

CBSE Class – XI
Physics (Set 2)
Last year Paper (2015-16)

Time: 3 Hrs. M.M: 70

General Instructions:

- (i) Question 1 to 5 one mark.
- (ii) Question 6 to 10 each two mark.
- (iii) Question 11 to 22 each three mark.
- (iv) Question 23 is value based question and carry four marks.
- (v) Questions 24 to 26 each five mark.

Section A

- 1. Identify the term which has unit but no dimension.
- 2. Would you expect a typical trajectory of a ping-pong ball to be a parabola, why?
- 3. What property of a tennis determine the ease with which it can be rapidly rotated?
- 4. Define safety factor in elasticity
- 5. Can water be made to boil without heating?

Section B

- 6. Two principal thrusts in physics are unification and reduction. Justify by giving illustrations.
- 7. An aircraft executes a horizontal loop at a speed of 720 km/h with its wings banked at 15° . What is the radius of the loop?
- 8. Can a body have energy without having momentum and have momentum without energy? Explain.
- 9. Pressure of a gas in a closed cylinder is expressed in the following manner $p = p_a + h\rho g$
Identify the expressions for
 - (i) absolute pressure of the gas
 - (ii) gauge pressure of the gas
- 10. What do you mean by phase of a wave? How does it change with position?

Or

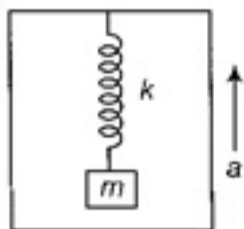
The frequencies of two tuning forks A and B are 250 Hz and 255 Hz, respectively. Both are sounded together. How many beats will be heard in 5s?

Section C

11. A particle of mass m is projected with velocity v at an angle θ with the horizontal. Find its angular momentum about the point of projection when it is at the highest point of its trajectory.

12. Find the expression for variation of acceleration due to gravity g , with height above the surface of the earth.

13. A spring mass system is hanging from the ceiling of an elevator in equilibrium. The elevator suddenly starts accelerating upwards with acceleration a .



Find:

(i) the frequency

(ii) the amplitude of the resulting SHM.

14. What is an isothermal process? Derive an expression for work done during an isothermal expansion of a gas.

15. What is capillarity? Water rises in a capillary tube to a height of 4.0 cm. In another capillary tube whose radius is one third of it, how much the water will rise?

16. Compute the fractional change in volume of a glass slab, when subjected to a hydraulic pressure of 10 atm.

17. Find the molar specific heat of the process $p = \frac{b}{t}$ for a diatomic gas, b being constant.

18. Define centre of mass of a n particles system. State the coordinates of centre of mass of a n particles system.

19. Derive the expression for excess pressure inside a spherical liquid drop of radius R .

Or

The molecules of a given mass of a gas have root mean square speeds of 100 m/s at 27°C and 1.00 atm pressure. What will be the root mean square speeds of the molecules of the gas

at 127°C and 2.0 atm pressure?

20. State and establish the law of equipartition of energy.

21. A body oscillates with SHM according to the equation

$$x(t) = 10 \cos\left(2\pi t + \frac{\pi}{6}\right)$$

where x is in metre and t is in second.

Calculate

(i) displacement at time $t = 0$

(ii) magnitude of maximum velocity

(iii) angular frequency.

22. Between p-V diagrams corresponding to adiabatic and isothermal process which is steeper and why?

Section D

23. Sonu and Raju were playing cricket. Raju hit the ball bowled by Sonu. Sonu starting running with the ball in air. When ball comes near Sonu's hand, he caught the ball suddenly due to this his finger got injured. Raju took Sonu to hospital, where he was treated. Later, Raju explained Sonu why his finger got injured while he was catching the ball.

(i) What are values shown by Raju?

(ii) Why Sonu got injured?

(iii) What values we should learn from this incidence?

Section E

24. (i) Derive an expression for the acceleration of a body sliding down a rough inclined plane.

(ii) A block of mass M is pulled along a horizontal frictionless surface by a rope of mass m by applying a force F at the free end of the rope. Find the force by the rope on the block.

Or

A satellite is to be placed in equatorial geostationary orbit around the earth for communication.

(i) Calculate height of such a satellite.

(ii) Find out the minimum number of satellites that are needed to cover entire earth so that

atleast one satellite is visible from any point on the equator. [$M = 6 \times 10^{24} \text{ kg}$, $R = 6400 \text{ km}$, $T = 24 \text{ h}$, $G = 6.67 \times 10^{-11} \text{ SI units}$]

25. A progressive wave is given by

$y(x, t) = 8 \sin (400t - 0.2x)$ where, x in metre, y in cm and t in second.

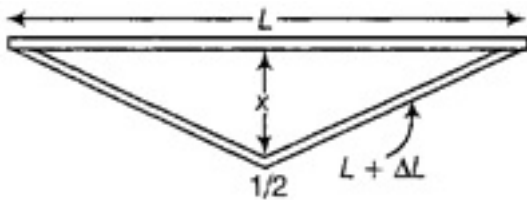
What is the

- (i) direction of propagation
- (ii) wavelength
- (iii) frequency
- (iv) wave speed
- (v) phase difference between two points 0.4 m apart?

Or

A tunnel is made along the diameter of the earth and a small stone is dropped in it. Show that stone will execute SHM around the centre of the earth. What is its time period?

26. Calculate the stress developed inside a tooth cavity filled with copper when hot tea at temperature of 57°C is drunk. You can take body (tooth) temperature to be 37°C and $\alpha = 1.7 \times 10^{-5} / ^\circ\text{C}$, bulk modulus for copper is $140 \times 10^9 \text{ N} - \text{m}^2$.



Or

A rail track made of steel having length 10 m is clamped on a railway line at its two ends. On a summer day due to rise in temperature by 20°C , it is deformed as shown in figure. Find x (displacement of the centre) if $\alpha_{\text{steel}} = 12 \times 10^{-5} / ^\circ\text{C}$