#According to their previous knowledge students will be asked some basic questions about physical quantities like

.what is the formula of area ,volume ,density,velocity,acceleration?

.how can they calculate the percentage of their marks?

VOCABULARY

DIMENSIONAL,ERROR,RELATIVE ERROR,ABSOLUTE ERROR ,PERCENTAGE ERROR

PROCEDURE/LINKS

#The students will be explained about the following in online classes through shiksha modules and diksha app

#The topics which will be explained are

.To derive the dimensional formula

.To calculate the errors by the methods which will be explained with the help of the following links

Dimensional analysis 1. If the units of energy, force and velocity are 50 J, 5 N and 2m/ s, what will be unit of mass, length and time?

2. The units of power, force and time are 1 kW, 1kN and 1 milli second. Find the unit of mass and length

. 3. What will be the value of G in CGS units if in SI units it is $6.67 \times 10^{-11}\ m^3\ kg^{-1}\ s^{-2}$

4. What will be the dimensions of a/b in the relation $E= b-x^2 / at$, where E is energy, x is distance and t is time.

5. In the relation $h= 2T\cos\alpha / r2\rho g$, where h is the height, T is surface tension ρ is density and r is the radius of a capillary tube, α is angle of contact and g is acceleration due to gravity. Verify the correctness of the equation

. 6. Give one example each of physical quantities which have SI unit but no dimensions, which neither have unit nor dimension.

7. Acceleration due to gravity is $10 m/s^2$. Determine its value in $cm/minutes^2$

. 8. If the units of force and length, each are doubled then how many times the unit of energy, Surface tension and stress be affected?

9. If velocity, density and frequency are taken as fundamental quantities, what will be the dimensions of linear momentum and surface tension

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LEARNING OUTCOMES

The students will

. understand how to find the formula of physical quantities

.to relate the dimensional formula with SI units

.to calculate error in the experiments from the given data

ASSESSMENT

#WILL BE DONE THROUGH

. GOOGLE APP

. FUTURISTIC APP DESIGNED FOR SCHOOL

ASSIGNMENT

Error Analysis

1. If P= c3 b 2 / cd, and percentage error in c, b,d are 1%,2 % and 3 % respectively, calculate the % error in P. 2. A force of (2500+-5) is applied over an area of (0.32+-0.02) m2 . Calculate the error in the measurement of pressure.

3. . To find the value of g, the following measurements were made- length l of thread l= 100 +- 0.2) cm and time period of oscillation t= (2+- 0.1) s. Find the % error in the measurement of g.

4. If two resistors of resistance R1 = (5 ± 0.2) Ω and R2 = (10 ± 0.5) Ω are connected, (i) in series; (2) in parallel. Find the equivalent resistor in each case in terms of % error.

5. The force acting on an object of mass m travelling at velocity v in a circle of radius r is F= mv2 /r. The measurements recorded as m m = 3.5kg ± 0.1kg v= 20m / s ±1m / s r =12.5m ± 0.5m Find the maximum possible fractional and percentage error in the measurement of force.

6. A student performed an experiment and found following values of the refractive index of a liquid: 1.29, 1.33, 1.34, 1.35, 1.32, 1.36, 1.30, 1.33 Find the mean value of refractive index, the mean absolute error, the relative error and the percentage error

. 7. For the estimation of Young's modulus=4Mg/πd2 .L/1 For the specimen of wire, following observations were recorded: L=2.890, M=3.00,d=0.082, g=9.81, l=0.087. Calculate the maximum percentage error in the value of Y and mention which physical quantity causes maximum error

. 8. Give the number of significant digits in each of the following measurements: a) 1278.50 b) 7. 8.002 c) 13. 43.050 d) 2. 120000 e) 8. 823.012 f) 3. 90027.00 g) 0.0053567 h) 542000. i) 0.00730

9. Perform the following operations giving the proper number of significant figures in the answer: a) 25. 23.4 x 14 b) 28. 0.005 - 0.0007 c) 26. 7.895 + 3.4 d) 29. 7.895 ÷ 34 e) 27. 0.0945 x 1.47 f) 30. 0.2 / 0.0005

TOPIC –MOTION IN ONE DIMENSION / MOTION IN STRAIGHT LINE

MONTH –APRIL AND MAY

LEARNING OUTCOMES

#The students will understand the following subtopics

.uniform motion

.uniformly accelerated motion

#will be able to differentiate between the above two types of motions

#will apply the equation of motion in solving the problems

#will understand the concept of relative velocity.

VOCABULARY

#velocity, acceleration, relative velocity, equation of motion

PROCEDURE/EXPLANATION

The students will be explained the equation of moton in online class through ZOOM APP.

1) rate of change of velocity = acceleration.

Let v be the velocity and a is acceleration. Then mathematically $\frac{dv}{dt} = a$

$$dv = a\,dt$$

$$\int_u^v dv = \int_0^t a\,dt$$

$$v - u = a\,t \text{ : where } u \text{ is initial velocity and } v \text{ is final velocity}$$

$$\text{hence } v = u + a\,t$$

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(2) rate of displacement = velocity

$$\frac{ds}{dt} = v$$

mathematically

where ds is a small displacement in time dt

$$ds = v\,dt = (u + a\,t)\,dt = u\,dt + a\,t\,dt$$

$$\int_0^s ds = \int_0^t u\,dt + \int_0^t a\,t\,dt$$

$$s = u\,t + \frac{1}{2}a\,t^2$$

Other topics

Like relative velocity, instantaneous velocity,average speed and velocity will also be explained in online class THROUGH ZOOM APP

LEARNING OUTCOMES

The students will understand the concept of relative velocity
Will be able to use calculus in deriving equation of motion
Calculate the numericlas from the given data
Apply it his daily life the concept of uniform motion and accelerated motion

LINKS AND RESOURCES

NCERT BOOKS THROUGH DIKSHA APP
MODULES OF SHIKSHA APP

ASSESSMENT

Will be done through

GOOGLE FORM
FUTURISTIC APP DEVELOPED FOR THE SCHOOL

ASSIGNMENT WILL BE GIVEN TO STUDENTS THROUGH WHATSAPP

PHYSICS ASSIGNMENT CLASS – XI

MOTION IN A STRAIGHT LINE

1. Delhi is at a distance of 200 km from Ambala. A set out from Ambala at a speed of 30 Km/h and B sets out at the same time from Delhi at a speed of 20 km/h. When will they meet each other?
2. Two trains 121m and 99m in length are running in opposite directions with velocities 40 km/h and 32 km/h. In what time will they completely cross each other?
3. Draw velocity-time graphs for uniformly accelerated motion in the following cases: i. u= +ve , a= +ve ii. u= +ve, a= -ve iii. u= -ve , a = +ve
4. Two particles begin to fall freely from rest from the top of a tower within a gap of 1 s. How long after the first particle begins to fall, the two particles be 15 m apart?
5. A particle is thrown upwards. It attains a height h after 5s and again after 9 s. What is the speed of the particle at the height h?
6. A 100 m sprinter uniformly increases his speed from rest at the rate of 1 m/s2 up to 3/4th of the total run and the covers the balance ¼ th run with

uniform speed. How much time does he take to complete the race? 7. A particle is moving along a straight line and its position is given by the relation x = (t3 – 6t2 - 15t + 40) m, the find: a. The time at which its velocity is zero b. The position and the displacement of the particle at that point c. The acceleration of the particle at that time

8. A football is kicked vertically upward from the ground and a girl gazing out of the window sees it moving upwards past her at 5 m/s. The window is 15 m above the ground. Find: a. How high does the football go above ground? b. How much time does it take to go from the ground to its highest point?

9. A police van moving on a highway with a speed of 30 km/h fires a bullet at a thief's car speeding away in the same direction with a speed of 192 km/h, if the muzzle speed of the bullet is 150m/s, with what speed does the bullet hit the thief's car.

10. On a two lane road, car A is travelling with a speed of 36 km/h. Two cars B and C approach car A in opposite directions with a speed of 54km/h each. At a certain instant, when the distance AB is equal to distance AC both being 1 km, B decides to overtake A before C does. What minimum acceleration of car B is required to avoid an accident?

TOPIC---PROJECTILE MOTION AND VECTORS
MONTH –MAY AND JULY

LEARNING OBJECTIVES

#Students will understand the vectors and their application in physics
#Projectile motion as two dimensional motion
#Addition and subtraction of vectors
#scalar and vector products
#Uniform circular motion

PREVIOUS KNOWLEDGE TESTING

SOME QUESTIONS WILL BE ASKED LIKE
What is the difference between scalar and vector quantities?
Are vectors can be added algebraically or not?

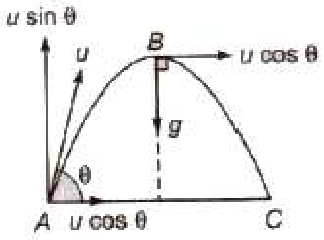
VOCABULARY

TWO DIMENSION,SCALAR,VECTOR,TRIANGLE LAW AND PARALLELOGRAM LAW OF VECTOR ADDITION,RESOLUTION, PROJECTILE, TRAJECTORY

PROCEDURE/INNOVATIVE IDEAS

Projectile Motion

When any object is thrown from horizontal at an angle θ except 90°, then the path followed by it is called *trajectory*, the object is called projectile and its motion is called projectile motion.
If any object is thrown with velocity u, making an angle θ, from horizontal, then



- ***Horizontal component of initial velocity = u cos θ.***
- ***Vertical component of initial velocity = u sin θ.***
- ***Horizontal component of velocity (u cos θ) remains same during the whole journey as no acceleration is acting horizontally.***

- *Vertical component of velocity (u sin θ) decreases gradually and becomes zero at highest point of the path.*
- *At highest point, the velocity of the body is u cos θ in horizontal direction and the angle between the velocity and acceleration is 90°.*

Important Points & Formulae of Projectile Motion

1. *At highest point, the linear momentum is mu cos θ and the kinetic energy is $(1/2)m(u \cos\theta)^2$.*
2. *The horizontal displacement of the projectile after t seconds*
   $x = (u \cos\theta)t$
3. *The vertical displacement of the projectile after t seconds*
   $y = (u \sin\theta)\, t - (1/2)gt^2$
4. *Equation of the path of projectile*
   $$y = x \tan\theta - \frac{g}{2u^2 \cos^2\theta} x^2$$
5. *The path of a projectile is parabolic.*
6. *Kinetic energy at lowest point = $(1/2)\, mu^2$*
7. *Linear momentum at lowest point = mu*
8. *Acceleration of projectile is constant throughout the motion and it acts vertically downwards being equal to g.*
9. *Angular momentum of projectile = mu cos θ x h, where h denotes the height.*
10. *In case of angular projection, the angle between velocity and acceleration varies from $0° < \theta < 180°$.*
11. *The maximum height occurs when the projectile covers a horizontal distance equal to half of the horizontal range, i.e., R/2.*
12. *When the maximum range of projectile is R, then its maximum height is R/4.*

Time of flight It is defined as the total time for which the projectile remains in air.

$$T = \frac{2u \sin\theta}{g}$$

Maximum height **It is defined as the maximum vertical distance covered by projectile.**

$$H = \frac{u^2 \sin^2 \theta}{2g}$$

Horizontal range **It is defined as the maximum distance covered in horizontal distance.**

$$R = \frac{u^2 \sin 2\theta}{g}$$

Note

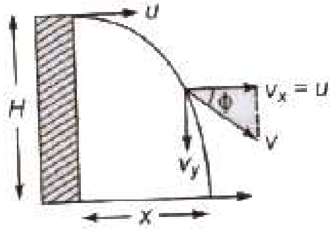
(i) Horizontal range is maximum when it is thrown at an angle of 45° from the horizontal

$$R_{max} = \frac{u^2}{g}$$

(ii) For angle of projections and (90°– 0) the hor izontal range is same.

Projectile Projected from Some Heights

1. When Projectile is Projected Horizontally



Initial velocity in vertical direction = 0

Time of flight T = √(2H/g)

Horizontal range x = uT = u √(2H/g)

Vertical velocity after t seconds

v_y = gt (u_y = 0)

Velocity of projectile after t seconds

$$v = \sqrt{v_x^2 + v_y^2} = \sqrt{u^2 + (gt)^2}$$

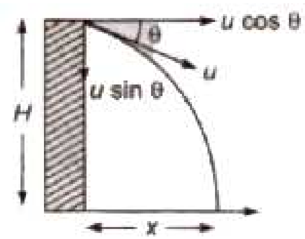
If velocity makes an angle ϕ, from horizontal, then

$$\tan \phi = \frac{v_y}{v_x} = \frac{gt}{u}$$

Equation of the path of the projectile

$$y = -\frac{g}{2u^2} x^2$$

2. When Projectile Projected Downward at an Angle with Horizontal



Initial velocity in horizontal direction = u cos θ

Initial velocity in vertical direction = u sin θ

Time of flight can be obtained from the equation,

$$H = u \sin \theta t + \frac{1}{2} g t^2$$

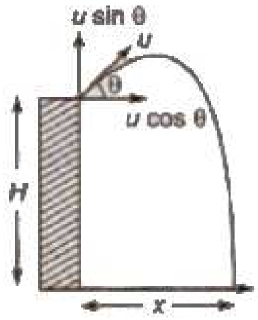
Horizontal range x = (u cos θ) t

Vertical velocity after t seconds

v_y = u sin θ + gt
Velocity of projectile after t seconds

$$v = \sqrt{v_x^2 + v_y^2} = \sqrt{(u \cos \theta)^2 + (u \sin \theta + gt)^2}$$
$$= \sqrt{u^2 + (gt)^2 + 2ugt \sin \theta}$$

3. When Projectile Projected Upward at an Angle with Horizontal



Initial velocity in horizontal direction = u cos θ

Initial velocity in vertical direction = u sin θ

Time of flight can be obtained from the equation

$$H = (-u\sin\theta)\,t + \frac{1}{2}gt^2$$

Horizontal range x = (u cos θ)t

Vertical velocity after t seconds, v_y = (- u sin θ) + gt
Velocity of projectile after t second

$$v = \sqrt{v_x^2 + v_y^2} = \sqrt{u^2 + (gt - u\sin\theta)^2}$$

$$= \sqrt{u^2 + (gt)^2 - 2ugt\sin\theta}$$

Time of flight $T = \dfrac{2u \sin(\alpha - \beta)}{g \cos\beta}$

Horizontal range $x = \dfrac{2u^2 \sin(\alpha - \beta) \cos\alpha}{g \cos\beta}$

Range on inclined plane

$$R = \frac{x}{\cos\beta} = \frac{2u^2 \sin(\alpha - \beta)\cos\alpha}{g \cos^2\beta}$$

Range on inclined plane will be maximum, when

$$\alpha = 45^\circ + \frac{\beta}{2}$$

$$R_{max} = \frac{u^2}{g(1 + \sin\beta)}$$

For angle of projections a and (90°– α + β), the range on inclined plane are same.

Circular Motion

Circular motion is the movement of an object in a circular path.

1. Uniform Circular Motion

If the magnitude of the velocity of the particle in circular motion remains constant, then it is called uniform circular motion.

2. Non-uniform Circular Motion

If the magnitude of the velocity of the body in circular motion is n constant, then it is called non-uniform circular motion.

Note **A special kind of circular motion is when an object rotates around itself. This can be called spinning motion.**

Variables in Circular Motion

(i) Angular Displacement **Angular displacement is the angle subtended by the position vector at the centre of the circular path.**
Angular displacement (□□) = (□S/r)

where □s is the linear displacement and r is the radius. Its unit is radian.

(ii) Angular Velocity **The time rate of change of angular displacement (□□) is called angular velocity.**
Angular velocity (□) = (□□/□t)

Angular velocity is a vector quantity and its unit is rad/s.

Relation between linear velocity (v) and angular velocity (□) is given by

v = r□

(iii) Angular Acceleration **The time rate of change of angular velocity (d□) is called angular acceleration.**

$$\text{Angular acceleration } (\alpha) = \frac{d\omega}{dt} = \frac{d^2\theta}{dt^2}$$

Its unit is rad/s^2 and dimensional formula is [T^{-2}].
Relation between linear acceleration (a) and angular acceleration (□).

a = r□

where, r = radius

Centripetal Acceleration
In circular motion, an acceleration acts on the body, whose direction is always towards the centre of the path. This acceleration is called centripetal acceleration.

Centripetal acceleration $a = \frac{v^2}{r} = r\omega^2$

Centripetal acceleration is also called radial acceleration as it acts along radius of circle.

Its unit is in m/s^2 and it is a vector quantity.

Centripetal Force

It is that force which complex a body to move in a circular path.

It is directed along radius of the circle towards its centre.

For circular motion a centripetal force is required, which is not a new force but any force present there can act as centripetal force.

Centripetal force $F = \frac{mv^2}{r} = mr\omega^2$

where, m = mass of the body, c = linear velocity,

ω = angular velocity and r = radius.

Work done by the centripetal force is zero because the centripetal force and displacement are at right angles to each other.

Examples of some incidents and the cause of centripetal force involved.

S.No.	*Incidents*	*Force providing Centripetal Force*
1	*Orbital motion of planets.*	*Gravitational force between planet and sun.*
2	*Orbital motion of electron.*	*Electrostatic force between electron and necleus.*
3	*Turning of vehicles at turn.*	*Frictional force acting between tyres of vehicle and road.*

4	*Motion of a stone in a circular path, tied with a string.*	*Tension in the string.*

Kinematical Equations in Circular Motion

Relations between different variables for an object executing circular motion are called kinematical equations in circular motion.

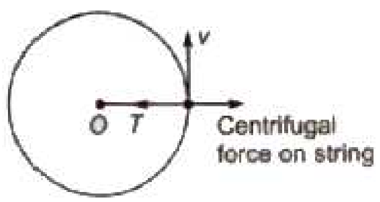
(i) $\omega = \omega_0 + \alpha t$ (ii) $\theta = \omega_0 t + \frac{1}{2}\alpha t^2$ (iii) $\omega^2 = \omega_0^2 + 2\alpha\theta$

where, ω_0 = initial angular velocity, ω = final angular velocity,
α = angular acceleration, θ = angular displacement and t = time.

Centrifugal Force

Centrifugal force is equal and opposite to centripetal force.
Under centrifugal force, body moves only along a straight line.

It appears when centripetal force ceases to exist.

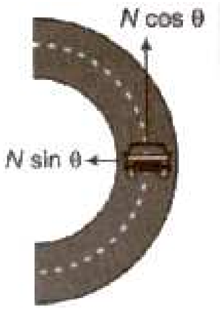


Centrifugal force does not act on the body in an inertial frame but arises as pseudo forces in non-inertial frames and need to be considered.

Turning at Roads

If centripetal force is obtained only by the force of friction between the tyres of the vehicle and road, then for a safe turn, the coefficient of friction (μ_s) between the road and tyres should be,

$$\mu_s \geq \frac{v^2}{rg} \quad \text{or} \quad v \leq \sqrt{\mu_s rg}$$



where, v = the velocity of the vehicle and r = radius of the circular path.

If centripetal force is obtained only by the banking of roads, then the speed (a) of the vehicle for a safe turn

$v = \sqrt{rg \tan θ}$

If speed of the vehicle is less than $\sqrt{rg \tan θ}$ than it will move inward (down) and r will decrease and if speed is more than $\sqrt{rg \tan θ}$, then it will move outward (up) and r will increase.

In normal life, the centripetal force is obtained by the friction force between the road and tyres as well as by the banking of the roads.

Therefore, the maximum permissible speed for the vehicle is much greater than the optimum value of the speed on a banked road. When centripetal force is obtained from friction force as well as banking of roads, then maximum safe value of speed of vehicle

$$v_{max} = \sqrt{\frac{rg(\tan\theta + \mu)}{(1 - \mu \tan\theta)}}$$

When a cyclist takes turn at road, he inclined himself from the vertical, slower down his speed and move on a circular path of larger radius.

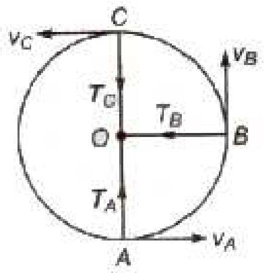
If a cyclist inclined at an angle θ, then $\tan θ = (v^2/rg)$

where, v = speed of the cyclist, r = radius of path and g = acceleration due to gravity.

Motion in a Vertical Circle

(i) Minimum value of velocity at the highest point is $\sqrt{gr}$

(ii) The minimum velocity at the bottom required to complete the circle



$v_A = \sqrt{5gr}$

(iii) Velocity of the body when string is in horizontal position

$v_B = \sqrt{3gr}$

(iv) Tension in the string

- ***At the top $T_c = 0$,***
- ***At the bottom $T_A = 6\ mg$***
- ***When string is horizontal $T_B = 3\ mg$***

Other topics of vectors will be explained by the teacher in online classes through DIKSHA APP and SHIKSHA MODULES

LEARNING OUTCOMES

STUDENTS

Will understand vectors

Will apply the concept of vectors in physics

Will practically understand the projectile motion

Will be able to distinguish between horizontal and vertical circular motion

LINK AND RESOURCE Khan academy .orgShiksha modulesDiksha app

LESSON PLAN

Chapter-> Laws Of Motion And Friction MONTH—JULY/AUGUST

Learning Objectives

The students will understand

. Rest and Motion

.Inertia , Laws of Motion

. Conservation Of Linear Momentum

.Friction and Frictional Forces

. Angle of Friction Nd Angle of Repose

.Static,Dynamic and limiting friction.

Previous Knowledge Testing

Students will be shown an activity on frictional forces and questions will be asked like

Why objects stops moving on rough surfaces?

Keywords

Inertia, Momentum,Conservation,Angle of repose,Angle of friction, Static,Kinetic and Limiting friction.

<u>Pedagogy/Innovative Methods/Aids.</u>

<u>Activity 1 Newtons Laws Of Motion</u>

Students will be told aboiut following activities from daily life

You have to pedal a bicycle hard and fast to get going because of inertia. You have to brake hard and can't stop instantly due to momentum.(First Law of Motion)

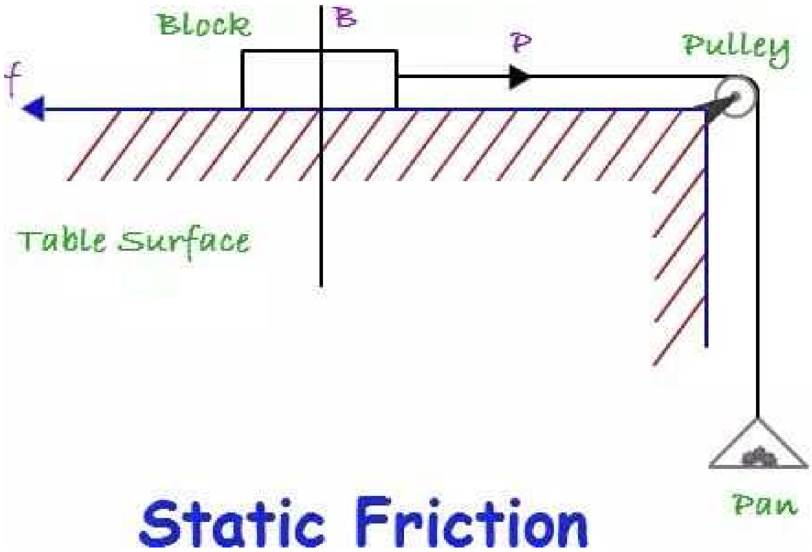
- Getting a ball to go where you want it to go is a matter of applying the correct force in the correct direction. (Second Law of Motion)

- Things that happen when you are skating (roller or ice) and pushing or pulling each other (as in hockey) are governed by action-reaction. (Third Law of Motion)

<u>Activity 2 Types Of Friction</u>

Students will be demonstrated about types of friction using

Horizontal plane,Wooden block,String,spring balance , pan and weights.Placing the wooden block tied to a pan over horizontal plane ,placing small weights in the pan and tapping on the plane , all types of frictions will be explained for example



<u>Participation of students</u>

Students will be asked to arrange the apparatus for above two activities.They will help in setting up the apparatus .

<u>Recapitulation/L:earning Outcomes:</u>

Students will come to know about

Inertia.

Types of Inertia.

Newtons Laws of motion.

Friction and Its types.

<u>Resources/Links:</u>

NCERT

Reference books

https://www.google.com/search?client=firefox-b-d&tbm=isch&sxsrf=ACYBGNTDHA2lB24dnfFy_MahwGAI4NLFig:1572266381729&q=simple+activities+on++types+of+friction+using+horizontal+plane+and+pan&chips=q:simple+activities+on+types+of+friction+using+horizontal+pl

ane+and+pan,online_chips:kinetic+friction&usg=AI4_-kRKs8wF54JVrj3FS6ky4XiKoKq3AA&sa=X&ved=0ahUKEwjeiLPZ_L7lAhUSbisKHU3DBRoQ4lYILygE&biw=1233&bih=613&dpr=1

LESSON PLAN

Chapter-> Work Energy And Power MONTH--AUGUST

Learning Objectives

The students will understand

.Work done,Energy and power

Different types of work done and energies.

SI units of work ,energy and power

Work energy theorem

Conservation of energy

Conservative nature of gravitational force

Collisions and types.

Previous Knowledge Testing

Students will be shown an activity on different types of work done and questions will be asked like

Why no work is done by coolie or in case of centripetal force?

Keywords

Positive and negative work done,conservative nature of gravitational force ,conservation of energy,collision,elastic and inelastic,restitution.

Pedagogy/Innovative Methods/Aids.

Activity 1 Different types of Work done

Students will be told about following activities from daily life

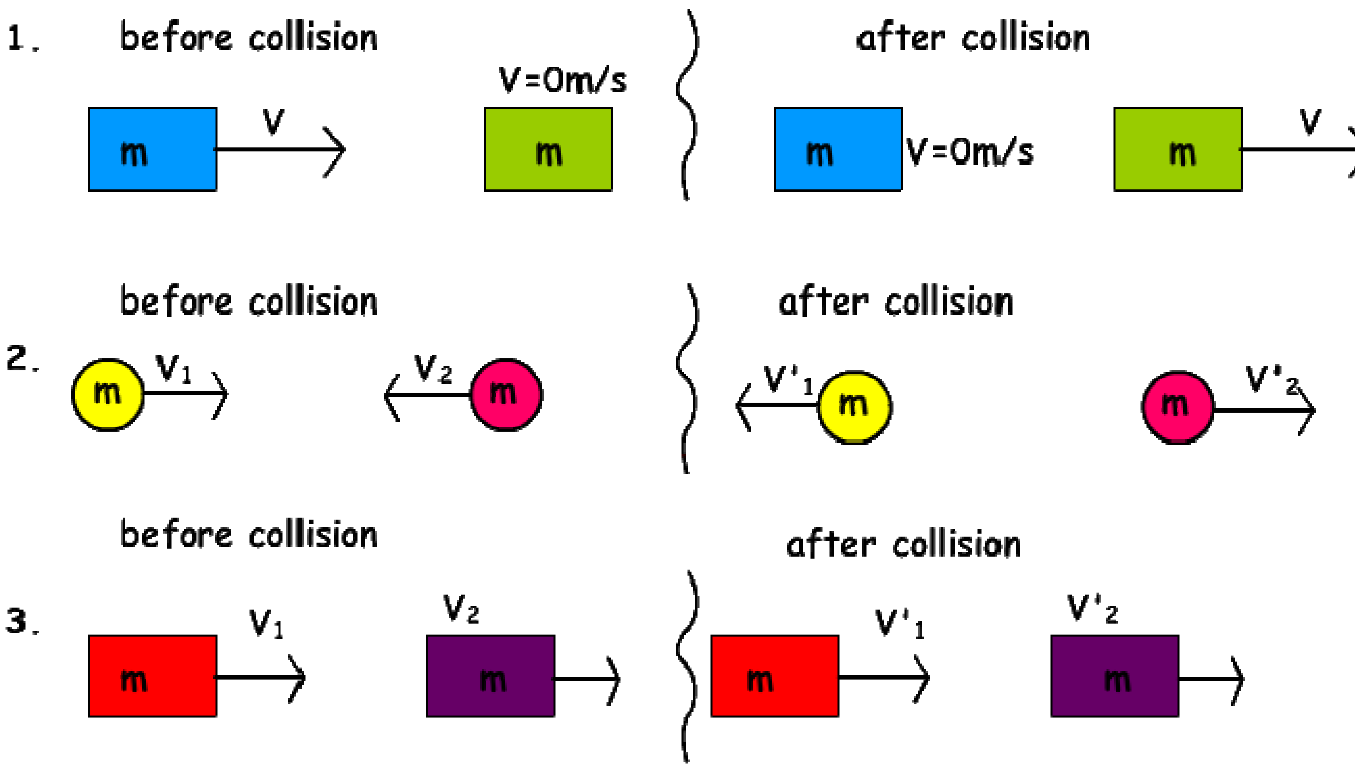
Work done during pulling or pushing.

Work done in lifting a load by coolie is zero.

Different forms of energy and conservation will be explained using example of freely falling body.

<u>Activity 2 Types Of Collisions</u>

Students will be demonstrated about types of collisions using following diagram



Participation of students

Students will be asked to arrange the apparatus for above two activities.They will help in setting up the apparatus .

Recapitulation/L:earning Outcomes:

Students will come to know about

Different types of work done.

Types of energies.

Collisions.

Resources/Links:

NCERT

Reference books

https://www.physicstutorials.org/home/impulse-momentum/collisions.

Chapter-> System of particles and rotational motion

MONTH –AUGUST/SEPTEMBER

Learning Objectives

The students will understand

Center of mass of different shaped objects.

Torque , angular momentum alongwith their geometrical meanings.

Moment of inertia of different bodies.

Relation between torque and Moment of inertia, between angular momentum and moment of inertia.

Dynamics of rolling down of solid cylinder on an inclined plane.

Previous Knowledge Testing

Students will be shown an activity of balancing of a lamina on the finger and question will be asked about its cause?

Keywords

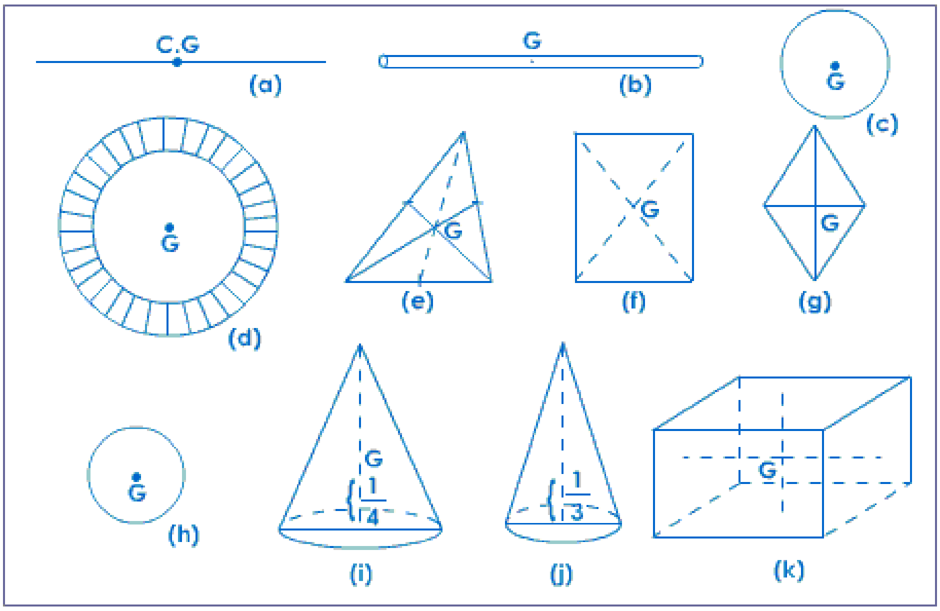
Centre of mass and centre of gravity,Moment of inertia, radius of gyration, torque,angular velocity.

Pedagogy/Innovative Methods/Aids.

Activity 1Centre of mass

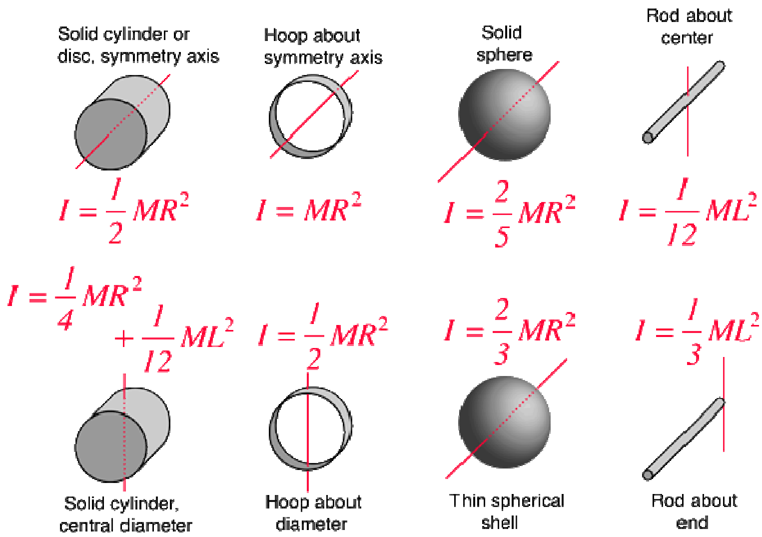
Students will be shown different figures and method of finding their Centre of mass will be discussed.

For simple rigid objects with uniform density, the center of mass is located at the centroid. For example, the center of mass of a uniform disc shape would be at its center. Sometimes the center of mass doesn't fall anywhere on the object. The center of mass of a ring for example is located at its center, where there isn't any material.



Activity Moment of inertia5

Students will be demonstrated about how to find moment of inertia of different



bodies using theorems

<u>**Participation of students**</u>

Students will be asked to arrange the apparatus for second activities.They will help in setting up the apparatus .

Recapitulation/L:earning Outcomes:

Students will come to know about

Centre of mass of different bodies

Moment of inertia of different bodies

Relation between torque and I and L and I

Resources/Links:

NCERT

Reference books

https://www.quora.com/What-is-the-centre-of-mass-of-different-shapes

https://www.google.com/search?q=moment+of+inertia+of+different+bodies&client=firefox-b-d&sxsrf=ACYBGNQMewe4TCKToxzYCOC4kNeYjhP62A:1572326875814&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjzip2H3sDlAhVSSX0KHdCCAXMQ_AUIESgB&biw=1233&bih=613#imgrc=brdh4dyvzNceLM:

LESSON PLAN TERM 2

Chapter-> Gravitation MONTH –OCTOBER/NOVEMBER

Learning Objectives

The students will understand

Gravitational force,Gravity,Newtons law of Gravitation.

Gravitational potential energy.

Escape velocity, Orbital velocity.

Variation of g with height and depth.

Satellite and its principle of launching.

Keplers laws of planetary motion.

<u>Previous Knowledge Testing</u>

Students will be shown an activity of a freely falling body and questions will be asked like

Why Earh and planets are revolving around sun?

Keywords

Gravitation, gravity,satellite,weightlessness.

<u>Pedagogy/Innovative Methods/Aids.</u>

<u>Activity 1 Gravitational force</u>

Students will be told about following activities from daily life

Revolution of earth around sun.

Satellite revolving around earth.

<u>Activity   Gravity</u>

Students will be demonstrated about how oscillating simple pendulum can be used to find value of g.

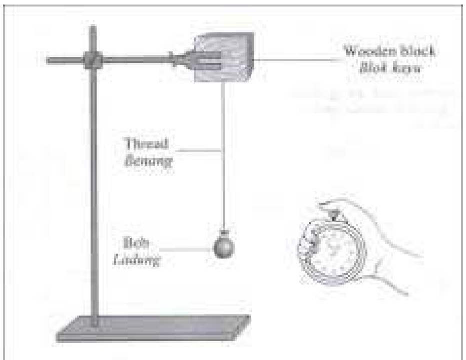


Diagram 1.1
Rajah 1.1

Participation of students

Students will be asked to arrange the apparatus for second activitie.They will help in setting up the apparatus .

Recapitulation/L:earning Outcomes:

Students will come to know about

Gravitational force.

Newtons law of gravitation.

Acceleration due to Gravity and its variation with height and depth.

Escape velocity, orbital velocity .

Gravitational potential energy.

Satellites.

Resources/Links:

NCERT

Reference books

https://www.google.com/search?q=oscillation+simple+pendulum+experiment&client=firefox-b-d&sxsrf=ACYBGNTvAVX-Nxux5EYFsr83D2aGObY6Gg:1572325274221&source=lnms&tbm=isch&sa=X&ved=0ahUKEwiIvsOL2MDlAhVDOSsKHTr-Am4Q_AUIEigC&biw=1233&bih=613#imgrc=_

TOPIC-- PROPERTIES OF MATTER

OCTOBER AND NOVEMBER

LEARNING OBJECTIVES

Students will understand the following

Elasticity and its application, surface tension, capillary action

Pressure ,pascals law

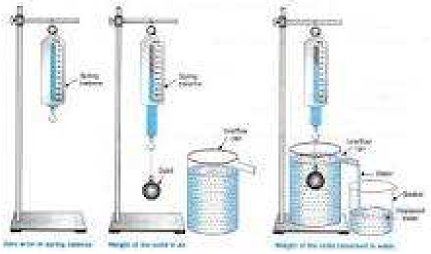
Fluid flow

Archimedes principle, Bernoullis theorem and its applications like venturimeter, magnus effect

Kinetic theory of gases, pressure exerted by an ideal gas

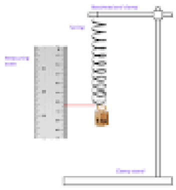
PREVIOUS KNOWLEDE TESTING

Students will be asked questions on elasticity, Archimedes principle

An activity on Archimedes principle will be shown and questions will be asked.  The questions will be asked on the above given activity

What is the difference in weight of object when it is dipped in water and when it is weigh in air?

PROCEDURE

 HOOKES LAW WILL BE EXPLAINED by showing the materials online through zoom class

Viscosity

The property of a fluid by virtue of which an internal frictional force acts between its different layers which opposes their relative motion is called viscosity.

These internal frictional force is called viscous force.

Viscous forces are intermolecular forces acting between the molecules of different layers of liquid moving with different velocities.

$$\text{Viscous force } (F) = -\eta A \frac{dv}{dx}$$

$$\eta = -\frac{F}{A\left(\frac{dv}{dx}\right)}$$

where, (dv/dx) = rate of change of velocity with distance called velocity gradient, A = area of cross-section and = coefficient of viscosity.

SI unit of η is Nsm^{-2} or pascal-second or decapoise. Its dimensional formula is $[ML^{-1}T^{-1}]$.
The knowledge of the coefficient of viscosity of different oils and its variation with temperature helps us to select a suitable lubricant for a given machine.

Viscosity is due to transport of momentum. The value of viscosity (and compressibility) for ideal liquid is zero.

The viscosity of air and of some liquids is utilised for damping the n.ving parts of some instruments.

The knowledge of viscosity of some organic liquids is used in determining the molecular weight and shape of large organic moleculars like proteins and cellulose.

Variation of Viscosity

The viscosity of liquids decreases with increase in temperature

$$\eta_t = \frac{\eta_0}{(1 + \alpha t + \beta t^2)}$$

where, η_0 and η_t is are coefficient of viscosities at 0℃ t℃, α and β are constants.
The viscosity of gases increases with increase in temperatures as

$\eta \propto \sqrt{T}$
The viscosity of liquids increases with increase in pressure but the viscosity of water decreases with increase in pressure.

The viscosity of gases do not changes with pressure.

Poiseuille's Formula

The rate of flow (v) of liquid through a horizontal pipe for steady flow is given by

$$v = \frac{\pi}{8} \frac{pr^4}{\eta l}$$

where, p = pressure difference across the two ends of the tube. r = radius of the tube, n = coefficient of viscosity and 1 = length of th tube.

The Rate of Flow of Liquid

Rate of flow of liquid through a tube is given by

v = (P/R)

where, R = $(8 \eta l/\pi r^4)$, called liquid resistance and p = liquid pressure.

(i) When two tubes are connected in series

- Resultant pressure difference $p = p_1 + p_2$
- Rate of flow of liquid (v) is same through both tubes.
- Equivalent liquid resistance, $R = R_1 + R_2$

(ii) When two tubes are connected in parallel

1. Pressure difference (p) is same across both tubes.
2. Rate of flow of liquid $v = v_1 + v_2$
3. Equivalent liquid resistance $(1/R) = (1/R_1) + (1/R_2)$

Stoke's Law

When a small spherical body falls in a long liquid column, then after sometime it falls with a constant velocity, called terminal velocity. When a small spherical body falls in a liquid column with terminal velocity then viscous force acting on it is

$F = 6\pi\eta rv$

where, r = radius of the body, V = terminal velocity and η = coefficient of viscosity.

This is called ***Stoke's law.***

$$\text{Terminal velocity } v = \frac{2}{9} \frac{r^2 (\rho - \sigma) g}{\eta}$$

where,

- $\square$ = density of body,
- $\square$ = density of liquid,
- $\square$ = coefficient of viscosity of liquid and,
- g = acceleration due to gravity

1. If $\square > \square_0$, the body falls downwards.
2. If $\square < \square_0$, the body moves upwards with the constant velocity.
3. If po << $\square$, $v = (2r^2\square g/9\square)$

Importance of Stoke's Law

1. This law is used in the determination of electronic charge by Millikan in his oil drop experiment.
2. This law helps a man coming down with the help of parachute.
3. This law account for the formation of clouds.

Flow of Liquid

1. *Streamline Flow* The flow of liquid in which each of its particle follows the same path as followed by the proceeding particles, is called streamline flow.
2. *Laminar Flow* The steady flow of liquid over a horizontal surface in the form of layers of different velocities, is called laminar flow.
3. *Turbulent Flow* The flow of liquid with a velocity greater than its critical velocity is disordered and called turbulent flow.

Critical Velocity

The critical velocity is that velocity of liquid flow, below which its fl is streamlined and above which it becomes turbulent.

Critical velocity $v_c = (k_\eta/r\square)$

where,

- K = Reynold's number,
- $\square$ = coefficient of viscosity of liquid
- r = radius of capillary tube and $\square$ = density of the liquid.

Reynold's Number

Reynold's number is a pure number and it is equal to the ratio of inertial force per unit area to the viscous force per unit area for flowing fluid.

$$\text{Reynold number } K = \frac{v_c \rho r}{\eta}$$

where, p = density of the liquid and v_c = critical velocity.
For pure water flowing in a cylindrical pipe, K is about 1000.

When $0 < K < 2000$, the flow of liquid is streamlined.

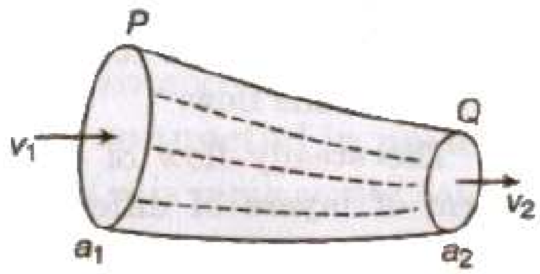
When $2000 < K < 3000$, the flow of liquid is variable betw streamlined and turbulent.

When $K > 3000$, the flow of liquid is turbulent.

It has no unit and dimension.

Equation of Continuity
If a liquid is flowing in streamline flow in a pipe of non-unif cross-section area, then rate of flow of liquid across any cross-sec remains constant.

$a_1v_1 = a_2v_2$ av = constant
The velocity of liquid is slower where area of cross-section is larger faster where area of cross-section is smaller.



The falling stream of water becomes narrower, as the velocity of f stream of water increases and therefore its area of cross-s decreases.

Energy of a Liquid
A liquid in motion possess three types of energy

(i) Pressure Energy Pressure energy per unit mass = p/ρ

where,

p= pressure of the liquid and p = density of the liquid.
Pressure energy per unit volume = p

(ii) Kinetic Energy

- Kinetic energy per unit mass = $(1/2v^2)$
- Kinetic energy per unit volume = $1/2\rho v^2$

(iii) Potential Energy

- Potential energy per unit mass = gh
- Potential energy per unit volume = ρgh

Bernoulli's Theorem

If an ideal liquid is flowing in streamlined flow then total energy, i.e., sum of pressure energy, kinetic energy and potential energy per unit volume of the liquid remains constant at every cross-section of the tube.

Mathematically

$$p + \frac{1}{2}\rho v^2 + \rho g h = \text{constant}$$

It can be expressed as

$$\frac{p}{\rho g} + \frac{v^2}{2g} + h = \text{constant}$$

where, $(p/\rho g)$ = pressure head, $(v^2/2g)$ = velocity head and h = gravitational head.
For horizontal flow of liquid,

$$p + \frac{1}{2}\rho v^2 = \text{constant}$$

- where, pis called static pressure and $(1/2\ \rho v^2)$ is called dynamic pressure.
- The erefore in horizontal flow of liquid, if p increases, v decreases and Nce-versa.

- The theorem is applicable to ideal liquid, i.e., a liquid which is non-viscous incompressible and irrotational.

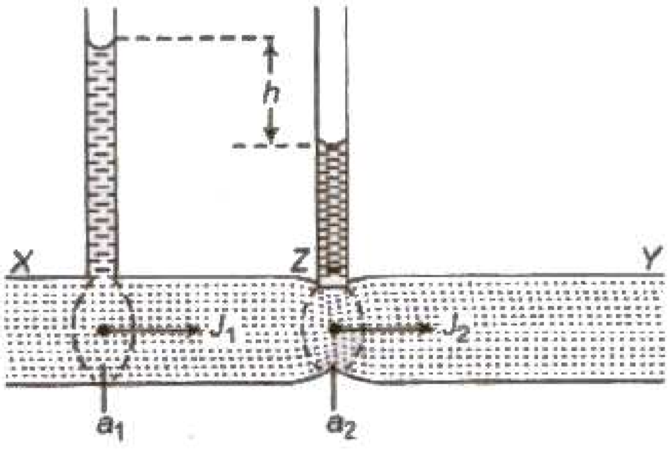
Applications of Bernoulli's Theorem

1. The action of carburetor, paintgun, scent sprayer atomiser insect sprayer is based on Bernoulli's theorem.
2. The action of Bunsen's burner, gas burner, oil stove exhaust pump is also based on Bernoulli's theorem.
3. Motion of a spinning ball (Magnus effect) is based on Bernoulli theorem.
4. Blowing of roofs by wind storms, attraction between two close parallel moving boats, fluttering of a flag etc are also based Bernoulli's theorem.

Venturimeter

It is a device used for measuring the rate of flow of liquid t pipes. Its working is based on Bernoulli's theorem.

Rate of flow of liquid, $v = a_1 a_2 \sqrt{\frac{2gh}{a_1^2 - a_2^2}}$

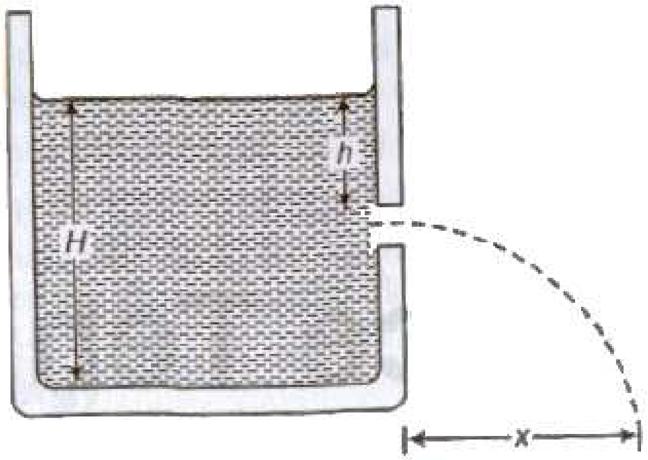


where, a_1 and a_2 are area of cross-sections of tube at bra and narrower part and h is difference of liquid columns in ver tubes.

Torricelli's Theorem

Velocity of efflux (the velocity with which the liquid flows out orifice or narrow hole) is equal to the velocity acquired by a falling body

through the same vertical distance equal to the dep orifice below the free surface of liquid.



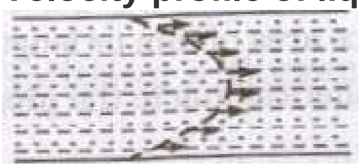
Velocity of efflux, v = $\sqrt{2gh}$
where, h = depth of orifice below the free surface of liquid.

Horizontal range, S = $\sqrt{4h(H - h)}$
where, H = height of liquid column.

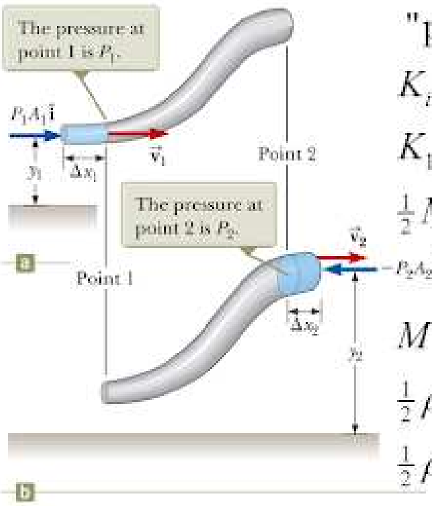
Horizontal range is maximum, equal to height of the liquid column H, when orifice is at half of the height of liquid column.

Important Points

- **In a pipe the inner layer .central layer) have maximum velocity and the layer in contact with pipe have least velocity.**
- **Velocity profile of liquid flow in a pipe is parabolic.**



Deriving Bernoulli's equation as Conservation of Energy



Energy - work relationship on "piece" of fluid M

$$K_i + U_i + W_{i\to f} = K_f + U_f$$

$$K_1 + U_1 + W_{1\to 2} = K_2 + U_2$$

$$\tfrac{1}{2}Mv_1^2 + Mgy_1 - (P_2 - P_1)\Delta V = \tfrac{1}{2}Mv_2^2 + Mgy_2$$

$$M = \rho\Delta V$$

$$\tfrac{1}{2}\rho v_1^2 + \rho g y_1 - (P_2 - P_1) = \tfrac{1}{2}\rho v_2^2 + \rho g y_2$$

$$\tfrac{1}{2}\rho v_1^2 + \rho g y_1 + P_1 = \tfrac{1}{2}\rho v_2^2 + \rho g y_2 + P_2$$

Other remaining topics will also be explained by the websites like DIKSHA APP AND SHIKHA MODULES

Let n = Molecule of gas

m = Mass of each molecule

M = m x n = Mass of gas

Similarly $Py = \frac{m}{a^3}\left(y_1^2 + y_2^2 + --- y_n^2\right)$

$Pz = \frac{m}{a^3}\left(z_1^2 + z_2^2 + --- z_n^2\right)$

P = Total pressure = $\frac{P_x + P_y + P_z}{3}$

$$= \frac{1}{3}\left[\frac{m}{a^3}\left(x_1^2 + x_2^2 + --- x_n^2\right) + \frac{m}{a^3}\left(y_1^2 + y_2^2 + --- y_n^2\right) + \frac{m}{a^3}\left(z_1^2 + z_2^2 + --- z_n^2\right)\right]$$

$$P = \frac{m}{3a^3}\left[\left(x_1^2 + y_1^2 + z_1^2\right) + --- \left(x_n^2 + y_n^2 + z_n^2\right)\right]$$

($\because$ from equation A)

$$P = \frac{m}{3v}\left[C_1^2 + C_2^2 + --- C_n^2\right]$$

→ Multiply & divide by n (no of molecules of gas)

$$P = \frac{1mxn}{3v}\left[\frac{C_1^2 + C_2^2 + --- C_n^2}{n}\right]$$

$$\boxed{P = \frac{1M}{3v}C^2}$$

$C^2 = \frac{C_1^2 + C_2^2 + --- C_n^2}{n}$ or $C = \sqrt{\frac{C_1^2 + C_2^2 + --- C_n^2}{n}}$

C = r. m s. velocity of gas.

RESOURCES AND LINKS

https//www.toppr.com

NCERT BOOKS FROM DIKSHA APP

FUNDAMENTAL OF PHYSICS BY HC VERMA

ASSESSMENT/ASSIGNMENT

ALL WILL BE DONE IN GOOGLE APP

FUTURISTIC APP

TOPIC-- HEAT AND THERMODYNAMICS

MONTH –NOVEMBER AND DECEMBER

LEARNING OBJECTIVES

The students will understand

#transfer of heat,its different methods

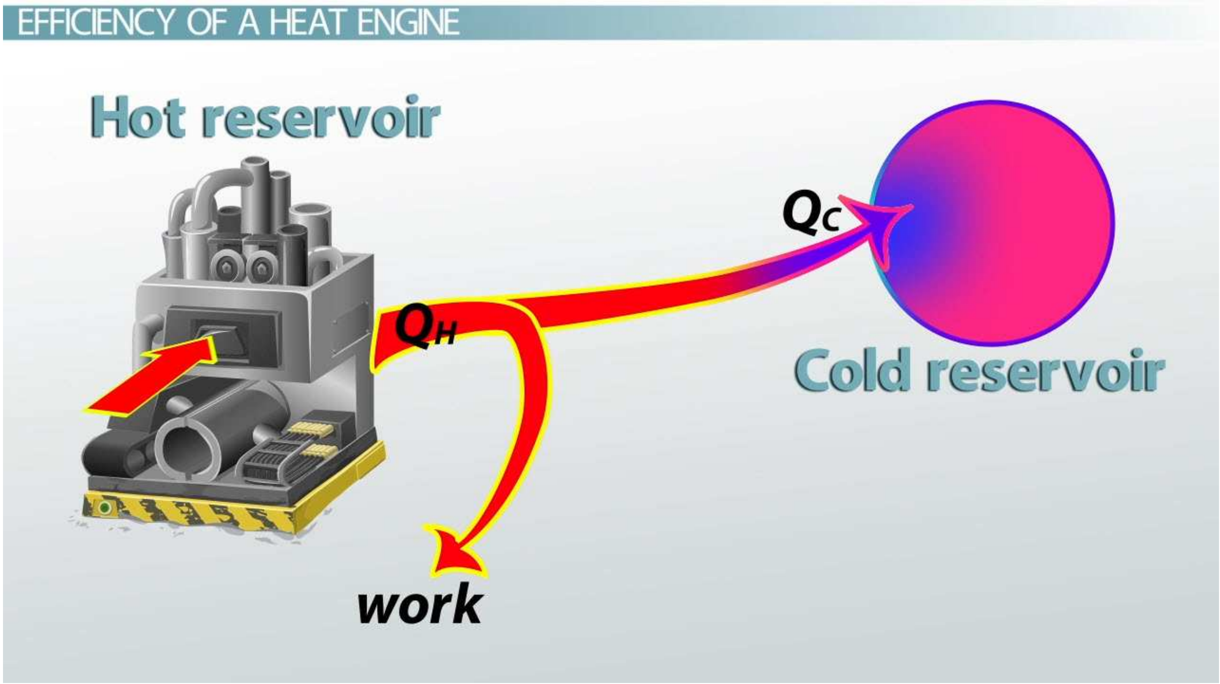
#thermodynamics , zeroth law first law and second law

#,isothermal process, adiabatic process,

#heat engine ,carnot heat engine

PREVIOUS KNOWLEDGE

Students will be shown some activity to intro duce the chapter and the topics in online class



Questions will be asked on the above figures showing the heat engine

PROCEDURE/INNOVATIVE IDEAS

Methods of Heat Transmission

There are three methods of heat transmission

(i) *Conduction* In solids, heat is transmitted from temperature to lower temperature without actual movements the particles. This mode of transmission of heat. is conduction.
(ii) *Convection* The process of heat-transmission in which particles of the fluid (liquid or gas) move. is called convection. Land breeze and see-breeze are formed due to convection.
(iii) *Radiation* The process of heat transmission in the form electromagnetic waves, is called radiation.
Radiation do not require any medium for propagation.

It propagates without heating the intervening medium.

The heat energy transferred by radiation, is called energy.

Heat from the sun reaches the earth by radiation.

Thermal Conductivity
In solids, heat is transferred through conduction. We will conduction of heat through a solid bar.

Conduction of Heat in a Conducting Rod
Steady State
The state of a conducting rod in which no part of the rod absorbs nea is caned the steady state.

Isothermal Surface
A surface of a material whose all points are at the same temperature, is called an isothermal surface.

Temperature Gradient
The rate of change of temperature with distance between two isothermal surfaces is called temperature gradient.

Temperature gradient = Change in temperature / Perpendicular distance = – □□ / □x

Its SI unit is “^{o}C per meter’ and dimension is [L^{-1}□].
The amount of heat flow in a conducting rod

Q = KA □□t / l

where K = coefficient of thermal conductivity.
A = area of cross-section,
l = length of rod,
□□ = temperature difference between the ends of the rod and
t = time.

The SI unit of K is ‘Wm^{-1} K^{-1}‘ and its dimension is [MLT^{-3}□$^{-1}$].

Difference Between Isothermal and Adiabatic process	
Isothermal	Adiabatic
Transfer of heat occurs	No Transfer of heat occurs
The pressure is more at a given volume	The pressure is less at a given volume
Temperature remains constant	Temperature changes due to internal system variations.
Heat can be added or released to the system just to keep the same temperature	There is no addition of heat nor heat is released because maintaining constant temperature doesn't matter here.
The transformation is slow	The transformation is fast

WORK DONE DURING ISOTHERMAL PROCESS

$W = \int dW$

$= \int_{V_1}^{V_2} P\,dV - - - - (i)$

Now we have a relation for one mole of gas,

$PV = RT$

Or $P = RT / V$

Putting this value in (i),

$W = \int_{V_1}^{V_2} \frac{RT}{V} dV = RT\int_{V_1}^{V_2} \frac{1}{V} dV$

$= RT \ln \frac{V_2}{V_1}$

For the constant temperature,

$\frac{P_1}{P_2} = \frac{V_2}{V_1}$ (As $P_1V_1 = P_2V_2$)

Therefore,

$W = \; = RT \ln \frac{P_1}{P_2}$

Remaining topics will be taught in ZOOM APP

ART INTERGRATION

Students will use their skill of drawing for drawing the diagrams of heat engine , graphs

LEARNING OUTCOMES

The students will

Understand the methods of transmission of heat

Able to distinguish between conduction convection and radiation

Apply the mathematical skills to solve numericals

Draw the diagrams and graphs

ASSESSMENT/ ASSIGNMENT

WILL BE CONDUCTED IN GOOGLE FORM

FUTURISTIC APP

RESOURCES AND LINKS

NCERT

DIKSHA APP

TOPIC –OSCILLATIONS AND WAVES   MONTH—JANUARY

LEARNING OBJECTIVES

The students will understand

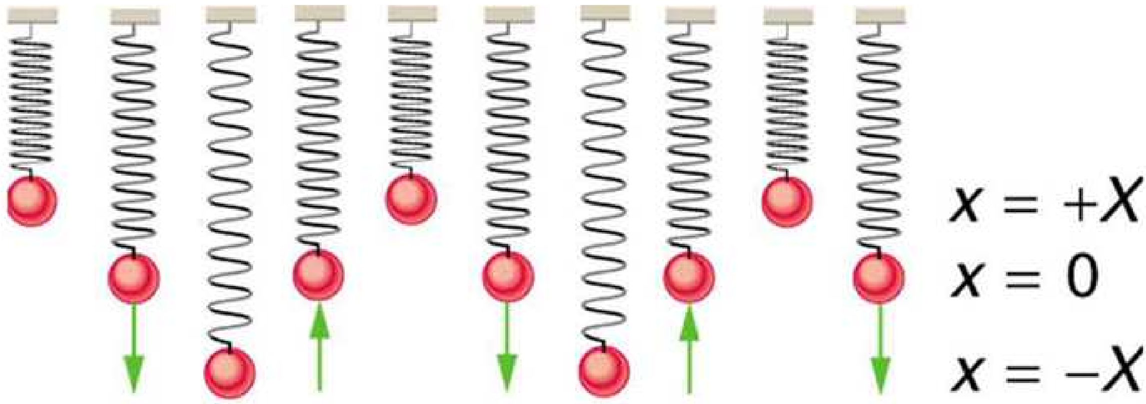
Simple harmonic motion

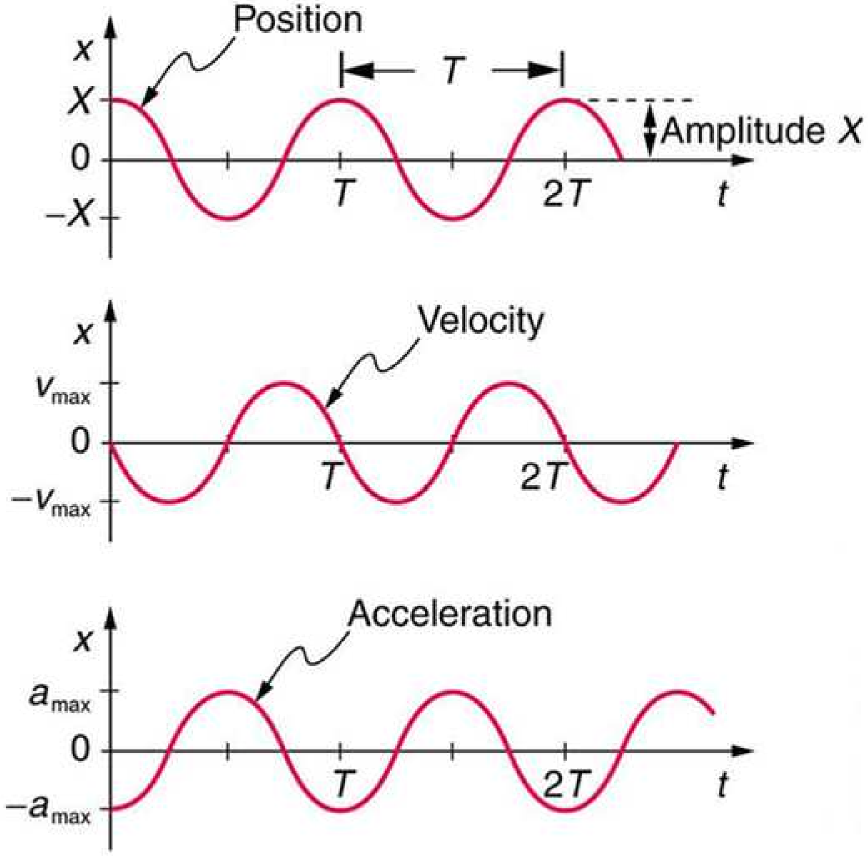
Its displacement, velocity acceleration,time period and energy

The students will get the knowledge of wave motion, stationary waves,beats and dopplers effect

PREVIOUS KNOWLEDGE TESTING

Students will be shown an activity in online class and questions will be asked


x = +X
x = 0
x = −X


Position
x
X
0
−X
T
2T
t
Amplitude X
Velocity
x
v max
0
−v max
T
2T
t
Acceleration
x
a max
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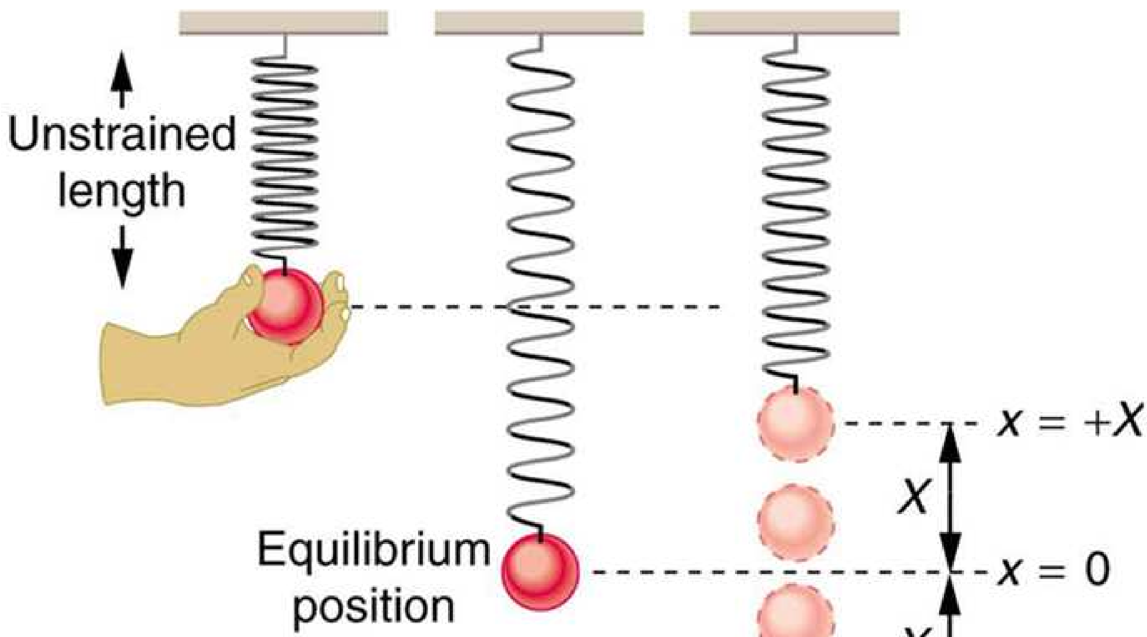
−a max
T
2T
t


Unstrained length
Equilibrium position
x = +X
X
x = 0

PROCEDURE/LINKS

Terminology for Periodic Motion λ

Period (T) • The time, in seconds, it takes for a vibrating object to repeat its motion – seconds per vibration, oscillation or cycle λ

Frequency (f) • The number of vibrations made per unit time – vibration, oscillation or cycles per second (Hz) λ T = 1/f • The relationship is reciprocal λ Amplitude (A or x) • The displacement from rest position Simple Harmonic Motion 3

SHM - Description λ An object is said to be in simple harmonic motion if the following occurs: • It moves in a uniform path. • A variable force acts on it. • The magnitude of force is proportional to the displacement of the mass. • The force is always opposite in direction to the displacement direction. • The motion is repetitive and a round trip, back and forth, is always made in equal time periods.

Stationary Waves

The third special case of solutions to the wave equation is that of standing waves. They are especially apropos to waves on a string fixed at one or both ends. There are two ways to find these solutions from the solutions above. A harmonic wave travelling to the right and hitting the end of the string (which is fixed), it has no choice but to reflect. This is because the energy in the string cannot just disappear, and if the end point is fixed no work can be done by it on the peg to which it is attached. The reflected wave has to have the same amplitude and frequency as the incoming wave. What does the sum of the incoming and reflected wave look like in this special case?

Suppose one adds two harmonic waves with equal amplitudes, the same wavelengths and frequencies, but that are travelling in opposite directions:

$$\begin{aligned} y(x,t) &= y_0\left(\sin(kx-\omega t)+\sin(kx+\omega t)\right) && (121)\\ &= 2y_0\sin(kx)\cos(\omega t) && (122)\\ &= A\sin(kx)\cos(\omega t) && (123)\end{aligned}$$

(where we give the standing wave the arbitrary amplitude A). Since all the solutions above are independent of the phase, a second useful way to write stationary waves is:

$$y(x,t) = A\cos(kx)\cos(\omega t) \qquad (124)$$

Which of these one uses depends on the details of the boundary conditions on the string.

In this solution a sinusoidal form oscillates harmonically up and down, but the solution has some very important new properties. For one, it is always zero when $x=0$ for all possible λ:

$$y(0,t) = 0 \qquad (125)$$

For a given λ there are certain other x positions where the wave vanishes at all times. These positions are called nodes of the wave. We see that there are nodes for any L such that:

$$y(L,t) = A\sin(kL)\cos(\omega t) = 0 \qquad (126)$$

which implies that:

$$kL = \frac{2\pi L}{\lambda} = \pi, 2\pi, 3\pi, \ldots \qquad (127)$$

or

$$\lambda = \frac{2L}{n} \qquad \text{(128)}$$

for $n = 1, 2, 3, ...$

Only waves with these wavelengths and their associated frequencies can persist on a string of length L *fixed at both ends so that*

$$y(0,t) = y(L,t) = 0 \qquad \text{(129)}$$

(such as a guitar string or harp string). Superpositions of these waves are what give guitar strings their particular tone.

It is also possible to stretch a string so that it is fixed at one end but so that the other end is free to move - to slide up and down without friction on a greased rod, for example. In this case, instead of having a node at the free end (where the wave itself vanishes), it is pretty easy to see that the slope of the wave at the end has to vanish. This is because if the slope were not zero, the terminating rod would be pulling up or down on the string, contradicting our requirement that the rod be frictionless and not able to pull the string up or down, only directly to the left or right due to tension.

The slope of a sine wave is zero only when the sine wave itself is a maximum or minimum, so that the wave on a string free at an end must have an antinode (maximum magnitude of its amplitude) at the free end. Using the same standing wave form we derived above, we see that:

$$kL = \frac{2\pi L}{\lambda} = \pi/2, 3\pi/2, 5\pi/2 \ldots \qquad \text{(130)}$$

for a string fixed at $x = 0$ *and free at* $x = L$*, or:*

$$\lambda = \frac{4L}{2n-1} \quad (131)$$

for $n = 1, 2, 3, \ldots$

There is a second way to obtain the standing wave solutions that particularly exhibits the relationship between waves and harmonic oscillators. One assumes that the solution $y(x,t)$ *can be written as the product of a fuction in* x *alone and a second function in* t *alone:*

$$y(x,t) = X(x)T(t) \quad (132)$$

If we substitute this into the differential equation and divide by $y(x,t)$ *we get:*

$$\frac{d^2y}{dt^2} = X(x)\frac{d^2T}{dt^2} = v^2\frac{d^2y}{dx^2} = v^2T(t)\frac{d^2X}{dx^2} \quad (133)$$

$$\frac{1}{T(t)}\frac{d^2T}{dt^2} = v^2\frac{1}{X(x)}\frac{d^2X}{dx^2} \quad (134)$$

$$= -\omega^2 \quad (135)$$

where the last line follows because the second line equations a function of t *(only) to a function of* x *(only) so that both terms must equal a constant. This is then the two equations:*

$$\frac{d^2T}{dt^2} + \omega^2 T = 0 \quad (136)$$

and

$$\frac{d^2X}{dt^2} + k^2 X = 0 \quad (137)$$

(where we use $k = \omega/v$ *).*

From this we see that:

$$T(t) = T_0 \cos(\omega t + \phi) \tag{138}$$

and

$$X(x) = X_0 \cos(kx + \delta) \tag{139}$$

so that the most general stationary solution can be written:

$$y(x,t) = y_0 \cos(kx + \delta) \cos(\omega t + \phi) \tag{140}$$

LINKS AND RESOURCES
NCERT BOOKS THROUGH DIKSHA APP
SHIKSHA MODULES

ASSIGNMENTS/ASSESSMENT

WAVEMOTION, INTERFERENCE, STATIONARY WAVES 1. A transverse harmonic wave on a string is described by y = 3.0 sin (36t + 0.018 x + Π/4), x, y are in cm and t is in sec. a. Give reasons why the expression indicates a travelling or a progressive wave and not a stationary wave. b. What are its amplitude and frequency? c. What is its initial phase? d. What is the distance between two alternate crests in the wave?

2. The transverse displacement of a string clamped at its two ends is given by y = 0.06 sin 2Π/3 x cos 120 Π t a. Why is this equation representing stationary wave? b. What are the wavelength, frequency and speed of propagation of each wave? c. Find the tension in the string if its length is 1.5 m and mass 3 x 10–2 kg.

3. $y = 2.0 \cos 2\Pi (10t - 0.008x + 35)$ What is the phase difference between two points separated by a distance of 4m, 0.5m?

4.Fill in the blanks a. In case of progressive waves, no particle of the media is permanently at ______ (at rest, in motion) b. In stationary waves the particles of the medium at _____ are permanently at rest. c. The frequency of the fundamental note emitted by an organ pipe open at both ends is _________ the frequency of the fundamental note emitted by a closed organ pipe of the same length. (twice, four times, half) d. In case of an open organ pipe _______ harmonics are present , but in case of a closed pipe only __________ harmonics are present (all, odd, even) e. The quality of sound produced by _________ is better than that produced by _________ (closed pipe , an open pipe) .

ASSESSMENT

The assessments will be conducted by FUTURISTIC APP for school