

## Physics – 2004 - AIEEE

1. Which one of the following represents the correct dimensions of the coefficient of viscosity?  
(A)  $ML^{-1}T^{-2}$  (B)  $MLT^{-1}$   
(C)  $ML^{-1}T^{-1}$  (D)  $ML^{-2}T^{-2}$
1. **C.**
2. A particle moves in a straight line with retardation proportional to its displacement. Its loss of kinetic energy for any displacement  $x$  is proportional to  
(A)  $x^2$  (B)  $e^x$   
(C)  $x$  (D)  $\log_e x$
2. **A.**
3. A ball is released from the top of a tower of height  $h$  metres. It takes  $T$  seconds to reach the ground. What is the position of the ball in  $T/3$  seconds?  
(A)  $h/9$  metres from the ground (B)  $7h/9$  metres from the ground  
(C)  $8h/9$  metres from the ground (D)  $17h/18$  metres from the ground.
3. **C.**
4. If  $\vec{A} \times \vec{B} = \vec{B} \times \vec{A}$ , then the angle between  $A$  and  $B$  is  
(A)  $\pi$  (B)  $\pi/3$   
(C)  $\pi/2$  (D)  $\pi/4$
4. **A.**
5. A projectile can have the same range  $R$  for two angles of projection. If  $T_1$  and  $T_2$  be the time of flights in the two cases, then the product of the two time of flights is directly proportional to  
(A)  $1/R^2$  (B)  $1/R$   
(C)  $R$  (D)  $R^2$
5. **C.**
6. Which of the following statements is false for a particle moving in a circle with a constant angular speed?  
(A) The velocity vector is tangent to the circle.  
(B) The acceleration vector is tangent to the circle.  
(C) The acceleration vector points to the centre of the circle.  
(D) The velocity and acceleration vectors are perpendicular to each other.
6. **B.**
7. An automobile travelling with speed of 60 km/h, can brake to stop within a distance of 20 cm. If the car is going twice as fast, i.e 120 km/h, the stopping distance will be  
(A) 20 m (B) 40 m  
(C) 60 m (D) 80 m
7. **D.**
8. A machine gun fires a bullet of mass 40 g with a velocity  $1200 \text{ ms}^{-1}$ . The man holding it can exert a maximum force of 144 N on the gun. How many bullets can he fire per second at the most?  
(A) one (B) four

(C) two

(D) three

8. D.

9. Two masses  $m_1 = 5 \text{ kg}$  and  $m_2 = 4.8 \text{ kg}$  tied to a string are hanging over a light frictionless pulley. What is the acceleration of the masses when left free to move?

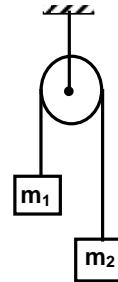
( $g = 9.8 \text{ m/s}^2$ )

(A)  $0.2 \text{ m/s}^2$

(B)  $9.8 \text{ m/s}^2$

(C)  $5 \text{ m/s}^2$

(D)  $4.8 \text{ m/s}^2$



9. A.

10. A uniform chain of length 2 m is kept on a table such that a length of 60 cm hangs freely from the edge of the table. The total mass of the chain is 4 kg. What is the work done in pulling the entire chain on the table?

(A) 7.2 J

(B) 3.6 J

(C) 120 J

(D) 1200 J

10. B.

11. A block rests on a rough inclined plane making an angle of  $30^\circ$  with the horizontal. The coefficient of static friction between the block and the plane is 0.8. If the frictional force on the block is 10 N, the mass of the block (in kg) is (take  $g = 10 \text{ m/s}^2$ )

(A) 2.0

(B) 4.0

(C) 1.6

(D) 2.5

11. A.

12. A force  $\vec{F} = (5\hat{i} + 3\hat{j} + 2\hat{k})\text{N}$  is applied over a particle which displaces it from its origin to the point  $\vec{r} = (2\hat{i} - \hat{j})\text{m}$ . The work done on the particle in joules is

(A) -7

(B) +7

(C) +10

(D) +13

12. B.

13. A body of mass  $m$ , accelerates uniformly from rest to  $v_1$  in time  $t_1$ . The instantaneous power delivered to the body as a function of time  $t$  is

(A)  $\frac{mv_1 t}{t_1}$

(B)  $\frac{mv_1^2 t}{t_1^2}$

(C)  $\frac{mv_1 t^2}{t_1}$

(D)  $\frac{mv_1^2 t}{t_1}$

13. B.

14. A particle is acted upon by a force of constant magnitude which is always perpendicular to the velocity of the particle, the motion of the particle takes place in a plane. It follows that

(A) its velocity is constant

(B) its acceleration is constant

(C) its kinetic energy is constant

(D) it moves in a straight line.

14. C.

15. A solid sphere is rotating in free space. If the radius of the sphere is increased keeping mass same which one of the following will not be affected?  
 (A) moment of inertia (B) angular momentum  
 (C) angular velocity (D) rotational kinetic energy.
15. **B.**
16. A ball is thrown from a point with a speed  $v_0$  at an angle of projection  $\theta$ . From the same point and at the same instant person starts running with a constant speed  $v_0/2$  to catch the ball. Will the person be able to catch the ball? If yes, what should be the angle of projection?  
 (A) yes,  $60^\circ$  (B) yes,  $30^\circ$   
 (C) no (D) yes,  $45^\circ$
16. **A.**
17. One solid sphere A and another hollow sphere B are of same mass and same outer radii. Their moment of inertia about their diameters are respectively  $I_A$  and  $I_B$  such that  
 (A)  $I_A = I_B$  (B)  $I_A > I_B$   
 (C)  $I_A < I_B$  (D)  $I_A/I_B = d_A/d_B$   
 Where  $d_A$  and  $d_B$  are their densities.
17. **C.**
18. A satellite of mass  $m$  revolves around the earth of radius  $R$  at a height  $x$  from its surface. If  $g$  is the acceleration due to gravity on the surface of the earth, the orbital speed of the satellite is  
 (A)  $gx$  (B)  $\frac{gR}{R-x}$   
 (C)  $\frac{gR^2}{R+x}$  (D)  $\left(\frac{gR^2}{R+x}\right)^{1/2}$
18. **D.**
19. The time period of an earth satellite in circular orbit is independent of  
 (A) the mass of the satellite  
 (B) radius of its orbit  
 (C) both the mass and radius of the orbit  
 (D) neither the mass of the satellite nor the radius of its orbit.
19. **A.**
20. If  $g$  is the acceleration due to gravity on the earth's surface, the gain in the potential energy of object of mass  $m$  raised from the surface of the earth to a height equal to the radius  $R$  of the earth is  
 (A)  $2 mgR$  (B)  $\frac{1}{2}mgR$   
 (C)  $\frac{1}{4}mgR$  (D)  $mgR$
20. **B.**

21. Suppose the gravitational force varies inversely as the  $n$ th power of distance. Then the time period planet in circular orbit of radius  $R$  around the sun will be proportional to

- (A)  $R^{\left(\frac{n+1}{2}\right)}$  (B)  $R^{\left(\frac{n-1}{2}\right)}$   
(C)  $R^n$  (D)  $R^{\left(\frac{n-2}{2}\right)}$

21. A.

22. A wire fixed at the upper end stretches by length  $\ell$  by applying a force  $F$ . The work done in stretching is

- (A)  $F/2\ell$  (B)  $F\ell$   
(C)  $2F\ell$  (D)  $F\ell/2$

22. D.

23. Spherical balls of radius  $R$  are falling in a viscous fluid of viscosity  $\eta$  with a velocity  $v$ . The retarding viscous force acting on the spherical ball is

- (A) directly proportional to  $R$  but inversely proportional to  $v$ .  
(B) directly proportional to both radius  $R$  and velocity  $v$ .  
(C) inversely proportional to both radius  $R$  and velocity  $v$ .  
(D) inversely proportional to  $R$  but directly proportional to velocity  $v$ .

23. B.

24. If two soap bubbles of different radii are connected by a tube,

- (A) air flows from the bigger bubble to the smaller bubble till the sizes are interchanged.  
(B) air flows from bigger bubble to the smaller bubble till the sizes are interchanged  
(C) air flows from the smaller bubble to the bigger.  
(D) there is no flow of air.

24. C.

25. The bob of a simple pendulum executes simple harmonic motion in water with a period  $t$ , while the period of oscillation of the bob is  $t_0$  in air. Neglecting frictional force of water and

given that the density of the bob is  $\left(\frac{4}{3}\right) \times 1000 \text{ kg/m}^3$ . What relationship between  $t$  and  $t_0$  is true?

- (A)  $t = t_0$  (B)  $t = t_0/2$   
(C)  $t = 2t_0$  (D)  $t = 4t_0$

25. C.

26. A particle at the end of a spring executes simple harmonic motion with a period  $t_1$ , while the corresponding period for another spring is  $t_2$ . If the period of oscillation with the two springs in series is  $T$ , then

- (A)  $T = t_1 + t_2$  (B)  $T^2 = t_1^2 + t_2^2$   
(C)  $T^{-1} = t_1^{-1} + t_2^{-1}$  (D)  $T^{-2} = t_1^{-2} + t_2^{-2}$

26. B.

27. The total energy of particle, executing simple harmonic motion is

- (A)  $\propto x$  (B)  $\propto x^2$   
(C) independent of  $x$  (D)  $\propto x^{1/2}$

27. C.

28. The displacement  $y$  of a particle in a medium can be expressed as  $y = 10^{-6} \sin(110t + 20x + \pi/4)$  m, where  $t$  is in seconds and  $x$  in meter. The speed of the wave is

- (A) 2000 m/s (B) 5 m/s  
(C) 20 m/s (D)  $5\pi$  m/s.

28. B.

29. A particle of mass  $m$  is attached to a spring (of spring constant  $k$ ) and has a natural angular frequency  $\omega_0$ . An external force  $F(t)$  proportional to  $\cos \omega t$  ( $\omega \neq \omega_0$ ) is applied to the oscillator. The time displacement of the oscillator will be proportional to

- (A)  $\frac{m}{\omega_0^2 - \omega^2}$  (B)  $\frac{1}{m(\omega_0^2 - \omega^2)}$   
(C)  $\frac{1}{m(\omega_0^2 + \omega^2)}$  (D)  $\frac{m}{\omega_0^2 + \omega^2}$

29. B.

30. In forced oscillation of a particle the amplitude is maximum for a frequency  $\omega_1$  of the force, while the energy is maximum for a frequency  $\omega_2$  of the force, then

- (A)  $\omega_1 = \omega_2$   
(B)  $\omega_1 > \omega_2$   
(C)  $\omega_1 < \omega_2$  when damping is small and  $\omega_1 > \omega_2$  when damping is large  
(D)  $\omega_1 < \omega_2$

30. A.

31. One mole of ideal monoatomic gas ( $\gamma = 5/3$ ) is mixed with one mole of diatomic gas ( $\gamma = 7/5$ ). What is  $\gamma$  for the mixture?  $\gamma$  denotes the ratio of specific heat at constant pressure, to that at constant volume.

- (A)  $3/2$  (B)  $23/15$   
(C)  $35/23$  (D)  $4/3$

31. A.

32. If the temperature of the sun were to increase from  $T$  to  $2T$  and its radius from  $R$  to  $2R$ , then the ratio of the radiant energy received on earth to what it was previously will be

- (A) 4 (B) 16  
(C) 32 (D) 64.

32. D.

33. Which of the following statements is correct for any thermodynamic system?  
 (A) The internal energy changes in all processes.  
 (B) Internal energy and entropy are state functions.  
 (C) The change in entropy can never be zero.  
 (D) The work done in an adiabatic process is always zero.

33. B.

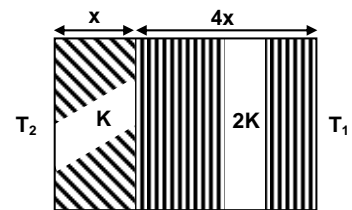
34. Two thermally insulated vessels 1 and 2 are filled with air at temperatures ( $T_1, T_2$ ), volume ( $V_1, V_2$ ) and pressure ( $P_1, P_2$ ) respectively. If the valve joining two vessels is opened, the temperature inside the vessel at equilibrium will be  
 (A)  $T_1 + T_2$  (B)  $(T_1 + T_2)/2$   
 (C)  $\frac{T_1 T_2 (P_1 V_1 + P_2 V_2)}{P_1 V_1 T_2 + P_2 V_2 T_1}$  (D)  $\frac{T_1 T_2 (P_1 V_1 + P_2 V_2)}{P_1 V_1 T_1 + P_2 V_2 T_2}$

34. C.

35. A radiation of energy  $E$  falls normally on a perfectly reflecting surface. The momentum transferred to the surface is  
 (A)  $E/c$  (B)  $2E/c$   
 (C)  $Ec$  (D)  $E/c^2$

35. B.

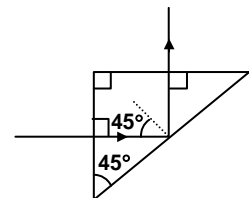
36. The temperature of two outer surfaces of a composite slab, consisting of two materials having coefficients of thermal conductivity  $K$  and  $2K$  and thickness  $x$  and  $4x$ , respectively are  $T_2$  and  $T_1$  ( $T_2 > T_1$ ). The rate of heat transfer through the slab, in a steady state is  $\left(\frac{A(T_2 - T_1)K}{x}\right) f$ , with  $f$  equal to



- (A) 1 (B)  $\frac{1}{2}$   
 (C)  $\frac{2}{3}$  (D)  $\frac{1}{3}$

36. D.

37. A light ray is incident perpendicular to one face of a  $90^\circ$  prism and is totally internally reflected at the glass-air interface. If the angle of reflection is  $45^\circ$ , we conclude that the refractive index  $n$



- (A)  $n < \frac{1}{2}$  (B)  $n > \sqrt{2}$   
 (C)  $n > \frac{1}{\sqrt{2}}$  (D)  $n < \sqrt{2}$

37. B.

38. A plane convex lens of refractive index 1.5 and radius of curvature 30 cm is silvered at the curved surface. Now this lens has been used to form the image of an object. At what distance from this lens an object be placed in order to have a real image of the size of the object?

- (A) 20 cm  
(C) 60 cm
- (B) 30 cm  
(D) 80 cm

38. A.

39. The angle of incidence at which reflected light totally polarized for reflection from air to glass (refractive index  $n$ ), is
- (A)  $\sin^{-1}(n)$   
(C)  $\tan^{-1}(1/n)$
- (B)  $\sin^{-1}(1/n)$   
(D)  $\tan^{-1}(n)$

39. D.

40. The maximum number of possible interference maxima for slit-separation equal to twice the wavelength in Young's double-slit experiment is
- (A) infinite  
(C) three
- (B) five  
(D) zero

40. B.

41. An electromagnetic wave of frequency  $\nu = 3.0$  MHz passes from vacuum into a dielectric medium with permittivity  $\epsilon = 4.0$ . Then
- (A) wavelength is doubled and the frequency remains unchanged  
(B) wavelength is doubled and frequency becomes half  
(C) wavelength is halved and frequency remains unchanged  
(D) wavelength and frequency both remain unchanged.

41. C.

42. Two spherical conductor B and C having equal radii and carrying equal charges in them repel each other with a force  $F$  when kept apart at some distance. A third spherical conductor having same radius as that of B but uncharged brought in contact with B, then brought in contact with C and finally removed away from both. The new force of repulsion, between B and C is
- (A)  $F/4$   
(C)  $F/8$
- (B)  $3F/4$   
(D)  $3F/8$ .

42. D.

43. A charged particle  $q$  is shot towards another charged particle  $Q$  which is fixed, with a speed  $v$  it approaches  $Q$  upto a closest distance  $r$  and then returns. If  $q$  were given a speed  $2v$ , the closest distances of approach would be
- (A)  $r$   
(C)  $r/2$
- (B)  $2r$   
(D)  $r/4$

43. D.

44. Four charges equal to  $-Q$  are placed at the four corners of a square and a charge  $q$  is at its centre. If the system is in equilibrium the value of  $q$  is
- (A)  $-\frac{Q}{4}(1+2\sqrt{2})$   
(B)  $\frac{Q}{4}(1+2\sqrt{2})$

(C)  $-\frac{Q}{2}(1+2\sqrt{2})$

(D)  $\frac{Q}{2}(1+2\sqrt{2})$

44. B.

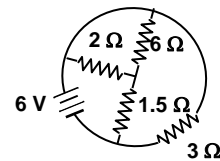
45. Alternating current can not be measured by D.C. ammeter because

- (A) A.C. cannot pass through D.C.
- (B) A.C. changes direction
- (C) average value of current for complete cycle is zero
- (D) D.C. ammeter will get damaged.

45. C.

46. The total current supplied to the circuit by the battery is

- (A) 1 A
- (B) 2 A
- (C) 4 A
- (D) 6 A



46. C.

47. The resistance of the series combination of two resistances is S. When they are joined in parallel through total resistance is P. If  $S = nP$ , then the minimum possible value of n is

- (A) 4
- (B) 3
- (C) 2
- (D) 1

47. A.

48. An electric current is passed through a circuit containing two wires of the same material, connected in parallel. If the length and radii of the wires are in the ratio of 4/3 and 2/3, then the ratio of the currents passing through the wire will be

- (A) 3
- (B) 1/3
- (C) 8/9
- (D) 2.

48. B.

49. In a metre bridge experiment null point is obtained at 20 cm from one end of the wire when resistance X is balanced against another resistance Y. If  $X < Y$ , then where will be the new position of the null point from the same end, if one decides to balance a resistance of 4X against Y?

- (A) 50 cm
- (B) 80 cm
- (C) 40 cm
- (D) 70 cm

49. A.

50. The thermistors are usually made of

- (A) metals with low temperature coefficient of resistivity
- (B) metals with high temperature coefficient of resistivity
- (C) metal oxides with high temperature coefficient of resistivity
- (D) semiconducting materials having low temperature coefficient of resistivity.

50. C.



51. Time taken by a 836 W heater to heat one litre of water from 10°C to 40°C is  
 (A) 50 s (B) 100 s  
 (C) 150 s (D) 200 s
51. **C.**
52. The thermo emf of a thermocouple varies with the temperature  $\theta$  of the hot junction as  $E = a\theta + b\theta^2$  in volts where the ratio  $a/b$  is 700°C. If the cold junction is kept at 0°C, then the neutral temperature is  
 (A) 700°C  
 (B) 350°C  
 (C) 1400°C  
 (D) no neutral temperature is possible for this thermocouple.
52. **D.**
53. The electrochemical equivalent of a metal is  $3.3 \times 10^{-7}$  kg per coulomb. The mass of the metal liberated at the cathode when a 3 A current is passed for 2 seconds will be  
 (A)  $19.8 \times 10^{-7}$  kg (B)  $9.9 \times 10^{-7}$  kg  
 (C)  $6.6 \times 10^{-7}$  kg (D)  $1.1 \times 10^{-7}$  kg
53. **A.**
54. A current  $I$  ampere flows along an infinitely long straight thin walled tube, then the magnetic induction at any point inside the tube is  
 (A) infinite (B) zero  
 (C)  $\frac{\mu_0 2i}{4\pi r}$  tesla (D)  $\frac{2i}{r}$  tesla
54. **B.**
55. A long wire carries a steady current. It is bent into a circle of one turn and the magnetic field at the centre of the coil is  $B$ . It is then bent into a circular loop of  $n$  turns. The magnetic field at the centre of the coil will be  
 (A)  $nB$  (B)  $n^2 B$   
 (C)  $2nB$  (D)  $2n^2 B$
55. **B.**
56. The magnetic field due to a current carrying circular loop of radius 3 cm at a point on the axis at a distance of 4 cm from the centre is  $54 \mu\text{T}$ . What will be its value at the centre of the loop?  
 (A)  $250 \mu\text{T}$  (B)  $150 \mu\text{T}$   
 (C)  $125 \mu\text{T}$  (D)  $75 \mu\text{T}$
56. **A.**
57. Two long conductors, separated by a distance  $d$  carry current  $I_1$  and  $I_2$  in the same direction. They exert a force  $F$  on each other. Now the current in one of them increased to two times and its direction reversed. The distance is also increased to  $3d$ . The new value of the force between them is

- (A)  $-2F$  (B)  $F/3$   
 (C)  $-2F/3$  (D)  $-F/3$

57. C.

58. The length of a magnet is large compared to its width and breadth. The time period of its width and breadth. The time period of its oscillation in a vibration magnetometer is 2 s. The magnet is cut along its length into three equal parts and three parts are then placed on each other with their like poles together. The time period of this combination will be  
 (A) 2 s (B)  $2/3$  s  
 (C)  $2\sqrt{3}$  s (D)  $2/\sqrt{3}$  s .

58. B.

59. The materials suitable for making electromagnets should have  
 (A) high retentivity and high coercivity (B) low retentivity and low coercivity  
 (C) high retentivity and low coercivity (D) low retentivity and high coercivity

59. B.

60. In an LCR series a.c. circuit, the voltage across each of the components, L, C and R is 50 V. The voltage across the LC combination will be  
 (A) 50 V (B)  $50\sqrt{2}$  V  
 (C) 100 V (D) 0 V(zero)

60. D.

61. A coil having  $n$  turns and resistance  $4R \Omega$ . This combination is moved in time  $t$  seconds from a magnetic field  $W_1$  weber to  $W_2$  weber. The induced current in the circuit is  
 (A)  $-\frac{W_2 - W_1}{5Rnt}$  (B)  $-\frac{(W_2 - W_1)}{5Rt}$   
 (C)  $-\frac{W_2 - W_1}{Rnt}$  (D)  $-\frac{n(W_2 - W_1)}{Rt}$

61. B.

62. In a uniform magnetic field of induction  $B$  a wire in the form of semicircle of radius  $r$  rotates about the diameter of the circle with angular frequency  $\omega$ . The axis of rotation is perpendicular to the field. If the total resistance of the circuit is  $R$  the mean power generated per period of rotation is  
 (A)  $\frac{B\pi r^2 \omega}{2R}$  (B)  $\frac{(B\pi r^2 \omega)^2}{2R}$   
 (C)  $\frac{(B\pi r \omega)^2}{2R}$  (D)  $\frac{(B\pi r \omega^2)^2}{8R}$

62. B.

63. In a LCR circuit capacitance is changed from  $C$  to  $2C$ . For the resonant frequency to remain unchanged, the inductance should be changed from  $L$  to  
 (A)  $4L$  (B)  $2L$   
 (C)  $L/2$  (D)  $L/4$

63. C.

64. A metal conductor of length 1 m rotates vertically about one of its ends at angular velocity 5 radians per second. If the horizontal component of earth's magnetic field is  $0.3 \times 10^{-4}$  T, then the e.m.f. developed between the two ends of the conductor is  
 (A) depends on the nature of the metal used  
 (B) depends on the intensity of the radiation  
 (C) depends both on the intensity of the radiation and the metal used  
 (D) is the same for all metals and independent of the intensity of the radiation.
64. B.
65. According to Einstein's photoelectric equation, the plot of the kinetic energy of the emitted photo electrons from a metal  $V_s$  the frequency, of the incident radiation gives straight line whose slope  
 (A) depends on the nature of the metal used  
 (B) depends on the intensity of the radiation  
 (C) depends both on the intensity of the radiation and the metal used  
 (D) is the same for all metals and independent of the intensity of the radiation.
65. D.
66. The work function of a substance is 4.0 eV. Then longest wavelength of light that can cause photoelectron emission from this substance approximately  
 (A) 540 nm (B) 400 nm  
 (C) 310 nm (D) 220 nm
66. C.
67. A charged oil drop is suspended in a uniform field of  $3 \times 10^4$  V/m so that it neither falls nor rises. The charge on the drop will be (take the mass of the charge =  $9.9 \times 10^{-15}$  kg and  $g = 10 \text{ m/s}^2$ )  
 (A)  $3.3 \times 10^{-18}$  C (B)  $3.2 \times 10^{-18}$  C  
 (C)  $1.6 \times 10^{-18}$  C (D)  $4.8 \times 10^{-18}$  C.
67. A.
68. A nucleus disintegrates into two nuclear parts which have their velocities in the ratio 2 : 1. The ratio of their nuclear sizes will be  
 (A)  $2^{1/3} : 1$  (B)  $1 : 3^{1/2}$   
 (C)  $3^{1/2} : 1$  (D)  $1 : 2^{1/3}$
68. B.
69. The binding energy per nucleon of deuteron ( ${}^2_1\text{H}$ ) and helium nucleus ( ${}^4_2\text{He}$ ) is 1.1 MeV and 7 MeV respectively. If two deuteron nuclei react to form a single helium nucleus, then the energy released is  
 (A) 13.9 MeV (B) 26.9 MeV  
 (C) 23.6 MeV (D) 19.2 MeV

69. C.

70. An  $\alpha$ -particle of energy 5 MeV is scattered through  $180^\circ$  by a fixed uranium nucleus. The distance of the closest approach is of the order of

- (A)  $1 \text{ \AA}$  (B)  $10^{-10} \text{ cm}$   
(C)  $10^{-12} \text{ cm}$  (D)  $10^{-15} \text{ cm}$

70. C.

71. When npn transistor is used as amplifier

- (A) electrons move from base to collector (B) holes move from emitter to base  
(C) electrons move from collector to base (D) holes move from base to emitter.

71. A.

72. For a transistor amplifier in common emitter configuration having load impedance of  $1 \text{ k}\Omega$  ( $h_{fe} = 50$  and  $h_{oe} = 25$ ) the current gain is

- (A)  $-5.2$  (B)  $-15.7$   
(C)  $-24.8$  (D)  $-48.78$

72. D.

73. A piece of copper and another of germanium are cooled from room temperature to  $77 \text{ K}$ , the resistance of

- (A) each of them increases  
(B) each of them decreases  
(C) copper decreases and germanium increases  
(D) copper increases and germanium decreases.

73. D.

74. The manifestation of band structure in solids is due to

- (A) Heisenberg's uncertainty principle (B) Pauli's exclusion principle  
(C) Bohr's correspondence principle (D) Boltzmann's law

74. B.

75. When p-n junction diode is forward biased

- (A) the depletion region is reduced and barrier height is increased  
(B) the depletion region is widened and barrier height is reduced.  
(C) both the depletion region and barrier height reduced  
(D) both the depletion region and barrier height increased.

75. C.