NEET-2021
IMPORTANT QUESTIONS_HOTS

1. The dimension of $\frac{1}{2}\varepsilon_0 E^2$ is

   (a) $[MLT^{-1}]$ **(b)** $[ML^{-1}T^{-2}]$

   (c) $[MLT^{2}]$ (d) $[ML^{2}T^{-1}]$

2. A cube has a side of length 1.2×10^{-2}m. Calculate its volume

   (a) $1.7\times10^{-6}m^3$ (b) $1.73\times10^{-6}m^3$

   (c) $1.70\times10^{-6}m^3$ (d) $1.732\times10^{-6}m^3$

3. A vernier calipers has 1 mm marks on the main scale. It has 20 equal divisions on the vernier scale which match with 16 main scale divisions. For this vernier calipers, the least count is

   (a) 0.02 mm (b) 0.05 mm

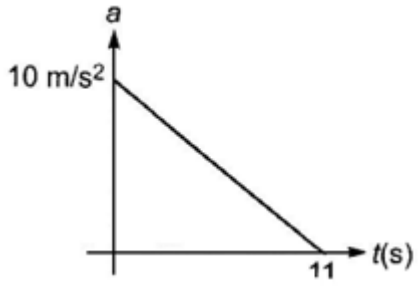
   (c) 0.1 mm **(d)** 0.2 mm

4. The dimensions of the quantities in one (or more) of the following pairs are the same, Identify the pair

   (a) torque and work (b) angular momentum and work

   (c) energy and young's modulus (d) light year and wavelength

5. **The given graph shows the variation of acceleration with time. Find final velocity if u=20m



   (a) 35 m/s (b) 55 m/s

   (c) 75 m/s (d) 66 m/s

6. *During paddling of a bicycle, the force of friction exerted by the ground on the two wheels is such that it acts

   (a) In the backward direction on the front wheel and in the forward direction on the rear wheel

   (b) In the forward direction on the front wheel and in the backward direction on the rear wheel

   (c) In the backward direction on both the front and the rear wheels

   (d) In the forward direction on both the front and thr rear wheels

7. **A car is moving in a circle of radius 10m with a constant speed of 10 m/s. A bob is suspended from the roof of the car by a light rod. The angle made by the rod with the vertical is

   (a) Zero (b) 300

(c) 450 (d) 600

8. Two masses of 1g and 4g are moving with equal kinetic energies. The ratio of the magnitudes of their momenta is

(a) 4:1 (b) 2:1

(c) 1:2 (d) 1:16

9. A body is moved along a straight line by a machine delivering constant power. The distance moved by the body in time t is proportional to

(a) $t^{1/2}$ (b) $t^{3/4}$

(c) $t^{3/2}$ (d) t^2

10. a uniform chain of length L and mass M is lying on a smooth table and one-third of its length is hanging vertically down over the edge of the table. If g is acceleration due to gravity, the work required to pull the hanging part on to the table is

(a) MgL (b) MgL/3

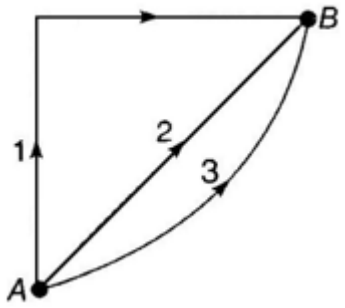
(c) MgL/9 **(d)** MgL/18

11. a spring of force constant k is cut into two pieces equal parts. Then the new force constant of each is

(a) (2/3)k **(b)** 2k

(c) 3 k (d) 6 k

12. If W_1,W_2 and W_3 represent the work done In moving a particle from A to B along three different paths 1,2 and 3 respectively in the gravitational field of a point mass m. Find the correct relation between W_1,W_2 and W_3



(a) $W_1>W_2>W_3$ **(b)** $W_1=W_2=W_3$

(c) $W_1<W_2<W_3$ (d) $W_2>W_1>W_3$.

13. When a rubber band is stretched by a distance x, it exerts a restoring force of magnitude $F = ax + bx^2$, where a and b are constants. The work done in stretching the unstreched rubber-band by L is

(a) $aL^2 + bL^3$ (b) $\frac{1}{2}(aL^2 + bL^3)$

(c) $\frac{aL^2}{2} + \frac{bL^3}{3}$ **(d)** $\frac{1}{2}\left(\frac{aL^2}{2} + \frac{bL^3}{3}\right)$

14. **Two particle A and B initially at rest, move towartds each other by mutual force of attraction. At the instant when the speed of A is v and the speed of B is 2v, the speed of the centre of mass of the system is

(a) 3 v (b) v

(c) 1.5 v **(d)** Zero

15. **A thin circular ring of mass M and radius r is rotating about its axis with a constant angular velocity ω. Two objects, each of mass m, are attached gently to the opposite ends of a diameter of the ring. The wheel now rotates with an angular velocity

(a) ω M/(M+m) (b) ω (M-2m)/(M+2m)

(c) ω M/(M+2m) (d) ω (M+2m)/M

16. A child is standing with folded hands at the centre of a platform rotating about its central axis. The kinetic energy of the system is K. the child now stretches his arms so that the moment of inertia of the system doubles. The kinetic energy of the system now is

(a) 2K **(b)** K/2

(c) K/4 (d) 4K

17. Statement I An astronaut in an orbiting space station above the earth experiences weightlessness. Statement II An object moving around the earth due to earth's gravitational force is in a state of 'free-fall'.

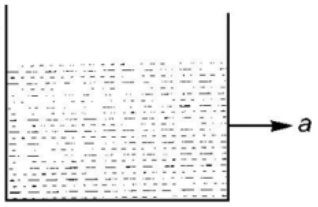
(a) If statemen I is true, statement II is true; statement II is the correct explanation for statement I

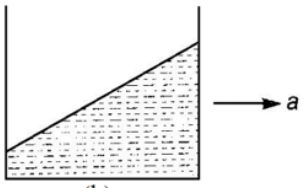
(b) If statement I is true, statement II is true; statement II is not a correct explanation for statement I

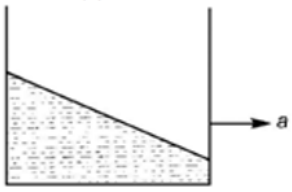
(c) If statement I is true, statement II is false

(d) If statement I is false, statement II is true

18. A vessels containing water is given a constant acceleration a towards the right along a straight horizontal path. Which of the following diagram represents the surface of the liquid?

(a) 

(b) 

(c) 

(d) None of these

19. An ideal gas is at pressure P and absolute temperature T. The isothermal bulk modulus of the gas is

(a) $\frac{2}{3}p$ **(b)** p

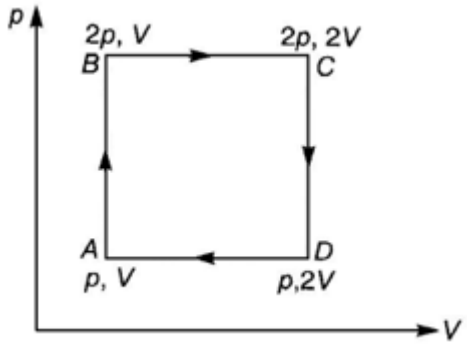
(c) $\frac{3}{2}p$ (d) $2p$

20. The pressure of a medium is changed from1.01×10^5 Pa to 1.165×10^5 Pa and change in volume is 10% keeping temperature constant. The bulk modulus is

(a) 204.8×10^5 Pa (b) 102.4×10^5 Pa

(c) 5.12×10^5 Pa **(d)** 1.55×10^5 Pa

21. An ideal monoatomic gas is taken round the cycle ABCDA as shown in the p-V diagram . The work done during the cycle is



(a) -pV (b) 2 pV

(c) + pV (d) zero

22. The temperature of ain ideal gas is increases from 120 K to 480 K. If at 120 K the root mean square velocity of the gas molecules is v. at 480 K it becomes

(a) 4 v **(b)** 2 v

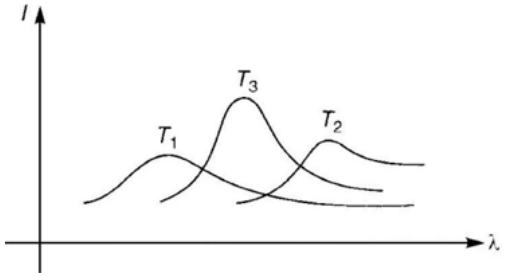
(c) v/2 (d) v/4

23. A spherical black body with a radius of 12 cm radiates 450 W power at 500 K. if the radius were halved and the temperature doubled, the power radiated in watt would be

(a) 225 (b) 450

(c) 900 **(d)** 1800

24. The plots of intensity versus wavelength for three black bodies at temperature T_1,T_2 and T_3 respectively are as shown. Their temperature are such that



(a) $T_1 > T_2 > T_3$ **(b)** $T_1 > T_3 > T_2$

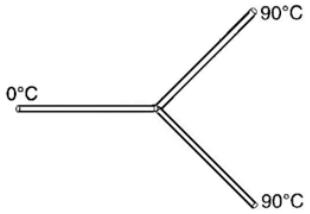
(c) $T_2 > T_3 > T_1$ (d) $T_3 > T_2 > T_1$.

25. Starting with the same initial conditions, an ideal gas expands from volume V_1 and V_2 in three different ways, the work done by the gas is W_1 if the process is purely isothermal, W_2 if purely isobaric and W_3 if purely adiabatic, then(Graph of expansion)

(a) $W_2 > W_1 > W_3$ (b) $W_2 > W_3 > W_1$

(c) $W_1 > W_2 > W_3$ (d) $W_1 > W_3 > W_2$

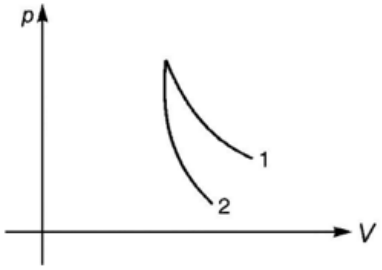
26. Three rods mode of the same material and having the same cross-section have been joined as shown in the figure. Each rod is of the same length. The left and right ends are kept at 0° C and 90° C respectively. The temperature of junction of the three rods will be



(a) 45°C **(b)** 60°C

(c) 30°C (d) 20°C

27. p-V plots for two gases during adiabatic processes are shown in the figure. Plots 1 and 2 should correspond respectively to

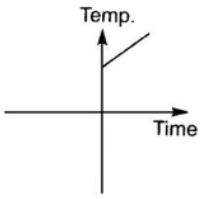


(a) He and O_2 **(b)** O_2 and He

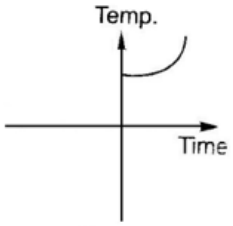
(c) He and Ar (d) O_2 and N_2.

28. Liquid oxygen at 50 K is heated to 300 K at constant pressure of 1 atm. The rate of heating is constant. Which of the following graphs represent the variation of temperature with time

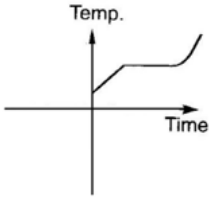
(a)



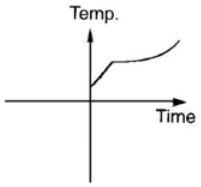
(b)



(c)



(d)



29. A real gas heaves like an ideal gas if its

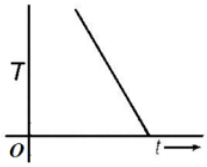
(a) Pressure and temperature are both high

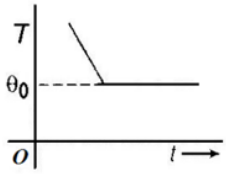
(b) Pressure and temperature are both low

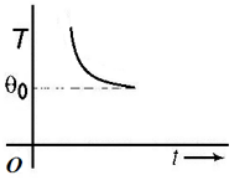
(c) Pressure is high and temperature is low

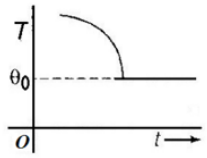
(d) Pressure is low and temperature is high

30. If a piece of metal is heated to temperature θ and then allowed to cool in a room which is at temperature θ0.The graph between the temperature T of the metal and time t will be closed to

(a) 

(b) 

(c) 

(d) 

31. A particle ececutes simple harmonic motion between x=-A and x=+A. The time taken for it to go from O to A/2 is T1 and to go from A/2 to A is T_2. Then

(a) $T_1<T_2$ (b) $T_1>T_2$

(c) $T_1 = T_2$ (d) $T_1 = 2T_2$

32. A particle executes simple harmonic motion with a frequency f. The frequency with which its kinetic energy oscillates is

(a) f/2 (b) f

(c) 2f (d) 4f

33. A whistle giving out 450 Hz approaches a stationary observer at a speed of 33 m/s. the frequency heard by the observer (in Hz) is (speed of sound = 330 m/s)

(a) 550 (b) 429

(c) 517 **(d)** 500

34. A travelling wave in a stretched string is described by the equation y = A sin (kx – ωt) the maximum particle velocity is

(a) Aω (b) ω/k

(c) dω/dk (d) x/ω

35. A source of sound of frequency 600 Hz is pleced inside water. The speed of sound in water is 1500m/s and in air it is 300 m/s. the frequency of sound recorded by an observer who is standing in air is

(a) 200 Hz (b) 3000 Hz

(c) 120 Hz **(d)** 600 Hz

36. A pipe of length 85 cm is closed from one end. Find the number of possible natural oscillations of air column in the pipe whose frequencies lie below 1050 Hz. The velocity of sound in air is 340 m/s.

(a) 12 **(b)** 5

(c) 6 (d) 10

37. A hollow metal sphere of radius 5 cm is charged such that the potential on its surface is 10 V. The potential at the centre of the sphere is

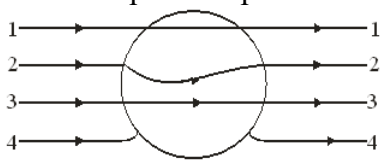
(a) zero

(b) 10 V

(c) same as at a point 5 cm away from the surface

(d) same as at a point 5 cm away from the surface.

38. A metallic solid sphere is placed in a uniform electric field. The lines of force follow the path



(a) 1 (b) 2

(c) 3 **(d)** 4.

39. If $E = 30x^2\hat{i}$. Then potential difference $V_A - V_O$, where V_O is the potential at the origin and V_A the potential at x = 2m is

(a) 120 J (b) –120 J

(c) –80 J (d) 80 J.

40. A piece of copper and another of germanium are cooled from room temperature to 80 K. The resistance of

(a) each of them increases

(b) each of them decreases

(c) copper increases and germanium decreases

(d) copper decreases and germanium increases.

41. A steady current flows in a metallic conductor of non-uniform cross-section. The quantity/quantities constant along the length of the conductor is/are

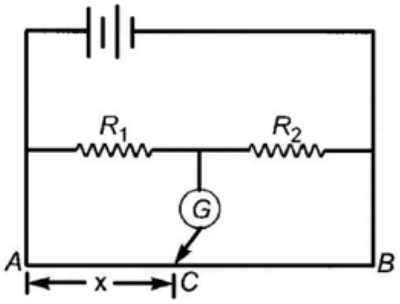
(a) current, electric field and drift speed

(b) drift speed only

(c) current and drift speed

(d) current only.

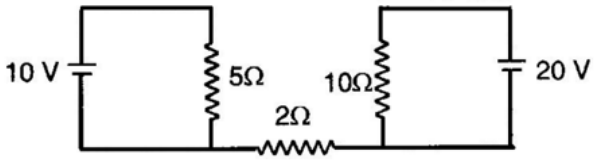
42. *In given meter bridge if AC corresponding to null deflection of galvanometer is x. What would be its value if the radius of the wire AB is double?



(a) x (b) x/4

(c) 4x (d) 2x.

43. **Find out the value of current through 2 Ω resistance for the given circuit (conceptual problem)



(a) 5 A (b) 2 A

(c) zero (d) 4 A.

44. *A magnetic needle is kept in a non-uniform magnetic field. It experiences

(a) a force and a torque (b) a force but not a torque

(c) a torque but not a force (d) neither a force nor a torque.

45. *A current I flows along the length of an infinitely long, straight, thin-walled pipe. Then

(a) the magnitude field at all points inside the pipe is the same, but not zero

(b) the magnitude field at any point inside the pipe is zero

(c) the magnitude field is zero only on the axis of the pipe

(d) the magnitude field is different at different points inside the pipe.

46. **A proton, a deuteron and an α-particle having the same kinetic energy are moving in circular trajectories in a constant magnetic field. If r_p, r_d and r_α denote the radii then

(a) $r_\alpha = r_p < r_d$ (b) $r_\alpha > r_d > r_p$

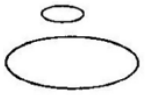
(c) $r_\alpha = r_p > r_d$ (d) $r_p = r_d = r_\alpha$.

47 . **Two particles, each of mass m and charge q, are attached to the two ends of a light rigid rod of length 2L. The rod is rotated at constant angular speed about a perpendicular axis passing through its centre. The ratio of the magnetic moment and its angular momentum about the centre of the rod is

(a) q/2m (b) q/m

(c) 2q/m (d) 2q/m.

48. **Two circular coils can be arranged in any of the three situations shown in the figure. Their mutual inductance will be



(A)

(C)

(a) maximum in situation (a) (b) maximum in situation (b)

(c) maximum in situation (c) (d) the same in all situations.

49. An AC voltage source of variable angular frequency ω and fixed amplitude V0 is connected in series with a capacitance C and an electric bulb of resistance R (inductance zero). When ω is increased

(a) the bulb glows dimmer

(b) the bulb glows brighter

(c) total impedance of the circuit is unchanged

(d) total impedance of the circuit increases.

50. When a ray of light enters a glass slab from air

(a) its wavelength decreases

(b) its wavelength increases

(c) its frequency increases

(d) neither its wavelength nor its frequency changes.

51. In Young's double slit experiment, the separation between the slits is halved and the distance between the slits and the screen is doubled. The fringe width is

(a) unchanged (b) halved

(c) doubled **(d)** quadrupled.

52. A convex lens of focal length 40 cm is in contact with a concave lens of focal length 25 cm. The power of the combination is

(a) – 1.5 D (b) – 6.5 D

(c) + 6.5 D (d) + 6.67 D.

53. Two coherent monochromatic light beams of intensities I and 4I are superposed. The maximum and minimum possible intensities in the resulting beam are

(a) 5I and I (b) 5I and 3I

(c) 9I and I (d) 9I and 3I.

54. An astronomical telescope has an angular magnification of magnitude 5 for far objects. The separation between the objective and the eyepiece is 36 cm and the final image is formed at infinity. The focal length f_o of the objective and the focal length f_e of the eyepiece are

(a) $f_o = 45$ cm and $f_e = -9$ cm (b) $f_o = 50$ cm and $f_e = 10$ cm

(c) $f_o = 7.2$ cm and $f_e = 5$ cm **(d)** $f_o = 30$ cm and $f_e = 6$ cm.

55. Spherical aberration in a thin lens can be reduced by

(a) using a monochromatic light

(b) using a doublet combination

(c) using a circular annular mark over the lens

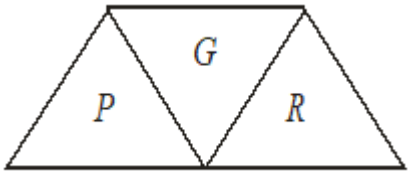
(d) increasing the size of the lens.

56. In a compound microscope, the intermediate image is

(a) virtual, erect and magnified (b) real, erect and magnified

(c) real, inverted and magnified (d) virtual, erect and reduced.

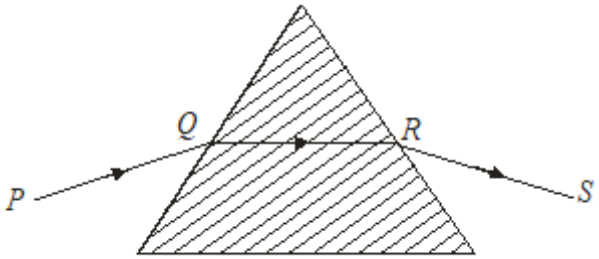
57. A given ray of light suffers minimum deviation in an equilateral prism P. Additional prisms G and R of identical shape and of the same material as P are now added. The ray will suffer



(a) greater deviation (b) no deviation

(c) same deviation as before (d) total internal reflection.

58. A ray of light is incident on an equilateral glass prism placed on a horizontal table. For minimum deviation which of the following is true ?



(a) PQ is horizontal **(b)** QR is horizontal

(c) RS is horizontal (d) Either PQ or RS is horizontal.

59. During a nuclear fusion reaction

(a) a heavy nucleus breaks into two fragments by itself

(b) a light nucleus bombarded by thermal neutrons breaks up

(c) a heavy nucleus bombarded by thermal neutrons breaks up

(d) two light nuclei combine to give a heavier nucleus and possibly other products.

60. The decay constant of a radioactive sample is decay constant of a radioactive sample is decay constant of a radioactive sample is λ. The half-life and mean-life of the sample are respectively given by

(a) $1/\lambda$ and $(\ln 2)/\lambda$ **(b)** $(\ln 2)/\lambda$ and $1/\lambda$

(c) λ $(\ln 2)$ and $1/\lambda$ (d) $\lambda/(\ln 2)$ and $1/\lambda$.

61. Fast neutrons can easily be slowed down by

(a) the use of lead shielding **(b)** passing them through heavy water

(c) elastic collisions with heavy nuclei (d) applying a strong electric field.

62. *The dominant mechanisms for motion of charge carriers in forward and reverse biased silicon p-n junctions are

(a) drift in forward bias, diffusion in reverse bias

(b) diffusion in forward bias, drift in reverse bias

(c) diffusion in both forward and reverse bias

(d) drift in both forward and reverse bias.

63. The maximum kinetic energy of photoelectrons emitted from a surface when photons of energy 6 eV fall on it is 4 eV. The stopping potential in volt is

(a) 2 **(b)** 4

(c) 6 (d) 10.

64. The work function of a substance is 4.0 eV. The longest wavelength of light that can cause photoelectron emission from this substance is approximately

(a) 540 nm (b) 400 nm

(c) 310 nm (d) 220 nm.

65. *Order of magnitude of density of uranium nucleus is ($m_p = 1.67 \times 10^{-27}$ kg)

(a) 10^{17} g/m^3 **(b)** 10^{17} kg/m^3

(c) 10^{14} kg/m^3 (d) 10^{11} kg/m^3.

66 . **A particle of mass M at rest decays into two particles of masses m1 and m2 having non-zero velocities. The ratio of the de-Broglie wavelengths of the particles λ_1/λ_2 is

(a) m_1 / m_2 (b) m_2 / m_1

(c) 1 (d) $\sqrt{(m_2)} / \sqrt{(m_1)}$.

67. The electron in a hydrogen atom makes a transition from an excited state to the ground state. Which of the following statement is true ?

(a) Its kinetic energy increases and its potential and total energy decreases

(b) Its kinetic energy decreases, potential energy increases and its total energy remains the same

(c) Its kinetic energy and total energy decreases and its potential energy increases

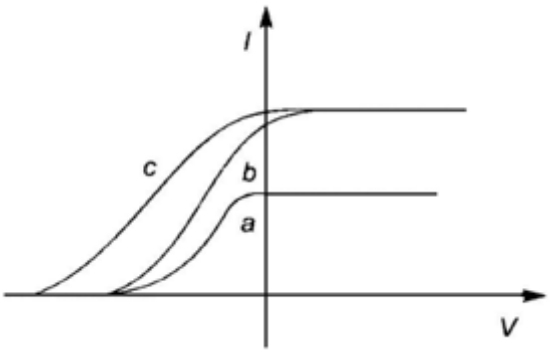
(d) Its kinetic, potential and total energy decreases.

68. *The half-life of 215At is 100 μs. The time taken for the activity of a sample of 215At to decay to 1/16th of its initial value is

(a) 400 μs (b) 63 μs

(c) 40 μs (d) 300 μs.

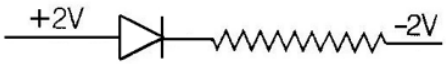
69. The figure shows the variation of photocurrent with anode potential for a photosensitive surface for three different radiations. Let I_a, I_b and I_c be the intensities and f_a, f_b and f_c be the frequencies for the curves a, b and c respectively

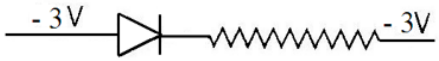


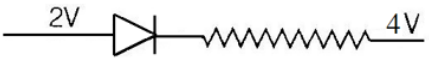
(a) $f_a = f_b$ and $I_a \neq I_b$ (b) $f_a = f_c$ and $I_a = I_c$

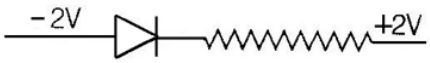
(c) $f_a = f_b$ and $I_a = I_b$ (d) $f_b = f_c$ and $I_b = I_c$.

70. *The forward biased diode connection is

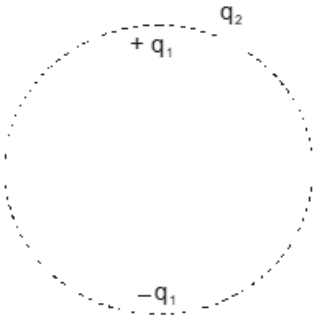
(a) 

(b) 

(c) 

(d) 

71. Consider the charge configuration and a spherical Gaussian surface. When calculating the flux of the electric field over the spherical surface, the electric field will be due to



(a) q_2 (b) only the positive charges

(c) all the charges (d) $+q_1$ and $-q_1$.