JIPMER Medical Entrance Exam Previous Year Question Paper 2017 With Answer Key

JIPMER MBBS Entrance Question Paper - 2017 PHYSICS

1. Two 20 g flatworms climb over a very thin wall, 10 cm high. One of the worm is 20 cm long, the other is wider and only 10 cm long. Which of the following statement is correct regarding them?

a) 20 cm worm has done more work against gravity

(b) 10 cm worm has done more work against gravity

(c) Both worms have done equal work against gravity

(d) Ratio of work done by both the worms is 4 : 5

Answer: (b)

2. A rocket is intended to leave the Earth's gravitational field. The fuel in tis main engine is a little less than the amount that is necessary and an auxiliary engine, (only capable of operating for a short time) has to be used as well. When is it best to switch on the auxiliary engine?

(a) at take-off

(b) when the rocket has nearly stopped with respect to the Earth.

(c) It doesn't matter.

(d) Can't say

Answer: (a)

3. The turns of a solenoid, designed to provide a given magnetic flux density along its axis, are wound to fill the space between two concentric cylinders of fixed radii. How should the diameter d of the wire used be chosen so as tominimize the heat dissipated in the windings?

(a) Wire should be multiple of 5d

(b) Wire should be multiple of d/3

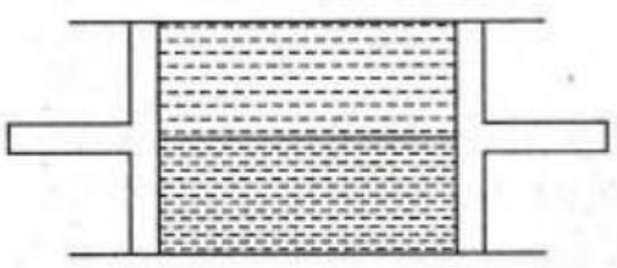
(c) Wire is independent of d

(d) Can't say

Answer: (c)

fitted with two air tight frictionless pistons. The pistons are

connected to each other by a metallic wire. Initially, the pressure of the gas is p_0 and temperature is {0, atmospheric pressure is also p_0. Now, the temperature of the gas is increased to $2I_0$, the tension of wire will be



(a) $2\rho_0 A$

(b) $\rho_0 A$

(c) $\rho_0 A/2$

(d) $4\rho_0 A$

Answer: (b)

5. A particle of mass m is executing oscillation about the origin on X-axis. Its potential energy is $V(x) = K|x|^3$. Where K is a positive constant. If the amplitude of oscillation is a, then its time period T is proportional to

(a) $1/\sqrt{a}$

(b) a

(c) $\sqrt{a}$

(d) $a^{3/2}$

Answer: (a)

6. A body is projected vertically upwards. The times corresponding to height h while ascending and while descending are t_1 and t_2, respectively.

Then, the velocity of projection will be (take g as acceleration due to gravity)

(a) $\frac{g\sqrt{t_1 t_2}}{2}$

(b) $\frac{g(t_1 + t_2)}{2}$

(c) $g\sqrt{t_1 t_2}$

(d) $g\frac{t_1 t_2}{(t_1 + t_2)}$

Answer: (b)

7. A long straight wire is carrying current I in +z direction. The x – y plane contains a closed circular loop carrying current I_2 and not encircling the straight wire. The force on the loop will be

(a) $\mu_0 l_1 l_0/2\pi$

(b) $\mu_0 l_1 l_0/4\pi$

(c) zero

(d) depends on the distance of the centre of the loop from the wire

Answer: (d)

8. When the radioactive isotope $_{88}Ra^{226}$ decays in a series by emission of three alpha (α) and a beta (ß) particle, the isotope X which remains undecay is

(a) $_{83}X^{214}$

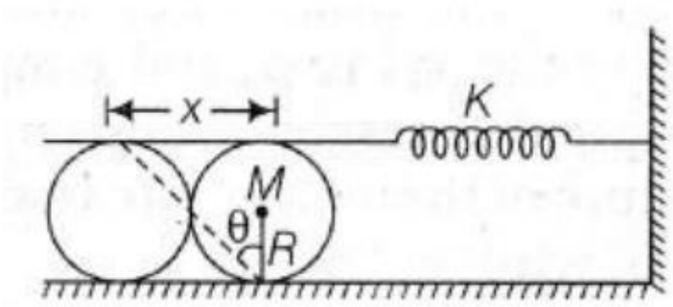
b) $_{84}X^{218}$

(c) $_{84}X^{220}$

(d) $_{87}X^{223}$

Answer: (a)

9. A solid cylinder is attached to a horizontal massless spring as shown in figure. If the cylinder rolls without slipping, the time period of oscillation of the cylinder is



(a) $2\pi\sqrt{\frac{x}{g}}$

(b) $2\pi\sqrt{\frac{2M}{3K}}$

(c) $2\pi\sqrt{\frac{3M}{8K}}$

(d) $2\pi\sqrt{\frac{3M}{2K}}$

Answer: (c)

10. N lamps each of resistance r, are fed by a machine of resistance R. If light emitted by any lamp is proportional to the square of the heat produced, prove that the most efficient way of arranging them is to place them in parallel arcs, each containing n lamps, where n is the integer nearest to

(a) $\left(\frac{r}{NR}\right)^{3/2}$

(b) $\left(\frac{NR}{r}\right)^{1/2}$

(c) $(NRr)^{3/2}$

(d) $(NRr)^{1/2}$

Answer: (b)

11. Radioactive decay will occur as follows

$$^{220}_{86}\text{Rn} \rightarrow {}^{216}_{84}\text{PO} + {}^{4}_{2}\text{He Half life} = 55\text{s}$$

$$^{216}_{84}\text{Po} \rightarrow {}^{216}_{82}\text{Pb} + {}^{4}_{2}\text{He Half life} = 0.66\text{ s}$$

$$^{812}_{82}\text{Pb} \rightarrow {}^{212}_{82}\text{BL} + \lambda^{\circ}\text{e Half life} = 10.6\text{ h}$$

If a certain mass of radon (Rn = 220) is allowed to decay in a certain container; then after 5 minutes the element with the greater mass willbe

(a) radon

(b) polonium

(c) lead

(d) bismuth

Answer: (c)

12. A stream of a liquid of density ρ flowing horizontally with speed v rushes out of a tube of radius r and hits a vertical wall nearly normally. Assuming that the liquid does not rebound from the wall, the force exerted on the wall by the impact of the liquid is given by

(a) $\pi r\rho v$

(b) $\pi r\rho v^2$

(c) $\pi r^2\rho v$

(d) $\pi r^2\rho v^2$

Answer: (d)

13. The x and y coordinates of a particle moving in a plane are given by x(t) = a cos (pt) and y(t) = b sin (pt) where a, b (<a) and pare positive constants of appropriate dimensions and t is time. Then, which of the following is not true?

(a) The path of the particle is an ellipse.

(b) Velocity and acceleration of the particle are perpendicular to each other at t =π/2ρ

(c) Acceleration of the particle is always directed towards a fixed point.

(d) Distance travelled by the particle in time interval between t = 0 and t = π/2P is a

Answer: (d)

14. White light is used to illuminate two slits in Young's double slit experiment. The separation between the slits is b and the screen is at a distance d (>>b) from the slits. At a point on the screen directly in front of one of the slits, which wavelengths are missing?

(a) $\frac{b}{d}, \frac{b}{3d}, \frac{b}{5d}$

(b) $\frac{b^2}{2d}, \frac{b^2}{4d}, \frac{b^2}{6d}$

(c) $\frac{b^2}{d}, \frac{b^2}{3d}, \frac{b^2}{5d}$

(d) $\frac{b}{2d}, \frac{b}{4d}, \frac{b}{6d}$

Answer: (c)

15. A skier starts from rest at point A and slides down the hill without turning or breaking. The friction coefficient is μ. When he stops at point B, his horizontal displacement is S. What is the height difference between points A and B

(The velocity of the skier is small so that the additional pressure on the snow due to the curvature can be neglected. Neglect also the friction of air and the dependence of μ on the velocity of the skier.)

(a) h = μS

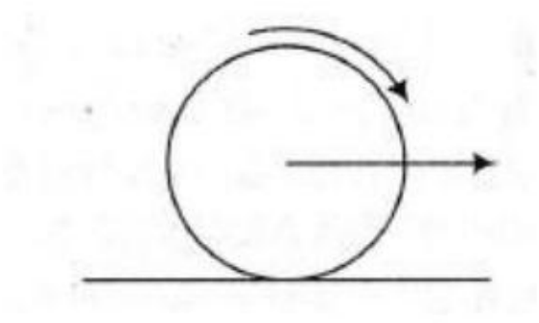
(b) $h = \mu/S$

(c) $h = 2\mu S$

(d) $h = \mu S^2$

Answer: (a)

16. A bicycle wheel rolls without slipping on a horizontal floor. Which one of the following is true about the motion of points on the rim of the wheel, relative to the axis at the wheel's centre?



(a) Points near the top move faster than points near the bottom

(b) Points near the bottom move faster than points near the top

(c) All points on the rim move with the same speed

(d) All points have the velocity vectors that are pointing in the radial direction towards the centre of the wheel

Answer: (a)

17. The planets with radii R_1 and R_2 have densities ρ_1, ρ_2 Their atmospheric pressures are p_1 and p_2 respectively. Therefore, the ratio of masses of their atmosphere, neglecting variation of g within the limits of atmosphere is

(a) $\rho_1 R_2 p_1 / \rho_2 R_1 p_2$

(b) $p_1 R_2 \rho_2 / p P_2 R_1 \rho_1$

(c) $p_1 R_1 \rho_1 / p_2 R_2 \rho_2$

(d) $p_1 R_1 \rho_2 / p_2 R_2 \rho_1$

Answer: (d)

18. A thin symmetrical double convex lens of refractive index $\mu_2 = 1.5$ is placed between a medium of refractive index $\mu_1 = 1.4$ to the left and another medium of refractive index $\mu_3 = 1.6$ to the right. Then, the system behaves as

(a) a convex lens

(b) a concave lens

(c) a glass plate

(d) a convexo concave lens

Answer: (c)

19. A wide hose pipe is held horizontally by a fireman. It delivers water through a nozzle at one litre per second. On increasing the pressure, this increases to two litres per second. The fireman has now to

(a) push forward twice as hard

(b) push forward four times as hard

(c) push backward four times as hard

(d) push backward twice as hard.

Answer: (b)

20. The wavelength λ of a photon and the de-Broglie wavelength of an electron have the same value. Find the ratio of energy of photon to the kinetic energy of electron in terms of mass m, speed of light c and planck constant.

(a) $\frac{\lambda mc}{h}$

(b) $\frac{hmc}{\lambda}$

(c) $\frac{2hmc}{\lambda}$

(d) $\frac{2\lambda mc}{h}$

Answer: (d)

21. A non-conducting ring of radius 0.5 m carries a total charge of 1.11×10^{-10} C distributed non-uniformly on its circumference producing on its circumference on electric field **E**, everywhere in space.

The value of line integral $\int_{l=\infty}^{l=0}(-\mathbf{E}\times\mathbf{dl})$ (l = 0 being centre of ring) in voltsis

(a) +2

(b) −1

(c) −2

(d) Zero

Answer: (a)

22. The upper half of an inclined p lane of inclination θ is perfectly smooth while the lower half rough. A block starting from rest at the top of the plane will again come to rest at the bottom if the coefficient of friction between the block and the lower half of the plane is given by

(a) $\mu = 2\tan\theta$

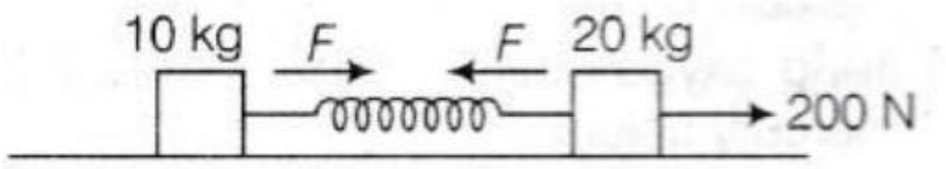
(b) $\mu = \tan\theta$

(c) $\mu = 2/(\tan\theta)$

(d) $\mu = 1/\tan\theta$

Answer: (a)

23. Two masses 10 kg and 20 kg respectively are connected by a massless spring as shown in figure. A force of 200 N acts on the 20 kg mass. At the instant shown is figure the 10 kg mass has acceleration of 12 m/s^2. The value of acceleration of 20 kg mass is



(a) $4\ m/s^2$

(b) $10\ m/s^2$

(c) $20\ m/s^2$

(d) $30\ m/s^2$

Answer: (a)

24. A cylinder rolls up an inclined plane, reaches some height and then rolls down (without slipping throughout these motions). The directions of the frictional force acting on the cylinder are

(a) up the incline while ascending and down the incline while descending.

(b) up the inline while ascending as well as descending.

(c) down the incline while ascending and up the incline while descending.

(d) down the incline while ascending as well as descending.

Answer: (b)

25. A liquid is allowed into a tube of truncated cone shape. Identify the correct statement from the following.

(a) The speed is high at the wider end and low at the narrow end.

(b) The speed is low at the wider end and high at the narrow end.

(c) The speed is same at both ends in an streamline flow.

(d) The liquid flows with uniform velocity in the tube.

Answer: (b)

26. Two soap bubble coalesce. It is noticed that, whilst joined together, the radii of the two bubbles are a and b where a > b. Then the radius of curvature of interface between the two bubbles will be

(a) a – b

(b) a + b

(c) $ab/(a - b)$

(d) $ab / (a + b)$

Answer: (c)

27. The displacement of a particle along the x-axis is given by $x = a \sin^2 \omega$ The motion of the particle corresponds to

(a) simple harmonic motion of frequency ω/π

(b) simple harmonic motion of frequency $3\omega/2\pi$

(c) non simple harmonic motion

(d) simple harmonic motion of frequency $\omega/2\pi$

Answer: (c)

28. Mercury boils at 367° However, mercury thermometers are made such that they can measure temperature upto 500°C. This is done by

(a) maintaining vacuum aboves mercury column in the stem of the thermometer

(b) filling nitrogen gas at high pressure above the mercury column.

(c) filling oxygen gas at high pressure above the mercury column.

(d) filling nitrogen gas at low pressure above the mercury column.

Answer: (b)

29. Two identical glass spheres filled with air are connected by a horizontal glass tube. The glass tube contains a pellet of mercury at its mid-points. Air in one sphere is at 0°C and the other is at 20° If both the vessels are heated through 10°C, then neglecting the expansions of the bulbs and the tube

(a) the mercury pellet gets displaced towards the sphere at lower temperature.

(b) the mercury pellet gets displaced towards the sphere at higher temperature.

(c) the mercury pellet does not get displaced at all

(d) the temperature rise causes the pellet to expand without any displacement.

Answer: (c)

30. A nucleus ${}^{A}_{Z}X$ has mass represented by m(A, Z). If m_p and m_n denote the mass of proton and neutron respectively and BE the binding energy (in MeV) then,

(a) $BE = [m(A, Z) - Zm_p - (A - Z)m_n]C^2$

(b) $BE = [Zm_p + (A - Z)m_n - m(A, Z)]C^2$

(c) $BE = [Zm_p + Am_n - m(A, Z)]\,C^2$

(d) $BE = m(A, Z) - Zm_p - (A - Z)\,m_N$

Answer: (b)

31. A graph between pressure P(along y-axis) and absolute temperature, T(along x-axis) for equal moles of two gases has been drawn. Given that volume of second gas is more than volume of first gas. Which of the following statement is correct?

(a) Slope of gas 1 is less than gas 2

(b) Slope of gas 1 is more than gas 2

(c) Both have some slopes

(d) None of the above

Answer: (b)

32. A piece of blue glass heated to a high temperature and a piece of red glass at room temperature are taken inside a dimly-lit room. Then,

(a) the blue piece will look blue and the red piece will look red as usual.

(b) the red piece will look brighter red and the blue piece will look ordinary blue.

(c) the blue will look brighter as compared to the red piece.

(d) both the pieces will look equal red.

Answer: (c)

33. A certain charge Q is divided into two parts q and Q – q. How the charge Q and q must be related so that when q and (Q – q) is placed at a certain distance apart experience maximum electrostatic repulsion?

(a) $Q = 2q$

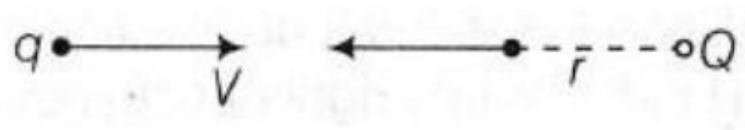
(b) $Q = 3q$

(c) $Q = 4q$

(d) $Q = 4q + c$

Answer: (a)

34. A charged particle 'q' is shot with speed v towards another fixed charged particle Q. It approaches Q upto a closest distance r and then returns. If q were given a speed 2v, the closest distance of approach would be



(a) r

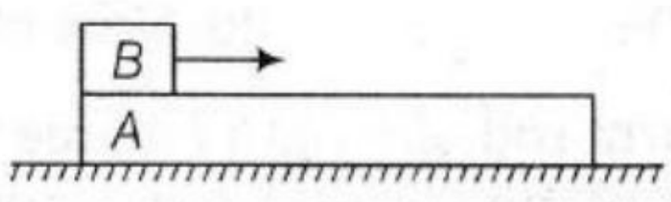
(b) 2r

(c) r/2

(d) r/4

Answer: (d)

35. A long block A of mass M is at rest on a smooth horizontal surface. A small block B of mass M/2 is placed on A at one end and projected along A with some velocity v. The coefficient of friction between the block is μ. Then, the accelerations of blocks A and B before reaching a common velocity will be respectively



(a) μg/2, (towards right), μg/2(towards left)

(b) μg(towards right), μg(towards left)

(c) μg/2(towards right), μg(towards left)

(d) μg(toward right), μg/2(towards left)

Answer: (c)

36. A beam of light composed of red and green rays is incident obliquely at a point on the face of a rectangular glass slab. When coming out on the opposite parallel face, the red and green rays emerge from

(a) two points propagating in two different non-parallel directions.

(b) two points propagating in two different parallel directions.

one point propagating in two different directions.

(c) one point propagating in the same direction.

Answer: (b)

37. The plane face of a plano convex lens is silvered. If μ be the refractive index and R, the radius of curvature of curved surface, then system will behave like a concave mirror of curvature

(a) μR

(b) R^2/μ

(c) $R/(\mu - 1)$

(d) $[(\mu + 1)/(\mu - 1)]R$

Answer: (c)

38. The maximum numbers of possible interference maxima for slit separation equal to twice the wavelength in Young's double slit experiment is

(a) infinite

(b) five

(c) three

(d) zero

Answer: (b)

39. An isotropic point source of light is suspended h metre vertically above the centre of circular table of radius r metre. Then, the ratio of illumenances at the centre to that at the edge of the table is

(a) $1+\left(\frac{r^2}{h^2}\right)$

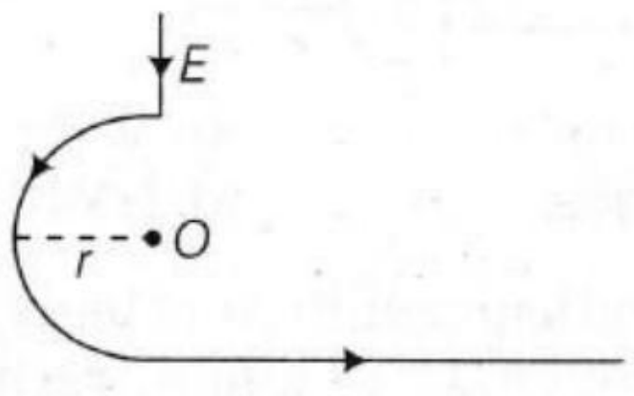
(b) $1+\left(\frac{h^2}{r^2}\right)$

(c) $\left\{1+\frac{r^2}{h^2}\right\}^{3/2}$

(d) $\left\{1+\frac{h^2}{r^2}\right\}^{3/2}$

Answer: (c)

40. In the given figure, what is the magnetic field induction at point O.



(a) $\frac{\mu_0 I}{4\pi r}$

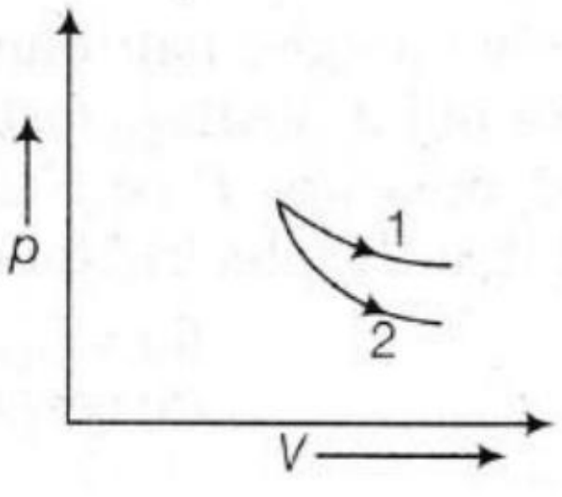
(b) $\frac{\mu_0 I}{4\pi r}+\frac{\mu_0 I}{2\pi r}$

(c) $\frac{\mu_0 I}{4r}+\frac{\mu_0 I}{4\pi r}$

(d) $\frac{\mu_0 I}{4r}-\frac{\mu_0 I}{4\pi r}$

Answer: (c)

41. p-V plots for two gases during adiabatic process as shown in figure plots 1 and 2 should correspond respectively to



(a) He and O_2

(b) O_2 and He

(c) He and Ar

(d) O_2 and N_2

Answer: (b)

42. The half-life period of a radioactive element X is same as the mean life of another radioactive element Y. Initially, both of them have the same numbers of atoms then,

(a) X and Y have the same decay rate initially.

(b) X and Y decay at the same rate always

(c) Y will decay at a faster rate than X

(d) X will decay at a faster rate than Y

Answer: (c)

43. A source emits electromagnetic waves of wavelength 3m. One beam reaches the observer directly and other after reflection from a water surface, travelling 1.5m extra distance and with intensity reduced to 1/4 as compared to intensity due to the direct beam alone. The resultant intensity will be

(a) (1/4) fold

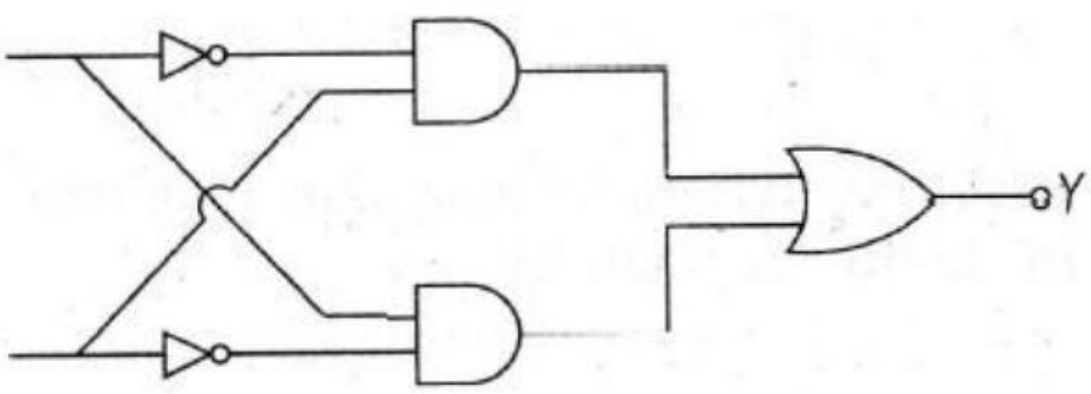
(b) (3/4) fold

(c) (5/4) fold

(d) (9/4) fold

Answer: (d)

44. The following circuit represents



(a) OR gate

(b) XOR gate

(c) AND gate

(d) NAND gate

Answer: (b)

45. Two identical conducting balls A and B have positive

charges q_1 and q_2 But $q_1 \neq q_2$/ The balls are brought together so that they touch each other and then kept in their original positions. The force between them is

(a) less than that before the balls touched

(b) greater than that before the balls touched

(c) same as that before the balls touched

(d) zero

Answer: (b)

46. A positively charged ball hangs from a silk thread. We put a positive test charges q_0 at a point and measure F/q_0, then it can be predicted that the electric field strength E

(a) $> F/q_0$

(b) $= F/q$

(c) $< F/q_0$

(d) cannot be estimated

Answer: (a)

47. Capacitor C_1 of capacitance 1 μF and capacitor C_2 of capacitance 2 μF are separately charged fully by a common battery. The two capacitors are then separately allowed to discharged through equal resistors at time t = 0

(a) the current in each of the two discharging circuits is zero at t =0

(b) the currents in the two discharging circuits at t = 0 are equal but non-zero

(c) the currents in the two discharging circuits at t = 0

(d) Capacitor C_1 loses 40% of its initial charge sooner than C_2 loses 40% of initialcharge.

Answer: (b)

48. A uniform electric field and a uniform magnetic field acting along the same direction in a certain region. If an electron is projected along the direction of the fields with a certain velocity, then

(a) it will turn towards left of direction of motion.

(b) it will turn towards right of direction of motion.

(c) its velocity will increase.

(d) its velocity will decrease.

Answer: (d)

49. To reduce the range of voltmeter, its resistance need to be reduced. A voltmeter has resistance R_0 and range V. Which of the following resistances when connected in parallel will convert it into a voltmeter of range V/n?

(a) nR_0

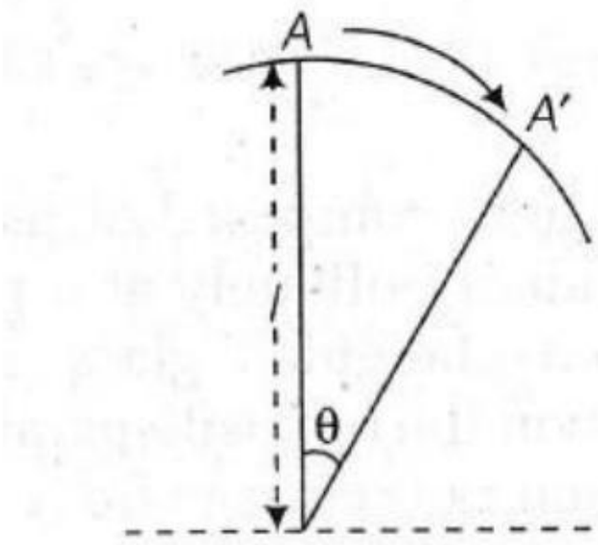
(b) $(n + 1)R_0$

(c) $(n - 1)R$

(d) None of these

Answer: (d)

50. A uniform rod of length l is free to rotate in a vertical plane about a fixed horizontal axis through B. The rod begins rotating from rest from its unstable equilibrium position. When, it has turned through an angle θ, its angular velocity ω is given by



(a) $\sqrt{\left(\frac{6g}{l}\right)}\sin\frac{\theta}{2}$

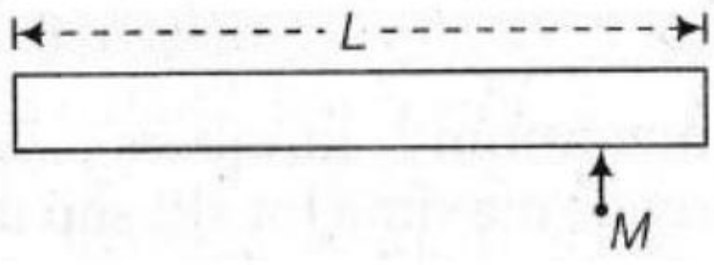
(b) $\sqrt{\left(\frac{6g}{l}\right)}\cos\frac{\theta}{2}$

(c) $\sqrt{\left(\frac{6g}{l}\right)}\sin\theta$

(d) $\sqrt{\left(\frac{6g}{l}\right)}\cos\theta$

Answer: (a)

51. A stick of length L and mass M lies on a frictionless horizontal surface on which it is free to move in any way. A ball of mass m moving with speed V collides elastically with the stick as shown in fig below. If after the collision, the ball comes to rest, then what should be the mass of the ball?



(a) m = 2M

(b) m = M

(c) m = M/2

(d) m = M/4

Answer: (d)

52. The mass of a proton is 1847 times that of an electron. A electron and a proton are injected into a uniform electric field at right angle to the direction of the filed with the same initial K.E.

(a) the electron trajectory will be less curved than the proton trajectory.

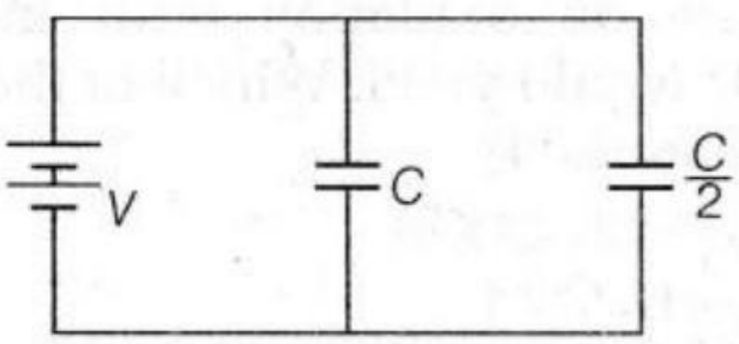
(b) both the trajectories will be straight.

(c) the proton trajectory will be less curved than the electron trajectory.

(d) both the trajectories will be equally curved.

Answer: (d)

53. Two condensers, one of capacity C and the other of capacity C/2, are connected to a V-volt battery, as shown.



The work done in charging fully both the condensers is

(a) CV^2

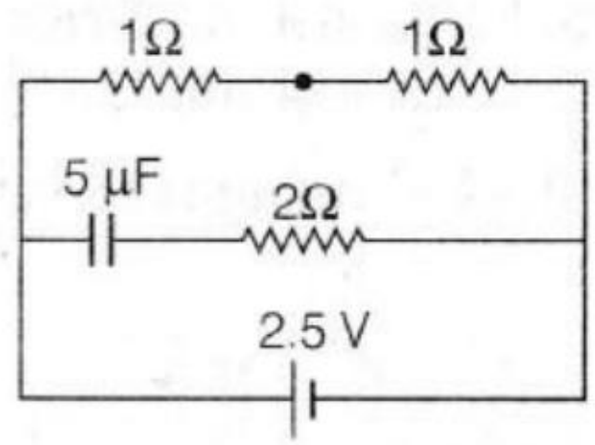
(b) $\frac{1}{4}CV^2$

(c) $\frac{3}{4}CV^2$

(d) $\frac{1}{2}CV^2$

Answer: (c)

54. A capacitor of capacitance 5μF is connected as shown in the figure. The internal resistance of the cell is 0.5Ω. The amount of charge on the capacitor plates is



(a) 80 μC

(b) 40 μC

(c) 20 μC

(d) 10 μC

Answer: (d)

55. A photo cell is illuminated by a small bright source placed 1m away. When the same source of light is placed

2m away, the electrons emitted by photo cathode

(a) carry one quarter of their previous energy

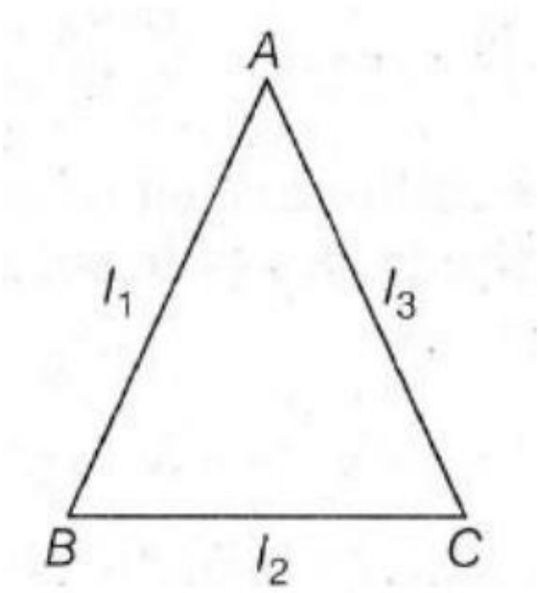
(b) carry one quarter of their previous momenta

(c) are half as numerous

(d) are one quarter as numerous

Answer: (d)

56. ABC is right angled triangular plane of uniform thickness. The sides are such that AB > BC as shown in figure. I_1, I_2, I_3 are momenta of inertia about AB, BC and AC, respectively. Then which of the following relations is correct?



(a) $I_1 = I_2 = I_3$

(b) $I_2 > I_1 > I_3$

(c) $I_3 < I_2 < I_1$

(d) $I_3 > I_1 > I_2$

Answer: (b)

57. An ice-berg of density 900 kgm^{-3} is floating in water of density 1000 kgm^{-3}. The percentage of volume of ice-berg outside the water is

(a) 20%

(b) 35%

(c) 10%

(d) 11%

Answer: (c)

58. The potential of an atom is given by $V = V_0 \log_e(r/r_0)$ where r_0 is a constant and r is the radius of the orbit. Assuming Bohr's model to be applicable, which variation of r_n with n is possible (n being principal quantum number)?

(a) $r_n \propto n$

(b) $r_n \propto 1/n$

(c) $r_n \propto n^2$

(d) $r_n \propto 1/n^2$

Answer: (a)

59. The temperature of source and sink of a heat engine are 127°C and 27°C, respectively. An inventor claims its efficiency to be 26%, then

(a) it is impossible

(b) it is possible with high probability

(c) it is possible with low probability

(d) Data are insufficient

Answer: (a)

60. You are given resistance wire of length 50 cm and a battery of negligible resistance. In which of the following cases is largest amount of heat generated?

(a) When the wire is connected to the battery directly

(b) When the wire is divided into two parts and both the parts are connected to the battery in parallel.

(c) When the wire is divided into four parts and all the four parts are connected to the battery in parallel.

(d) When only half of the wire is connected to the battery.

Answer: (c)