VITEEE physics 2013

1. Two balls of equal masses are thrown upwards along the same vertical direction at an interval of 2 s,with the same initial velocity of 39.2 m/s. The two balls will collide at a height of

(a) 39.2 m (b) 73.5 m

(c) 78.4 m (d) 117.6 m

2. The dimensional formula of magnetic flux is

(a) $[M^1L^2T^{-1}A^{-2}]$ (b) $[M^1L^2T^{-2}A^{-1}]$

(c) $[M^1L^2T^{-1}A^{-1}]$ (d) $[M^1L^0T^{-2}A^{-1}]$

3. The time dependence of a physical quantity P is given by $P=P_0 e\alpha P(-\alpha t^2)$, where α is a constant and t is time. The constant α

(a) is a dimensionless (b) has dimensions of P

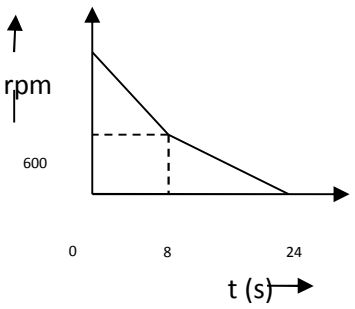
(c) has dimensions of T^{-2} (d) has dimensions of T^2

4. If the potential energy of a gas molecule is $U = \frac{M}{r^6} - \frac{N}{r^{12}}$, M and N being positive constants, then the potential energy at equilibrium must be

(a) zero (b) $NM^2/4$

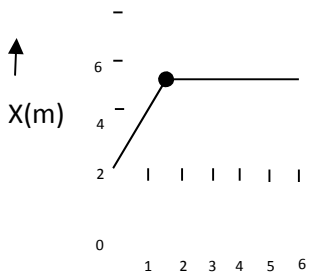
(c) $MN^2/4$ (d) $M^2/4N$

5. A table fan rotating at a speed of 2400 rpm is switched off and the resulting variation of revolution/minute with time is shown in figure. The total number of revolutions of the fan before it comes to rest is



(a) 160 (b) 280 (c) 380 (d) 420

6. In the adjoining figure, the position time graph of a particle of mass 0.1 kg is shown. The impulse at t = 2 s is



(a) 0.02 kg m/s (b) 0.1 kg m/s

(c) 0.2 kg m/s (d) 0.4 kg m/s

7. The pressure on a square plate is measured by measuring the force on the plate and the length of sides of the plate and the length of sides of the plate. If the maximum error in the measurement of force and length are respectively 4% and 2%, then the maximum error in the measurement of pressure is

(a) 1% (b) 2% (c) 4% (d) 8%

8. The centre of a wheel rolling on a plane surface moves with a speed v_0. A particle on the rim of the wheel at the same level as the centre will be moving at speed

(a) zero (b) v_0 (c) $2v_0$ (d) $\sqrt{2}\, v_0$

9. A body of mass 5 m initially at rest explodes into 3 fragments with mass ratio 3:1:1. Two of fragments each of mass 'm' are found to move with a speed of 60 m/s is mutually perpendicular directions. The velocity of third fragment is

(a) $10\sqrt{2}$ (b) $20\sqrt{2}$

(c) $20\sqrt{3}$ (d) $60\sqrt{2}$

10. A body of mass 2 kg moving with velocity of 6 m/s strikes in elastically with another body of same mass mass at rest. The amount of heat evolved during collision is

(a) 18 J (b) 36 J (c) 9 J (d) 3 J

11. Two particles of equal mass m go round a circle of redius R under the action of their mutual gravitational attraction. The speed of each particle is

(a) $\frac{1}{2}\sqrt{\frac{Gm}{R}}$ (b) $\sqrt{\frac{4Gm}{R}}$

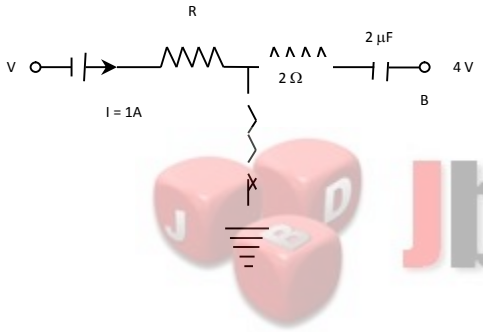
(c) $\sqrt{\frac{Gm}{2R}}$ (d) $\frac{1}{2R}\sqrt{\frac{1}{Gm}}$

12. Four equal charges Q each are placed at four corners of a square of side a each. Work done in carrying a charge –q from its centre to infinity is

(a) zero (b) $\frac{\sqrt{2}q}{\pi\varepsilon_0 a}$

(c) $\frac{q^2}{2\pi\varepsilon_0 a}$ (d) $\frac{\sqrt{2}q^2}{\pi\varepsilon_0 a}$

13. A network of resistances, cell and capacitor C(= 2 μ F) is shown in adjoining figure.In steady state condition, the charge on 2μF capacitor is Q, while R is unknown resistance. Values of Q and R are respective.,



(a) 4 μC and 10 Ω
(b) 4 μC and 4 Ω
(c) 2 μC and 2 Ω
(d) 8 μC and 4 Ω

14. As the electron in Bohr's orbit of hydrogen atom passes from state n =2 to,n =1 , the KE (K) and the potential energy (U) changes as

(a) K four fold, U also four fold

(b) K two fold, V also two fold

(c) K four fold, U two fold

(d) K two fold, U four fold

15. To get an OR gate from a NAND gate, we need

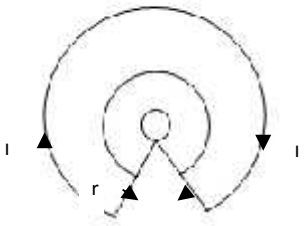
(a) Only two NAND gates

(b) Two NOT gates obtained

(c) Four NAND gates and two AND gates obtained from NAND gates

(d) None of the above

16. If a current I is flowing in a loop of radius r as shown in adjoining figure, then the magnetic field induction ate the centre O will be



(a) Zero (b) $\frac{\mu_0 / \theta}{4 \pi r}$

(c) $\frac{\mu_0 / \sin\theta}{4 \pi r}$ (d) $\frac{2 \mu_0 / \sin \theta}{4 \pi r^2}$

17. Two indentical magnetic dipoles of magnetic moment 1.0 Am^2 each,placed at a separation of 2 m with their axes perpendicular to each other. The resultant magnetic field at a p[oint midway between the dipoles is

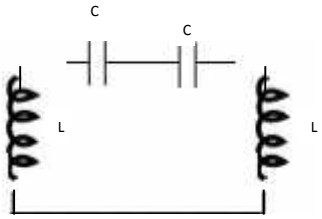
(a) $\sqrt{5} \times 10^{-7}$ T

(b) 5×10^{-7} T

(c) 10^{-7} T

(d) 2×10^{-7} T

18. The natural frequency of the circuit shown in adjoining figure is

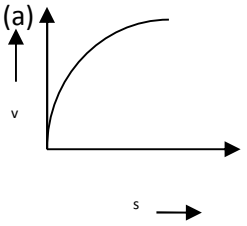


(a) $\frac{1}{2\pi\sqrt{LC}}$ (b) $\frac{1}{2\pi\sqrt{2LC}}$

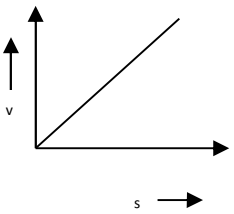
(c) $\frac{2}{2\pi\sqrt{LC}}$ (c) zero

19. A lead shot of 1 m diameter falls through a long column of glycerine. The variation of the velocity v with distance covered (s) is correctly represented by

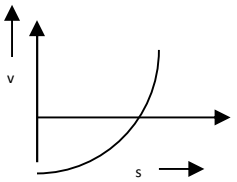
(a)



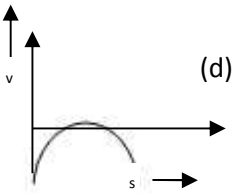
(b)



(c)



(d)

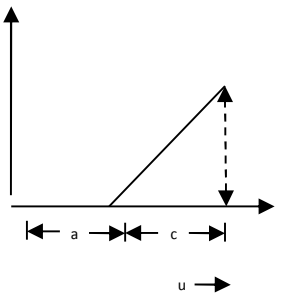


20. If ε_0 and μ_0 represent the permittivity and permeability of vaccum and ε and μ represent the prmittivity and permeability of medium, then refractive index of the medium is given by

(a) $\sqrt{\frac{\varepsilon_0\mu_0}{\varepsilon\mu}}$ (b) $\sqrt{\frac{\varepsilon\mu}{\varepsilon_0\mu_0}}$

(c) $\sqrt{\frac{\varepsilon_0\mu_0}{\varepsilon}}$ (d) $\sqrt{\frac{\varepsilon_0\mu_0}{\mu}}$

21. A students plots a graph between inverse of magnification 1/m produced by a convex thin lines and the object distance u as shown in figure. What was the focal length of the lens used?



(a) $\frac{b}{ca}$ (b) $\frac{bc}{a}$

(c) $\frac{c}{b}$ (d) $\frac{b}{c}$

22. Two waves $y_1 = A_1\sin(\omega t - \beta_1)$ and $y_2 = A_2 \sin(\omega t - \beta_2)$ supeermose to form a resultant wave whose amplitude is

(a) $A_1 + A_2$

(b) $|A_1 + A_2|$

(c) $\sqrt{A_1^2 + A_2^2\ 2A_1A_2\sin(\ _1 - \ _2)}$

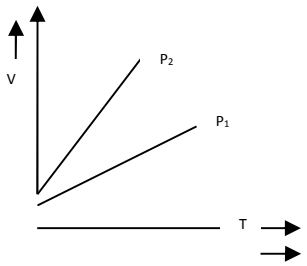
(d) $\sqrt{A_1^2 + A_2^2\ 2A_1A_2\cos(\ _1 - \ _2)}$

23. When a certain metallic surface is illuminated with monochromatic light of wavelength λ, the stopping potential for photoelectric current $3V_0$.When the same surface is illuminated with a light of wave length 2λ, the stopping potential is V_0. The threshold wavelength for this surface to photoelectric effect is

(a) 4λ (b) 6λ

(c) 8λ (d) $\frac{4}{3}\lambda$

24. In the V-T diagram shown in adjoining figure, what is the relation between p_1 and p_2 ?



(a) $P_2 = p_1$ (b) $P_2 < p_1$

(c) $P_2 > p_1$ (d) insufficient data

25. If a gas mixture contains 2 moles of O_2 and 4 moles of Ar at temperature T, then what will bne then total energy of the system of the system (neglecting all vibrational modes)

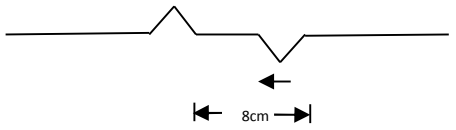
(a) 11 RT

(b) 15 RT

(c) 8 RT

(d) RT

26. In the adjoining figure, two pulses in a stretched string are shown. If initially their centres are 8 cm apart and they are moving towards each other, with speed of 2cm/s, then total energy of the pulses after 2 s will be



(a) Zero
(b) Purely kinetic
(c) Purely potential
(d) Partly kinetic and partly potential

27. When two waves of almost equal frequency n_1 and n_2 are produced simultaneously, the the time interval between succesive maxima is

(a) $\frac{1}{n_1+n_2}$ (b) $\frac{1}{n_1}+\frac{1}{n_1}$

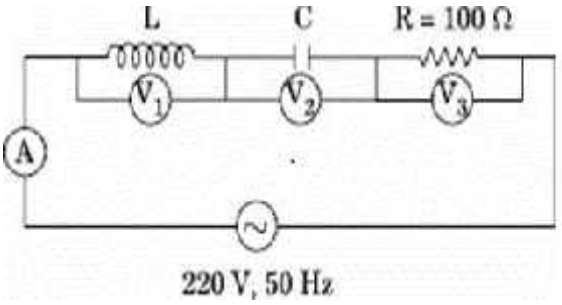
(c) $\frac{1}{n_1}-\frac{1}{n_1}$ (d) $\frac{1}{n_1-n_2}$

28. A long glass capillary tube is dipped in water. It is unknown that water wets glass. The water level rises by h in the tube. The tube is now pushed down so that only a length h/2 is outside the water surface. The angle of contact at the water surface at the upper end of the tube will be

(a) $\tan^{-1}2$ (b) 60^0

(c) 30^0 (d) 15^0

29. In the adjoining circuit, if the reading of voltmeter V_1 and V_2 are 300 volts each, then the reading voltmeter V_3 and ammeter A are respectively



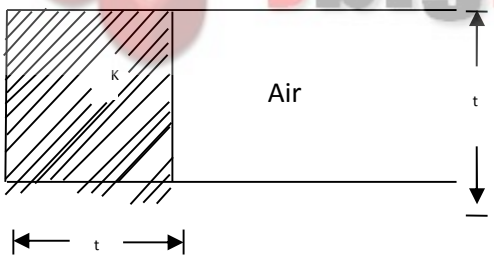
(a) 220 V , 2.2 A
(b) 100 V , 2.0 A
(c) 220 V , 2.0 A
(d) 100 V , 2.2 A

30. if the work done in turning a magnet of magnetic moment M by an angle of 90^0 from the magnetic meridian is n times the corresponding work done to turn it through an angle of 60^0, then the value of n is

(a) 1 (b) 2

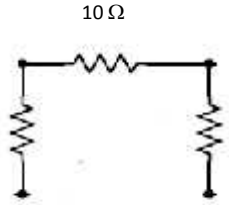
(b) ½ (d) ¼

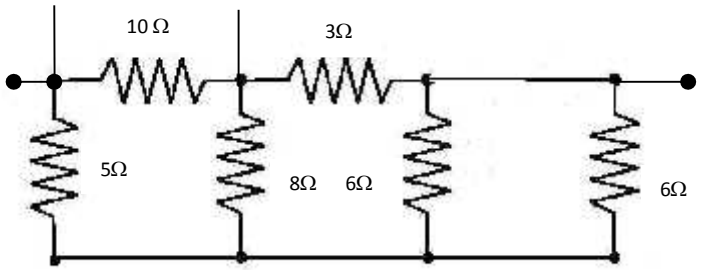
31. The capacitance of a parallel plate capacitor with air as dielectric is C. If a slab of dielectric constant K and of the same thickness as the separation between the plates is introduced so as to fill $1/4^{th}$ of the capacitor (shown in figure), then the new capacitance is



(a) $(K+2)\frac{C}{4}$
(b) $(K+3)\frac{C}{4}$
(c) $(K+1)\frac{C}{4}$
(d) None of these

32. Seven resistance are connected between points A and B as shown in figure. The equivalent resistance between A and B is





(a) 5 Ω (b) 4.5 Ω

(c) 4 Ω (d) 3 Ω

33. The amplitude of an electromagnetic wave in vaccum is doubled with no other changes made to the wave. As a result of this doubling of the amplitude, which of the following statement is correct?

(a) The frequency of the wave changes only

(b) The wave length of the wave changes only

(c) The speed of the wave propagation changes only

(d) Alone of the above is correct

34. An element with atomic number Z = 11 emits K_α - X ray of wavelength λ. The atomic number which emits K_α - X-ray of wavelength 4λ is

(a) 4 (b) 6

(c) 11 (d) 44

35. Mobilities of electrons and holes in a sample of intrinsic germanium at room temperature are $0.36 m^2 V^{-1}s^{-1}$. The electron and hole densities are each equal to 2.5×10^{19} m^3. The electrical conductivity of germanium is

(a) 4.24 Sm^{-1} (b) 2.12 Sm^{-1}

(c) 1.09 Sm^{-1} (d) 0.47 Sm^{-1}

36. If a radio-receiever amplifies all the signal frequencies equally well, it is said to have high

(a) sensitivity (b) selectivity

(c) distortion (d) fidelity

37. If a progressive wave is represented as y = 3 sin $\pi\left(\frac{t}{2}-\frac{x}{4}\right)$ where x is in meter and t is in second, then the distance travelled by the wave in 5 s is

(a) 5 m (b) 10 m

(c) 25 m (d) 32 m

38. The gravitational potential at a place varies inversely with x^2(i.e.,$V = k/x^2$), the gravitational field at that place is

(a) $2k/x^3$ (b) $-2k/x^3$

(c) k/x (d) $-k/x$

39. A copper wire of length 2.2 m and a steel wire of length 1.6 m, both of diameter 3.0 mm are connected end to end. When stretched by a force, the electrogation in length 0.50 mm is produced in the copper wire. The stretching force is

($Y_{cu} = 1.1 \times 10^{11}$ N/m^2 ,

$Y_{steel} = 2.0 \times 10^{11}$ N/m^2)

(a) 5.4×10^2 N (b) 3.6×10^2 N

(b) 2.4×10^2 N (d) 1.8×10^2 N

40. If $\bar{v}$, v_{rms} and v_p represent the mean speed, root mean square and most probable speed of the molecules in an ideal monoatomic gas at temperature T and if m is mass of the molecule, then

(a) $v_p < v < v_{rms}$

(b) no molecule can have a speed greater than $\sqrt{2}\, v_{rms}$

(c) no molecule can have a speed less than $v_p/\sqrt{2}$

(d) None of the above