

KENDRIYA VIDYALAYA SANGATHAN Regional Office Lucknow

Bridge Course

Class XII

Physics 2024-25

Patron

Smt Sona Seth

Deputy Commissioner

KVS RO Lucknow

Course Coordinator

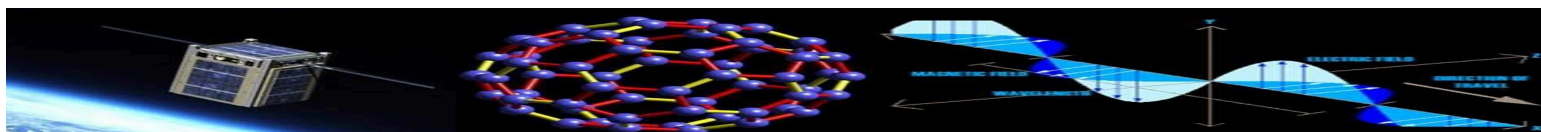
Sh. Ravish Chandra Pandey

Principal

KV IIT Kanpur

Resource Persons

- Sh Pravin Gupta PGT Physics PM Shree KV No3 Chakeri Kanpur
- Sh Sunil Vishwakarma, PGT Physics PM Shree KV No 1 Chakeri Kanpur
- Smt. Seema Bajpai PGT Physics, KV JLA Bareilly
- Sh Alok Trivedi, PGT Physics, KV IIT Kanpur
- Ms Meenu Rana, PGT Physics, PM Shree KV No1 Chakeri Kanpur



Day 1,2,3

Topic: Mathematical Tools

Days	Subtopics	Content	Learning Outcome(s)
Day-1	Common Identities of algebra. Quadratic equation, Important formulae of mensuration Bionomial theorem Trigonometrically ratios, Important trigonometrical formulae Values of Trigonometrical ratios of some Standard Angle	<u>Algebra : Basic Formulae:</u> $(a+b)^2=a^2+b^2+2ab$ $(a-b)^2=a^2+b^2-2ab$ $(a+b)^3=a^3+b^3+3ab(a+b)$ $(a-b)^3=a^3-b^3-3ab(a-b)$ If $ax^2+bx+c=0$ then $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$ Surface areas and volume of different shapes <u>Binomial Expansion :</u> $(1+x)^n= 1+nx+n(n-1)x^2/2+.....$ Special Case :- For $x \ll 1$, higher power terms can be neglected Hence, $(1+x)^n= 1+nx$ <u>Trigonometry:</u> ● $\sin^2 \theta + \cos^2 \theta = 1$ ● $\sin 2\theta = 2 \sin \theta \cos \theta$ ● $\cos 2\theta = 2 \cos^2 \theta - 1$ $= 1 - 2 \sin^2 \theta$ $= \cos^2 \theta - \sin^2 \theta$ ● $\tan 2\theta = \frac{2 \tan \theta}{1 - \tan^2 \theta}$ ● $\sin (A + B) = \sin A \cos B + \cos A \sin B$ ● $\sin (A - B) = \sin A \cos B - \cos A \sin B$ ● $\cos (A + B) = \cos A \cos B - \sin A \sin B$ ● $\cos (A - B) = \cos A \cos B + \sin A \sin B$ ● $\sin A + \sin B = 2 \sin \left(\frac{A+B}{2} \right) \cos \left(\frac{A-B}{2} \right)$ ● $\sin A - \sin B = 2 \cos \left(\frac{A+B}{2} \right) \sin \left(\frac{A-B}{2} \right)$	● Able to learn basic formulae of algebra and trigonometry ● Able to know Binomial theorem and Quadratic equation

Day-2	Logarithmic formulae, Co-ordinate Geometry,	• $\cos A + \cos B = 2 \cos \frac{A+B}{2} \sin \frac{A-B}{2}$ • $\cos A - \cos B = 2 \sin \frac{A+B}{2} \sin \frac{A-B}{2}$ • $\sin(-\theta) = -\sin \theta$ • $\cos(-\theta) = \cos \theta$ • $\tan(-\theta) = -\tan \theta$ • $\sin(90 - \theta) = \cos \theta$ • $\sin(90 + \theta) = \cos \theta$ • $\cos(90 - \theta) = \sin \theta$ • $\log \log (mxn) = \log \log m + \log \log n$ • $\log \log \frac{m}{n} = \log \log m - \log \log n$ • $a^x = N$, Then $N = a^x$	• Able to know basic concepts of co-ordinate geometry and learn Logarithmic formulae
	Analysis of graphs.	<u>Graphs :</u> A diagrammatic representation of variation of one quantity with respect to another is called a Graph. <u>Main Points</u> • From shape of graph we can have clear idea about the relationship between two quantities represented by it. • If graph is a straight line and passes through the origin, it is of the form $y=mx$. A straight line graph having positive or negative intercepts on y axis is represented by $y = mx \pm c$ • The slope of the graph and its intercepts on x or y axis gives us the values of physical quantity.	• Able to analyze different graphs

Day-3	Differential Calculus and Integral Calculus.	• With the help of graph we can determine mean value from a large no. of observations. • Graph for straight line equation. Basic Calculus : Differentiation Rate of change of a physical quantity with respect to some variable is differentiation. $y = f(X) \Rightarrow \frac{dy}{dx} = \text{Rate of Change of } y \text{ w.r.t } x$ Ex: Velocity = Rate of change of displacement Or $v = \frac{dx}{dt}$ Acceleration = Rate of change of velocity Or $a = \frac{dv}{dt}$ Formulae : • $\frac{d}{dx}(x^n) = nx^{n-1}$ • $\frac{d}{dx}(\sin x) = \cos x$ • $\frac{d}{dx}(\cos x) = -\sin x$ • $\frac{d}{dx}(\log x) = \frac{1}{x}$ • $\frac{d}{dx}(e^x) = e^x$ • $\frac{d}{dx}(u \times v) = u \times \frac{dv}{dx} + v \times \frac{du}{dx}$ • $\frac{d}{dx}(u / v) = (v \times \frac{du}{dx} - u \times \frac{dv}{dx}) / v^2$ Integration: Integration means summation Formulae :	• Able to learn the basic concepts and important formulae of differential and Integral Calculus
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		• $\int x^n dx = x^{n+1}$ • $\int \sin \sin x dx = -\cos \cos x$ • $\int \cos \cos x dx = \sin \sin x$ • $\int (u + v) dx = \int u dx + \int v dx$ <u>Definite Integration:</u> If $\frac{d}{dx} f(x) = f'(x)$ then $\int_b^a f'(x) dx = f(a) - f(b)$	
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Assessment Day 1

Level 1

Q1. Find the values of the following:

(a) $\sin 120^\circ$ (b) $\cos 135^\circ$

Q2. Calculate the area of triangle of base 5 m and height 2m.

Q3. Prove the equation: $(a+b)^2 - (a-b)^2 = 4ab$

Q4. Find the values of

(a) $\sin(-30^\circ)$ (b) $\cos(-60^\circ)$

Q5. What is the value of 1 radian in degree?

Q6. Solve the equation: $6x^2 - 13x + 6 = 0$

Q7. The acceleration due to gravity at a height 'h' above the surface of the earth is given by $g' = \frac{gR^2}{(R+h)^2}$

If $h \ll R$ then show that: $g' = g\left(\frac{1-2h}{R}\right)$

Q8. If $\sin \theta = \frac{3}{5}$ Find the values of $\cos \theta$ and $\tan \theta$

Q9. Find the

- (i) Surface area
- (ii) Volume of the cylinder of length 10 cm and radius 2 cm

Q10. An inclined plane raises 1 in 10 . if the length of the include plane in 5 m . calculate the height of the raised and above the horizontal.

Level-2

Q1.Solve the following quadratic equations by factorization method,

$$\frac{1}{a+b+x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x} , a+b \neq 0.$$

Q2.Simplify the following using Binomial Theorem.

$$E=k \left[\left(1+\frac{\Delta\theta}{\theta}\right)^4 -1 \right] \text{ where } \theta \ll \theta_0$$

Q3. If the α and β are the zero of the quadratic polynomial

$$f(x) = ax^2 + bx + c, \text{ then evaluate}$$

$$(i) \quad \alpha^2 + \beta^2 \quad (ii) \quad \frac{\alpha}{\beta} + \frac{\beta}{\alpha}$$

Q4. In a $\triangle ABC$ right angled at c if $\tan A = \frac{1}{\sqrt{3}}$ Find the value of $\sin A \cos B + \cos A \sin B$

Q5. Find an acute angle θ , when $\frac{\cos \theta - \sin \theta}{\alpha \cos \theta + \sin \theta} = \frac{1-\sqrt{3}}{1+\sqrt{3}}$.

Q6. A solid is in the form of a cylinder with hemispherical ends. The total height of the solid is 19 cm and the diameter of the cylinder is 7 cm. Find the volume and total surface are of the solid.

Assessment Day-2

Level-1

Q1. On which axis do the following points lie?

$$(a) P(5,0) \quad (b) Q(0,-2)$$

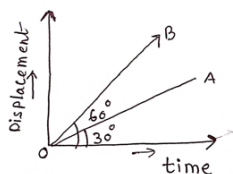
Q2. Let ABCD be a square of side 2a. Find the co-ordinate of the vertices of this square when 'A' coincides with the origin 'O' and AB and AD are along OX and OY respectively.

Q3. Draw V-I Graph for an Conductor when $V \propto I$.

Q4. Plot a graph showing the variation of resistance 'R' of a conductor wire as a function of its radius 'r' keeping the length of the wire and its temperature as constant.

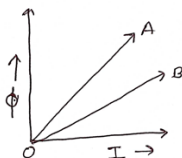
$$(\text{Given } R \propto \frac{1}{r^2})$$

Q5. What is the ratio of two velocities from the given graph.



Level 2

Q1. A plot of magnetic flux(ϕ) versus current (I) is showing in figure for two Inductors A and B . which of the two has larger value of self-Inductors (L) ? (Given $L = \frac{\phi}{I}$)

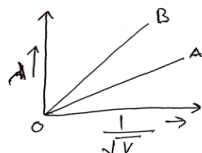


Q2. A ball is thrown vertically upwards Draw its velocity –time graph.

Q3. Find a point on x-axis which is equidistant from A(2,-5) and B(-2,9).

Q4. If the point (x,y) is equidistant from the points(a+b , b-a) and (a-b, a+b) , prove that bx=ay.

Q5. In the Given graph which particle A or B have the heavier mass? (Given $\lambda = \frac{h}{\sqrt{2}mev}$)



DAY 4,5,6

DAY	NAME OF UNIT	CONTENT	LEARNING OBJECTIVE
4	Units and Measurement	Units, Finding Units by using formula	Able to define units like henry, weber, coulomb , tesla by the formula of physical quantity
		Dimensional formula	Able to find dimensions of physical quantity
	Kinematics	Velocity, Acceleration (Uniform, Inst., Avg.)	Students will be able to apply these concept in various topics in XII class
5	Kinematics	Equation of Motion	
		Plotting graph and interpreting it	
		Addition of vectors	

6		Resolution of vectors, Multiplication of vectors (Dot and cross product)	Students will be able to deal with vectors in various topics in XII class
		Concept of centripetal acceleration	

ASSESSMENT DAY 4

UNIT & MEASUREMENT, KINEMATICS (VELOCITY & ACCELERATION)

Level 1

Q 1 Find the dimensions of a physical quantity which has same dimensions as that of

Energy/mass *length

Q 2 Find SI unit of coulombs constant if $F = kq_1q_2/r^2$

Q 3 Find the conversion factor for expressing universal gravitational constant from SI units to cgs units.

Q 4 Average speed of a car between points A and B is 20 m/s, between B and C is 15 m/s, between C and D is 10 m/s. What is the average speed between A and D, if the time taken in the mentioned sections is 20s, 10s and 5s respectively?

Q 5 The expression for displacement is $x = \sin(5t)$. The expression for acceleration is _____

Level 2

Q 1 A physical quantity times speed equals power. What dimensions does this physical quantity has?

Q 2 Formula for Rydberg's constant is given. The dimensions of the Rydberg constant are

$$\frac{1}{\lambda} = R \left[\frac{1}{n_1^2} - \frac{1}{n_2^2} \right]$$

Q 3 Find the dimensions of resistance if $R = V/I$ & $V = W/Q$, $Q = It$

Q 4 The trajectory of an object is defined as $x = (t-4)^2$, what is the velocity at $t = 5$?

Q 5 The velocity of a body varies as, $v = 2t + 5t^2$. What is the acceleration when velocity is 7 ms^{-1} ?

ASSESSMENT DAY 5

KINEMATICS (Equations of motion, plotting graph & interpreting it, Addition of vectors)

Level 1

Q 1 A car moves for 60s covering a distance of 3600m with zero initial velocity. What is the acceleration in m/s^2 ?

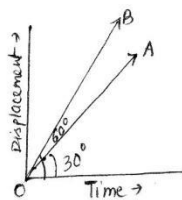
Q 2 A ball is thrown up with an initial velocity of 20 m/s and after some time it returns. What is the maximum height reached? Take $g = 10 \text{ m/s}^2$

Q 3 Adding $2\hat{i} + 7\hat{j}$ and $\hat{i} + \hat{j}$ gives

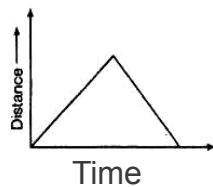
Q 4 The two straight rays OA and OB on the same displacement-time graph make angle 30° and 60° with time axis respectively as shown in figure

(i) Which ray represents greater velocity?

(ii) What is the ratio of two velocities represented by OA and OB



Q 5 The graph between total path length and time for a particle moving along a straight line as shown in figure is not possible. Explain why?



Level 2

Q 1 Two equal vectors have their resultant equal to either of them. Calculate at what angle are they inclined to each other?

Q 2 A vector, 7 units from the origin, along the X axis, is added to vector 11 units from the origin along the Y axis. What is the resultant vector?

.Q3 A body covers 12m in 2nd second and 20m in 4th second. What is the distance covered in 7th second?

Q 4 The sum of the magnitude of two forces acting at a point is 18N and the magnitude of their resultant is 12N. If the resultant is at 90° with the force of smaller magnitude, what are the magnitude of forces ?

Q 5 Two tall buildings are 45m apart. With what velocity must a ball be thrown horizontally from a window 50m above the ground in one building so that it enters a window 5.9m above the ground in other building?

ASSESSMENT DAY 6

KINEMATICS (Resolution of vectors, multiplication of vectors, centripetal acceleration)

Level 1

Q 1 What is the resolved form for a vector which is 5 units in long and is inclined at an angle of 45 degrees to the X axis?

Q 2 A vector is represented as $4\hat{i} + 3\hat{j}$. What is its magnitude?

Q 3 Find the torque of a force $F = 7\hat{i} + 3\hat{j} + 5\hat{k}$ N about the origin. The force acts on a particle whose position vector is $\hat{i} + \hat{j} + \hat{k}$ m.

Q 4 A car is moving in a spiral starting from the origin with uniform angular velocity. What can be said about the instantaneous velocity?

- a) It increases with time
- b) It decreases with time
- c) It remains constant
- d) It does not depend on time

Q5 The sum and difference of two vectors are perpendicular to each other. Prove that the vectors are equal in magnitude.

Level 2

Q1 What will be the angle between **A** and **B**, if the area of the parallelogram drawn with **A** and **B** as its adjacent sides is $\frac{1}{2} AB$

Q 2 Find the angle between force $F = (3\hat{i} + 4\hat{j} + 5\hat{k})$ unit and displacement $d = (5\hat{i} + 4\hat{j} + 3\hat{k})$ unit.

Q 3 Find $|\mathbf{x}|$ if for a unit vector **a**, $(\mathbf{x} - \mathbf{a}) \cdot (\mathbf{x} + \mathbf{a}) = 12$.

Q 4 Find the value of λ for which the two vectors $2\hat{i} - \hat{j} + 2\hat{k}$ and $3\hat{i} + \lambda\hat{j} + \hat{k}$ are perpendicular.

Q 5 What is the angle between two vectors if the ratio of their dot product and magnitude of cross product is $\sqrt{3}$.

Day 7,8,9

DAY	NAME OF UNIT	CONTENT	LEARNING OBJECTIVE
7,8,9	1. LAWS OF MOTION	• Newton's second and third laws of motion • Uniform circular motion • Centripetal force • Centripetal acceleration Graph analysis	• Application of formulae to solve problems • Difference of vectors • Magnitude and direction of vectors • Resolution of vectors • Use of Differentiation • Plotting graphs • Graph analysis and solving problems using graphical data

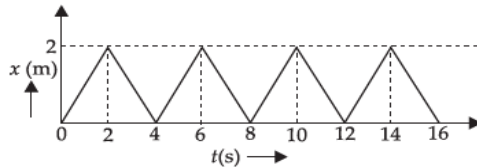
WORK, ENERGY AND POWER

UNIT	TOPIC	LEARNING OBJECTIVES
2. WORK, ENERGY AND POWER DAY 2	• Kinetic energy • Power • Graph analysis	• Conversion of one form of energy to another • Function of function • Potential gradient • Percentage change • Integral calculus • Conservation laws • Graph analysis

Assessment Day 7

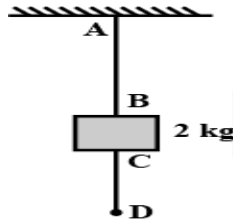
ONE MARK QUESTIONS

1. A cricket ball of mass 150 g has an initial velocity $u = (3\hat{i} + 4\hat{j}) \text{ ms}^{-1}$ and a final velocity $v = -(3\hat{i} + 4\hat{j}) \text{ ms}^{-1}$ after being hit. Find the change in momentum (in kg m s^{-1}).
2. A body of mass 2 kg travels according to the law $x(t) = pt + qt^2 + rt^3$ where $p = 3 \text{ ms}^{-1}$, $q = 4 \text{ ms}^{-2}$ and $r = 5 \text{ ms}^{-3}$. Calculate the force acting on the body at $t = 2$ seconds?
3. A hockey player is moving northward and suddenly turns westward with the same speed to avoid opponent. Find the direction of force that acts on the player.
4. A block placed on a rough horizontal surface is pulled by a horizontal force F . let f be the force applied by the rough surface on the block. Plot a graph of f versus F .
5. The figure shows the position-time (x - t) graph of one-dimensional motion of a body of mass 0.4 kg. Find the magnitude of each impulse.

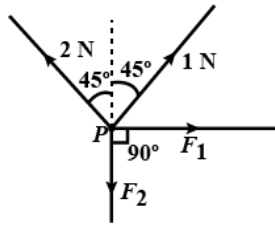


TWO MARKS QUESTIONS

1. A mass of 2 kg is suspended with thread AB as shown in the fig. Thread CD of the same type is attached to the other end of 2 kg mass. Lower thread is pulled gradually, harder and harder in the downward direction so as to apply force on AB. Which of the threads will break and why?



2. A cricket bowler releases the ball in two different ways
 - (a) Giving it only horizontal velocity, and
 - (b) Giving it horizontal velocity and a small downward velocity.The speed v_s at the time of release is the same. Both are released at a height H from the ground. Which one will have greater speed when the ball hits the ground? Neglect air resistance.
3. There are four forces acting at a point P produced by strings as shown in fig., which is at rest. Find the forces **F1** and **F2**.



4. Two stones of masses m and $2m$ are whirled in horizontal circles, the heavier one in a radius $r/2$ and the lighter one in radius r . The tangential speed of lighter stone is n times that of the value of heavier stone when they experience the same centripetal forces. Find the value of n .
5. A monkey is descending from the branch of a tree with constant acceleration. If the breaking strength is 75% of the weight of the monkey. Calculate the minimum acceleration with which monkey can slide down without breaking the branch of the tree.

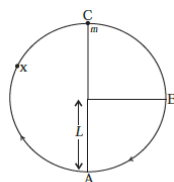
Assessment Day 8

LEVEL 1

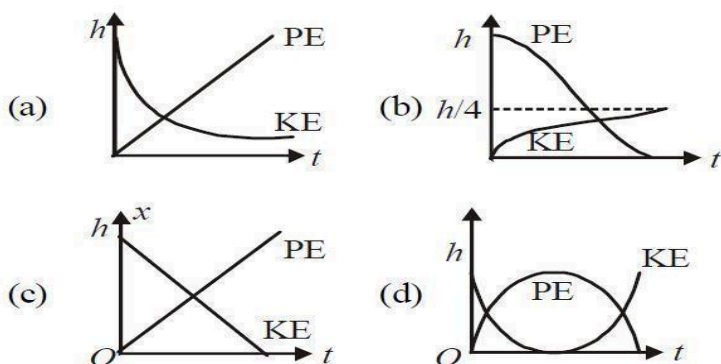
1. A ball of mass 2 kg and another of mass 4 kg are dropped together from a 60 feet tall building. After a fall of 30 feet each towards the Earth, find the ratio of their respective kinetic energies.
2. A balloon filled with helium rises against gravity increasing its potential energy. The speed of the balloon also increases as it rises. How do you reconcile this with the law of conservation of mechanical energy? Neglect the viscous drag of air and assume that density of air is constant.
3. A body projected vertically from the earth reaches a height equal to earth's radius before returning to the earth. The power exerted by the gravitational force is greatest:
 - (a) At the highest position of the body
 - (b) At the instant just before the body hits the earth
 - (c) It remains constant all through
 - (d) At the instant just after the body is projected
4. Two bodies of unequal masses are moving in the same direction with equal kinetic energy. The two bodies are brought to rest by applying retarding force of same magnitude. How would you the distance moved by them before coming to rest compare?

LEVEL 2

1. A bob of mass m suspended by a light string of length L is whirled into a vertical circle as shown in fig. What will be the trajectory of the particle if the string is cut at
 - (a) Point B?
 - (b) Point C?
 - (c) Point X?



2. The momentum of a body increases by 20%. Find the percentage increase in its kinetic energy.
3. An engine pumps water continuously through a hose. Water leaves the hose with a velocity v and m is the mass per unit length of the water jet. What is the rate at which kinetic energy is imparted to water?
4. A force $F = 20 + 10y$ acts on a particle in y -direction where F is in newton and y is in metre. Calculate the work done by this force to move the particle from $y = 0$ to $y = 1$ m.
5. A raindrop falling from a height h above ground, attains a near terminal velocity when it has fallen through a height $(3/4)h$. Which of the diagrams shown in fig. correctly shows the change in kinetic and potential energy of the drop during its fall to the ground?

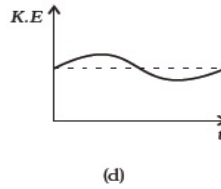
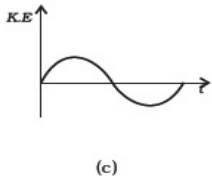
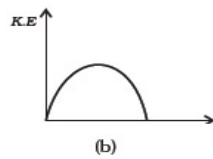
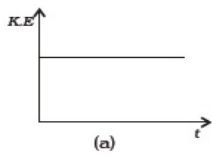


6. The potential energy of a particle in a force field is: $U = \frac{A}{r^2} - \frac{B}{r}$ where A and B are positive constants and r is the distance of particle from the centre of the field. Find the distance of the particle for stable equilibrium.

Assessment Day 9

LEVEL 1

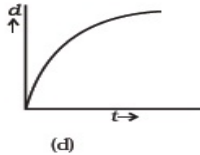
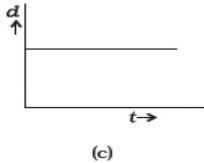
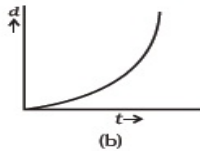
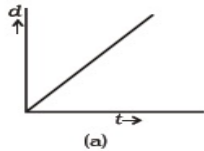
1. A cyclist turns around a curve at 15 miles/hour. If he turns at double the speed, what will be the tendency to overturn?
2. Two bodies of equal masses revolve in circular orbits of radii R_1 and R_2 with the same speed. Calculate the ratio of their centripetal forces.
3. A mass is supported on a frictionless horizontal surface. It is attached to a string and rotates about a fixed centre at an angular velocity ω_0 . If the length of the string and angular velocity are doubled, what will be the new tension in the string if initially it was T_0 .
4. Which of the diagrams shown in fig. most closely shows the variation in kinetic energy of the earth as it moves once around the sun in its elliptical orbit?



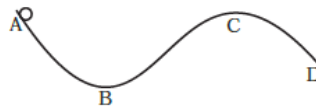
LEVEL 2

- A closed compartment containing gas is moving with some acceleration in horizontal direction. Neglect effect of gravity, then the pressure in the compartment is
 (a) Same everywhere
 (b) Lower in front side
 (c) Lower in rear side
 (d) Lower in upper side

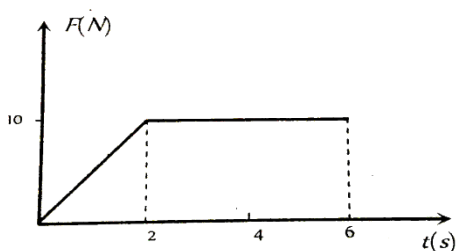
- A body is moving unidirectionally under the influence of a source of constant power supplying energy. Which of the following diagrams shown in fig. correctly shows the displacement-time curve for its motion?



- A curved surface is shown in fig. The portion BCD is free of friction. There are three spherical balls of identical radii and masses. Balls are released from rest one by one from A which is at a slightly greater height than C.



- With the surface AB, ball 1 has large enough friction to cause rolling down without slipping; ball 2 has a small friction and ball 3 has a negligible friction.
- For which balls is total mechanical energy conserved?
 - Which ball(s) can reach D?
 - For balls which do not reach D, which of the balls can reach back A?
- A body of mass 3 kg is acted on by a force which varies as shown in the graph below. Calculate the momentum acquired



Day 10,11,12

DAY	NAME OF UNIT	CONTENT	LEARNING OBJECTIVE
10	Motion of System of Particles and Rigid Body	Centre of mass	Students will be able to apply the previous knowledge in understanding the Electrostatics, electromagnetic waves, Alternating Currents,, dual Nature and Atoms &nuclei.
		Angular momentum & Torque	
		Law of conservation of Linear momentum	
		Law of conservation of angular momentum	
11	Motion of System of Particles and Rigid Body	Equilibrium of rigid body	Students will be able to apply the previous knowledge of moment of inertia in understanding the equivalent physical quantities in physics
		Moment of inertia	
		Values of moments of inertia for simple geometrical objects	
		Equations of rotational	
12	Gravitation	Universal law of gravitation.	The students enable themselves to understand the cause and effect different types of fields.
		Acceleration due to gravity and its variation	
		Gravitational potential energy	
		Gravitational potential	
		Orbital velocity	

Assessment Day 10

Level :1

- (1) The centre of mass should always lie inside the body? True/False
- (2) Name the bodies where the geometrical centre and centre of mass of a body coincide?
- (3) The centre of mass of a triangular lamina lies at
- (4) Moment of a couple does not depend on the point about which you take the moments.

True/False

- (5) Just as the moment of a force is the rotational analogue of force, the quantity angular momentum is the rotational analogue of

Level :2

- (1) Find the centre of mass of three particles at the vertices of an equilateral triangle. The masses of the particles are 100g, 150g, and 200g respectively. Each side of the equilateral triangle is 0.5m long.
- (2) Find the torque of force $7\mathbf{i} + 3\mathbf{j} - 5\mathbf{k}$ about the origin, The force acts on the particle whose position vector is $\mathbf{i} - \mathbf{j} + \mathbf{k}$.
- (3) A girl sits on a swivel chair what happens if she stretches her arms/brings her arms closer to the body.
- (4) Why is the speed of whirl wind in a tornado so high?
- (5) If angular momentum is conserved in a system whose moment of inertia is decreased, will its rotational kinetic energy be also conserved? Explain

Assessment Day 11

Level:1

- (1) If the moment of inertia of an isolated system is halved. What happens to its angular velocity?
- (2) Find the angular momentum of the object. When an object with the moment of inertia $I = 10 \text{ kg.m}^2$ is made to rotate 2 rad/sec speed.
- (3) Two lenses of same mass and same radius are given. One is concave and other is convex. Which will have more MI?
- (4) Write equations of motion for rotational motion.

(5) What are the factors on which moment of inertia depend upon?

Level:2

(1) What is the moment of inertia of a ring about a tangent to the circle of the ring?

(2) The M. I. of a solid sphere about tangent is $(5/3)MR^2$ Where M is mass and R is radius of the sphere. Find the M.I. of the sphere about its diameter .

(3) The angular speed of a motor wheel is increased from 1200 rpm to 3120 rpm in 16 seconds. What is its angular acceleration?

(4) According to principal of moments, a body will be in rotational equilibrium if..

(5) Estimate the conditions for mechanical equilibrium for a rigid body.

Assessment Day 12

Level:1

(1) The gravitational force between the objects two is F. If masses of both the objects are halved without altering the distance between them, the gravitational force would become

(2) The masses of physical object is :-

(a) Not the same thing as weight of an object. (b) The amount of matter contained in object, independent of position of object.

(c) Measure of extent to which a particle or object resists a change in direction or speed when a force is applied.

(d) All of the above

(3) What is the value of the Gravitational potential energy at Infinity?

(4) Define Intensity of gravitational field.

(5) Orbital velocity of a satellite is Dependent of the mass of the satellite. True/false

Level 2

(1) The radius of the Earth shrinks by 1% the acceleration due to gravity on the earth's surface would

(2) What is the Gravitational Intensity and Gravitational Potential at all points inside a uniform spherical shell?

(3) Write the factors on which acceleration due to gravity depends.

(4) Write the Reason of weightlessness in satellite.

(5) An artificial satellite moving in a circular orbit at a distance H from the centre of the earth has a total energy E_t . Its potential energy is.....

Day 13,14,15

Day	TOPICS	LEARNING OBJECTIVES
13,14,15	Periodic motion and periodic functions, (Sine and Cos curve), Equation of SHM, Definition: Mean position, Displacement, and angular displacement, Restoring force, amplitude, time period, Intensity frequency, angular frequency wavelength, wave number, wave speed, Resonance	• Understand the concept of Periodic motion • Understand the terms time period, frequency, displacement as a function of time • Understand the terms restoring force and force constant • Apply the concepts of energy in S.H.M. Kinetic and potential energies to solve problems • Graphical analysis of a plane progressive and simple harmonic wave and finding displacement, velocity, acceleration, wavelength, time-period, phase etc using graphs as well as mathematically (use of derivatives)
	Types of waves, Transverse and longitudinal waves, Phase and phase difference, wavefront, Principle of superposition of waves	• Understand the terms Wave motion. Transverse and longitudinal waves, • Solve problems on speed of wave motion. Displacement relation for a progressive wave • Understand the Principle of superposition of waves and Reflection of waves • Apply the principle of superposition of waves to solve numericals

Assessment Day 13

Level 1

1. What is the principle of tuning of a radio receiver?
2. A transverse wave is moving along $+x$ axis. In which plane, particles of the medium will oscillate?

3. The distance and displacement by a particle performing SHM during time interval equal to its periodic time is
 (a) 0 and 4A (b) 4A and 0 (c) 0 and 2A (d) 2A and 0
4. Two points on a travelling wave having frequency 500 Hz and velocity 300 m/s are 60° out of phase, find the distance between the two points.
5. Draw the curve for the following function (i) $f(t) = A \sin 2\pi t/T$ (ii) $g(t) = A \cos 2\pi t/T$

Level 2

1. Displacement of a particle is given as $x(t) = 5 \cos (2\pi t + \pi/4)$ find its displacement at $t = 0$ and time period
2. Identify the term representing the phase in equation $Y = A \sin (2\pi t/T + \theta)$. Hence find the phase difference for the equations $V = V_0 \sin (\omega t + \pi/2)$ and $V = V_0 \sin (\omega t - \pi/2)$.
3. If two waves $Y_1 = a \sin (kx - \omega t)$ and $Y_2 = a \sin (kx - \omega t + \phi)$ are superimposing what will be the amplitude of resultant wave? Hence find the condition of constructive (maximum amplitude) and destructive (minimum amplitude) positions.
4. In superposition, two individual amplitudes are A_0 each and the intensity is I_0 each. Find resultant amplitude and intensity at a point, where (a) phase difference between two waves is 60° (b) path difference between two waves is $\lambda/3$
5. Assertion (A) : Resonance is a special case of forced vibration in which the natural frequency of vibration of the body is the same as the impressed frequency and the amplitude of forced vibration, is maximum.

Reason (R) : The amplitude of forced vibrations of a body increases with an increase in the frequency of the externally impressed periodic force

Assessment Day 14

Level 1

1. A, B and C are three particles of a medium which are equally separated and lie along x axis. When a sinusoidal transverse wave of wavelength λ propagates along the x axis, the following observations are made (i) A and B have the same speed (ii) A and C have the same velocity. Find (a) the minimum distance between A and B (i) the minimum distance between A and C

2. Sound waves of wavelength λ travelling in a medium with a speed of v m/s enter into another medium where its speed is $2v$ m/s. Find the wavelength of waves in second medium.
3. The displacement of an elastic wave is given by the function $y = 3 \sin \omega t + 4 \cos \omega t$, where y is in cm and t is in second. Calculate the resultant amplitude
4. $\vec{E}$ and $\vec{B}$ represent the electric and the magnetic field of transverse em wave respectively. The direction of propagation of the wave is along (a) $\vec{B}$ (b) $\vec{E}$ (c) $\vec{E} \times \vec{B}$ (d) $\vec{B} \cdot \vec{E}$
5. Two waves represented by the following equations are travelling in the same medium $y_1 = 5 \sin 2\pi (75t - 0.25 x)$, $y_2 = 10 \sin 2\pi (150 t - 0.50 x)$. Find their intensity ratio.

Level 2

1. When two sound waves with a phased difference of $\pi/2$, and each having amplitude A and frequency ω , are superimposed on each other, then find the maximum amplitude and frequency of resultant wave.
2. Equation of a plane progressive wave is given by $Y = 0.6 \sin 2\pi(t-x/2)$. On reflection from a denser medium its amplitude is reduced by $2/3$. Write the equation of reflected wave.
3. Two sinusoidal waves of the same frequency are to be sent in the same direction along a taut string. One wave has an amplitude of 5.0 mm, the other 8.0 mm. (a) What phase difference ϕ_1 between the two waves results in the smallest amplitude of the resultant wave? (b) What is that smallest amplitude? (c) What phase difference ϕ_2 results in the largest amplitude of the resultant wave? (d) What is that largest amplitude? (e) What is the resultant amplitude if the phase angle is $(\phi_1 - \phi_2)/2$?
4. The equation of a progressive wave is given by $y = 0.20 \sin 2\pi (60t-x/5)$ where x and y are in meters and t is in seconds. Find the phase difference (i) between two particles separated by a distance of 125 cm (ii) between two instants $1/120$ s and $1/40$ s, for any particle.
5. Three waves from three coherent sources meet at some point. Resultant amplitude of each is A_0 . Intensity corresponding to A_0 is I_0 . Phase difference between first wave and second

wave is 60° . Path difference between first wave and third wave is $\lambda/3$. The first wave lags behind in phase angle from second and third wave. Find resultant intensity at this point.