



DELHI PUBLIC SCHOOL

SAIL TOWNSHIP, RANCHI

HALF YEARLY EXAMINATION (2017-18)

Class:-XI
Time- 3 Hrs.

Subject:-Physics
M.M.-70

General Instructions:-

- 1. All questions are compulsory:*
- 2. Section A contain five question of one mark each , Section B contain 5 questions of two marks each, Section C contains 12 questions of three marks each, Section D contain one value based question of 4 marks, Section E contains 3 questions of 5 marks each.*
- 3. There is no overall choice, however internal choice in provided in section B, C and E.*

Section-A

[1x5=5]

1. 5.74 g of a substance occupies 1.2 cm³. Express its density keeping significant figures in view .
2. If g is the acceleration due to gravity and λ is wavelength, then which physical quantity does $\sqrt{\lambda g}$ represent?
3. If $\vec{a} + \vec{b} = \vec{c}$ and $|\vec{a}| + |\vec{b}| = |\vec{c}|$, what can we say about the direction of these vectors?
4. The distance travelled by a body is directly proportional to time. Is any external force acting on it?
5. An impulse is applied to a moving object with a force at an angle of 20° w.r.t velocity vector. What is the angle between the impulse vector and change in momentum vector?

Section-B

[2x5=10]

6. The heat dissipated in a resistor can be determined by the relation $H = \frac{I^2 R t}{4.2}$ cal. If the maximum errors in the measurement of current, resistance and time are 2%, 1% and 1% respectively. What is the maximum error in dissipated heat?
7. An artificial satellite of mass m is revolving in a circular orbit around a planet of mass M and radius R. If the radius of the orbit of satellite be r, then period of satellite is $T = 2\pi \sqrt{\frac{r}{g}}$, Justify the relation using the method of dimensions.
8. State four advantage of S.I. over other system of units.
9. A ball is released from the top of a tower of height h metres. It takes T second to reach the ground . What is the position of the ball after T/3 second?

10. At $t = 0$, a particle at rest at origin. Its acceleration is 2m/s^2 for the 1st 3 sec and -2 m/s^2 for next 3s. Plot the acceleration versus time and velocity versus give graph.

OR

A block slides down an incline of angle 30° with an acceleration $g/4$. Find the coefficient of kinetic friction.

Section-C

[12x3=36]

11. State the law of conservation of linear momentum and derive this law from Newton's 3rd law of motion.

OR

The initial speed of a body of mass 2 kg is 5ms^{-1} . A force acts for 4 seconds in the direction of motion of the body. The force-time graph is shown in the future below. Calculate impulse of the force and also find the speed of the body.



12. A ball is thrown upward with an initial velocity 100 m/s . After how much time it will return? Draw velocity time graph for the ball and from the graph find maximum height attained by the ball.
13. Define centripetal acceleration. Derive an expression for the centripetal acceleration of a body moving with uniform speed v along a circular path of radius r .
14. What is meant by parallax? How can we find the distance of the moon by parallax method?
15. If velocity of light (c), Planck's constant (h) and gravitational constant (G) are taken as fundamental quantities then express mass and time in terms of dimensions of these quantities.
16. The distance travelled by a body is proportional to the square of time. What type of motion this body has? Points P , Q and R are in a vertical line such that $PQ = QR$. A ball at p is allowed to fall freely. What is the ratio at the times of descent through PQ and QR ?
17. The density of a material in C.G.S, system is 8 gcm^{-3} . In a system of units, in which unit of length is 5 cm and unit of mass is 20 g , what is the density of the material?
18. State parallelogram law of vector addition. Using this law find the magnitude and direction of the two given vector inclined at an angle θ .

19. The X and Y component of \vec{A} are 4m and 6m respectively. The X and Y component of the vector $(\vec{A} + \vec{B})$ are 10 m and 9 m respectively. Calculate for the vector \vec{B}
- The X and Y component
 - The length and
 - The angle it makes with the X- axis .
20. Define absolute error and relative error. In an experiment the refractive index of a medium was observed to be 1.45, 1.56, 1.54 , 1.44 , 1.54 and 1.53
Calculate (i) absolute error (ii) relative error
21. Solar constant may be defined as the amount of solar energy received per cm^2 per minute. What is the dimension of solar constant?
Which of the following is dimensionless?
- (i) $\frac{v^2}{rg}$ (ii) $\frac{v^2g}{r}$ (iii) $\frac{vg}{r}$ (d) $V^2 rg$
22. When the component of a vector \vec{A} along the direction of \vec{B} is zero , what can you conclude about the two vectors? Find the component of vector $\vec{A} = 2\hat{i} + 3\hat{j}$ along the direction of vector $\hat{i} + \hat{j}$ and $\hat{i} - \hat{j}$.

Section-D

[4]

23. In a flood hit areas of Uttarakhand , helicopter was dropping ration and other items for the victims. The helicopter was flying at a height of 49 m above the ground. Students of nearby school were helping the authority to evacuate the victims. They saw a child was drowning . They rushed towards the child with life boat and saved the child.
(i) what was the time taken by the objects dropped from helicopter to reach the ground?
(ii) What values are shown by students?

Section-E

[3x5=15]

24. Deduce the following relations analytically for a uniformly accelerated motion along a straight line
- (i) $v = u + at$ (ii) $s = ut + \frac{1}{2} at^2$ (iii) $v^2 = u^2 + 2as$
where the term have their usual meaning.

OR

A train passes a station A at 40 km/hr. and maintains its speed for 7 km and is then uniformly retarded stopping at B which is 8.5 km from A. A 2nd train starts from A at the instant the first train passes and being accelerated some part of the journey and uniformly retarded for the rest, stop at B at the same time as the first train , Calculate the greatest speed of the second train , use only the graphical method.

25. A projectile is fired with velocity u at an angle θ with the vertical. Show that its path is parabolic .
Find the expression for (i) time of flight (ii) maximum height.

OR

(a) Show that for a projectile the angle between the velocity and the X-axis as function of time is given by

$$\theta(t) = \tan^{-1} \left(\frac{v_{oy} - gt}{v_{ox}} \right)$$

(b) Show that projection angle θ_0 , for a projectile launched from the origin is given by

$$\theta_0 = \tan^{-1} \left(\frac{4hm}{g} \right)$$

26. State Newton's 2nd law of motion. Derive Newton's 1st and 3rd law of motion from 2nd law. If the speed of a motor car is doubled, how much more distance will it cover before stopping under the same retarding force?

OR

- (i) 1 kg stationary bomb is explodes in three parts having mass 1:1:3 respectively. Parts having same mass move in perpendicular direction with velocity 39 m/s, what is the velocity of the bigger part?
- (ii) Two bodies of Masses M and m are allowed to fall from the same height. If the air resistance be same for each body, will the two bodies reach the earth simultaneously?