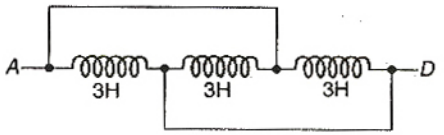
1. The inductance between A and D is :



(a) 3.66 H (b) 9 H
(c) 0.66 H (d) 1 H

2. A ball whose kinetic energy is E, is projected at an angle of 45° to the horizontal. The kinetic energy of the ball at the highest point of its flight will be :

(a) E (b) $E/\sqrt{2}$
(c) $E/2$ (d) zero

3. From a building two balls A and B are thrown such that A is thrown upwards and B downwards (both vertically). If v_A and v_B are their respective velocities on reaching the ground, then :

(a) $v_B > v_A$
(b) $v_A = v_B$
(c) $v_A > v_B$
(d) their velocities depend on their masses

4. If a body loses half of its velocity on penetrating 3 cm in a wooden block, then how much will it penetrate more before coming to rest ?

(a) 1 cm (b) 2 cm
(c) 3 cm (d) 4 cm

5. If suddenly the gravitational force of attraction between earth and a satellite revolving around it becomes zero, then the satellite will :

(a) continue to move in its orbit with same velocity
(b) move tangentially to the original orbit with the same velocity
(c) become stationary in its orbit
(d) move towards the earth

6. If an ammeter is to be used in place of a voltmeter, then we must connect with the ammeter a :

(a) low resistance in parallel
(b) high resistance in parallel
(c) high resistance in series
(d) low resistance in series

7. If in a circular coil A of radius R, current i is flowing and in another coil B of radius $2R$ a current $2i$ is flowing, then the ratio of the magnetic fields, B_A and B_B produced by them will be :

(a) 1 (b) 2
(c) 1/2 (d) 4

8. If two mirrors are kept at 60° to each other, then the number of images formed by them is :

(a) 5 (b) 6
(c) 7 (d) 8

9. A wire when connected to 220 V mains supply has power dissipation P_1. Now the wire is cut into two equal pieces which are connected in parallel to the same supply. Power dissipation in this case is P_2. Then $P_2 : P_1$ is :

(a) 1 (b) 4
(c) 2 (d) 3

10. If 13.6 eV energy is required to ionize the hydrogen atom, then the energy required to remove an electron from $n = 2$ is :

(a) 10.2 eV (b) 0 eV
(c) 3.4 eV (d) 6.8 eV

11. Tube A has both ends open while tube B has one end closed, otherwise they are identical. The ratio of fundamental frequency of tubes A and B is :

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

12. A tuning fork arrangement (pair) produces 4 beats/s with one fork of frequency 288 cps. A little wax is placed on the unknown fork and it then produces 2 beats/s. The frequency of the unknown fork is :

(a) 286 cps (b) 292 cps
(c) 294 cps (d) 288 cps

13. A wave $y = a \sin(\omega t - kx)$ on a string meets with another wave producing a node at $x = 0$. Then the equation of the unknown wave is :
(a) $y = a \sin(\omega t + kx)$
(b) $y = -a \sin(\omega t + kx)$
(c) $y = a \sin(\omega t - kx)$
(d) $y = -a \sin(\omega t - kx)$

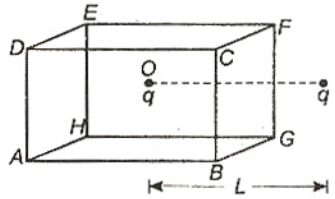
14. On moving a charge of 20 C by 2 cm, 2 J of work is done, then the potential difference between the points is :
(a) 0.1 V (b) 8 V
(c) 2 V (d) 0.5 V

15. If an electron and a proton having same momenta enter perpendicularly to a magnetic field, then :
(a) curved path of electron and proton will be same (ignoring the sense of revolution)
(b) they will move undeflected
(c) curved path of electron is more curved than that of proton
(d) path of proton is more curved

16. Energy required to move a body of mass m from an orbit of radius $2R$ to $3R$ is :
(a) $GMm/12R^2$ (b) $GMm/3R^2$
(c) $GMm/8R$ (d) $GMm/6R$

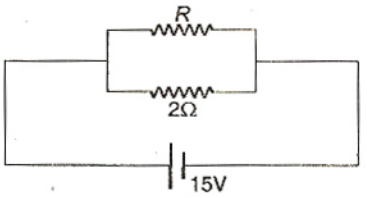
17. If a spring has time period T, and is cut into n equal parts, then the time period of each part will be :
(a) $T\sqrt{n}$ (b) $\frac{T}{\sqrt{n}}$
(c) nT (d) T

18. A charged particle q is placed at the centre O of cube of length L ($ABCDEFGH$). Another same charge q is placed at a distance L from O. Then the electric flux through $ABCD$ is :



(a) $q/4\pi\varepsilon_0 L$ (b) zero
(c) $q/2\pi\varepsilon_0 L$ (d) $q/3\pi\varepsilon_0 L$

19. If in the circuit, power dissipation is 150 W, then R is :



(a) 2Ω (b) 6Ω
(c) 5Ω (d) 4Ω

20. Wavelength of light used in an optical instrument are $\lambda_1 = 4000$ Å and $\lambda_2 = 5000$ Å, then ratio of their respective resolving powers (corresponding to λ_1 and λ_2) is :
(a) 16 : 25 (b) 9 : 1
(c) 4 : 5 (d) 5 : 4

21. Two identical particles move towards each other with velocity $2v$ and v respectively. The velocity of centre of mass is :
(a) v (b) $v/3$
(c) $v/2$ (d) zero

22. If a current is passed through a spring then the spring will :
(a) expand (b) compress
(c) remain same (d) none of these

23. Heat given to a body which raises its temperature by 1°C is :
(a) water equivalent
(b) thermal capacity
(c) specific heat
(d) temperature gradient

24. At absolute zero, Si acts as :
(a) non-metal (b) metal
(c) insulator (d) none of these

25. Electromagnetic waves are transverse in nature is evident by :
(a) polarization (b) interference
(c) reflection (d) diffraction

26. Which of the following is used in optical fibres ?
(a) Total internal reflection
(b) Scattering
(c) Diffraction
(d) Refraction

27. The escape velocity of a body depends upon mass as :
(a) m^0 (b) m^1
(c) m^2 (d) m^3

28. Which of the following are not electromagnetic waves ?
(a) Cosmic-rays (b) γ-rays
(c) β-rays (d) X-rays

29. Identify the pair whose dimensions are equal :
(a) Torque and work (b) Stress and energy
(c) Force and stress (d) Force and work

30. If θ_i is the inversion temperature, θ_n is the neutral temperature, θ_c is the temperature of the cold junction then :
(a) $\theta_i + \theta_c = \theta_n$ (b) $\theta_i - \theta_c = 2\theta_n$
(c) $\frac{\theta_i + \theta_c}{2} = \theta_n$ (d) $\theta_c - \theta_i = 2\theta_n$

31. Infrared radiations are detected by :
(a) spectrometer (b) pyrometer
(c) nanometer (d) photometer

32. If N_0 is the original mass of the substance of half-life period $t_{1/2} = 5$ years, then the amount of substance left after 15 years is :
(a) $\frac{N_0}{8}$ (b) $\frac{N_0}{16}$
(c) $\frac{N_0}{2}$ (d) $\frac{N_0}{4}$

33. By increasing the temperature, the specific resistance of a conductor and a semiconductor :
(a) increases for both
(b) decreases for both
(c) increases, decreases respectively
(d) decreases, increases respectively

34. If there are n capacitors in parallel connected to V volt source, then the energy stored is equal to :
(a) CV (b) $\frac{1}{2} nCV^2$
(c) CV^2 (d) $\frac{1}{2n} CV^2$

35. Which of the following is more close to a black body ?
(a) Black board paint (b) Green leaves
(c) Black holes (d) Red roses

36. Which statement is incorrect ?
(a) All reversible cycles have same efficiency
(b) Reversible cycle has more efficiency than an irreversible one
(c) Carnot cycle is a reversible one
(d) Carnot cycle has the maximum efficiency in all cycles

37. Length of a string tied to two rigid supports is 40 cm. Maximum length (wavelength in cm) of a stationary wave produced on it, is :
(a) 20 (b) 80
(c) 40 (d) 120

38. The power factor of an AC circuit having resistance R and inductance L (connected in series) and an angular velocity ω is :
(a) $\frac{R}{\omega L}$ (b) $\frac{R}{(R^2 + \omega^2 L^2)^{1/2}}$
(c) $\frac{\omega L}{R}$ (d) $\frac{R}{(R^2 - \omega^2 L^2)^{1/2}}$

39. An astronomical telescope has a large aperture to :
(a) reduce spherical aberration
(b) have high resolution
(c) increase span of observation
(d) have low dispersion

40. The kinetic energy needed to project a body of mass m from the earth's surface (radius R) to infinity is :
(a) $\frac{mgR}{2}$ (b) $2mgR$
(c) mgR (d) $\frac{mgR}{4}$

41. Cooking gas containers are kept in a lorry moving with uniform speed. The temperature of the gas molecules inside will :
(a) increase
(b) decrease
(c) remain same
(d) decrease for some, while increase for others

42. When temperature increases, the frequency of a tuning fork :
(a) increases
(b) decreases
(c) remains same
(d) increases or decreases depending on the material

43. If mass-energy equivalence is taken into account, when water is cooled to form ice, the mass of water should :
(a) increase
(b) remain unchanged
(c) decrease
(d) first increase then decrease

44. The energy band gap is maximum in :
(a) metals (b) superconductors
(c) insulators (d) semiconductors

45. The part of a transistor which is most heavily doped to produce large number of majority carriers is :
(a) emitter
(b) base
(c) collector
(d) can be any of the above three

46. In a simple harmonic oscillator, at the mean position :
(a) kinetic energy is minimum, potential energy is maximum
(b) both kinetic and potential energies are maximum
(c) kinetic energy is maximum, potential energy is minimum
(d) both kinetic and potential energies are minimum

47. Initial angular velocity of a circular disc of mass M is ω_1. Then two small spheres of mass m are attached gently to two diametrically opposite points on the edge of the disc. What is the final angular velocity of the disc ?

(a) $\left(\frac{M+m}{M}\right)\omega_1$ (b) $\left(\frac{M+m}{m}\right)\omega_1$

(c) $\left(\frac{M}{M+4m}\right)\omega_1$ (d) $\left(\frac{M}{M+2m}\right)\omega_1$

48. The minimum velocity (in ms^{-1}) with which a car driver must traverse a flat curve of radius 150 m and coefficient of friction 0.6 to avoid skidding is :
(a) 60 (b) 30
(c) 15 (d) 25

49. A cylinder of height 20 m is completely filled with water. The velocity of efflux of water (in ms^{-1}) through a small hole on the side wall of the cylinder near its bottom, is :
(a) 10 (b) 20
(c) 25.5 (d) 5

50. A spring of force constant 800 N/m has an extension of 5 cm. The work done in extending it from 5 cm to 15 cm is :
(a) 16 J (b) 8 J
(c) 32 J (d) 24 J

51. A child swinging on a swing in sitting position, stands up, then the time period of the swing will :
(a) increase
(b) decrease
(c) remain same
(d) increase if the child is long and decrease if the child is short

52. A lift is moving down with acceleration a. A man in the lift drops a ball inside the lift. The acceleration of the ball as observed by the man in the lift and a man standing stationary on the ground are respectively :
(a) g, g (b) $g-a, g-a$
(c) $g-a, g$ (d) a, g

53. The mass of a product liberated on anode in an electrochemical cell depends on :
(a) $(It)^{1/2}$ (b) It
(c) I/t (d) I^2t

(where t is the time period for which the current is passed)

54. At what temperature is the rms velocity of a hydrogen molecule equal to that of an oxygen molecule at 47°C ?
(a) 80 K (b) –73 K
(c) 3 K (d) 20 K

55. The time period of a charged particle undergoing a circular motion in a uniform magnetic field is independent of its :
(a) speed (b) mass
(c) charge (d) magnetic induction

56. A solid sphere, a hollow sphere and a ring are released from top of an inclined plane (frictionless) so that they slide down the plane. Then maximum acceleration down the plane is for (no rolling) :
(a) solid sphere (b) hollow sphere
(c) ring (d) all same

57. In a transformer, number of turns in the primary are 140 and that in the secondary are 280. If current in primary is 4 A, then that in the secondary is :
(a) 4 A (b) 2 A
(c) 6 A (d) 10 A

58. Even Carnot engine cannot give 100% efficiency because we cannot :
(a) prevent radiation
(b) find ideal sources
(c) reach absolute zero temperature
(d) eliminate friction

59. Moment of inertia of a circular wire of mass M and radius R about its diameter is :
(a) $MR^2/2$ (b) MR^2
(c) $2MR^2$ (d) $MR^2/4$

60. When forces F_1, F_2, F_3 are acting on a particle of mass m such that F_2 and F_3 are mutually perpendicular, then the particle remains stationary. If the force F_1 is now removed then the acceleration of the particle is :
(a) F_1/m (b) F_2F_3/mF_1
(c) $(F_2-F_3)/m$ (d) F_2/m

61. Two forces are such that the sum of their magnitudes is 18 N and their resultant which has magnitude 12 N, is perpendicular to the smaller force. Then the magnitudes of the forces are :
(a) 12 N, 6 N (b) 13 N, 5 N
(c) 10 N, 8 N (d) 16 N, 2 N

62. Speeds of two identical cars are u and $4u$ at a specific instant. The ratio of the respective distances at which the two cars are stopped from that instant is :
(a) 1 : 1 (b) 1 : 4
(c) 1 : 8 (d) 1 : 16

63. 1 mole of a gas with $\gamma = 7/5$ is mixed with 1 mole of a gas with $\gamma = 5/3$, then the value of γ for the resulting mixture is :
(a) 7/5 (b) 2/5
(c) 24/16 (d) 12/7

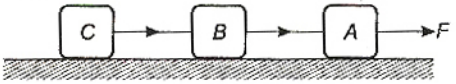
64. If a charge q is placed at the centre of the line joining two equal charges Q such that the system is in equilibrium then the value of q is :
(a) $Q/2$ (b) $-Q/2$
(c) $Q/4$ (d) $-Q/4$

65. Capacitance (in F) of a spherical conductor having radius 1 m, is :
(a) 1.1×10^{-10} (b) 10^{-6}
(c) 9×10^{-9} (d) 10^{-3}

66. A light string passing over a smooth light pulley connects two blocks of masses m_1 and m_2 (vertically). If the acceleration of the system is $g/8$, then the ratio of the masses is :
(a) 8 : 1 (b) 9 : 7
(c) 4 : 3 (d) 5 : 3

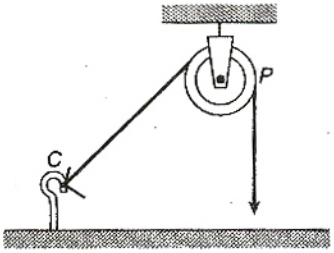
67. Two spheres of the same material have radii 1 m and 4 m and temperatures 4000 K and 2000 K respectively. The ratio of the energy radiated per second by the first sphere to that by the second is :
(a) 1 : 1 (b) 16 : 1
(c) 4 : 1 (d) 1 : 9

68. Three identical blocks of masses $m = 2$ kg are drawn by a force $F = 10.2$ N with an acceleration of $0.6\ ms^{-2}$ on a frictionless surface, then what is the tension (in N) in the string between the blocks B and C ?



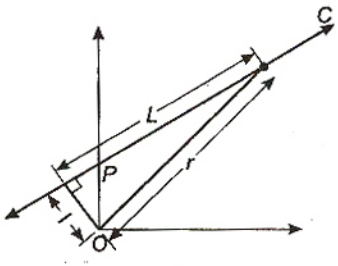
(a) 9.2 (b) 7.8
(c) 4 (d) 9.8

69. One end of massless rope, which passes over a massless and frictionless pulley P is tied to a hook C while the other end is free. Maximum tension that the rope can bear is 360 N. With what value of maximum safe acceleration (in ms^{-2}) can a man of 60 kg climb on the rope ?



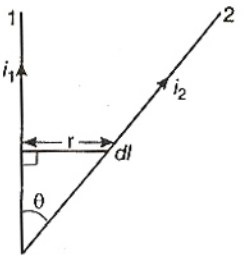
(a) 16 (b) 6
(c) 4 (d) 8

70. A particle of mass m moves along line PC with velocity v as shown. What is the angular momentum of the particle about O ?



(a) mvL (b) mvl
(c) mvr (d) Zero

71. Wires 1 and 2 carrying currents i_1 and i_2 respectively are inclined at an angle θ to each other. What is the force on a small element dl of wire 2 at a distance r from wire 1 (as shown in figure) due to the magnetic field of wire 1 ?



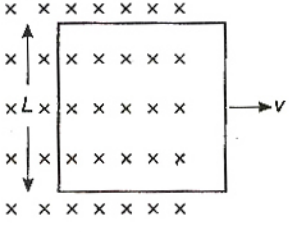
(a) $\frac{\mu_0}{2\pi r} i_1 i_2\, dl \tan\theta$ (b) $\frac{\mu_0}{2\pi r} i_1 i_2\, dl \sin\theta$
(c) $\frac{\mu_0}{2\pi r} i_1 i_2\, dl \cos\theta$ (d) $\frac{\mu_0}{4\pi r} i_1 i_2\, dl \sin\theta$

72. At a specific instant emission of radioactive compound is deflected in a magnetic field. The compound can emit :
(i) electrons (ii) protons
(iii) He^{2+} (iv) neutrons
The emission at the instant can be :
(a) i, ii, iii (b) i, ii, iii, iv
(c) iv (d) ii, iii

73. Sodium and copper have work functions 2.3 eV and 4.5 eV respectively. Then the ratio of the wavelengths is nearest to :
(a) 1 : 2 (b) 4 : 1
(c) 2 : 1 (d) 1 : 4

74. Formation of covalent bonds in compounds exhibits :
(a) wave nature of electron
(b) particle nature of electron
(c) both wave and particle nature of electron
(d) none of the above

75. A conducting square loop of side L and resistance R moves in its plane with a uniform velocity v perpendicular to one of its sides. A magnetic induction B constant in time and space, pointing perpendicular and into the plane at the loop exists everywhere with half the loop outside the field, as shown in figure. The induced emf is :



(a) zero (b) RvB
(c) $\frac{vBL}{R}$ (d) vBL