PHYSICS-2008

Q.1. The value of $\left(\vec{A}+\vec{B}\right)X\left(\vec{A}-\vec{B}\right)$ is

(a) Zero

(b) $A^2 - B^2$

(c) $\vec{B}X\vec{A}$

(d) $2\left(\vec{B}X\vec{A}\right)$

Q.2. Which of the following group have different dimension

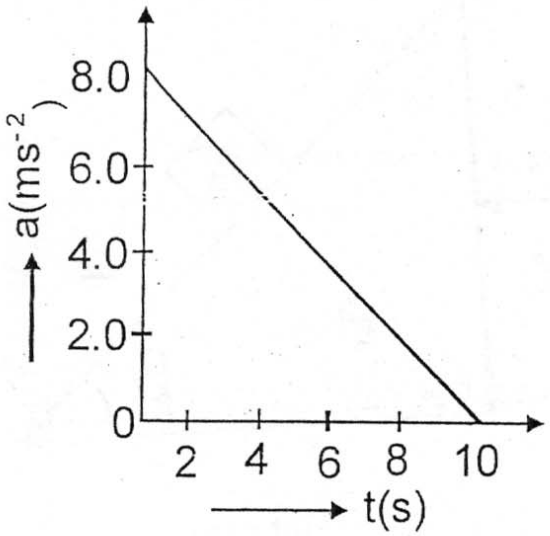
(a) potential difference, emf, voltage

(b) dipole moment, electric flux, electric field strength

(c) pressure, stress, modulus of rigidity

(d) heat, energy, torque

Q.3. A particle starts from rest. Its acceleration (a) versus time (t) graphs is shown here. The maximum speed of the particle will be



(a) $40ms^{-1}$

(b) $400ms^{-1}$

(c) $20ms^{-1}$

(d) $200ms^{-1}$

Q.4. In case of uniform circular motion, which of the following quantities does not remain constant?

(a) speed

(b) mass

(c) momentum

(d) kinetic energy

Q.5. Two bodies are projected with the same velocity. If one is projected at an angle of 30^0 and the other at an angle of 60^0 to the horizontal, the ratio of their respective maximum heights reached $\frac{h1}{h2}$ is

(a) 3 : 1 (b) 1 : 3

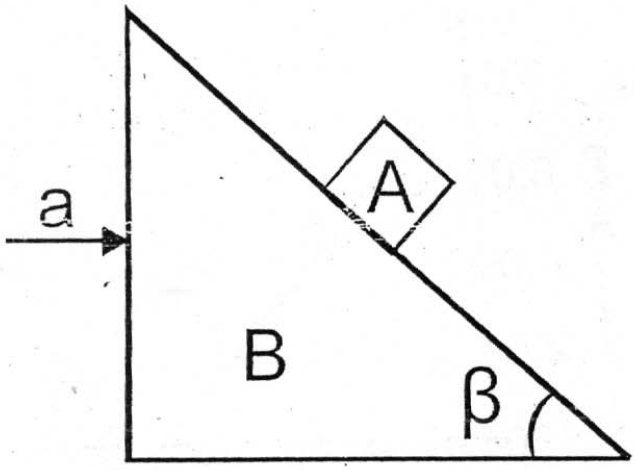
(c) 1 : 2 (d) 2 : 1

Q.6. A rocket has an initial mass of $20x10^3$ kg. If it is to blast off with an initial acceleration of $4ms^{-2}$, the initial thrust needed is – (Take $g = 10ms^{-2}$)

(a) $16x10^4\,N$ (b) $20x10^4\,N$

(c) $8x10^4\,N$ (d) $28x10^4\,N$

Q.7. Small sized block A is kept on a large frictionless inclined surface having angle of inclination β as shown here. The incline is given a horizontal acceleration 'a' to keep the block stationary. Value of acceleration 'a' is equal to



(a) g (b) g tan β

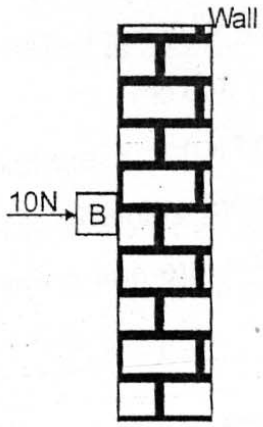
(c) $\frac{g}{\sin\beta}$ (d) g cos β

Q.8. A 0.5 kg ball is projected vertically upward with an initial speed of $14ms^{-1}$. The ball reaches a maximum height of 8.0m. How much energy is dissipated by air drag acting on the ball during its ascent? $(g = 9.8ms^{-2})$

(a) 19.6J (b) 4.9J

(c) 9.8J (d) 39.2J

Q.9. A horizontal force of 10N is necessary to just hold a block stationary against a wall. The coefficient of friction between the block and the wall is 0.2. The weight of the block is



(a) 2N (b) 20N

(c) 50N (d) 100N

Q.10. An automobile engine develops 100kw power when rotating at a speed of 1800 r.p.m. The torque delivered by the engine is

(a) 350Nm (b) 440Nm

(c) 531Nm (d) 628Nm

Q.11. If the distance between the earth and the sun becomes half of its present value, the number of days in a year would have been

(a) 64.5 (b) 129

(c) 182.5 (d) 730

Q.12. An artificial satellite moving in a circular orbit around the earth has a total energy Eo. Its potential energy is

(a) –Eo (b) Eo

(c) 2Eo (d) -2Eo

Q.13. You are given four wires of steel, whose lengths and diameters are given below. All the four wires are suspended from rigid supports and same force is applied at their free ends. In which case is

(a) L = 0.5m, D = 0.05cm (b) L = 1.0m, D = 0.10cm

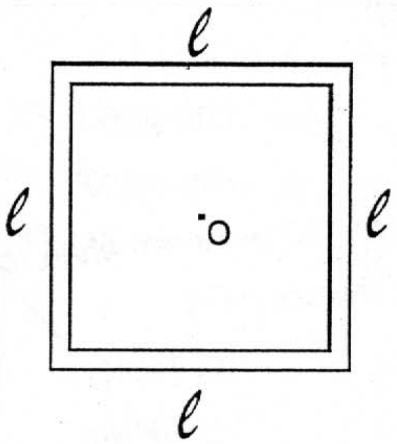
(c) L = 2.0m, D = 0.20cm (d) L = 3.0m, D = 0.30cm

Q.14. In a capillary tube water rises to 3cm. The height of water that will rise in another capillary tube having one third radius of the first tube will be

(a) 1cm (b) $\sqrt{3}$ cm

(c) 9cm (d) $3\sqrt{3}$ cm

Q.15. Four identical thin rods, each of mass M and length ℓ, are joined together so as to form a square as shown in the figure. Moment of inertia of this system about an axis passing through centre point O of the square and perpendicular to its plane is



(a) $\frac{4}{3}M\ell^2$ (b) $\frac{1}{3}M\ell^2$

(c) $\frac{1}{6}M\ell^2$ (d) $\frac{2}{3}M\ell^2$

Q.16. A manometer connected to a closed water tap reads $4.5x10^5\,Pa$. When the tap is opened, the reading of the manometer falls to $4.0x10^5\,Pa$. Speed of flow of water from the tap in ms^{-1} is

(a) 7 (b) 8

(c) 9 (d) 10

Q.17. One litre of helium gas, at a pressure of 76cm of mercury column and temperature 27^0C, is heated till its pressure as well as volume are doubled. The final temperature attained by the gas is

(a) 927^0C (b) 327^0C

(c) 600^0C (d) 1200^0C

Q.18. One mole of an ideal gas requires 207J heat to raise its temperature by 10K when heated at constant pressure. If the same gas is heated at constant volume by same range of temperature, the amount of heat required is - (Value of universal gas constant is $8.3 Jmol^{-1}k^{-1}$)

(a) 198.7J (b) 29J

(c) 215.3J (d) 124J

Q.19. An ideal refrigerator has a freezer at a temperature of -13^0C. The coefficient of performance of the refrigerator is 5. The temperature of the atmospheric air, to which heat is rejected, will be

(a) 325K (b) 312^0C

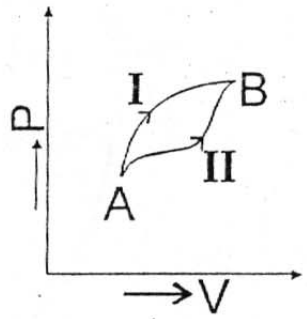
(c) 39^0C (d) 325^0C

Q.20. A body cools from 60^0C to 50^0C in 10 minute. If the room temperature is 25^0C and assuming Newton's law of cooling to hold good, the temperature of the body at the end of the next 10 minutes will be

(a) 38.5^0C (b) 40^0C

(c) 42.8^0C (d) 45^0C

Q.21. A system goes from state A to state B via two different processes I and II as shown in the figure. If ΔU_1 and ΔU_2 are the changes in internal energies in the process I and II respectively, then



(a) $\Delta U_{II} > \Delta U_I$ (b) $\Delta U_{II} < \Delta U_I$

(c) $\Delta U_I + \Delta U_{II} = 0$ (d) $\Delta U_{II} = \Delta U_I$

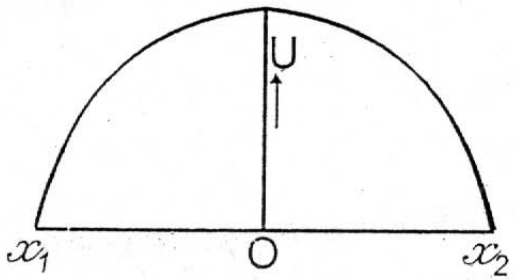
Q.22. The periodic time of a body executing S.H.M. is 3s. After how much time interval from starting from its equilibrium position, its displacement will be half of its amplitude:

(a) $\frac{1}{8}s$ (b) $\frac{1}{6}s$

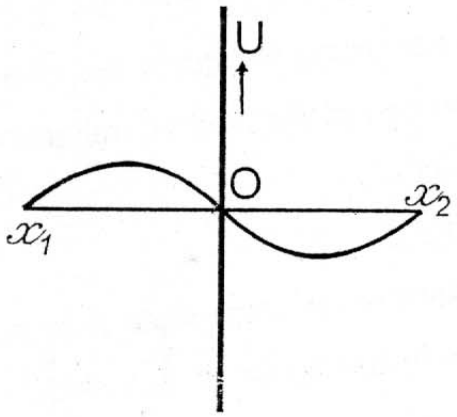
(c) $\frac{1}{4}s$ (d) $\frac{1}{3}s$

Q.23. A particle of mass m oscillates with simple harmonic motion between points x_1 and x_2 and the equilibrium position is at O. Its potential energy (U) plot is as given below in the graph:

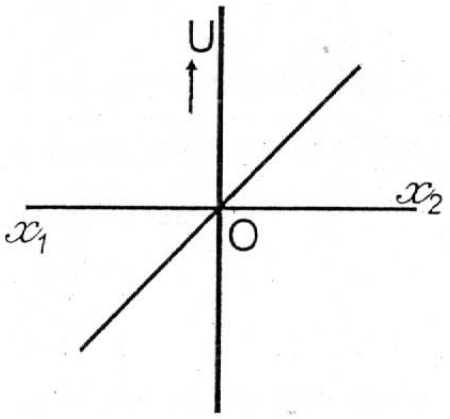
(a)



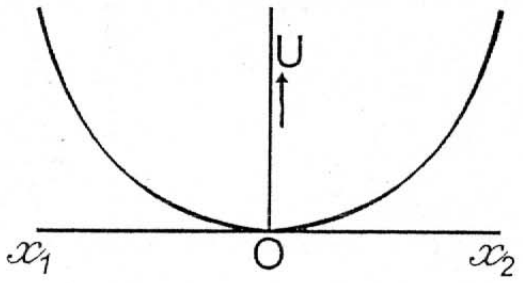
(b)



(c)



(d)



Q.24. Two identical flutes produce fundamental notes of frequency 300Hz at 27^0C. If the temperature of air in one flute is increased to 31^0C, the number of beats heard per second will be

(a) 1 (b) 2

(c) 3 (d) 4

Q.25. Equation of a progressive wave is given by:

$$y(x,t) = a\sin\pi(80t - 2x)$$

where a and x are in metre and t in second. The wave velocity will have a megniture-

(a) $80ms^{-1}$ (b) $40ms^{-1}$

(c) $80\pi ms^{-1}$ (d) $\frac{40}{\pi}ms^{-1}$

Q.26. A hollow metal sphere of redius 10cm is charged so that the potential on its surface is 10V. The potential at a point 5cm from its centre will be:

(a) 10V (b) 20V

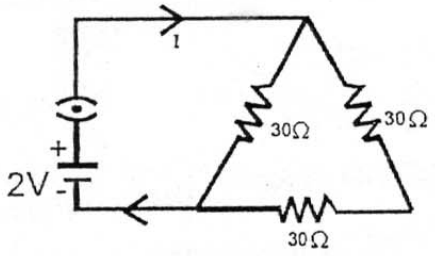
(c) 5V (d) Zero

Q.27. An air capacitor of capacitance $10\mu F$ is connected to a constant voltage source of 12V. Now the space between the plates of capacitor is completely filled with a dielectric medium (dielectric constant K=5). The charge that flows now, from the voltage source to capacitor, is-

(a) $120\mu C$ (b) $600\mu C$

(c) $480\mu C$ (d) $240\ \mu C$

Q.28. The value of current I in the adjoining circuit will be-



(a) $\frac{1}{45}A$ (b) $\frac{1}{15}A$

(c) $\frac{1}{10}A$ (d) $\frac{1}{5}A$

Q.29. A Daniel cell is balanced on 125cm length of a potentiometer wire. Now the cell is short circuited by a resistance of 2Ω and the balance point is obtained at 100cm. The internal resistance of the given cell is-

(a) 0.50Ω (b) 0.25Ω

(C) 1.25Ω (d) 0.80Ω

Q.30. Two particles X and Y having equal charges, after being accelerated through the same potential difference, enter a region of uniform magnetic field and describe circular paths of radius r_1 and r_2 respectively. The ratio of mass of X to that of Y is-

(a) $\left[\frac{r_1}{r_2}\right]^{1/2}$ (b) $\left[\frac{r_2}{r_1}\right]$

(c) $\left[\frac{r_1}{r_2}\right]^{2}$ (d) $\left[\frac{r_1}{r_2}\right]$

Q.31. Curie's law can be written as-

(a) $\chi \propto (T - Tc)$ (b) $\chi \propto \frac{1}{(T - Tc)}$

(c) $\chi \propto \frac{1}{T}$ (d) $\chi \propto T$

Q.32. A circular loop of area 0.01m^2, carrying a current of 10A, is held perpendicular to a magnetic field of 0.1T. The torque acting on the loop is-

(a) Zero (b) 0.01Nm

(c) 0.001Nm (d) 0.8Nm

Q.33. The dimensions of magnetic flux are

(a) $MLT^{-2}A^{-2}$ (b) $ML^2T^{-2}A^{-2}$

(c) $ML^2T^{-1}A^{-2}$ (d) $ML^2T^{-2}A^{-1}$

Q.34. Two coils have a mutual inductance of 0.005H. The current changes in the first coil according to the equation $I = 10\sin 100\pi t$ ampere. The maximum value of induced emf developed in the second coil is-

(a) 2π volt (b) 5π volt

(c) π volt (d) 4π volt

Q.35. In an a.c. circuit the potential difference across an inductor and a resistor joined in series are respectively 16V and 20V. The total potential difference across the entire circuit is-

(a) 20.0V (b) 36.0V

(c) 25.6V (d) 31.9V

Q.36. A fish looking up through the water sees the outside world contained in a circular horizon. If the refractive index of water is $\frac{4}{3}$ and the fish is 12cm below the surface of water, the radius of this circle in centimeter is-

(a) $36\sqrt{5}$ (b) $4\sqrt{5}$

(c) $36\sqrt{7}$ (d) $\frac{36}{\sqrt{7}}$

Q.37. A ray of light passes through an equilateral glass prism in such a manner that the angle of incidence is equal to the angle of emergence and each of these angles is equal to $\frac{3}{4}$ of the angle of the prism. The refractive index of the material of prism is-

(a) $\sqrt{2}$ (b) 2

(c) $\sqrt{3}$ (d) $\frac{3}{2}$

Q.38. The angular resolution of an astronomical telescope having an objective lens of focal length 10m and aperture diameter 50cm is nearly-
(wavelength of light = 500nm)

(a) 1.2×10^{-6} radian (b) 5.0×10^{-6} radian

(c) 6.0×10^{-5} radian (d) 1.0×10^{-7} radian

Q.39. In a Young's double slit experiment, 12 fringes are observed to be formed in a certain segment of the screen when light of wavelength $6000\,\overset{0}{A}$ is used. If the wavelength of light is changed to $4000\,\overset{0}{A}$, then number of fringes observed in the same segment of the screen is given by:

(a) 12 (b) 18

(c) 8 (d) 27

Q.40. We have a concave mirror whose radius of curvature is 40cm. The mirror is immersed completely in a transparent medium of refractive index 1.25. The focal length of the mirror in the given medium will be-

(a) 40cm (b) 20cm

(C) 32cm (d) 50cm

Q.41. Let $\vec{E}$ and $\vec{B}$ be the electric and magnetic and magnetic field vectors of an electromagnetic wave. The direction of propagation of electromagnetic wave is along the direction of-

(a) $\vec{E}$ (b) $\vec{B}$

(c) $\vec{E} \times \vec{B}$ (d) $\vec{E} \bullet \vec{B}$

Q.42. The maximum distance, up to which TV transmission from a TV tower of height h can be received, is proportional to

(a) $h^{\frac{1}{2}}$ (b) $h^{-\frac{1}{2}}$

(c) h (d) h^2

Q.43. In Mullikan's oil drop experiment a charged oil drop of mass $8x10^{-9}kg$ remains freely suspended on applying an electric field of $10^6 Vm^{-1}$. If $g = 10ms^{-2}$, the magnitude of charge on the oil drop is-

(a) $8x10^{-12}C$ (b) $8x10^{-14}C$

(c) $8x10^{-16}C$ (d) $16x10^{-15}C$

Q.44. If a photon has velocity c and frequency f, then the momentum of the photon is given by-

(a) $\frac{hf}{c}$ (b) $\frac{hc}{f}$

(c) $\frac{hf}{c^2}$ (d) $\frac{hc}{f^2}$

Q.45. When a point source of monochromatic light is at a distance of 0.2m from a photoelectric cell, the stopping potential and the saturation current are 0.6 volt and 18mA respectively. If the same light source is placed 0.6m away from the photoelectric cell, then-

(a) the stopping potential will be 0.2 volt

(b) the stopping potential will be 0.6 volt

(c) the saturation current will be 6mA

(d) the saturation current will be 18mA

Q.46. If the wavelength of the first line of the Balmer series of hydrogen is $6561\overset{0}{A}$, the wavelength of the second line of the series should be-

(a) $13122\overset{0}{A}$ (b) $3280\overset{0}{A}$

(c) $4860\overset{0}{A}$ (d) $2187\overset{0}{A}$

Q.47. Fusion reaction takes place at high temperature because-

(a) Atoms are ionized at high temperature.

(b) Molecules break-up at high temperature.

(c) Nuclei break-up into neutrons and protons at high temperature.

(d) Kinetic energy of nuclei is high enough to overcome repulsive force between them.

Q.48. A radio active substance has a half life of 2.8 year. The fraction of this material, that would remain intact after 14 years, will be-

(a) $\frac{1}{32}$ (b) $\frac{1}{5}$

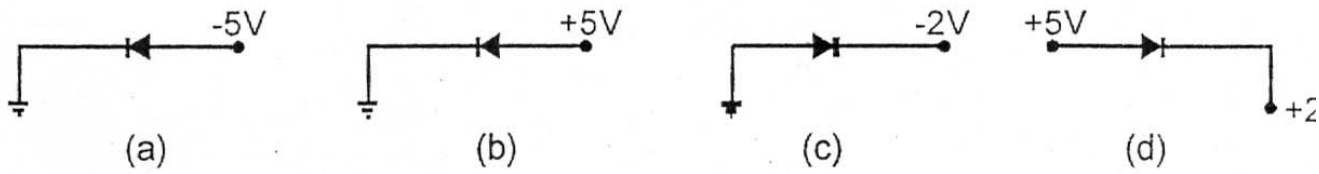
(c) $\frac{4}{5}$ (d) $\frac{1}{14}$

Q.49. A piece of semiconductor is connected in series in an electric circuit. On increasing the temperature, the current in the circuit will-

(a) Decrease (b) Increase

(c) Remain unchanged (d) Stop flowing

Q.50. Which of the following semiconductor diodes is reverse biased?



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