GOVIND VIDYALAYA, TAMULIA

PHYSICS (SET I)

SAMPLE PAPER OF 1ST TERM (2015-16)

STD. XI

TIME :3:00HRS. **F.M.- 70**

GENERAL INSTRUCTION :

(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.**

1. Name the physical quantities that have dimensional formula [M L^{-1} T^{-1}].
2. Deduce dimensional formulae of—(i) Boltzmann's constant (ii) mechanical equivalent of heat.
3. What does the area under velocity –time graph represent.
4. Define the conservative and non-conservative forces. Give examples of each.
5. What is the maximum number of components into which a vector can be resolved?
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 m/s. (g = 9.8 ms^{-2}).
10. Write the dimensional formulae of the following : (i) angular velocity (ii) angle (iii) specific gravity (iv)density
11. 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.
12. 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.
13. It is easier to pull a roller than to push it. Why?
14. 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.
15. Define force of friction? How does ball bearing reduce friction?
16. A body is projected at an angle with the horizontal. Derive an expression for its horizontal range. Show that there are two angles θ_1 and θ_2 projections for the same horizontal range. such that θ_1+ θ_2 = 90°
17. Derive the relation: S_n = u + a/2 (2n -1), where S nth = distance travelled in nth second
    a = Uniform acceleration, u = Initial speed
18. Two vectors A and B are inclined to each other at an angle ⍰. Using triangle law of vector addition, find the magnitude and direction of their resultant.
19. 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.
20. What are the uses of dimensional analysis. Explain with examples
21. 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?
22. State and prove work-Energy theorem.

23. **A monkey is sitting on a tree. Rahim seeing the Monkey brought some fruits and gave them to the Monkey, and ran into the house immediately. On hearing the sound produced when Rahim was running the monkey was scared and climbed the nearby tree.**
(a) What values of Rahim inspired you?
(b)A monkey of mass 40 Kg climbs on a rope which can stand a maximum tension of 600 N.

In which of the following cases will the rope will break. The monkey
(I) Climbs up with an acceleration of 6 m/s.
(II) Climbs down with an acceleration of 4 m/s.
(III) Climbs up with a uniform speed of 5m/s
(IV) Falls down the rope nearly under gravity? (Take g= 10 m/s2) (Ignore the mass of the rope)

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 $U_2 = 0$

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

PHYSICS (SET II)
SAMPLE PAPER OF 1ST TERM (2015-16)
STD. XI

TIME :3:00HRS. **F.M.- 70**

GENERAL INSTRUCTION :

(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.**

1. Give examples of dimensional constants and dimensionless constants.
2. What are positive and negative acceleration in straight line motion?
3. Under what condition the sum and difference of two vectors will be equal in magnitude and direction.
4. Write the relationship between numerical value of a quantity and the size of the unit.
5. A light and a heavy body have same K.E. which of the two have more momentum and why?
6. Write the limitations of dimensional analysis.
7. Show that the path of projectile will be parabolic, if a body is projected horizontally from height h.

8. What will be the effect on horizontal range of a projectile when its initial velocity is doubled keeping angle of projection same?
9. 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?
10. 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.
11. A ball bounces to 80% of its original height. Calculate the mechanical energy lost in each bounce.
12. 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
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. It is easier to pull a roller than to push it. Why?
15. Define force of friction? How does ball bearing reduce friction?
16. 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.
17. Deduce the equations of motion by calculus method.
18. Derive the relation: S_n = u + a/2 (2n -1),where S nth = distance travelled in nth second a = Uniform acceleration ,u = Initial speed
19. A body is projected horizontally from the top of a cliff with a velocity of 9.8 m/s. What time elapses before horizontal and vertical velocities become equal? Take g=9.8 m/s^2
20. . 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.
21. 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.
22. Define Principle of homogeneity? Is this equation, v = u-at , both dimensionally and physically correct or not. Explain it by using dimensional analysis.
23. **Suresh noticed a big Granite Rock in his locality. He thought that if they worked upon it they could earn money. He took permission from the Government, completed all the formalities .He broke the Rock using a bomb. The rock was made into slices .They established a Granite industry. Many of the people in the surroundings started to earn and live comfortably.**
    (a) What values of Suresh impress you?
    (b)A bomb is thrown in a horizontal direction with a velocity of 50 m/s. It explodes into two parts of masses 6 Kg and 3 Kg. the heavier fragment continues to move in the horizontal direction with a velocity of 80 m/s .Calculate the velocity of the lighter fragment.
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 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

PHYSICS (SET III)

SAMPLE PAPER OF 1ST TERM (2015-16)

STD. XI

TIME :3:00HRS. **F.M.- 70**

GENERAL INSTRUCTION :

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

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. When does (i) height attained by a projectile maximum? (ii) horizontal range is maximum?
4. What is the angle between velocity vector and acceleration vector in uniform circular motion?
5. Deduce the dimension formulae for the Gravitational constant & surface tension.
6. 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?
7. 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.
8. A ball thrown vertically upwards with speed of 19.6 m/s. from the top of a tower returns to the earth in 6 s. Find the height of the tower.
9. Derive the relation between linear velocity and angular velocity.
10. Find the value of 60 J/min on a system that has 100 g, 100cm and 1 min as the base units.
11. Convert the values of 10 joule on a system which has 1000 grams , 10cms and 30 seconds as fundamental units.
12. Inside a stationary lift the time period of a simple pendulum is 4 sec. what will be the time period of a simple pendulum , if the lift (1) moves upward with an acceleration of 4 m/s^2 (2) moves downward with an acceleration of 4 m/s^2.
13. A horse cannot pull a cart and run in empty space. Why?
14. 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 m/s. 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)
15. It is easier to pull a roller than to push it. Why?
16. 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.
17. a) A force F is directed along Y-axis , Calculated its component along x and y axis.

b) At what angle three forces of equal magnitude may act so that their resultant is equal to zero.

18. 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?
19. 15. A hiker stands on the edge of a cliff 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.
20. If Force(F), Length (L) and Time(T) are chosen as fundamental quantities , then what would be the dimensional formula for density.
21. If the momentum of a body increased by 40%, then what would be the % increase in its K.E?
22. A force acting on a body of mass 2 kg moves it, such that y =$\frac{t^3}{3}$, where y is in m and t in sec. Calculate the work done by the force in first two seconds.
23. **Rakesh with the intention to win in the interschool sports practiced high jump**

Every day for about a month. He participated and won I position in the interschool sports. (a) Comment upon the values Rakesh possesses. (b) Why does an athlete run some steps before taking a jump?

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 $U_2 = 0$

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

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GOVIND VIDYALAYA, TAMULIA

PHYSICS (SET IV)

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STD. XI

TIME :3:00HRS. **F.M.- 70**

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2. Deduce dimensional formulae of—(i) Boltzmann's constant (ii) mechanical equivalent of heat.
3. What does the area under velocity –time graph represent.
4. Define the conservative and non-conservative forces. Give examples of each.
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10. Find the value of 60 J/min on a system that has 100 g, 100cm and 1 min as the base units.
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