INDIAN SCHOOL SOHAR
TERM-II EXAMINATION 2019-20
PHYSICS

No. of printed pages: 4

CLASS: XI
DATE: 14/01/2020

Max Marks: 70
Duration: 3 Hours

General Instructions:

(i) All questions are compulsory. There are 37 questions in all.
(ii) This question paper has four sections: Section A, Section B, Section C and Section D.
(iii) Section A contains 20 questions of one mark each, Section B contains seven questions of two marks each; Section C contains seven questions of three marks each and Section D contains three questions of five marks each.
(iv) There is no overall choice. However, internal choice have been provided in two questions of one mark each , two questions of two marks, one question of three marks, and all the three questions of five marks weightage. You have to attempt only one of the choices in such questions.
(v) You may use the following values of physical constants wherever necessary:

Section A

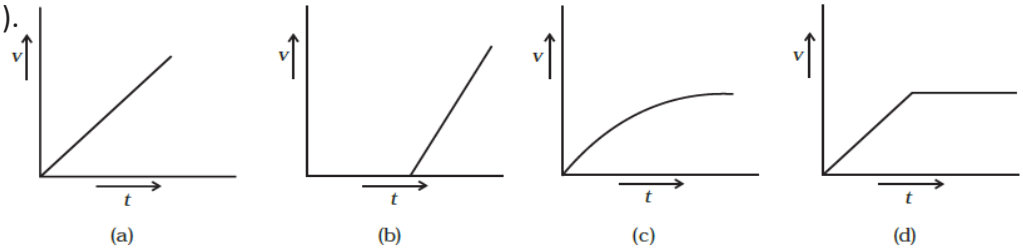
1. Which of the following measurements is most precise?
   (a) 5.00 mm
   (b) 5.00 cm
   (c) 5.00 m
   (d) 5.00 km.

OR

The mean length of an object is 5 cm. Which of the following measurements is most accurate?
   (a) 4.9 cm
   (b) 4.805 cm
   (c) 5.25 cm
   (d) 5.4 cm.

2. A lift is coming from 8th floor and is just about to reach 4th floor. Taking ground floor as origin and positive direction upwards for all quantities, which one of the following is correct?
   (a) $x < 0, v < 0, a > 0$
   (b) $x > 0, v < 0, a < 0$
   (c) $x > 0, v < 0, a > 0$
   (d) $x > 0, v > 0, a < 0$
3. The horizontal range of a projectile fired at an angle of 15° is 50 m. If it is fired with the same speed at an angle of 45°, its range will be
   (a) 60 m
   (b) 71 m
   (c) 100 m
   (d) 141 m
4. The component of a vector r along X-axis will have maximum value if
   (a) r is along positive Y-axis
   (b) r is along positive X-axis
   (c) r makes an angle of 45° with the X-axis
   (d) r is along negative Y-axis
5. Conservation of momentum in a collision between particles can be understood from
   (a) conservation of energy.
   (b) Newton's first law only.
   (c) Newton's second law only.
   (d) both Newton's second and third law.

6. A cricket ball of mass 150 g has an initial velocity $\mathbf{u} = 3\mathbf{i} + 4\mathbf{j}$ and a final velocity $\mathbf{v} = -(3\,\mathbf{i} + 4\mathbf{j})$ after being hit. The change in momentum is (in kg m s^{-1})
   (a) zero
   (b) $-(0.45\,\mathbf{i} + 0.6\,\mathbf{j})$
   (c) $-(0.9\,\mathbf{i} + 1.2\,\mathbf{j})$
   (d) $-5(\mathbf{i} + \mathbf{j})$
7. A body is falling freely under the action of gravity alone in vacuum. Which of the following quantities remain constant during the fall?
   (a) Kinetic energy. (b) Potential energy.
   (c) Total mechanical energy. (d) Total linear momentum
8. A mass of 5 kg is moving along a circular path of radius 1 m. If the mass moves with 300 revolutions per minute, its kinetic energy would be
   (a) $250\pi^2$
   (b) $100\ \pi^2$
   (c) $5\ \pi^2$
   (d) 0
9. For which of the following does the centre of mass lie outside the body ?
   (a) A pencil (b) A shotput
   (c) A dice (d) A bangle
10. A tall cylinder is filled with viscous oil. A round pebble is dropped from the top with zero initial velocity. From the plot shown indicate the one that represents the velocity (v) of the pebble as a function of time (t).



11. The time period of a second's pendulum in a satellite is ----------
12. The maximum load a wire can withstand without breaking, when its length is reduced to half of its original length, will be ----------
13. A sphere, a cube and a thin circular plate, all of same material and same mass are initially heated to same high temperature. ..... will cool fastest and ..... the slowest
14. The internal energy change of a system of ideal gas in cyclic process is .....
15. A particle is acted simultaneously by mutually perpendicular simple hormonic motions $x = a\cos\omega t$ and $y = a\sin\omega t$. The trajectory of motion of the particle will be .....

    OR

    The phenomenon of increase in amplitude when the driving force is close to the natural frequency of the oscillator is called ----------
16. What is the temperature which has same numeral value on Celsius and Fahrenheit scale.
17. What is the Young's modulus for a perfect rigid body?
18. A spring of force constant 800 Nm^{-1} has an extension of 5 cm. the work done in extending it from 5 cm to 15 cm is .....
19. Equation of a plane progressive wave is given by y = $0.6\sin 2\pi\left(t - \frac{x}{2}\right)$. On reflection from a denser medium its amplitude becomes 2/3 of the amplitude of the incident wave. Give the equation of the reflected wave.

20. The displacement of a string is given by $y\,(x,t) = 0.06 \sin(2\pi x/3) \cos(120\pi t)$ .where x and y are in m and t in s. The length of the string is 1.5m and its mass is 0.030 kg. Give the amplitude of this wave.

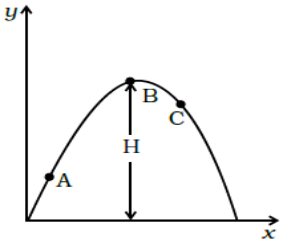
Section B

21. Calculate the solid angle subtended by the periphery of an area of $1cm^2$ at a point situated symmetrically at a distance of 5 cm from the area.

OR

Define random and systematic errors.

22. A particle is projected in air at some angle to the horizontal, moves along parabola as shown in Fig. where x and y indicate horizontal and vertical directions, respectively. Show in the diagram, direction of velocity and acceleration at points A, B and C.



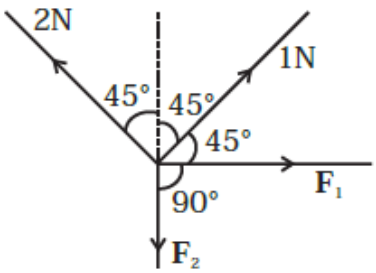
23. Define moment of inertia. Write any two factors on which it depends?
24. Time period of a planet around the Sun is 11.6 years. How far is the planet from the Sun? The distance between the Sun and the earth is $1.5\times10^{8}\,km$.
25. A truck is pulling a car out of a ditch by means of a steel cable that is 9.1 m long and has a radius of 5 mm. When the car just begins to move, the tension in the cable is 800 N. How much has the cable stretched? (Young's modulus for steel is $2 \times 10^{11}\ Nm^{-2}$.)
26. What is the effect of pressure on melting point of a substance? What is regelation?
27. An organ pipe of length L open at both ends is found to vibrate in its first harmonic when sounded with a tuning fork of 480 Hz. What should be the length of a pipe closed at one end, so that it also vibrates in its first harmonic with the same tuning fork?

OR

Write Newton's formula for the speed of sound in air. Discuss the correction made by the Laplace in this formula.

Section C

28. Derive the equation for the distance covered by a uniformly accelerated body in nth second of its motion. A body is moving with a uniform acceleration. Its velocity after 5s is 25 m/s and after 8s is 34 m/s. Calculate the distance it will cover in 10^{th} second.
29. There are four forces acting at a point P produced by strings as shown in Fig which is at rest. Find the forces $\mathbf{F_1}$ and $\mathbf{F_2}$.



30. In an elastic collision of two billiard balls, which of the following quantities remain conserved during the short time of collision of the balls (i.e., when they are in contact).
    (a) Kinetic energy.
    (b) Total linear momentum?

Give reason for your answer in each case.

31. Find the centre of mass of a system of three particles at the vertices of an equilateral triangle. The masses of the particles are 100gm, 150 gm and 200 gm respectively. Each side of the triangle is 0.5 m long.
32. Derive the gravitational potential at point of distant r from the mass M .
33. A cylindrical log of wood of height *h* and area of cross-section *A* floats in water. It is pressed and then released. Show that the log would execute S.H.M. with a time period.

$$T = 2\pi\sqrt{\frac{m}{A\rho g}}$$

where *m* is mass of the body and ρ is density of the liquid

OR

Show that the motion of the pendulum is S.H.M. and hence deduce an expression for the time period.

34. A train standing at the outer signal of a railway station blows a whistle of frequency 400 Hz still air. The train begins to move with a speed of 10 m s^{-1} towards the platform. What is the frequency of the sound for an observer standing on the platform ?
(sound velocity in air = 330 m s^{-1})

Section D

35. State Bernoulli's theorem. Derive the expression for rate of flow of fluid as measured by venturimeter.

OR

(i)Define surface tension and surface energy. (ii)Write unit and dimension of surface tension.(iii) derive the expression for the excess pressure inside a soap bubble.

36. (i) Derive an expression for the work done during an isothermal expansion of μ moles of an ideal gas.
(ii) A steam engine delivers 1.5×10^8 J of work per minute and services 3.6×10^9 J of heat per minute from its boiler what is the efficiency of the engine? How much heat is wasted per minute.?

OR

Define molar specific heat capacities at constant volume and pressure. Considering thermodynamical process in a cylinder with parameters P (Pressure),V (Volume), and T (Temperature) derive the Mayer's relation ($C_p - C_v = R$).

37. Derive an expression for pressure of a gas in a container. Using it , relate kinetic energy with pressure.

OR

State the law of equipartition of energy of a dynamic system and use it to find the values of internal energy and the ratio of specific heats of (a) monoatomic, (b) diatomic and (c) triatomic gas molecules.