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Previous Year Paper

Physics - 2011

Multiple Choice Questions

1. If C be the capacitance and V be the electric potential, then the dimensional formula of CV^2 is

   A. $[ML^2T^{-2}A^0]$

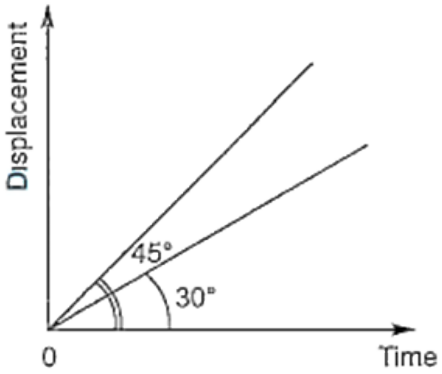
   B. $[MLT^{-2}A^{-1}]$

   C. $[M^0LT^{-2}A^0]$

   D. $[ML^{-3}TA]$

   Answer

2. The displacement-time graph of two moving particles make angles of 30° and 45° with the X-axis. The ratio of their velocities is



   A. 3 : 2

   B. 1 : 1

   C. 1 : 2

   D. 1 : 3

   Answer

3. Block A of mass of 2 kg is placed over block B of mass 8 kg. The combination is placed over a rough horizontal surface. Coefficient of friction between B and the floor is 0.5. Coefficient of friction between blocks A and B is 0.4. A horizontal force of 10 N is applied on block B. The force of friction between blocks A and Bi s ($g = 10\ ms^{-2}$)

   A. 100 N

   B. 40 N

   C. 50 N

   D. Zero

   Answer

4. The height y and the distance x along the horizontal plane of a projectile on a certain planet

(with no surrounding atmosphere) are given by $y = 8t - 5t^2$ m and $x = 6t$ m, where t is in seconds. The velocity with which the projectile is projected is

A. 6 ms^{-1}

B. 8 ms^{-1}

C. 10 ms^{-1}

D. 14 ms^{-1}

Answer

5. A body of mass 5 kg is thrown vertically up with a kinetic energy of 490 J. The height at which the kinetic energy of the body becomes half of the original value is (acceleration due to gravity = 9.8 ms^{-2})

A. 5 m

B. 2.5 m

C. 10 m

D. 12.5 m

Answer

6. A solid sphere of mass m rolls down an inclined plane without slipping, starting from rest at the top of an inclined plane. The linear speed of the sphere at the bottom of the inclined plane is v. The kinetic energy of the sphere at the bottom is

A. 12 mv2

B. 53 mv2

C. 25 mv2

D. 710 mv2

Answer

7. Two satellites of mass m and 9m are orbiting a planet in orbits of radius R. Their periods of revolution will be in the ratio of

A. 9 : 1

B. 3 : 1

C. 1 : 1

D. 1 : 3

Answer

8. The resultant of two forces acting at an angle of 120° is 10 kg-wt and is perpendicular to one of the forces. That force is

A. 103 kg-wt

B. 203 kg-wt

C. 10 kg-wt

D. 103 kg-wt

Answer

9. Faintest stars are called

A. zero magnitude stars
B. second magnitude stars
C. sixth magnitude stars
D. dwarfs

Answer

10. The following four wires of length L and radius r are made of the same material. Which of these will have the largest extension,when the same tension is applied ?

A. L = 1000 cm, r = 0.2 mm
B. L = 2000 cm, r = 0.4 mm
C. L = 3000 cm, r = 0.6 mm
D. L = 4000 cm, r = 0.8 mm

Answer

11. Eight equal drops of water are falling through air with a steady velocity of 10 cm s^{-1}. If the drops combine to form a single drop big in size, then the terminal velocity of this big drop is

A. 40 cms^{-1}
B. 10 cms^{-1}
C. 30 cms^{-1}
D. 80 cms^{-1}

Answer

12. Two capillary tubes of different diameters are dipped in water. The rise of water is

A. the same in both tubes
B. greater in the tube of larger diameter
C. greater in the tube of smaller diameter
D. independent of the diameter of the tube

Answer

13. A perfect gas at 27°C is heated at constant pressure so as to double its volume. The increase in temperature of the gas will be

A. 600°C
B. 327°C
C. 54°C
D. 300°C

Answer

14. Three identical rods A, B and C are placed end to end. A temperature difference is maintained between the free ends of A and C. The thermal conductivity of B is thrice that of C and half ofthat of A. The effective thermal conductivity of the system will be (K_A is the thermal conductivity of rod A)

A. 13 KA
B. 3 K_A

C. 2 KA

D. 23 KA

Answer

15. The quantities of heat required to raise the temperatures of two copperspheres of radii r_1 and r_2 (r_1 = 1.51 r_2) through 1 K are in the ratio of

A. 278

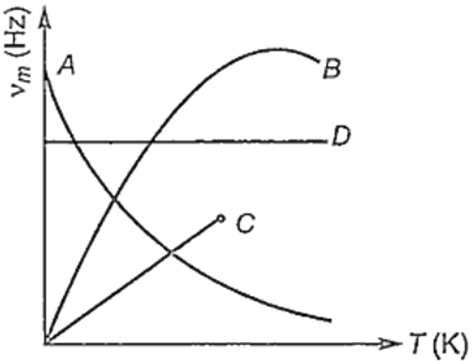
B. 94

C. 32

D. 1

Answer

16. Which one of the following is v-T graph for perfectly black body ? v_m is the frequency of radiation with maximum intensity. T is the absolute temperature.



A. A

B. B

C. C

D. D

Answer

17. A particle executing a simple harmonic motion has a period of 6 s. The time taken by the particle to move from the mean position to half the amplitude, starting from the mean position is

A. 32 s

B. 12 s

C. 34 s

D. 14 s

Answer

18. The equation of a wave is given by y = 10 sin 2π45 t + α. If the displacement is 5 cm at t = 0, then the total phase at t =7.5 s is

A. π3

B. π2

C. π6

D. π

Answer

19. Two tuning forks A and B, produce notes of frequencies 258 Hz and 262 Hz. An unknown note sounded with A produces certain beats. When the same note is sounded with B, the beat frequency gets doubled. The unknown frequency is

    A. 250 Hz
    B. 252 Hz
    C. 254 Hz
    D. 256 Hz

    Answer

20. A wire under tension vibrates with a fundamental frequency of 600 Hz. If the length of the wire is doubled, the radius is halved and the wire is made to vibrate under one-ninth the tension. Then the fundamental frequency will become

    A. 200 Hz
    B. 300 Hz
    C. 600 Hz
    D. 400 Hz

    Answer

21. Wavefront is the locus of all points, where the particles of the medium vibrate with the same

    A. phase
    B. amplitude
    C. frequency
    D. period

    Answer

22. Two identical charged spheres of material density ρ, suspended from the same point by inextensible strings of equal length make an angle θ between the strings. When suspended in a liquid of density σ the angle θ remains the same. The dielectric constant K of the liquid is

    A. ρρ - σ
    B. ρ - σρ
    C. ρρ + σ
    D. ρ + σρ

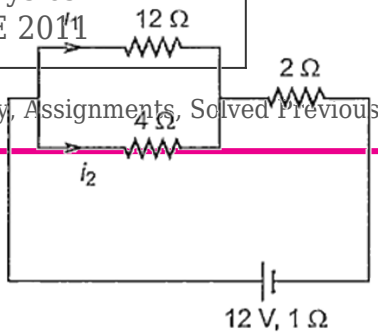
    Answer

23. The electric field at a point due to an electric dipole, on an axis inclined at an angle θ (< 90°) to the dipole axis, is perpendicular to the dipole axis, if the angle θ is

    A. $\tan^{-1}$ (2)
    B. tan-112
    C. tan-1 2
    D. tan-112

    Answer

24. In the circuit shown, the currents i_1 and i_2 are



A. i_1 = 1.5 A, i_2 = 0.5 A

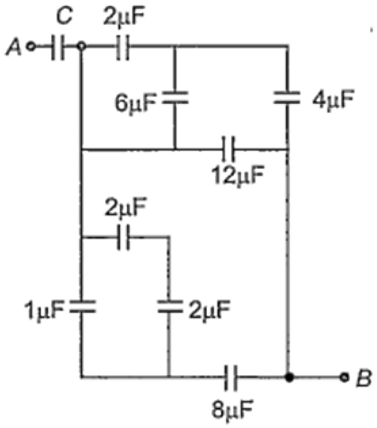
B. i_1 = 0.5 A, i_2 = 1.5 A

C. i_1 = 1 A, i_2 = 3 A

D. i_1 = 3 A, i_2 = 1 A

Answer

25. In the given network, the valve of C, so that an equivalent capacitance between points A and B is 3 μF, is



A. 15 μF

B. 315 μF

C. 48 μF

D. 36 μF

Answer

26. A conductor wire having 10^{29} free electrons / m^3 carries a current of 20A. If the cross-section of the wire is 1 mm^2, then the drift velocity of electrons will be (e = 1.6 × 10^{-19} C)

A. 1.25 × 10^{-4} ms^{-1}

B. 1.25 × 10^{-3} ms^{-1}

C. 1.25 × 10^{-5} ms^{-1}

D. 6.25 × 10^{-3} ms^{-1}

Answer

27. A resistor has a colour code of green, blue, brown and silver. What is its resistance ?

A. 56 Ω ± 5 %

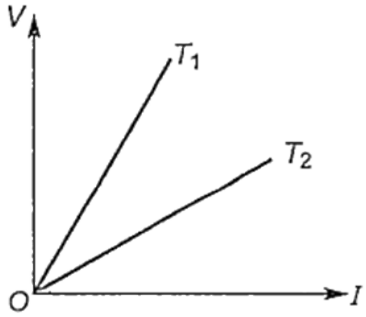
B. 560 Ω ± 10 %

C. 560 Ω ± 5 %

D. 5600 Ω ± 10 %

Answer

28. The voltage V and current I graph for a conductor at two different temperatures T_1 and T_2 and shown in the figure. The relation between T_1 and T_2 is



A. $T_1 > T_2$

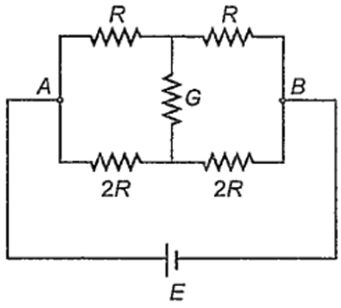
B. $T_1 < T_2$

C. $T_1 = T_2$

D. T1 = 1T2

Answer

29. Consider the following statements regarding the network shown in the figure.



1. The equivalent resistance of the network between points A and Bis independent of value of G.
2. The equivalent resistance of the network between points A and B is 43 R.
3. The current through G is zero.

Which of the above statements is/are true ?

A. (1) alone

B. (2) alone

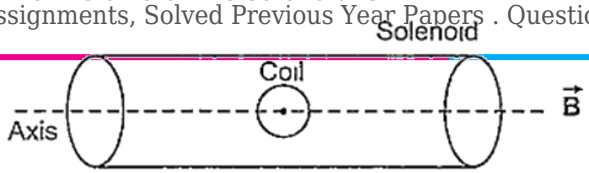
C. (2) and (3)

D. (1), (2) and (3)

Answer

30. The torque required to hold a small circular coil of 10 turns, area 1 mm^2 and carrying a current

of 2144 A in the middle of a long solenoid of 10^3 turns/m carrying a current of 2.5 A, with its axis perpendicular to the axis of the solenoid is



A. 1.5×10^{-6} N-m

B. 1.5×10^{-8} N-m

C. $1.5 \times 10^{+6}$ N-m

D. $1.5 \times 10^{+8}$ N-m

Answer

31. A particle of charge e and mass m moves with a velocity v in a magnetic field B applied perpendicular to the motion of the particle. The radius r of its path in the field is

A. mvBe

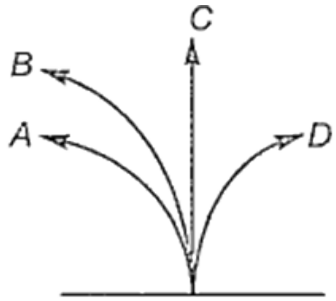
B. Bemv

C. evBm

D. Bvem

Answer

32. A neutron, a proton, an electron and an α-particle enter a region of uniform magnetic field with the same velocities. The magnetic field is perpendicular and directed into the plane of the paper. The tracks of the particles are labelled in the figure. The electron follows the track.



A. A

B. B

C. C

D. D

Answer

33. The deflection in a moving coil galvanometer is reduced to half when it is shunted with a 40 Ω coil. The resistance of the galvanometer

A. 80 Ω

B. 40 Ω

C. 20 Ω

D. 15 Ω

Answer

34. A current of 23 A, produces a deflection of 60° in a tangent galvanometer. The reduction factor is

A. 23 A

B. 23 A

C. 2 A

D. 32 A

Answer

35. In an AC circuit, V and I are given by V = 150 sin (150 t) volt and I = 150 sin 150 + π3 amp. The power dissipated in the circuit is

A. 106 W

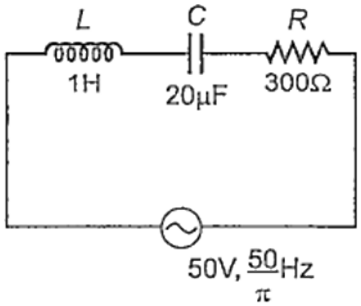
B. 150 W

C. 5625 W

D. Zero

Answer

36. In the series L-C-R circuit shown, the impedance is



A. 200 Ω

B. 100 Ω

C. 300 Ω

D. 500 Ω

Answer

37. The energy stored in an inductor of self inductance L henry carrying a current of I ampere is

A. 12 L2I

B. 12 LI2

C. LI^2

D. L^2I

Answer

38. A transformer works on the principle of

A. self-induction

B. electrical inertia

C. mutual induction

D. magnetic effect of the electrical current

Answer

39. Flash spectrum confirms a/an

A. total solar eclipse

B. lunar eclipse

C. earthquake

D. magnetic storm

Answer

40. Wavelength of given light waves in air and in a medium are 6000 A◦ and 4000 A◦ respectively. The critical angle is

A. tan-1 23

B. tan-1 32

C. sin-1 23

D. sin-1 32

Answer

41. The time required for the light to pass through a glass slab (refractive index = 1.5) of thickness 4 mm is ($c = 3 \times 10^8$ ms^{-1}, speed of light in free space)

A. 10^{-11} s

B. 2×10^{-11} s

C. 2×10^{11} s

D. 2×10^{-5} s

Answer

42. A prism having refractive index 1.414 and refracting angle 30° has one of the refracting surfaces silvered. A beam of light incident on the other refracting surface will retrace its path, if the angle of incidence is

A. 0°

B. 30°

C. 60°

D. 45°

Answer

43. A planoconvex lens has a maximum thickness of 6 cm. When placed on a horizontal table with the curved surface in contact with the table surface, the apparent depth of the bottom most point of the lens is found to be 4 cm. If the lens is inverted such that the plane face of the lens is in contact with the surface of the table, the apparent depth of the centre of the plane face is found to be 174 cm. The radius of curvature of the lens is

A. 68 cm

B. 75 cm

C. 128 cm

D. 34 cm

Answer

44. Two thin lenses have a combined power of +9D. When they are separated by a distance of 20 cm, their equivalent power becomes + 275 D. Their individual powers (in dioptre) are

A. 1, 8

B. 2, 7

C. 3, 6

D. 4, 5

Answer

45. Two monochromatic light waves of amplitudes 3A and 2A interfering at a point have a phase difference of 60°. The intensity at that point will be proportional to

A. $5\ A^2$

B. $13\ A^2$

C. $7\ A^2$

D. $19\ A^2$

Answer

46. Consider the following statements in case of Young's double slit experiment.

1. A slit S is necessary if we use an ordinary extended source of light.
2. A slit S is not needed if we use an ordinary but well collimated beam of light.
3. A slit S is not needed if we use a spatially coherent source of light.

Which ofthe above statements are correct ?

A. (1), (2) and (3)

B. (1) and (2)

C. (2) and (3)

D. (1) and (3)

Answer

47. A parallel beam of light ofwavelength 6000 A∘ gets diffracted by a single slit of width 0.3 mm. The angular position of the first minima of diffracted light is

A. 2×10^{-3} rad

B. 3×10^{-3} rad

C. 1.8×10^{-3} rad

D. 6×10^{-3} rad

Answer

48. The critical angle of a certain medium is sin-1 35. The polarizing angle of the medium is

A. sin-1 45

B. tan-1 53

C. tan-1 34

Answer

49. The photoelectric threshold wavelength for silver is M. The energy of the electron ejected from the surface of silver by an incident wavelength λ ($\lambda < \lambda_0$) will be

A. hc ($\lambda_0 - \lambda$)

B. hcλ0 - λ

C. hc λ0 - λλλ0

D. hc λ0 - λλλ0

Answer

50. Rutherford's atomic model could account for

A. stability of atoms

B. origin of spectra

C. the positive charged central core of an atom

D. concept of stationary orbits

Answer

51. When an electron jumps from the orbit n = 2 to n = 4, then wavelength of the radiations absorbed will be (R is Rydberg's constant)

A. 163R

B. 165R

C. 5R16

D. 3R16

Answer

52. The thermonuclear reaction of hydrogen inside the stars is taking place by a cycle of operations. The particular element which acts as a catalyst is

A. Nitrogen

B. Oxygen

C. Helium

D. Carbon

Answer

53. The ratio of minimum wavelengths of Lyman and Balmer series will be

A. 1.25

B. 0.25

C. 5

D. 10

Answer

54. The fraction of the initial number of radioactive nuclei which remain undecayed after half of a half-life of the radioactive sample is

A. 14

B. 122

C. 12

D. 12

Answer

55. 1 curie represents

A. 3.7×10^{7} disintegrations per second

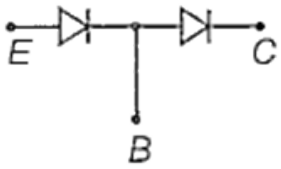
B. 3.7×10^{10} disintegrations per second

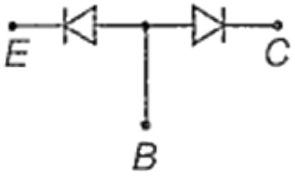
C. 10^{6} disintegrations per second

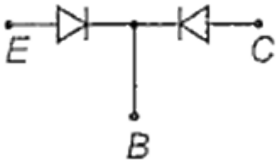
D. 1 disintegrations per second

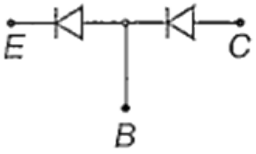
Answer

56. An n-p-n transistor can be considered to be equivalent to two diodes, connected. Which of the following figure is the correct one ?

A. 

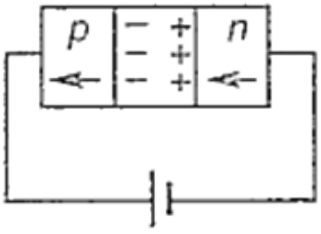
B. 

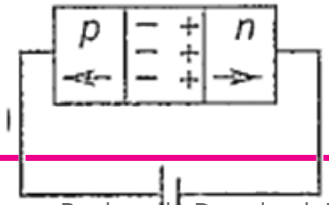
C. 

D. 

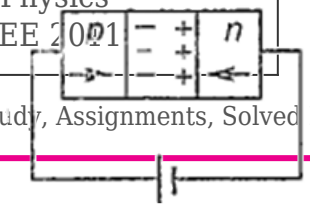
Answer

57. In the case of forward biasing of a p-n junction diode, which one of the following figures correctly depicts the direction of conventional current (indicated by an arrow mark) ?

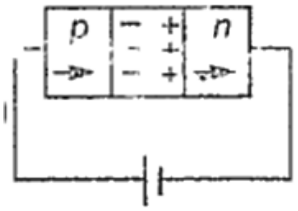
A. 

B. 

C.



D.



Answer

58. An electron of mass m_e and a proton of mass m_p are moving with the same speed. The ratio of their de-Broglie's wavelengths λ_e / λ_p is

A. 1

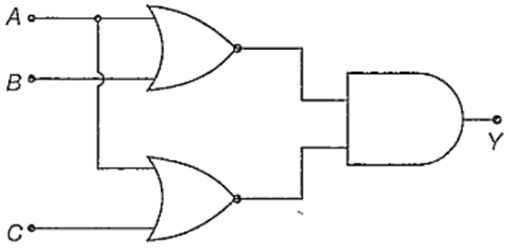
B. 1836

C. 11836

D. 918

Answer

59. The output of given logic circuit is



A. A . (B + C)

B. A . (B . C)

C. (A + B) . (A + C)

D. A + B + C

Answer

60. If the scattering intensity of a liquid is 8 units at a wavelength of 500 nm, then the scattering intensity at a wavelength of 400 nm will be approximately

A. 13 units

B. 16 units

C. 20 units

D. 24 units

Answer