**AIEEE Previous Years Papers Solutions**

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| [AIEEE Paper](http://www.askiitians.com/aieee/AIEEE-Past-Papers) > 2007-Physics Solutions  **AIEEE 2007 Physics Answers and Solutions**  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   |  | | --- | | | [**1**](http://www.askiitians.com/aieee-papers/AIEEE-2007-physics-solutions.aspx) | | [**2**](http://www.askiitians.com/aieee-papers/AIEEE-2007-physics-solutions-page2.aspx) | | [**3**](http://www.askiitians.com/aieee-papers/AIEEE-2007-physics-solutions-page3.aspx) | | [**4**](http://www.askiitians.com/aieee-papers/AIEEE-2007-physics-solutions-page4.aspx) | | [**5**](http://www.askiitians.com/aieee-papers/AIEEE-2007-physics-solutions-page5.aspx) | |   **ANSWERS**   |  |  |  |  | | --- | --- | --- | --- | | 1) 1 | 2) 2 | 3) 2 | 4) 4 | | 5) 4 | 6) 3 | 7) 3 | 8) 2 | | 9) 2 | 10) 4 | 11) 4 | 12) 2 | | 13) 3 | 14) 4 | 15) 4 | 16) 2 | | 17) 2 | 18) 4 | 19) 1 | 20) 4 | | 21) 3 | 22) 3 | 23) 3 | 24) 3 | | 25) 4 | 26) 4 | 27) 1 | 28) 2 | | 29) 3 | 30) 4 | 31) 1 | 32) 1 | | 33) 1 | 34) 3 | 35) 1 | 36) 4 | | 37) 4 | 38) 4 | 39) 1 | 40) 1 |     **Some Important Hints and Solutions:**  **1**x = 2 X 10-2 cos πt      Differentiating both side      => dx/dt = -0.02πsinπt      => v = -0.02π sinπt      => v is maximum when, πt = π/2      => t = 1/2 = 0.5 sec    **2** In AC circuit average power is :      Pavg = VrmsIrms cosφ      In AC circuit voltage and current is represented as:      V = V0sin(ωt+φ)      I = I0sin(ωt)       So, φ = -π/2 = -90°      So, Pavg = VrmsIrms cos(-90°)      So, Pavg = 0    **3** Distance between point A and origin(0,0) = 2     Distance between point B and origin(0,0) = 2     As the distance from the electric charge of A and B are same     so both A and B will have same potential.     So potential difference between point A an B will be = 0    **4** Q = charge on the capacitor = CV     Work done by battery = Q.V = CV2     Energy stored in capacitor = (1/2)CV2     So, (Energy stored in capacitor)/(Work done by battery) = 1/2    **5**I=I0[1-e-Rt/L]     I0 = 5/5 = 1     So, I=1-e-5t/10     => I=1-e-t/2     As t=2, so     I=1-e-1  **6. Magnetic Field around a wire (B1) when r is greater than the radius of the wire.**  B1 = μ0I/2 π r  where  I = current  r = distance from wire  and r ≥ Radius of the wire  **Magnetic Field around a wire (B2) when r is less than the radius of the wire.**  B2 = μ0Ir/2 π R2  where  I = current  R = radius of wire  r = distance from wire  and r ≤ Radius of the wire (R)  B2 = μ0Ia/4 π a2  B1 = μ0I/4 π a  So, B2/B1 = 1    **7.** If electric current flowing through a hollow pipe, it will induce a magnetic field outside the pipe.The magnetic field inside the pipe will be zero because a closed loop just inside the pipe will not have any current flowing through it.This situation is similar to a Faraday cage where the electric field inside a hollow conducting shell is zero.    **8.**Nuclear binding energy = [mass of nucleus - mass of nucleons].C   Nuclear binding energy = (M0 - 8 MP - 9 MN) C2    **9.** Gamma ray is aform electromagnetic radiation. It is produced by sub-atomic particle interactions, such as electron-positron annihilation or radioactive decay. It does does not involve any change in proton number or neutron number    **10.**In the first half cycle, the diode is in forward biased.  In the next half-cycle, the diode is in reverse biased  Diode is forward biased in first half-cycle.  Voltage applied: 10 V (it difference the peak ie. +5V and -5V)  So the amplitude of signal: 5V.    **11.  Relation between energy and frequency**  E = hν   where   E = Energy   h = Planck's constant   ν = frequency **As per de Broglie equation**   λ = h/mv   where   p = momentum  λ   = wavelength   h = Planck's constant   v = velocity   By solving above two equation   p = hν/c    **12.**  **integration-1**    **13.** Using perpendicular Axis Theorem:   IAC = IEF  **14.**   x = x0 cos (ω t - π/4)  dx/dt = v = -x0ωsin(ωt-π/4)  dv/dt = a = -x0ω2cos(ωt-π/4)  a = x0ω2cos(ωt+3π/4)  By comparing it with , a = A cos (ω t + δ )  A = x0ω2  δ = 3π/4    **15.**Electric field (E) is vector quantity.  Electric Potential (V) is scalar quantity.  By changing the charge Electric Potential (V) do not change, but the direction of Electric field (E) changes.    **16.  Half life of radioactive element**  t1/2 = ln(2)/λ  **Average life of radioactive element**  τ = 1/λ  So, x = 1/λy  ln(2)/λ  So, 1.4λx = λy  λx < λy  So element Y will decay faster than element X    **17**.  **Efficiency of Carnot cycle**  η =  1 - Tc/Th  W = η.Q where Q=total energy put into system  => 10=(1/10)Q  => Q = 100  => So energy absorbed by the system = (total energy put into system)-(Work done)  => energy absorbed by the system = 100-10 = 90    **19 .** Magnetic force acting on charge = **Fm** = q **v** x **B**  Electric force acting on charge = **Fe** = q **E**  So, q **v** x **B** = q **E**  => q **v** x **B** = q **E**  => **v** =(**E** x **B**)/B2  **20.** V(x) = 20/x2-4  E = -dV/dx = 20/(x2-4)2  (2x-0) = 160/144 = 10/9  (+ve)    **21.   Emitting Photons(Rydberg Formula)**  Ephoton = E0(1/n12 -1/n22)  where n1 < n2  E0 = 13.6 eV  By using above formula E is maximum when n=2 to n=1  As, E=hν  So ν is maximum if E is maximum.    **22.** Assuming acceleration of both blocks are: a  a = F/M+m  So force acting on m = Fm = Fm/M+m  **23.** P = P1+P2 = -15+5=-10  The focal length of the combination = 1/P = -1/10 m = -10cm    **24.**Assume that the temperature at the interface = T  (T1-T)k1/l1 = (T-T2)k2 /l2  By solving above equation, T = T1k1l2+T2k2l1 / k1l2+k2l1    **25.** Sound intensity is sound power Pac per unit area A  Sound intensity I = 10log10(I/I0)  B1 = 10log10(I1/I0)  B2 = 10log10(I2/I0)  B1-B1=20  20 = 10log10(I1/I2)  => 2 = log10(I1/I2)  => I1/I2 = 100  => I1 = 100I2    **26.** cp - cv = R [for one mole of gas]  => cp - cv = R [for one 28 gm of nitrogen gas]  => cp - cv = R/28 [for one 1 gm of nitrogen gas]    **27.** Force acting on the particle = **F** = q **v** x **B**  The force acts perpendicular to the velocity so there is no work done on particle. So kinetic energy will not change.  As force acts on the particle so there is change in its momentum    **28.**  action-of-force  Force acting at a distance d from O, due to wire AOB = F1 = μ0I1/2 π d  Force acting at a distance d from O, due to wire COD = F2 = μ0I2/2 π d  F1 and F2 are perpendicular to each other, So net force will be  μ0/2 π d ( I12 + I22 )½    **29.**5=R0(1+50α) ..................... (i)  6=R0(1+100α) ..................... (ii)  By solving (i) and (ii)  α = 1/200  R0 = 4Ω    **30.**Net work done by the system is zero because there is no change in energy of the system.    **31.**Net work done by the system is zero because there is no change in energy of the system.    **32.** Let mass of the circular disc = M  So mass of the removed disc = M/4  So mass of the remaining desc = 3M/4  Assume that centre of mass of remaining disc is at a distance x from centre  So, (3M/4).x = (M/4).R  => x = R/3 = αR  => α = 1/3  **33.**  angular-acceleration  Assume that acceleration = a  So angular acceleration = a/R  mgsinθ - f = ma .............. (i)  fR = I(a/R) ....................... (ii)  By solving (i) and (ii)  g sin θ/1 + (I/(MR2))    **34.** The direction of the force that acts on the rotating particle passes thru the center. So there is no torque acting on the particle. As **no torque** acts on the particle so angular momentum is constant.    **35.** Assume that spring is compressed by distance=x  Kinetic energy of the block = (1/2)×2×42 = 16  While compressing the spring, energy loss due to friction = 10x  Energy transferred to spring due to block = (1/2)×10000×x2  (1/2)×10000×x2 + 10x = 16 ...................(i)  By solving equation (i), x = 5.5 (approx.)    **36.** Kinetic energy of the particle at the beginning : K = (1/2)mv2  Horizontal velocity of the particle = vcos60° Kinetic energy of the particle at the beginning : K = (1/2)mv2  Kinetic energy of the particle at the hightest point = (1/2)m(vcos60°)2  Kinetic energy of the particle at the hightest point = (1/2)mv2cos260° = K/4  **37.** Now, I/I0 = cos2φ/2 = cos2(2π/λ)(λ/12) = cos230°  I/I0 = 3/4    **38.**  **calculating-values**    **39.** As per the first law of thermodynamics :  ΔQ = ΔU + ΔW  For the route iaf, 50 = 20 + ΔU  ΔU = 30  For the route ibf, 36 = ΔW + 30  ΔW = 6  **40.** Kinetic Energy = (1/2)mω2a2sin2ωt  and ω = 2πν  kinetic-energy  Kinetic Energy = π2ma2ν2 |