STD XI

BLUE PRINT OF PHYSICS- FIRST TERM-2015

CHAPTER	VSA (1 Marks) 1X5=5	SA-1 (2 Marks) 2X5=10	SA-II (3 Marks) 3X12=36	VBQ (4 Marks) 1X4=4	L.A (5 Marks) 3X5=15	TOTAL 70 Marks
Unit I : Physical World and Measurement	1		1			4 Marks
Unit II: Kinematics		3	4		1	23 Marks
Unit III: Laws of Motion	1		3		1	15 Marks
Unit IV : Work, Energy and Power	1	1	2		1	14 Marks
Unit V: Motion of System of Particles and Rigid Body	2	1	2	1		14 Marks

GENERAL INSTRUCTION FOR ALL SET

(a) **All questions are compulsory.**

(b) **There are 26 questions in total. Questions 1 to 5 carry one mark each, questions 6 to 10 carry two marks each, questions 11 to 22 carry three marks each, question no.23 carry four marks and questions 24 to 26 carry five marks each.**

(c) **There is no overall choice. However, an internal choice has been provided in all three questions of five marks each. You have to attempt only one of the given choices in such questions.**

(d) **Use of calculators is not permitted.**

(e) **You may use the following physical constants wherever necessary :**

c = 3 × 10^8 m/s
h = 6.63 × 10^{-31} Js
e = 1.6 × 10^{-19} C
μ_0 = 4 π × 10^{-7}T mA^{-1}
$\frac{1}{4\pi\varepsilon_0}$ = 9 × 10^9 N m^2C^{-2}
Mass of electron = 9.1 × 10^{-31} kg
Mass of Neutron= 1.675 × 10^{-27} kg
Mass of proton = 1.673 × 10^{-27}kg

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GOVIND VIDYALAYA TAMULIA
XI– PHYSICS
SET NO-01

Time : 3 Hours **Max. Marks: 70**

1. Name the physical quantities that have dimensional formula [M L^{-1} T^{-1}].

2. Why is it difficult to catch a cricket ball than a tennis ball even when both are moving with the same velocity?

3. Define the conservative and non-conservative forces. Give examples of each.

4. A particle moves on a circular path with decreasing speed. What happens to its angular momentum?

5. What is the value of instantaneous speed of the point of contact during pure rolling?

6. The greatest height to which a man can throw a stone is h. What will be the greatest distance upto which he can throw the stone?

7. A person sitting in a train moving at constant velocity throws a ball vertically upwards. How will the ball appear to move to an observer

(i) Sitting inside the train (ii) Standing outside the train

8. A gunman always keep his gun slightly tilted above the line of sight while shooting. Why?

9. How high must a body be lifted to gain an amount of P.E equal to the K.E.When it has moving at speed 20 ms–1. (g = 9.8 ms^{-2}).

10. Show that in the absence of any external force, the velocity of the centre of mass remains constant.

11. Obtain the expression for the linear acceleration of a cylinder rolling down an inclined plane and

12. State the theorem of (i) perpendicular axis (ii) parallel axis.

13. A particle of mass m is moving in a horizontal circle of radius r under a centripetal force equal to K/r^2, k is a constant. What is the total energy of the particle.

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14. A bullet of mass 0.02 kg is moving with a speed of 10m–1s. It can penetrate 10 cm of a wooden block, and comes to rest. If the thickness of the target would be 6 cm only find the KE of the bullet when it comes out.

15. It is easier to pull a roller than to push it. Why?

16. An aeroplane requires to take off a speed of 80 km h–1 on a runway of 100m. Mass of the plane is 10000 kg and coefficient of friction between the plane and the ground is 0.2. If the acceleration of the plane is uniform during take off, Calculate the minimum force required by the engine for the take off.

17. Define force of friction? How does ball bearing reduce friction?

18. A body is projected at an angle θ with the horizontal. Derive an expression for its horizontal range. Show that there are two angles θ1 and θ2 projections for the same horizontal range. such that $\theta_1 + \theta_2 +$ = 90°

19. Derive the relation: S_n = u + a/2 (2n -1), where S nth = distance travelled in nth second
a = Uniform acceleration ,u = Initial speed

20. A body covers 12 m in 2nd second and 20 m in 4th second. How much distance will it cover in 4 seconds after the 5th second?
21. Two vectors A and B are inclined to each other at an angle θ. Using triangle law of vector addition, find the magnitude and direction of their resultant.
22. The escape velocity *v* of a body depends on– (i) the acceleration due to gravity 'g' of the planet, (ii) the radius R of the planet. Establish dimensionally the relation for the escape velocity.
23. Radha found the wheel getting detached from her uncle's car. She took it to workshop and got it repaired. She informed her uncle, who is a mechanical engineer, about this matter.
(a) What according to you the values displayed by Radha?
(b)A thin wheel can stay up-right on its rim for a considerable length of time when rolled with a considerable velocity, while it falls from its upright position at the slightest disturbance, when stationery. Explain.

24. Define spring constant, Write the characteristics of the force during the elongation of a spring. Derive the relation for the PE stored when it is elongated by X. Draw the graphs to show the variation of P.E. and force with elongation.

OR

How does a perfectly inelastic collision differ from perfectly elastic collision? Two particles of mass m_1 and m_2 having velocities U_1 and U_2 respectively make a head on collision. Derive the relation for their final velocities. Discuss the following special cases. (i) m_1 = m_2 (ii) m_1 >> m_2 and U_2 = 0 (iii) m_1 << m_2 and U_2 = 0

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25. Define the principle of conservation of linear momentum. Deduce the law of conservation of linear momentum from Newton's third law of motion.

OR

Why circular roads are banked? Derive an expression for angle of banking for safe circular turn?

26. A projectile is fired horizontally with a velocity u. Show that its trajectory

is a parabola. Also obtain expression for (i) time of flight (ii) horizontal range (iii) velocity at any instant.

OR

Define centripetal acceleration. Derive an expression for the centripetal

acceleration of a particle moving with constant speed v along a circular

path of radius r.

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GOVIND VIDYALAYA TAMULIA
XI– PHYSICS
SET NO-02

Time : 3 Hours **Max. Marks : 70**

1. Deduce dimensional formulae of—(i) Boltzmann's constant (ii) mechanical equivalent of heat.
2. Lubricants are used between the two parts of a machine. Why?
3. The momentum of the body is doubled what % does its K.E change?
4. Can the couple acting on a rigid body produce translatory motion?
5. Which component of linear momentum does not contribute to angular momentum?
6. A vector a is turned through a small angle do without a change in its length. What are Δa and a .
7. What will be the effect on horizontal range of a projectile when its initial velocity is doubled keeping angle of projection same?
8. The greatest height to which a man can throw a stone is h. What will be the greatest distance up to which he can throw the stone?

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9. 20 J work is required to stretch a spring through 0.1 m. Find the force constant of the spring. If the spring is further stretched through 0.1m. Calculate work done.
10. State the factors on which the position of centre of mass of a rigid body depends.
11. Find the moment of inertia of a rod of mass M and length L about and axis perpendicular to it through one end. Given the moment of inertia about an axis perpendicular to rod and through COM is $\frac{1}{12}$ ML^2
12. Obtain the expression for the linear acceleration of a cylinder rolling down an inclined plane.
13. A ball bounces to 80% of its original height. Calculate the mechanical energy lost in each bounce.
14. The K.E. of a particle moving along a circle of radius R depends on the distance covered S as T= αS^2 where α is constant. Find the force acting on the particle as a function of S
15. A bob of mass 0.1 kg hung from the ceiling of room by a string 2 m long is oscillating. At its mean position the speed of the bob is 1 ms–1. What is the trajectory of the oscillating bob if the string is cut when the bob is :- (i) At the mean position (Parabolic) (ii) At its extreme position. (vertically downwards)
16. It is easier to pull a roller than to push it. Why?
17. Define force of friction? How does ball bearing reduce friction?
18. Two vectors A and B are inclined to each other at an angle θ. Using triangle law of vector addition, find the magnitude and direction of their resultant.
19. A body is projected at an angle θ with the horizontal. Derive an expression for its horizontal range. Show that there are two angles θ1 and θ2 projections for the same horizontal range. such that $\theta_1 + \theta_2 +$ = 90°
20. Derive the relation: S_n = u + a/2 (2n -1),where Snth = distance travelled in nthsecond a = Uniform acceleration ,u = Initial speed
21. A body covers 12 m in 2nd second and 20 m in 4th second. How much distance will it cover in 4 seconds after the 5th second.
22. . The frequency of vibration of a string depends of on, (i) tension in the string (ii) mass per unit length of string, (iii) vibrating length of the string. Establish dimensionally the relation for frequency.
23. Radha found the wheel getting detached from her uncle's car. She took it to workshop and got it repaired. She informed her uncle, who is a mechanical engineer, about this matter.
    (a) What according to you the values displayed by Radha?
    (b)A thin wheel can stay up-right on its rim for a considerable length of time when rolled with a considerable velocity, while it falls from its upright position at the slightest disturbance, when stationery. Explain.
24. A projectile is fired horizontally with a velocity u. Show that its trajectory

is a parabola. Also obtain expression for (i) time of flight (ii) horizontal range (iii) velocity at any instant.

OR

Define centripetal acceleration. Derive an expression for the centripetal

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path of radius r.

25.Why circular roads are banked? Derive an expression for angle of banking for safe circular turn?

OR

Obtain an expression for minimum velocity of projection of a body at the lowest point for Looping a vertical loop.

26. Define spring constant, Write the characteristics of the force during the elongation of a spring. Derive the relation for the PE stored when it is elongated by X. Draw the graphs to show the variation of P.E. and force with elongation.

OR

How does a perfectly inelastic collision differ from perfectly elastic collision? Two particles of mass m_1 and m_2 having velocities U_1 and U_2 respectively make a head on collision. Derive the relation for their final velocities. Discuss the following special cases. (i) $m_1 = m_2$ (ii) $m_1 >> m_2$ and $U_2 = 0$ (iii) $m_1 << m_2$ and $U_2 = 0$

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GOVIND VIDYALAYA TAMULIA
XI– PHYSICS
SET NO-03

Time : 3 Hours **Max. Marks: 70**

1. Give examples of dimensional constants and dimensionless constants.
2. Action and reaction forces do not balance each other. Why?
3. State the two conditions under which a force does no work?
4. Which physical quantity is conserved when a planet revolves around the sun?
5. What is the value of torque on the planet due to the gravitational force of sun?
6. What are positive and negative acceleration in straight line motion?
7. Can a body have zero velocity and still be accelerating? If yes gives any situation
8. The displacement x of a particle varies with time as $x = 4t^2 - 15t + 25$. Find the position, velocity and acceleration of the particle at t = 0.
9. A force F= 2x j acts in a region, where a particle moves clock wise along the sides of a square of length 2m. Find the total amount of work done?
10. On what factors does radius of gyration of body depend?
11. Obtain the expression for the linear acceleration of a cylinder rolling down an inclined plane.
12. State the theorem of (i) perpendicular axis (ii) parallel axis.

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13. The K.E. of a particle moving along a circle of radius R depends on the distance covered S as T= αS^2 where α is constant. Find the force acting on the particle as a function of S.
14. A man pulls a lawn roller with a force of 20 kg F. If he applies the force at an angle of 60° with the ground. Calculate the power developed if he takes 1 min in doing so.
15. A horse cannot pull a cart and run in empty space. Why?
16. A bob of mass 0.1 kg hung from the ceiling of room by a string 2 m long is oscillating. At its mean position the speed of the bob is 1 ms–1. What is the trajectory of the oscillating bob if the string is cut when the bob is :- (i) At the mean position (Parabolic) (ii) At its extreme position. (vertically downwards)
17. . Define force of friction? How does ball bearing reduce friction?
18. Derive the relation: S_n = u + a/2 (2n -1),where Snth = distance travelled in nth second a = Uniform acceleration ,u = Initial speed
19. Two vectors A and B are inclined to each other at an angle θ. Using triangle law of vector addition, find the magnitude and direction of their resultant.
20. A body is projected at an angle θ with the horizontal. Derive an expression for its horizontal range. Show that there are two angles θ1 and θ2 projections for the same horizontal range. such that $\theta_1 + \theta_2 +$ = 90°
21. A body covers 12 m in 2nd second and 20 m in 4th second. How much distance will it cover in 4 seconds after the 5th second.
22. A calorie is a unit of heat or energy and it equals 4.2 J where IJ = 1kg $m^2 s^{-2}$. Suppose we employ a system of units in which unit of mass is α kg, unit of length is β m, unit of time is γ s. What will be magnitude of calorie in terms of this new system
23. . Radha found the wheel getting detached from her uncle's car . She took it to workshop and got it repaired. She informed her uncle, who is a mechanical engineer, about this matter.
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24. . Show that at any instant of time during the motion total mechanical energy of a freely falling body remains constant. Show graphically the variation of K.E. and P.E. during the motion.

OR

Define spring constant, Write the characteristics of the force during the elongation of a spring. Derive the relation for the PE stored when it is elongated by X. Draw the graphs to show the variation of P.E. and force with elongation.

25.Derive an expression for acceleration of a body down a rough inclined plane? (Sliding only)

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GOVIND VIDYALAYA TAMULIA
XI– PHYSICS
SET NO-04

Time : 3 Hours **Max. Marks: 70**

1. Given relative error in the measurement of length is .02, what is the percentage error?

2. What is inertial frame of reference?

3. A light and a heavy body have same K.E. which of the two have more momentum and why?

4. Is radius of gyration a constant quantity?

5. Two solid spheres of the same mass are made of metals of different densities. Which of them has a large moment of inertia about the diameter?

6. A person sitting in a train moving at constant velocity throws a ball vertically upwards. How will the ball appear to move to an observer

(i) Sitting inside the train (ii) Standing outside the train

7. A gunman always keep his gun slightly tilted above the line of sight while shooting. Why?

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8. The V-t graphs of two objects make angle 30° and 60° with the time axis. Find the ratio of their accelerations

9. A force acting on a body along Y axis the direction of motion of the body.If this force produces a potential energy U = A X^4 when A = 1.2 Jm^{-1}. What is the force acting on the body when the body is at x = 0.8m.

10. An internal force cannot change the state of motion of center of mass of a body. How does the internal force of the brakes bring a vehicle to rest?

11.A uniform circular disc of radius R is rolling on a horizontal surface. Determine the tangential velocity (i) at the upper most point (ii) at the centre of mass and (iii) at the point of contact.

12. Calculate the ratio of radii of gyration of a circular ring and a disc of the same radius with respect to the axis passing through their centres and perpendicular to their planes.

13. A pendulum bob of mass 0.1 kg is suspended by a string of 1 m long. The bob is displaced so that the string becomes horizontal and released. Find its kinetic energy when the string makes an angle of (i) 0°, (ii) 30° with the vertical.

14. A spring is first stretched by x by applying a force F. Now the extension of the spring is increases to 3x. What will be the new force required to keep the spring in this condition? Calculate the work done in increasing the extension.

15. The motion of a particle of mass m is described by h = ut + 1/2gt^2. Findthe force acting on particle. (F = mg)

16.A particle of mass 0.3 kg is subjected to a force of F = -kx with k = 15 N km^{-1}. What will be its initial acceleration if it is released from a point 20 cm away from the origin? (a= –10 ms–2)

17. . Define force of friction? How does ball bearing reduce friction?

18. Two vectors A and B are inclined to each other at an angle θ. Using triangle law of vector addition, find the magnitude and direction of their resultant.

19. A body is projected at an angle θ with the horizontal. Derive an expression for its horizontal range. Show that there are two angles θ1 and θ2 projections for the same horizontal range. such that θ_1+ θ_2+ = 90°.

20. Derive the relation: S_n = u + a/2 (2n -1),where Snth = distance travelled in nthsecond a = Uniform acceleration ,u = Initial speed

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21. Two vectors A and B are inclined to each other at an angle θ. Using triangle law of vector addition, find the magnitude and direction of their resultant.

22. What are the uses of dimensional analysis. Explain with examples

23. Radha found the wheel getting detached from her uncle's car . She took it to workshop and got it repaired. She informed her uncle, who is a mechanical engineer, about this matter.

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Define centripetal acceleration. Derive an expression for the centripetal

acceleration of a particle moving with constant speed v along a circular

path of radius r.

25. Why circular roads are banked? Derive an expression for angle of banking for safe circular turn?

OR

Obtain an expression for minimum velocity of projection of a body at the lowest point for Looping a vertical loop.

26. . Show that at any instant of time during the motion total mechanical energy of a freely falling body remains constant. Show graphically the variation of K.E. and P.E. during the motion.

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GOVIND VIDYALAYA TAMULIA
XI– PHYSICS
SET NO-05

Time : 3 Hours **Max. Marks: 70**

1. If a physical quantity is represented by X = [$M^a\ L^b\ T^{-c}$] and the percentage errors in the measurements of Mm L and T are α, β and γ. What will be the percentage error in X.

2. What provides the centripetal force to a car taking a turn on a level road?

3. . K.E of a body is increased by 300 %. Find the % increase in its momentum?

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4. A particle moves on a circular path with decreasing speed. What happens to its angular momentum?

5. Which component of linear momentum does not contribute to angular momentum?

6. . if A= 3i + 4j and B =7i + 24j ,find a vector having the same magnitude of B parallel to A.

7. What is the angle made by vector A =2i+ 2j, with x- axis?

8.A body projected horizontally moves with the same horizontal velocity although it moves under gravity. Why?

9. A spring of force constant K is cut into two equal pieces. Calculate force constant of each part.

10.When does a rigid body said to be in equilibrium? State the necessary condition for a body to be in equilibrium.

11. Two particles mass 100 g and 300 g at a given time have velocities 10i-7j-3k ms^{-1} and 7i-9j+6k ms^{-1} respectively. Determine velocity of COM.

12. Prove that the rate of change of angular momentum of a system of particles about a reference point is equal to the net torque acting on the system.

13. A mass less pan is placed on an elastic spring. Spring is compressed by 0.01 m when a sand bag of mass 0.1 kg is dropped on it from a height 0.24 m. From what height should the sand bag be dropped to cause a compression of 0.04 m?

14. A particle of mass m is moving in a horizontal circle of radius r under a centripetal force equal to K/r^2, k is a constant. What is the total energy of the particle.

15.Define force of friction? How does ball bearing reduce friction?

16. Is larger surface area break on a bicycle wheel more effective than smaller surface area brake? Explain?

17. A horse cannot pull a cart and run in empty space. Why?

18. Derive the relation between linear velocity and angular velocity in a uniform circular motion

19. A boat is moving with a velocity (3i – 4j) with respect to ground. The water in river is flowing with a velocity (-3i – 4j) with respect to ground. What is the relative velocity of boat with respect to river?

20.Two vectors A and B are inclined to each other at an angle θ. Using triangle law of vector addition, find the magnitude and direction of their resultant.

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21. A body is projected at an angle θ with the horizontal. Derive an expression for its horizontal range. Show that there are two angles θ1 and θ2 projections for the same horizontal range. such that $\theta_1 + \theta_2 +$ = 90°.

22. What are the uses of dimensional analysis. Explain with examples

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24. Define spring constant, Write the characteristics of the force during the elongation of a spring. Derive the relation for the PE stored when it is elongated by X. Draw the graphs to show the variation of P.E. and force with elongation.

OR

Show that at any instant of time during the motion total mechanical energy of a freely falling body remains constant. Show graphically the variation of K.E. and P.E. during the motion

25.Define the principle of conservation of linear momentum. Deduce the law of conservation of linear momentum from Newton's third law of motion.

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GOVIND VIDYALAYA TAMULIA
XI– PHYSICS
SET NO-06

Time : 3 Hours **Max. Marks: 70**

1. Give two examples of dimension less variables.
2. Calculate the impulse necessary to stop a 1500 kg car moving at a speed of $25\mathrm{m}s^{-1}$.
3. A body is moving at constant speed over a friction surface. What is the work done by the weight of the body?
4. What is the value of instantaneous speed of the point of contact during pure rolling?
5. Which physical quantity is conserved when a planet revolves around the sun?
6. When does (i) height attained by a projectile maximum? (ii) horizontal range is maximum?
7. What is the angle between velocity vector and acceleration vector in uniform circular motion?
8. What is the vector sum of n coplanar forces, each of magnitude F, if each force makes an angle of $\frac{2\pi}{n}$ with the preceding force?
9. A particle of mass 1 g moving with a velocity V_1= (3i-2j)m/s has elastic collision with another particle of mass 2 g moving with a velocity V_2 =(4j-6k)m/s. Find the velocity of the particle formed.
10. State the factors on which the moment of inertia of a body depends.

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11. A uniform circular disc of radius R is rolling on a horizontal surface. Determine the tangential velocity (i) at the upper most point (ii) at the centre of mass and (iii) at the point of contact.
12. Three masses 3 kg, 4 kg and 5 kg are located at the corners of an equilateral triangle of side 1m. Locate the centre of mass of the system.
13. A particle of mass m is moving in a horizontal circle of radius r under a centripetal force equal to K/r^2, k is a constant. What is the total energy of the particle.
14. A bullet of mass 0.02 kg is moving with a speed of 10m–1s. It can penetrate 10 cm of a wooden block, and comes to rest. If the thickness of the target would be 6 cm only find the KE of the bullet when it comes out.
15. A horse cannot pull a cart and run in empty space. Why?
16. 35. A bob of mass 0.1 kg hung from the ceiling of room by a string 2 m long is oscillating. At its mean position the speed of the bob is 1 ms–1. What is the trajectory of the oscillating bob if the string is cut when the bob is :- (i) At the mean position (Parabolic) (ii) At its extreme position. (vertically downwards)
17. It is easier to pull a roller than to push it. Why?
18. Show that there are two values of time for which a projectile is at the same height. Also show that the sum of these two times is equal to the time of flight.
19. Derive the relation between linear velocity and angular velocity in a uniform circular motion
20. A boat is moving with a velocity (3i – 4j) with respect to ground. The water in river is flowing with a velocity (-3i – 4j) with respect to ground. What is the relative velocity of boat with respect to river?
21. 15. A hiker stands on the edge of a clift 490 m above the ground and throws a stone horizontally with an initial speed of 15 m s^{-1}.Neglecting air resistance, find the time taken by the stone to reach the ground and the speed with which it hits the ground g=9.8m/s^2.
22. What are the uses of dimensional analysis. Explain with examples
23. Radha found the wheel getting detached from her uncle's car . She took it to workshop and got it repaired. She informed her uncle, who is a mechanical engineer, about this matter.
    (a) What according to you the values displayed by Radha?
    (b)A thin wheel can stay up-right on its rim for a considerable length of time when rolled with a considerable velocity, while it falls from its upright position at the slightest disturbance, when stationery. Explain.

24. A projectile is fired horizontally with a velocity u. Show that its trajectory

is a parabola. Also obtain expression for (i) time of flight (ii) horizontal range (iii) velocity at any instant.

OR

Define centripetal acceleration. Derive an expression for the centripetal

acceleration of a particle moving with constant speed v along a circular

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path of radius r.

25.Why circular roads are banked? Derive an expression for angle of banking for safe circular turn?

OR

Obtain an expression for minimum velocity of projection of a body at the lowest point for Looping a vertical loop.

26. Define spring constant, Write the characteristics of the force during the elongation of a spring. Derive the relation for the PE stored when it is elongated by X. Draw the graphs to show the variation of P.E. and force with elongation.

OR

How does a perfectly inelastic collision differ from perfectly elastic collision? Two particles of mass m_1 and m_2 having velocities U_1 and U_2 respectively make a head on collision. Derive the relation for their final velocities. Discuss the following special cases. (i) $m_1 = m_2$ (ii) $m_1 >> m_2$ and $U_2 = 0$ (iii) $m_1 << m_2$ and $U_2 = 0$

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GOVIND VIDYALAYA TAMULIA
XI– PHYSICS
SET NO-07

Time : 3 Hours **Max. Marks: 70**

1. Name same physical quantities that have same dimension.
2. Why does a gun recoils when a bullet is being fired?
3. What happens to the P.E of a bubble when it rises in water?
4. What is the value of torque on the planet due to the gravitational force of sun?
5. If no external torque acts on a body, will its angular velocity be constant?
6. On a 60 km straight road, a bus travels the first 30 km with a uniform speed of 30kmh^{-1}. How fast must the bus travel the next 30 km so as to have average speed of 40 kmh^{-1} for the entire trip?
7. A train is moving on a straight track with acceleration a. A passenger drops a stone. What is the acceleration of stone with respect to passenger?
8. a) What is the average value of acceleration vector in uniform circular motion over one cycle?
   b) Does a vector quantity depends upon frame of reference chosen?

9. Find the work done if a particle moves from position r_1= (3i -2j-6k) m to a position r_2= (14i+13j-9k)m under the effect of force ,F=(4i+j+3k) N.

10.What is the turning effect of force called for ? On what factors does it depend?

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11. The angular speed of a motor wheel is increased from 1200 rpm to 3120 rpm in 16 seconds. (i)What is its angular acceleration (assume the acceleration to be uniform) (ii) How many revolutions does the wheel make during this time?

12. Prove that the acceleration of a solid cylinder rolling without slipping down an inclined plane is $\frac{2g}{3}\sin\theta$.

13. A bullet of mass 0.02 kg is moving with a speed of 10m–1s. It can penetrate 10 cm of a wooden block, and comes to rest. If the thickness of the target would be 6 cm only find the KE of the bullet when it comes out.

14. A locomotive of mass m starts moving so that its velocity v is according to the law v=a$\sqrt{s}$, where a is constant and s is distance covered. Find the total work done by all the forces acting the locomotive during the first t seconds after the beginning of motion.

15. A spring balance is attached to the ceiling of a lift. When the lift is at rest spring balance reads 49N of a body hang on it. If the lift moves :- (i) Downward (ii) upward, with an acceleration of 5m/s^2 (iii) with a constant velocity. What will be the reading of the balance in each case?

16. It is easier to pull a roller than to push it. Why?

17. A force of 98 N is just required to move a mass of 45 kg on a rough horizontal surface. Find the coefficient of friction and angle of friction?

18. A cyclist is riding with a speed of 27 kmh^{-1}. As he approaches a circular turn on the road of radius 30 m, he applies brakes and reduces his speed at the constant rate 0.5

19. Prove that the maximum horizontal range is four times the maximum height attained by the projectile, when fired at an inclination so as to have maximum range.

20. Show that there are two values of time for which a projectile is at the same height. Also show that the sum of these two times is equal to the time of flight.

21. Derive the relation between linear velocity and angular velocity in a uniform circular motion

22. What are the uses of dimensional analysis. Explain with examples

23. . Radha found the wheel getting detached from her uncle's car . She took it to workshop and got it repaired. She informed her uncle, who is a mechanical engineer, about this matter.

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24. Show that at any instant of time during the motion total mechanical energy of a freely falling body remains constant. Show graphically the variation of K.E. and P.E. during the motion.

OR

Define spring constant, Write the characteristics of the force during the elongation of a spring. Derive the relation for the PE stored when it is elongated by X. Draw the graphs to show the variation of P.E. and force with elongation.

25.Define the principle of conservation of linear momentum. Deduce the law of conservation of linear momentum from Newton's third law of motion.

OR

Why circular roads are banked? Derive an expression for angle of banking for safe circular turn?

26. A projectile is fired horizontally with a velocity u. Show that its trajectory

is a parabola. Also obtain expression for (i) time of flight (ii) horizontal range (iii) velocity at any instant.

OR

Define centripetal acceleration. Derive an expression for the centripetal

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GOVIND VIDYALAYA TAMULIA
XI– PHYSICS
SET NO-08

Time : 3 Hours **Max. Marks: 70**

1. Name the strongest force in nature. What is its range?
2. A passenger sitting in a car at rest, pushes the car from within. The car doesn't move. Why?
3. How can we change the momentum of a body without change in its K.E.?
4. Two solid spheres of the same mass are made of metals of different densities. Which of them has a large moment of inertia about the diameter?
5. The moment of inertia of two rotating bodies A and B are IA and IB (IA >IB) and their angular momenta are equal. Which one has a greater kinetic energy.
6. a)What is the angular velocity of the hour hand of a clock?
   b)What is the source of centripetal acceleration for earth to go round the sun.
7. A body covers 12 m in 2nd second and 20 m in 4th second. How much distance will it cover in 4 seconds after the 5th second.
8. 10. A ball thrown vertically upwards with a speed of 19.6 ms^{-1} from the top of a tower returns to the earth in 6s. Find the height of the tower (g = 9.8 m/s^2)
9. How high must a body be lifted to gain an amount of P.E equal to the K.E.When it has moving at speed 20 ms–1. (g = 9.8 ms^{-2}).
10. Can a body be in equilibrium while in motion? If yes, give an example.

11.

11. Three masses 3 kg, 4 kg and 5 kg are located at the corners of an equilateral triangle of side 1m. Locate the centre of mass of the system.

12. A uniform circular disc of radius R is rolling on a horizontal surface. Determine the tangential velocity (i) at the upper most point (ii) at the centre of mass and (iii) at the point of contact.
13. A locomotive of mass m starts moving so that its velocity v is according to the law v=a$\sqrt{s}$, where a is constant and s is distance covered. Find the total work done by all the forces acting the locomotive during the first t seconds after the beginning of motion.
14. A ball falls under gravity from a height 10m, with an initial velocity V_0, it hits the ground, looses 50% of its energy after collision and it rises to the same height. What is the value of V_0?
15. A 50 g bullet is fired from a 10 kg gun with a speed of 500 ms–1. What is the speed of the recoil of the gun. (2.5 ms–1)
16. 30. A block of mass M is pulled along a horizontal frictionless surface by a rope of mass m by applying a force P at the free end of the rope. Find the force exerted by the rope on the block.
17. A force of 98 N is just required to move a mass of 45 kg on a rough horizontal surface. Find the coefficient of friction and angle of friction?
18. A stone tied to the end of a string 80 cm long is whirled in a horizontal circle with a constant speed. If the stone makes 14 revolutions in 25 seconds, what is the magnitude and direction of acceleration of the stone?
19. A cyclist is riding with a speed of 27 kmh^{-1}. As he approaches a circular turn on the road of radius 30 m, he applies brakes and reduces his speed at the constant rate 0.5

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20. Prove that the maximum horizontal range is four times the maximum height attained by the projectile, when fired at an inclination so as to have maximum range.
21. Show that there are two values of time for which a projectile is at the same height. Also show that the sum of these two times is equal to the time of flight.
22. What are the uses of dimensional analysis. Explain with examples
23. . Radha found the wheel getting detached from her uncle's car . She took it to workshop and got it repaired. She informed her uncle, who is a mechanical engineer, about this matter.
(a) What according to you the values displayed by Radha?
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24. A projectile is fired horizontally with a velocity u. Show that its trajectory

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OR

Define centripetal acceleration. Derive an expression for the centripetal

acceleration of a particle moving with constant speed v along a circular

path of radius r.

25. Obtain an expression for minimum velocity of projection of a body at the lowest point for Looping a vertical loop.

OR

Derive an expression for acceleration of a body down a rough inclined plane? (Sliding only)

26. Show that at any instant of time during the motion total mechanical energy of a freely falling body remains constant. Show graphically the variation of K.E. and P.E. during the motion.

OR

Define spring constant, Write the characteristics of the force during the elongation of a spring. Derive the relation for the PE stored when it is elongated by X. Draw the graphs to show the variation of P.E. and force with elongation.

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GOVIND VIDYALAYA TAMULIA
XI– PHYSICS
SET NO-09

Time : 3 Hours **Max. Marks: 70**

1. Define the term unit. Distinguish between fundamental and derived units

2. Why the passengers in a moving car are thrown outwards when it suddenly takes a turn?

3. Two bodies stick together after collision. What type of collision is in between these two bodies?

4. Can the couple acting on a rigid body produce translatory motion?

5. Which component of linear momentum does not contribute to angular momentum?

6. A motorboat is racing towards north at 25 km$h^{-1}$and the water current in that region is 10 kmh^{-1} in the direction of 60° east of south. Find the resultant velocity of the boat.

7. What is the magnitude of (A + B) equal to the magnitude of (A – B)?

8. What is the maximum number of component into which a vector can be resolved?

9. Derive an expression for it K.E of a body of mass m moving with a velocity v by calculus method.

10. When does a rigid body said to be in equilibrium? State the necessary condition for a body to be in equilibrium.

11. Show that the angular momentum of a particle is the product of its linear momentum and moment arm. Also show that the angular momentum is produced only by the angular component of linear momentum.

12. Two particles mass 100 g and 300 g at a given time have velocities 10i-7j-3k ms^{-1} and 7i-9j+6k ms^{-1} respectively. Determine velocity of COM.

13. A ball falls under gravity from a height 10m, with an initial velocity V_0, it hits the ground, looses 50% of its energy after collision and it rises to the same height. What is the value of V_0?

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14. A spring is first stretched by x by applying a force F. Now the extension of the spring is increases to 3x. What will be the new force required to keep the spring in this condition? Calculate the work done in increasing the extension.

15. It is difficult to push a box full of clothes than an empty box. Explain.

16. A particle of mass 0.3 kg is subjected to a force of F = -kx with k = 15 N km^{-1}. What will be its initial acceleration if it is released from a point 20 cm away from the origin? (a= –10 ms–2)

17. A force of 98 N is just required to move a mass of 45 kg on a rough horizontal surface. Find the coefficient of friction and angle of friction?

18. Two vectors A and B are inclined to each other at an angle θ. Using triangle law of vector addition, find the magnitude and direction of their resultant.

19. A body is projected at an angle θ with the horizontal. Derive an expression for its horizontal range. Show that there are two angles θ1 and θ2 projections for the same horizontal range. such that $\theta_1 + \theta_2 +$ = 90°

20. Prove that the maximum horizontal range is four times the maximum height attained by the projectile, when fired at an inclination so as to have maximum range.

21. Show that there are two values of time for which a projectile is at the same height. Also show that the sum of these two times is equal to the time of flight.

22. What are the uses of dimensional analysis. Explain with examples

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24. Define spring constant, Write the characteristics of the force during the elongation of a spring. Derive the relation for the PE stored when it is elongated by X. Draw the graphs to show the variation of P.E. and force with elongation.

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Show that at any instant of time during the motion total mechanical energy of a freely falling body remains constant. Show graphically the variation of K.E. and P.E. during the motion.

25. Define the principle of conservation of linear momentum. Deduce the law of conservation of linear momentum from Newton's third law of motion.

OR

Derive an expression for acceleration of a body down a rough inclined plane? (Sliding only)

26. A projectile is fired horizontally with a velocity u. Show that its trajectory

is a parabola. Also obtain expression for (i) time of flight (ii) horizontal range (iii) velocity at any instant.

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GOVIND VIDYALAYA TAMULIA
XI– PHYSICS
SET NO-10

Time : 3 Hours **Max. Marks: 70**

1 In Van der Wall equation (P + $\frac{a}{V^2}$) (V – b) = RT, Determine the dimensions of *a* and *b*.

2. Give the magnitude and directions of the net force acting on a rain drop falling with a constant speed.

3. Mountain roads rarely go straight up the slope, but wind up gradually. Why?

4. A system is in stable equilibrium. What can we say about its potential energy?

5. State the principle of moments of rotational equilibrium.

6. A particle is in clockwise uniform circular motion the direction of its acceleration is radially inward. If sense of rotation or particle is anticlockwise then what is the direction of its acceleration?

7. A train is moving on a straight track with acceleration a. A passenger drops a stone. What is the acceleration of stone with respect to passenger?

8. What is the average value of acceleration vector in uniform circular motion over one cycle?

9. A elastic spring is compressed by an amount x. Show that its P.E is ½ kx^2 ,Where k is the spring constant?

10. On what factors does radius of gyration of body depend?

11.Prove that the rate of change of angular momentum of a system of particles about a reference point is equal to the net torque acting on the system.

12. Derive a relation between angular momentum, moment of inertia and angular velocity of a rigid body.

13. A spring is first stretched by x by applying a force F. Now the extension of the spring is increases to 3x. What will be the new force required to keep the spring in this condition? Calculate the work done in increasing the extension.

14. A locomotive of mass m starts moving so that its velocity v is according to the law v=a$\sqrt{s}$, where a is constant and s is distance covered. Find the total work done by all the forces acting the locomotive during the first t seconds after the beginning of motion.

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15. A block of mass M is pulled along a horizontal frictionless surface by a rope of mass m by applying a force P at the free end of the rope. Find the force exerted by the rope on the block,

16. Three forces F1, F2 and F3 are acting on the particle of mass m which is stationary. F2 is perpendicular to F1 if F1 is removed, what will be the acceleration of particle? (a = F1/m)

17. A force of 98 N is just required to move a mass of 45 kg on a rough horizontal surface. Find the coefficient of friction and angle of friction?

18.Derive the relation: S_n = u + a/2 (2n -1),where Snth = distance travelled in nthsecond a = Uniform acceleration ,u = Initial speed

19. The velocity time graph for a particle is shown in figure. Draw acceleration time graph from it.

20. Draw position-time graphs of two objects, A and B moving along a straight line, when their relative velocity is zero

21. For an object projected upward with a velocity Vo, which comes back to the same point after some time, draw (i) Acceleration-time graph (ii) Position-time graph (iii) Velocity-time graph.

22. What are the uses of dimensional analysis. Explain with examples.

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OR

How does a perfectly inelastic collision differ from perfectly elastic collision? Two particles of mass m_1 and m_2 having velocities U_1 and U_2 respectively make a head on collision. Derive the relation for their final velocities. Discuss the following special cases.
(i) $m_1 = m_2$ (ii) $m_1 >> m_2$ and $U_2 = 0$ (iii) $m_1 << m_2$ and $U_2 = 0$

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