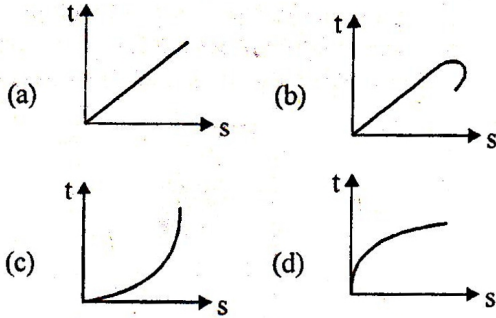


1. A force is given by $F = at + bt^2$, where t is time, the dimensions of a and b are respectively

- (a) $[MLT^{-4}]$ and $[MLT^{-1}]$
 (b) $[MLT^{-1}]$ and $[MLT^0]$
 (c) $[MLT^{-3}]$ and $[MLT^{-4}]$
 (d) $[MLT^{-3}]$ and $[MLT^0]$

2. Which of the following time-displacement graph is not possible in nature?



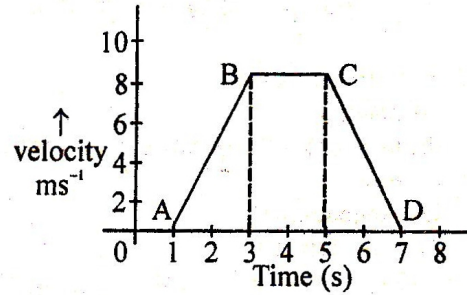
3. A particle undergoes simple harmonic motion having time period T . The time taken in $3/8$ th oscillation is

- (a) $\frac{3}{8}T$ (b) $\frac{5}{8}T$
 (c) $\frac{5}{12}T$ (d) $\frac{7}{12}T$

4. The angular velocity of a body changes from ω_1 to ω_2 without applying torque but by changing moment of inertia. The ratio of initial radius of gyration to the final radius of gyration is

- (a) $\omega_2 : \omega_1$ (b) $\omega_2^2 : \omega_1^2$
 (c) $\sqrt{\omega_2} : \sqrt{\omega_1}$ (d) $1/\omega_2 : 1/\omega_1$

5. For the velocity time graph shown in the figure below the distance covered by the body in the last two seconds of its motion is what fraction of the total distance travelled by it in all the seven seconds?



- (a) $\frac{1}{2}$ (b) $\frac{1}{4}$
 (c) $\frac{2}{3}$ (d) $\frac{1}{3}$

6. The work function of aluminium is 4.2 eV. If two photons each of energy 3.5 eV strike an electron of aluminium, then emission of electron will

- (a) depend upon the density of the surface
 (b) possible
 (c) not possible
 (d) None of these

7. If a capacitor of capacitance ' C ' is connected in series with an inductor of inductance L , then the angular frequency will be

- (a) $\sqrt{\frac{1}{LC}}$ (b) $\sqrt{\frac{L}{C}}$
 (c) LC (d) \sqrt{LC}

8. Two wires A and B of the same material, having radii in the ratio 1 : 2 and carry currents in the ratio 4 : 1. The ratio of drift speed of electrons in A and B is

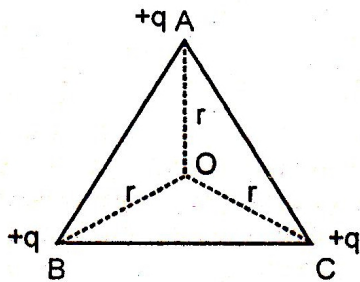
- (a) 16 : 1 (b) 1 : 16
 (c) 1 : 4 (d) 4 : 1

9. A stone is thrown with a velocity u making an angle θ with the horizontal. The horizontal distance covered by its fall to ground is maximum when the angle θ is equal to

- (a) 0° (b) 30°
 (c) 45° (d) 90°

10. If for a gas, $\frac{R}{C_V} = 0.67$, this gas is made up of molecules which are
- diatomic
 - mixture of diatomic and polyatomic molecules
 - monoatomic
 - polyatomic

11. ABC is an equilateral triangle. Charges $+q$ are placed at each corner as shown in fig. The electric intensity at centre O will be



- $\frac{1}{4\pi\epsilon_0} \frac{q}{r}$
 - $\frac{1}{4\pi\epsilon_0} \frac{q}{r^2}$
 - $\frac{1}{4\pi\epsilon_0} \frac{3q}{r^2}$
 - zero
12. Photoelectric current from a given photocell will depend upon
- number of photons striking per second
 - frequency of incident photon
 - material of the target
 - None of these

13. A circular disc A of radius r is made from an iron plate of thickness t and another circular disc B of radius $4r$ is made from an iron plate of thickness $t/4$. The relation between the moments of inertia I_A and I_B is

- $I_A > I_B$
- $I_A = I_B$
- $I_A < I_B$
- depends on the actual value of t and r

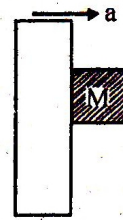
14. Einstein's work on photoelectric effect provided support for the equation

- $E = hv$
- $E = mc^2$
- $E = \frac{-Rhc}{n^2}$
- $K.E. = \frac{1}{2}mv^2$

15. A metallic bar is heated from 0°C to 100°C . The coefficient of linear expansion is 10^{-5}K^{-1} . What will be the percentage increase in length?

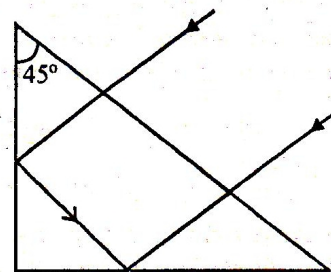
- 0.01%
- 0.1%
- 1%
- 10%

16. A rough vertical board has an acceleration a along the horizontal so that a block of mass M pressing against it does not fall. The coefficient of friction between block and the board is



- $> \frac{a}{g}$
- $< \frac{g}{a}$
- $= \frac{a}{g}$
- $> \frac{g}{a}$

17. What should be the minimum value of refractive index of the material of the prism for the reflections to take place as shown in the figure?



- 1.7
- 1.4
- 1.2
- 2.7

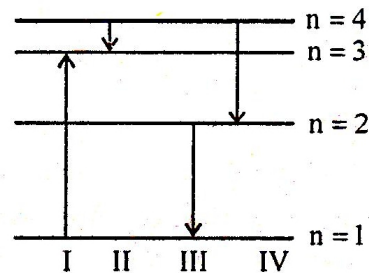
18. Electric lines of force about a negative point charge are
 (a) circular, anti-clockwise
 (b) circular, clockwise
 (c) radial, inwards
 (d) radial, outwards
19. Ohm's law is not obeyed by
 (a) electrolytes (b) discharge tube
 (c) vacuum tubes (d) all of the above
20. The temperature of an iron block is 140°F . Its temperature on the Celsius scale is
 (a) 60° (b) 160°
 (c) 140° (d) 132°
21. A gun fires two bullets at 60° and 30° with horizontal. The bullets strike at some horizontal distance. The ratio of maximum height for the two bullets is in the ratio of
 (a) 2:1 (b) 3:1
 (c) 4:1 (d) 1:1
22. A generator has an e.m.f. of 440 Volt and internal resistance of 400 Ohm. Its terminals are connected to a load of 4000 Ohm the voltage across the load is
 (a) 220 volt (b) 440 volt
 (c) 200 volt (d) 400 volt
23. Electric field inside a copper wire of length 10 metres, resistance 2 ohm connected to a 10 volt battery is
 (a) 1 Vm^{-1} (b) 0.5 Vm^{-1}
 (c) 10 Vm^{-1} (d) 5 Vm^{-1}
24. The radius vector, drawn from the sun to a planet, sweeps out equal areas in equal intervals of time. This is the statement of
 (a) Kepler's first law (b) Kepler's second law
 (c) Newton's first law (d) Kepler's third law
25. The path difference between the two waves :

$$y_1 = a_1 \sin\left(\omega t - \frac{2\pi x}{\lambda}\right)$$

$$\text{and } y_2 = a_2 \sin\left(\omega t - \frac{2\pi x}{\lambda} + \phi\right) \text{ will be}$$

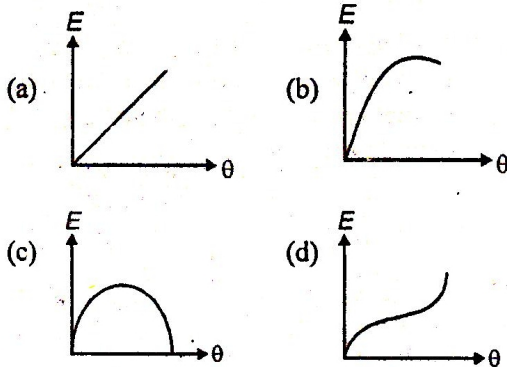
- (a) $\frac{2\pi}{\lambda}\phi$ (b) $\frac{2\pi}{\lambda}\left(\phi - \frac{\pi}{2}\right)$
 (c) $\frac{\lambda}{2\pi}\phi$ (d) $\frac{2\pi}{\lambda}\left(\phi + \frac{\pi}{2}\right)$

26. The diagram shows the energy levels for an electron in a certain atom. Which transition shown represents the emission of a photon with the most energy?



- (a) IV (b) III
 (c) II (d) I
27. The direction of propagation of electromagnetic waves is given by the direction of
 (a) Vector \vec{E} (b) Vector \vec{B}
 (c) Vector $(\vec{E} \times \vec{B})$ (d) None of these
28. A body of mass 10 kg and velocity 10 m/s collides with a stationary body of mass 5 kg. After collision both bodies stick to each other, velocity of the bodies after collision will be
 (a) $\frac{3}{10}$ m/s (b) $\frac{18}{3}$ m/s
 (c) $\frac{9}{20}$ m/s (d) $\frac{20}{3}$ m/s
29. Two particles of mass m_1 and m_2 ($m_1 > m_2$) attract each other with a force inversely proportional to the square of the distance between them. If the particles are initially held at rest and then released, the centre of mass will
 (a) move towards m_1 (b) move towards m_2
 (c) remain at rest (d) Nothing can be said

30. Which of the following graphs represent the variation of thermo emf (E) of a thermocouple with temperature θ of hot junction (the cold junction being kept at 0°C)



31. The r.m.s. velocity of oxygen molecule at 16°C is 474 m/sec . The r.m.s. velocity in m/s of hydrogen molecule at 127°C is

- (a) 1603 (b) 1896
(c) 2230.59 (d) 2730

32. To demonstrate the phenomenon of interference, we require two sources which emit radiation

- (a) of the same frequency
(b) of different wavelengths
(c) of the same frequency and having a definite phase relationship
(d) of nearly the same frequency

33. The oscillating electric and magnetic field vectors of electromagnetic wave are oriented along

- (a) the same direction and in phase
(b) the same direction but have a phase difference of 90°
(c) mutually perpendicular directions and are in phase
(d) mutually perpendicular directions but has a phase difference of 90°

34. A uniform spherical shell gradually shrinks maintaining its shape. The gravitational potential at the centre

- (a) increases (b) decreases
(c) remains constant (d) oscillates

35. If v_e and v_o represent the escape velocity and orbital velocity of a satellite corresponding to a circular orbit of radius R , then

- (a) $v_e = v_o$
(b) $v_e = \sqrt{2} v_o$
(c) $v_e = (1/\sqrt{2}) v_o$
(d) v_e and v_o are not related

36. At 0°K which of the following properties of a gas will be zero?

- (a) Kinetic energy
(b) Potential energy
(c) Vibrational energy
(d) Density

37. A galvanometer coil has a resistance of 15Ω and gives full scale deflection for a current of 4 mA . To convert it to an ammeter of range 0 to 6 A

- (a) $10\text{ m}\Omega$ resistance is to be connected in parallel to the galvanometer
(b) $10\text{ m}\Omega$ resistance is to be connected in series with the galvanometer
(c) $0.1\ \Omega$ resistance is to be connected in parallel to the galvanometer
(d) $0.1\ \Omega$ resistance is to be connected in series with the galvanometer

38. A uniform rod of mass m , length ℓ , area of cross-section A has Young's modulus Y . If it is hanged vertically, elongation under its own weight will be

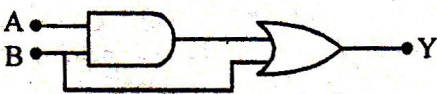
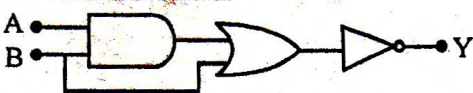
- (a) $\frac{mg\ell}{2AY}$ (b) $\frac{2mg\ell}{AY}$
(c) $\frac{mg\ell}{AY}$ (d) $\frac{mgY}{A\ell}$

39. The magnifying power of a telescope is 9 . When it is adjusted for parallel rays, the distance between the objective and the eye piece is found to be 20 cm . The focal length of lenses are

- (a) $18\text{ cm}, 2\text{ cm}$ (b) $11\text{ cm}, 9\text{ cm}$
(c) $10\text{ cm}, 10\text{ cm}$ (d) $15\text{ cm}, 5\text{ cm}$

40. If two soap bubbles of different radii are connected by a tube. Then
- air flows from the smaller bubble to the bigger
 - air flows from bigger bubble to the smaller bubble till the sizes are interchanged
 - air flows from the bigger bubble to the smaller bubble till the sizes become equal
 - there is no flow of air.
41. An object undergoing SHM takes 0.5 s to travel from one point of zero velocity to the next such point. The distance between those points is 50 cm. The period, frequency and amplitude of the motion is
- 1s, 1Hz, 25 cm
 - 2s, 1Hz, 50 cm
 - 1s, 2Hz, 25 cm
 - 2s, 2Hz, 50 cm
42. A plane wave of wavelength 6250 \AA is incident normally on a slit of width $2 \times 10^{-2} \text{ cm}$. The width of the principal maximum on a screen distant 50 cm will be
- $312.5 \times 10^{-3} \text{ cm}$
 - $312.5 \times 10^{-3} \text{ m}$
 - $312.5 \times 10^{-3} \text{ m}$
 - 312 m
43. In a p-type semi-conductor germanium is doped with
- aluminium
 - boron
 - gallium
 - all of these
44. The table given below represents the truth table for which of the following combinations of logic gates?

A	B	Y
0	0	1
0	1	0
1	0	1
1	1	0

- (a) 
- (b) 



- (d) None of these
45. In a transistor
- both emitter and collector have same length
 - length of emitter is greater than that of collector
 - length of collector is greater than that of emitter
 - any one of emitter and collector can have greater length