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Previous Year Paper

Physics - 2016

Multiple Choice Questions

1. A body falls freely for 10 s. Its average velocity during this journey is (Take, g = 10 ms^{-2})

   A. 100 ms^{-1}

   B. 10 ms^{-1}

   C. 50 ms^{-1}

   D. 5 ms^{-1}

   Answer

2. Three projectiles A, B and C are projected at an angle of 30°, 45°, 60° respectively. If R_A, R_B and R_C are ranges of A, B and C respectively, then (velocity of projection is same for A, B and C)

   A. $R_A = R_B = R_C$

   B. $R_A = R_C > R_B$

   C. $R_A < R_B < R_C$

   D. $R_A = R_C < R_B$

   Answer

3. The component ofa vector r along X-axis will have a maximum value, if

   A. r is along positive X-axis

   B. r is along positive Y-axis

   C. r is along negative Y-axis

   D. r makes an angle of 45° with the X-axis

   Answer

4. Maximum acceleration of the train in which a 50 kg box lying on its floor will remain stationary (Given, coefficient of static friction between the box and the train's floor is 0.3 and g = 10 ms^{-2})

   A. 5.0 ms^{-2}

   B. 3.0 ms^{-2}

   C. 1.5 ms^{-2}

   D. 15 ms^{-2}

   Answer

5. A 12 kg bomb at rest explodes into two pieces of 4 kg and 8 kg. If the momentum of 4 kg piece is 20 Ns, the kinetic energy of the 8 kg piece is

   A. 25 J

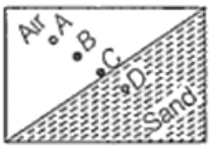
   B. 20 J

C. 50 J

D. 40 J

Answer

6. Which of the points is likely position of the centre of mass of the system shown in the figure ?



A. A

B. D

C. B

D. C

Answer

7. Three bodies a ring (R), a solid cylinder (C) and a solid sphere (S) having same mass and same radius roll down the inclined plane without slipping. They start from rest, if v_R, v_C and v_S are velocities of respective bodies on reaching the bottom of the plane, then

A. $v_R = v_C = v_S$

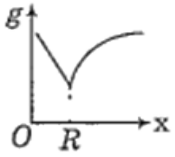
B. $v_R > v_C > v_S$

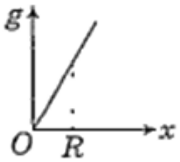
C. $v_R < v_C < v_S$

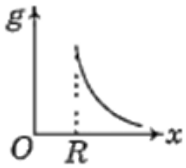
D. $v_R = v_C > v_S$

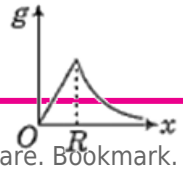
Answer

8. Variation of acceleration due to gravity (g) with distance x from the centre of the Earth is best represented by (R → Radius of the Earth)

A. 

B. 

C. 

D. 

Answer

9. A spring is stretched by applying a load to its free end. The strain produced in the spring is
   A. volumetric
   B. shear
   C. longitudinal and shear
   D. longitudinal

   Answer

10. An ideal fluid flows through a pipe of circular cross-section with diameters 5 cm and 10 cm as shown in the figure. The ratio of velocities of fluid at A and B is

   A. 4 : 1
   B. 1 : 4
   C. 2 : 1
   D. 1 : 2

   Answer

11. A pan filled with hot food cools from 94°C to 86°C in 2 min. When the room temperature is 20°C. Howl ong will it cool from 74°C to 66°C ?
   A. 2 min
   B. 2.8 min
   C. 2.5 min
   D. 1.8 min

   Answer

12. Four rods of same material with different radii r and length l are used to connect two heat reservoirs at different temperature. Which one will conduct most heat ?
   A. r = 1 cm, l = 1 m
   B. r = 1 cm, l = 12 m
   C. r = 2 cm, l = 2 m
   D. r = 2 cm, l = 12 m

   Answer

13. A Carnot engine working between 300 K and 400 K has 800 J of useful work. The amount of heat energy supplied to the engine from the source is
   A. 2400 J
   B. 3200 J
   C. 1200 J
   D. 3600 J

   Answer

14. A particle executing SHM has a maximum speed of 0.5 ms^{-1} and maximum acceleration of 1.0

ms^{-2}. The angular frequency of oscillation is

A. 2 rad s^{-1}

B. 0.5 rad s^{-1}

C. 2π rad s-1

D. 0.5 π rad s-1

Answer

15. A source of sound is moving with a velocity of 50 ms^{-1} towards a stationary observer. The observer measures the frequency of sound as 500 Hz. The apparent frequency of sound as heard by the observer when source is moving away from him with the same speed is (Speed of sound at room temperature is 350 ms^{-1})

A. 400 Hz

B. 666 Hz

C. 375 Hz

D. 177.5 Hz

Answer

16. If there are only one type of charge in the universe, then (E → Electric field , dS → Area vector)

A. ∮E dS ≠ 0 on any surface

B. ∮E dS could not be defined

C. ∮E dS = ∞ if charge is inside

D. ∮E dS = 0 if charge is outside, = qε0 if charge is inside

Answer

17. An electron of mass m, charge e falls through a distance h metre in a uniform electric field E. Then, time of fall

A. t = 2hmeE

B. t = 2hmeE

C. t = 2eEhm

D. t = 2eEhm

Answer

18. If E_{ax} and E_{eq} represents electric field at a point on the axial and equatorial line of a dipole. If points are at a distance r from the centre of the dipole, for r >> a

A. $E_{ax} = E_{eq}$

B. $E_{ax} = -E_{eq}$

C. $E_{ax} = -2E_{eq}$

D. $E_{eq} = 2E_{ax}$

Answer

19. Nature of equipotential surface for a point charge is

A. Ellipsoid with charge at foci

B. Sphere with charge at the centre of the sphere

C. Sphere with charge on the surface of the sphere

D. Plane with charge on the surface

Answer

20. A particle of mass 1 g and charge 1 μC is held at rest on a frictionless horizontal surface at distance 1 m from the fixed charge 2 mC. If the particle is released, it will be repelled. The speed of the particle when it is at a distance of 10 m from the fixed charge.

A. 60 ms^{-1}

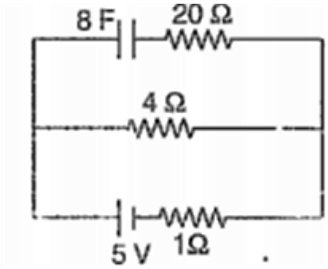
B. 100 ms^{-1}

C. 90 ms^{-1}

D. 180 ms^{-1}

Answer

21. A capacitor of 8 Fis connected as shown in the figure. Charge on the plates of the capacitor



A. 32 C

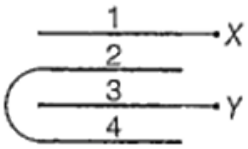
B. 40 C

C. 0 C

D. 80 C

Answer

22. Four metal plates are arranged as shown in the figure. Capacitance between X and Y (A ➔ Area of each plate, d ➔ distance between the plates) is



A. 32 ε0Ad

B. 2ε0Ad

C. 23 ε0Ad

D. 3ε0Ad

Answer

23. Mobility of free electrons in a conductor is

A. directly proportional to electron density

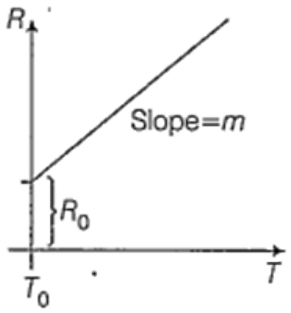
B. directly proportional to relaxation time

C. inversely proportional to electron density

D. inversely proportional to relaxation time

Answer

24. Variation of resistance of the conductor with temperature is as shown



The temperature coefficient (α) of the conductor is

A. R0m

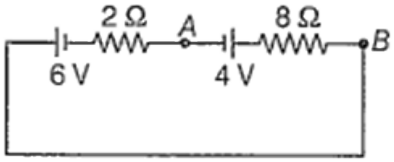
B. mR_0

C. m^2R_0

D. mR0

Answer

25. Potential difference between A and B in the following circuit



A. 4 V

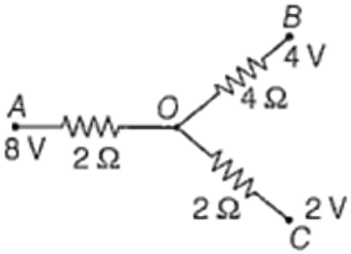
B. 5.6 V

C. 2.8 V

D. 6 V

Answer

26. In the following network, potential at O is



A. 4 V

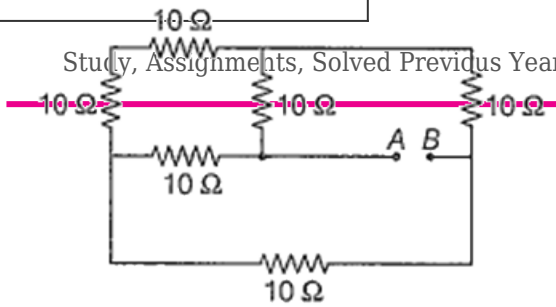
B. 3 V

C. 6 V

D. 4.8 V

Answer

27. Effective resistance between A and B in the following circuit



A. 10 Ω

B. 20 Ω

C. 5 Ω

D. 203 Ω

Answer

28. Two heating coils of resistances 10 Ω and 20 Ω are connected in parallel and connected to a battery of emf 12 V and internal resistance 1 Ω. The power consumed by them are in the ratio

A. 1 : 4

B. 1 : 3

C. 2 : 1

D. 4 : 1

Answer

29. A proton is projected with a uniform velocity v along the axis of a current-carrying solenoid, then

A. the proton will be accelerated along the axis

B. the proton path will be circular about the axis

C. the proton move along helical path

D. the proton will continue to move with velocity v along the axis

Answer

30. In the cyclotron, as radius of the circular path of the charged particle increases (ω = angular velocity, v = linear velocity)

A. both ω and v increase

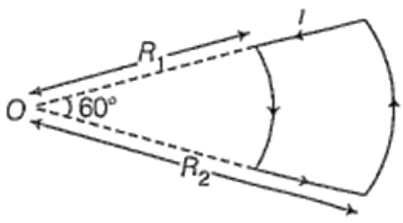
B. ω only increases, v remains constant

C. v increases, ω remains constant

D. v increases, ω decreases

Answer

31. A conducting wire carrying current is arranged as shown in the figure. The magnetic field at O is



A. $\frac{\mu_0 i}{12}\left(\frac{1}{R_1}-\frac{1}{R_2}\right)$

B. μ0i2 1R1 + 1R2

C. μ0i6 1R1 - 1R2

D. μ0i6 1R1 + 1R2

Answer

32. The quantity of a charge that will be transferred by a current flow of 20 A over 1 h 30 min period is

A. 10.8×10^3 C

B. 10.8×10^4 C

C. 5.4×10^3 C

D. 1.8×10^4 C

Answer

33. A galvanometer coil has a resistance of 50 Ω and the meter shows full scale deflection for a current of 5 mA. This galvanometer is converted into voltmeter of range 0-20 V by connecting

A. 3950 Ω in series with galvanometer

B. 4050 Ω in series with galvanometer

C. 3950 Ω in parallel with galvanometer

D. 4050 Ω in parallel with galvanometer

Answer

34. χ1 and χ2 are susceptibility of a paramagnetic material at temperatures T_1 K and T_2 K respectively, then

A. χ1 = χ2

B. χ1T1 = χ2T2

C. χ1T2 = χ1T1

D. χ1 T1 = χ2 T2

Answer

35. At certain place, the horizontal component of Earth's magnetic field is 3.0 G and the angle dip at that place is 30°. The magnetic field of Earth at that location is

A. 4.5 G

B. 5.1 G

C. 3.5 G

D. 6.0 G

Answer

36. A long solenoid with 40 turns per cm carries a current of 1 A. The magnetic energy stored per unit volume is

A. 3.2 π Jm-3

B. 32 π Jm-3

C. 1.6 π Jm-3

D. 6.4 π Jm-3

Answer

37. A wheel with 10 spokes each of length L m is rotated with a uniform angular velocity ω in a plane normal to the magnetic field B. The emf induced between the axle and the rim of the wheel is

    A. 12 NωBL2
    B. 12 ωBL2
    C. ωBL2
    D. $N\omega BL^2$

    Answer

38. The rms value of current in a 50 Hz AC circuit is 6 A. The average value of AC current over a cycle is

    A. 62
    B. 3π/2
    C. Zero
    D. 6π2

    Answer

39. A capacitor of capacitance 10 μF is connected to an AC ammeter. If the source voltage varies as V = 502 sin 100 t, the reading of the ammeter is

    A. 50 mA
    B. 70.7 mA
    C. 5.0 mA
    D. 7.07 mA

    Answer

40. In a series L-C-R circuit, the potential drop across L, C and R respectively are 40 V, 120 V and 60 V. Then, the source voltage is

    A. 220 V
    B. 160 V
    C. 180 V
    D. 100 V

    Answer

41. In a series L-C-R circuit, an alternating emf (V) and current (i) are given by the equation V = V0 sin ωt, I = I0 sin ωt + π3. The average power dissipated in the circuit over a cycle of AC is

    A. V0I02
    B. V0I04
    C. 32 V0I0
    D. zero

    Answer

42. Electromagnetic radiation used to sterilise milk is

A. X-rays
B. γ-rays
C. UV rays
D. Radio waves

Answer

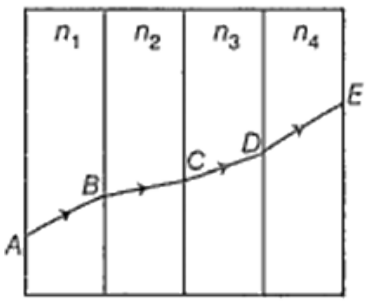
43. The process of superimposing message signal on high frequency carrier wave is called
    A. amplification
    B. demodulation
    C. transmission
    D. modulation

    Answer

44. A plane glass plate is placed over a various coloured letters (violet, green, yellow, red). The letter which appears to raised more is
    A. red
    B. yellow
    C. green
    D. violet

    Answer

45. A ray of light passes through four transparent media with refractive index n_1, n_2, n_3 and n_4 as shown in the figure. The surfaces of all media are parallel.



    If the emergent ray DE is parallel to incident ray AB, then
    A. $n_1 = n_4$
    B. $n_2 = n_4$
    C. $n_3 = n_4$
    D. n1 = n2 + n3 + n43

    Answer

46. Focal length of a convex lens is 20 cm and its refractive index is 1.5. It produces an erect, enlarged image if the distance of the object from the lens is
    A. 40 cm
    B. 30 cm
    C. 15 cm
    D. 20 cm

    Answer

Answer

47. A ray of light suffers a minimum deviation when incident on an equilateral prism of refractive index 2. The angle of deviation is

    A. 30°

    B. 45°

    C. 60°

    D. 50°

    Answer

48. In Young's double slit experiment, the source is white light. One slit is covered with red filter and the other with blue filter. There shall be

    A. alternate red and blue fringes

    B. alternate dark and pink fringes

    C. alternate dark and yellow fringes

    D. no interference

    Answer

49. Light of wavelength 600 nm is incident normally on a slit of width 0.2 mm. The angular width of central maxima in the diffraction pattern is (measured from minimum to minimum)

    A. 6×10^{-3} rad

    B. 4×10^{-3} rad

    C. 2.4×10^{-3} rad

    D. 4.5×10^{-3} rad

    Answer

50. For what distance ray optics is good approximation when the aperture is 4 mm and the wavelength of light is 400 nm ?

    A. 24 m

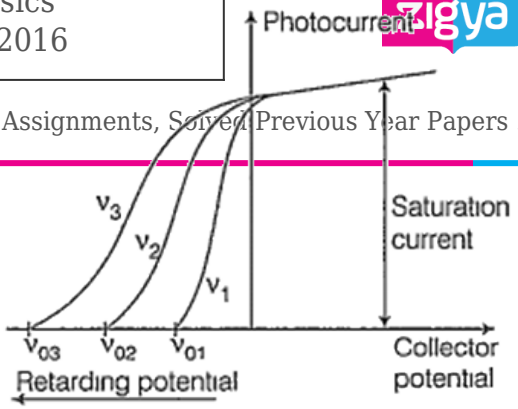
    B. 40 m

    C. 18 m

    D. 30 m

    Answer

51. The variation of photocurrent with collector potential for different frequencies of incident radiation v_1, v_2 and v_3 is as shown in the graph, then



A. $v_1 = v_2 = v_3$

B. $v_1 > v_2 > v_3$

C. $v_1 < v_2 < v_3$

D. v3 = v1 + v22

Answer

52. The de-Broglie wavelength of an electron accelerated to a potential of 400 V is approximately

A. 0.03 nm

B. 0.04 nm

C. 0.12 nm

D. 0.06 nm

Answer

53. Total energy of electron in an excited state of hydrogen atom is − 3.4 eV. The kinetic and potential energy of electron in this state are

A. K = − 3.4 eV, U = − 6.8 eV

B. K = 3.4 eV, U − 6.8 eV

C. K = − 6.8 eV, U = + 3.4 eV

D. K = + 10.2 eV, U = − 13.6 eV

Answer

54. When electron jumps from n = 4 level to n = 1 level, the angular momentum of electron changes by

A. h2π

B. 2h2π

C. 3h2π

D. 4h2π

Answer

55. A radioactive sample of half-life 10 days contains 1000 x nuclei. Number of original nuclei present after 5 days is

A. 707 x

B. 750 x

C. 500 x

Answer

56. An element X decays into element Z by two-step process

$X \rightarrow Y + He^{4}_{2}Y \rightarrow Z + 2e^{-}$, then

A. X and Z are isobars
B. X and Y are isotopes
C. X and Z are isotones
D. X and Z are isotopes

Answer

57. A nucleus of mass 20 u emits a γ-photon of energy 6 MeV. If the emission assume to occur when nucleus is free and rest, then the nucleus will have kinetic energy nearest to (Take, 1 u = 1.6×10^{-27} kg)

A. 10 keV
B. 1 keV
C. 0.1 keV
D. 100 keV

Answer

58. Constant DC voltage is required from a variable AC voltage. Which of the following is correct order of operation ?

A. Regulator, filter, rectifier
B. Rectifier, regulator, filter
C. Rectifier, filter, regulator
D. Filter, regulator, rectifier

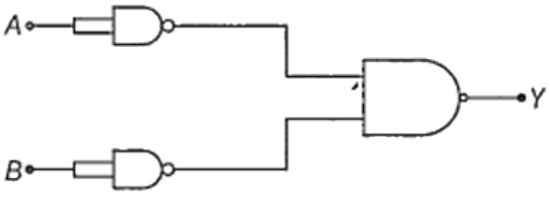
Answer

59. In a transistor, the collector current varies by 0.49 mA and emitter current varies by 0.50 mA. Current gain β measured is

A. 49
B. 150
C. 99
D. 100

Answer

60. Identify the logic operation carried out by the following circuit



A. AND
B. NAND

C. NOR
D. OR

Answer