

Holidays Practice Assignment

General Instruction:

ATTEMPT ALL QUESTION

1. What do you conclude about vectors **A** and **B**, if $\mathbf{A}+\mathbf{B}=\mathbf{0}$?
2. A body is weightless at the center of the earth. Why?
3. A ball is thrown straight upward. What is its velocity and acceleration at topmost point?
4. How will the momentum of a body change if its kinetic energy is doubled?
5. What is the work done by a centripetal force F when the body completes one rotation around the circle of radius R ?
6. Velocity v of sound in a gas depends on the pressure P and density ρ of the gas. Using dimensional analysis, establish a relation between v and ρ .
7. How acceleration due to gravity varies with altitude?
8. A displacement of a particle starting from rest (at $t=0$) is given by $x=6t^2-t^3$. Calculate the time at which the particle will attain zero velocity again.
9. A body is rolling on the ground with a velocity of 1ms^{-1} . After travelling a distance of 5m , it comes to rest. Find the coefficient of friction. Take $g=9.8\text{ms}^{-2}$
10. A particle moves along x -axis from $x=0$ to $x=4\text{m}$ under the influence of force given by $F=(5-3x+2x^2)\text{N}$. Calculate the work done by the force.
11. The percentage errors in the measurement of mass and speed are 2% and 3% respectively. How much will be the maximum error in the estimate of the kinetic energy obtained by measuring mass and speed.
12. A simple pendulum has a time period T_1 when on the earth surface, and T_2 when taken to a height R above the surface of earth, where R is the radius of the earth. What is the value of T_1/T_2 ?
13. Prove that the horizontal range is same when angle of projection is (i) greater than 45° by certain value and (ii) less than 45° by the same value.
14. Two resistors of resistance $R_1 = 100\pm 3$ ohm and $R_2 = 200\pm 4$ ohm are connected (a) in series, (b) in parallel. Find the equivalent resistance of the (a) series combination, $R = R_1+R_2$ and (b) parallel combination, $1/R = 1/R_1+1/R_2$ and $\Delta R/R^2 = \Delta R_1/R_1^2 + \Delta R_2/R_2^2$
15. Derive an expression for the maximum velocity required for a car on a banked road by taking into account the force of friction for safe turn.
16. Prove the law of conservation of energy by taking the case of a freely falling body.
17. Define escape velocity. Derive an expression for the escape velocity of an object from the surface of a planet.
18. Derive the equation $S = ut + \frac{1}{2}at^2$ by calculus method.
19. A body of mass m moving with speed v collides elastically head on with another body of mass m initially at rest. Show that the moving body will come to a stop as a result of this collision.
20. Find the unit vector perpendicular to both vectors $\mathbf{A}=2\hat{i}+2\hat{j}+2\hat{k}$ and $\mathbf{B}=\hat{i}-\hat{j}+2\hat{k}$

21. Two masses of 5kg and 3 kg are suspended with the help of mass less inextensible string as shown in figure. Find the values of T_1 and T_2 when whole system is going upward with acceleration of 2m/s^{-2} Take $g= 10\text{ms}^{-2}$.
22. A body starting from rest accelerates uniformly along a straight line at the rate of 10m/s for 5s.it moves for 2s with uniform velocity of 50m/s . Then it retards uniformly and comes to rest in 3 s. Draw velocity time graph of the body and find total distance traveled by the body
23. Discuss the elastic collision of two bodies in one dimension. Calculate the velocities of the bodies after the collision. Discuss, what happens when both the bodies are of equal mass.
24. A projectile is fired at an angle θ with initial velocity u . find the expression for the maximum height time of flight and horizontal range of projectile.
25. A block of metal of mass 50g is when placed over an inclined plane at an angle 15° slide down without acceleration. If the inclination is increased by 15° ,what would be the acceleration of the block
26. (a) Rain is falling vertically with a speed of 35m/s . A woman rides a bicycle with a speed of 12m/s in east to west direction. What is the relative velocity and direction in which she should hold her umbrella?
(b) A man can swim with a speed of 4km/h in still water. How long does he take to cross the river 1km wide, if the river flows steadily at 3km/h and he makes his strokes normal to the river current? How far from the river does he go, when he reaches the other bank?