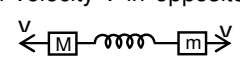
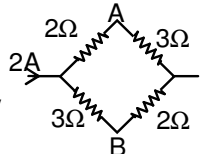


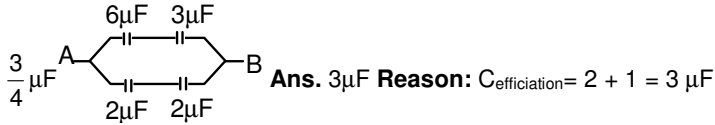
OJEE PHYSICS SOLUTION 2011

HELD ON 08.05.11

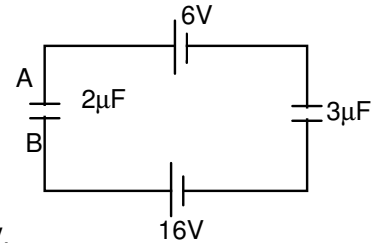
This writeup aims to help you to assess your score in the Orissa JEE-2011. The qns stated have been collected from memory of iBooks Institute® students who appeared at the Exam on 08.05.11. Though we have tried to be accurate, there may be errors (in Qns as well as Answers) in whatever has been stated here. iBooks Institute® is not responsible for the same.

1. ML^2T^{-3} is the dimension of (a) Work (b) Power (c) Force (d) Momentum
Ans. Power Reason. Power = $\frac{\text{work}}{\text{time}} = \frac{\text{Force} \times \text{distance}}{\text{time}} = \frac{ML^2T^{-2}}{T} ML^2T^{-3}$
2. 200 cal of heat is given to a heat engine so that it rejects 150 cal of heat, if source temp is 400 K, then the sink temp is (a) 300 K (b) 200 K (c) 100 K (d) 50K. **Ans.** 300 K
3. An inductor of 50 mH draws a current of 2A. The energy stored is (a) 50 mJ (b) 60 mJ (c) 100 mJ (d) 25 mJ. **Ans.** 100 mJ
4. Two point charges each Q placed at a distance r apart. Another charge is placed at the middle so that the system will remain in equilibrium. Then the value of q is (a) $-\frac{Q}{4}$ (b) $\frac{Q}{4}$ (c) $-\frac{Q}{2}$ (d) $\frac{Q}{2}$. **Ans.** $-\frac{Q}{4}$.
5. Refractive index of a medium is μ . The incidence angle is double of refracting angle. The angle of incidence is (a) $2\cos^{-1}\left(\frac{\mu}{2}\right)$ (b) $\sin^{-1}\left(\frac{\mu}{2}\right)$ (c) $\cos^{-1}\frac{\mu}{2}$ (d) $\sin^{-1}\mu$. **Ans.** $2\cos^{-1}\left(\frac{\mu}{2}\right)$
6. If Temperature of an ideal gas is increases by three times, then its rms velocity became (a) $\sqrt{3}$ times (b) 3 times (c) one third (d) remains same. **Ans.** $\sqrt{3}$ times Reason. $C = \sqrt{\frac{3RT}{m}} \Rightarrow C \propto \sqrt{T}$
7. A body moves with initial velocity 10 m/s. If it covers a distance of 20 m in 2 sec then acceleration of the body is (a) zero (b) $10m/s^2$ (c) $5 m/s^2$ (d) $2 m/s^2$ **Ans.** Zero
8. Two mass attached to a spring of spring constant k. If both are given velocity v in opposite direction, then maximum elongation of spring is (a) $\sqrt{\frac{2mv^2}{k}}$ (b) $\sqrt{\frac{mv^2}{k}}$ (c) $\sqrt{\frac{mv^2}{2k}}$ (d) $2\sqrt{\frac{mv^2}{k}}$  **Ans.** $\sqrt{\frac{2mv^2}{k}}$ Reason. $\frac{1}{2}mv^2 + \frac{1}{2}mv^2 = \frac{1}{2}kx^2 \Rightarrow mv^2 = \frac{1}{2}kx^2 \Rightarrow x = v\sqrt{\frac{2m}{k}}$
9. The potential difference between A and B as shown in figure is (a) 1 V (b) 2V (c) 3V (d) 4V  **Ans.** 1 V
10. A body vibrating with SHM with time period T, time taken by the body to travel from mean position to half of the amplitude is (a) T/12 (b) T/6 (c) T/3 (d) T/2. **Ans.** T/12
11. A circular coil of n turn and radius r carries a current I. The magnetic field at the centre is given by (a) $\frac{\mu_0 n I}{2r}$ (b) $\frac{\mu_0 n I}{r}$ (c) $\frac{2\mu_0 n I}{r}$ (d) $\frac{\mu_0 n I}{4r}$ **Ans.** $\frac{\mu_0 n I}{2r}$.
12. A wave of wavelength 2m is reflected from a surface. If a node is formed at 3 m from the surface, then at what distance from the surface another node will be formed (a) 3m (b) 2m (c) 1 m (d) 4m. **Ans.** 4 m Reason: distance between the node is $\lambda/2 = 1m$

13. The equivalent capacitance between A and B as shown in figure is (a) $3\mu\text{F}$ (b) $1\mu\text{F}$ (c) $\frac{25}{26}\mu\text{F}$ (d) $\frac{3}{4}\mu\text{F}$



14. The potential difference between A and B is (a) 13.2V (b) -13.2 V (c) -6V (d) 6V.



15. In young's double slit experiment if the separation between two slit is halved and the distance between plane of slit and screen is doubled then fringe width will be (a) four times (b) doubled (c) halved (d) one fourth. **Ans. Four times Reason:**

$$\beta' = \frac{\lambda(2D)}{(d/2)} = 4\left(\frac{\lambda D}{d}\right) = 4 \text{ times.}$$

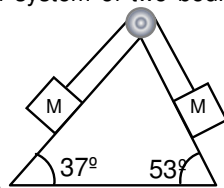
16. A circular wire of radius r rotates about its own axis with angular speed ω in a magnetic field B perpendicular to its plane, then the induced emf is (a) zero (b) $\frac{1}{2}B\omega^2$ (c) $B\omega^2$ (d) $2B\omega^2$ **Ans. Zero Reason:** No change in flux linkage.

17. A body is projected with speed u at an angle θ with the horizontal so that its range and maximum height are equal. Then $\tan \theta$ will be equal to (a) 4 (b) $\frac{1}{4}$ (c) 2 (d) 1/2. **Ans. 4**

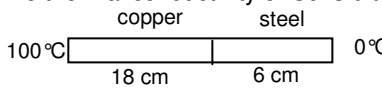
18. If orbital velocity is V_0 and escape velocity is V_e , then the relation between them will be (a) $V_e = \sqrt{2} V_0$ (b) $V_0 = \sqrt{2} V_e$ (c) $V_0 = V_e$ (d) $V_e = 2V_0$. **Ans. $V_e = \sqrt{2} V_0$**

19. Two bodies of mass 1 kg and 4 kg moving with same kinetic energy, then the ratio of their momentum will be (a) 2 (b) $\frac{1}{2}$ (c) 3 (d) 1/3. **Ans. 1/2. Reason.** $P = \sqrt{2mE}$, $\frac{P_1}{P_2} = \sqrt{\frac{m_1}{m_2}} = \sqrt{\frac{1}{4}} = \frac{1}{2}$.

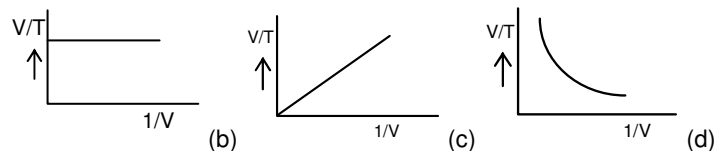
20. The acceleration of system of two bodies over the wedge as shown in figure is (a) 1 m/s^2 (b) 2 m/s^2 (c) 0.5 m/s^2 (d) 10 m/s^2 **Ans. 1 m/s^2**



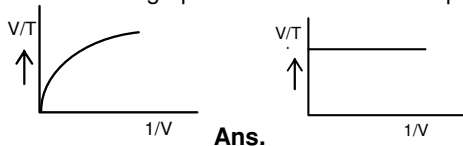
21. A body moves with constant velocity in a straight line parallel to x-axis. The angular momentum with respect to origin is (a) zero (b) constant (c) continuously increases (d) continuously decreases. **Ans. constant**
22. A body of mass 2kg is rotating with angular speed 2π rad/s in a circular path of radius 1m. Then centripetal force acting on the body is (a) $8\pi^2$ (b) $6\pi^2$ (c) $4\pi^2$ (d) $2\pi^2$. **Ans. $8\pi^2$**
23. A convex lens of focal length 16 cm produces real image of magnification $m = 2$. The object distance from the lens is (a) 24 cm (b) 12cm (c) 8cm (d) 20cm. **Ans. 24 cm.**
24. Which is not electromagnetic wave (a) γ -ray (b) X-ray (c) heat ray (d) β -ray. **Ans. β -ray**
25. Two nucleons of mass x and y fuse to form a nucleus of mass m . Then energy released is (a) $x + y > m$ (b) $x + y < m$ (c) $x + y = m$ (d) $x - y = m$ **Ans. $x + y > m$**
26. Sun energy is due to (a) Fission of hydrogen (b) Fusion of hydrogen (c) Both Fission and Fusion (d) Neither Fusion and Fission **Ans. Fusion**

27. In AC series circuit, the resistance inductive reactance and capacitive reactance are 3Ω , 10Ω and 14Ω respectively. The impedance of the circuit is (a) 5Ω (b) 4Ω (c) 7Ω (d) 10Ω **Ans.** 5Ω . Reason. $Z = \sqrt{R^2 + (X_L - X_C)^2} \Rightarrow \sqrt{3^2 + (10 - 14)^2} = 5\Omega$.
28. A force of $6\hat{i} - 8\hat{j} + 10\hat{k}$ is acting on a body so that it moves with acceleration 1 m/s^2 . The mass of the body is (a) $10\sqrt{2}\text{ kg}$ (b) 10 kg (c) $20\sqrt{2}\text{ kg}$ (d) 20 kg . **Ans.** $10\sqrt{2}\text{ kg}$ Reason: $|\vec{F}| = \sqrt{6^2 + 8^2 + 10^2} = 10\sqrt{2}\text{ m} = \frac{f}{a} = \frac{10\sqrt{2}}{1} = 10\sqrt{2}$
29. A source is moving towards a stationary observer, so that the apparent frequency increases by 50%. If velocity of sound is 330 m/s , then velocity of source is (a) 110 m/s (b) 150 m/s (c) 180 m/s (d) 220 m/s . **Ans.** 110 m/s . Reason: $f' = 3f/2$, $f' = \frac{3v}{v - v_s} \Rightarrow \frac{3f}{2} = f \frac{v}{v - v_s} \Rightarrow 3v - 3v_s = 2v \Rightarrow v_s = v/2 = \frac{330}{2} = 165\text{ m/s}$
30. In an ideal transformer the no. of turns of primary and secondary coil is given as 100 and 300 respectively. If the Power input is 60 W , the power output is (a) 100 w (b) 300 w (c) 180 w (d) 60 w . **Ans.** 60 w .
31. The relation between surface tension T , surface area A and surface energy E is given by (a) $T = E/A$ (b) $T = EA$ (c) $E = T/A$ (d) $T = A/E$ **Ans.** $T = E/A$
32. A radioactive substance with activity A_0 became one third after 9 hour, then after another 9 hour it will become (a) $\frac{A_0}{9}$ (b) $\frac{A_0}{3}$ (c) $\frac{A_0}{27}$ (d) A_0 . **Ans.** $\frac{A_0}{9}$
33. In a transistor if collector current is 25 mA and base current is 1 mA then current amplification factor α is (a) $\frac{25}{26}$ (b) $\frac{26}{25}$ (c) $\frac{25}{24}$ (d) $\frac{24}{25}$ **Ans.** $\frac{25}{26}$
34. The intensity ratio of two waves at a point is $\frac{4}{9}$. The amplitude ratio will be (a) $\frac{2}{3}$ (b) $\frac{4}{9}$ (c) $\frac{16}{81}$ (d) $\frac{\sqrt{13}}{\sqrt{5}}$ **Ans.** $\frac{2}{3}$
Reason: $\frac{A_1^2}{A_2^2} = \frac{4}{9} \Rightarrow \frac{A_1}{A_2} = \frac{2}{3}$
35. The thermal conductivity of Cu is 9 time that of steel as shown in figure, then the temperature at the junction is

 (a) 75°C (b) 66.6°C (c) 75°C (d) 33.3°C **Ans** 75°C Reason:
 $\frac{9KA[100 - \theta]}{18} = \frac{KA[\theta - 0]}{6} \Rightarrow 300 - 3\theta = \theta \Rightarrow 4\theta = 300 \Rightarrow \theta = 75^\circ\text{C}$
36. A body of area 1 cm^2 is heated to a temperature 1000 K . If stefans constant $\sigma = 5.67 \times 10^{-8}\text{ w/m}^2\text{K}^4$ then amount of energy radiated by the body in 1 sec is (a) 5.67 Joule (b) 0.567 Joule (c) 56.7 Joule (d) 567 Joule **Ans.** 5.67 Joule .
37. The magnetic field at a perpendicular distance of 2 cm from an infinite straight current carrying conductor is $2 \times 10^{-6}\text{ T}$. The current in the wire is (a) 0.2 A (b) 0.4 A (c) 0.1 A (d) 0.8 A **Ans.** 0.2 A
38. A train is moving north with speed 20 m/s . If it turns west with same speed, then the change in velocity will be (a) $20\sqrt{2}\text{ m/s SW}$ (b) $20\sqrt{2}\text{ m/s NW}$ (c) 40 m/s NE (d) 20 m/s SE **Ans.** $20\sqrt{2}\text{ m/s SW}$
39. Lenz's law is the consequence of (a) conservation of energy (b) conservation of charge (c) conservation of mass (d) conservation of momentum. **Ans.** conservation of energy Reason. Facts.
40. A body of mass 60 kg is resting in a lift which accelerates upwards with acceleration 2 m/s^2 . The apparent weight is (a) 72 kg (b) 60 kg (c) 48 kg (d) 720 kg **Ans.** 72 kg .
41. In relativity which is constant between two frame of reference (a) velocity (b) space interval (c) time interval (d) acceleration. **Ans.** Velocity Reason: Relativity is valid for inertial frame.
42. In an equilateral prism if incident angle is 45° then minimum deviation is (a) 30° (b) 60° (c) 45° (d) 90° . **Ans.** 30° Reason.
 $\delta_m = (2i - A) = 2(45) - 60 = 30^\circ$.

43. In a conductor if 3000 coulomb of charge enters and 3000 coulomb of charge exit in time 10 min, then the current is (a) 5 amp (b) 10 amp (c) 2.5 amp (d) zero **Ans.** 5 amp Reason: $I = \frac{q}{t} = \frac{3600}{10 \times 60} = 5A$.
44. Solids having highest energy level partially filled with electrons are (a) Semi conductor (b) Conductor (c) Insulator (d) None of these. **Ans** Conductor
45. A positive charge is moving towards observer. The direction of magnetic induction is (a) clockwise (b) anticlockwise (c) right (d) left. **Ans.** Anticlockwise
46. If Young's modulus is Y and Stress is F then energy stored per unit volume will be (a) $\frac{F^2}{2Y}$ (b) $\frac{F^2}{Y}$ (c) $\frac{2F^2}{Y}$ (d) $\frac{F}{2Y}$. **Ans.** $\frac{F^2}{2Y}$
47. A man standing between two parallel hills and claps his hand and hear successive echo at regular interval of 1 sec. If velocity of sound is 340 m/s, then distance between the hill is (a) 510m (b) 170m (c) 340m (d) 100m **Ans.** 510m.
48. A train is moving on a parallel rail in a vertical magnetic field of 2×10^{-3} Tesla. If speed of the train is 60 km/hr then induced emf between is axle when distance between the rail track is 1.5 m is (a) 5×10^{-4} V (b) zero (c) 5V (d) 10V **Ans.** 5×10^{-4} V
49. A man drag a block through 10m on rough surface $\mu = 0.5$. A force of $\sqrt{3}$ KN acting at 30° to the horizontal. The work done by applied force is (a) 15 KJ (b) 10 KJ (c) 5 KJ (d) zero. **Ans.** 15 KJ
50. Two masses of 0.25 kg each moves towards each other with speed 3 m/s and 1 m/s collides and stick together. Find the final velocity (a) 1 m/s (b) 2 m/s (c) 0.5 m/s (d) 0.25 m/s. **Ans.** (a) 1 m/s.
51. The displacement of a body along X-axis depends on time as $\sqrt{x} = t + 1$. Then the velocity of body (a) Increased with time (b) Decreases with time (c) Independent of time (d) None of these. **Ans.** Increased with time.
52. A galvanometer of resistance 'G' can measure 1 amp current. If a shunt S is used to convert it into ammeter to measure 10 amp current. The ratio of G/S is (a) 1/9 (b) 9/1 (c) 10 (d) 1/10. **Ans.** 9/1. **Reason:** $S = \frac{G}{n-1} = \frac{G}{10-1} = \frac{G}{9}$.



53. Which of the graph is correct at constant pressure (a)



54. A block of mass 5 kg is resting on a smooth surface. At what angle a force of 20N be act ed on the body so that it will acquired a KE of 40J after moving 4m. (a) 60° (b) 30° (c) 45° (d) 120° . **Ans.** 60° . **Reason:** $20 \times 4 \times \cos \theta = 40$.

$$\cos \theta = \frac{1}{2} \Rightarrow \theta = 60^\circ.$$

55. In the Nuclear reaction ${}_{92}^{235}\text{U}$ decay to ${}_{91}^{231}\text{X}$, what are the particle emitted ? (a) One α -particle and one electron (b) One α -particle and one proton (c) One deuteron and one positron (d) One electron and one proton. **Ans** One α -particle and one electron.
56. 5 cells, each of emf 0.2 V and internal resistance 1Ω are connected to an external circuit of resistance of 10Ω . Find the current through external circuit. (a) $\frac{1}{15}$ A (b) $\frac{1}{10}$ A (c) $\frac{1}{2.5}$ A (d) $\frac{1}{2}$ A. **Ans.** $\frac{1}{15}$ A
57. A bulb rated 36 W and 12 V is connected across 20 V cell. What resistance is required to glow it with full intensity (a) 2.7 ohm (b) 5.8 ohm (c) 1.2 ohm (d) 7 ohm. **Ans.** 2.7 ohm **Reason.** $I = \frac{P}{V} = \frac{36}{12} = 3$ amp, $3(R) = 20 - 12 = 8$, $R = \frac{8}{3} = 2.7$ ohm.

58. Two charges of magnitude 10 units and 20 units are separated by certain distance. Now both the charges are brought to contact and again separated to initial position. What will be the ratio of initial and final force. (a) 8/9 (b) 4/3 (c) 3/2 (d) 9/8.

Ans 8/9. **Reason** $\frac{F}{F'} = \frac{K(10)(20)/r^2}{K(15)(15)/r^2} = \frac{8}{9}$.

59. A bulb of resistance 280Ω is supply with a 200V supply. What is peak current? (a) Nearly 1A (b) Nearly 2A (c) Nearly 1.4A (d) Nearly 2.8A. **Ans** Nearly 1A
60. A semiconductor doped with a donor impurity is (a) n-p-n-type (b) p-n-p-type (c) n-type (d) p-type. **Ans.** n-type
-