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Previous Year Paper

Physics - 2005

Multiple Choice Questions

1. The dimensional formula of magnetic flux is

   A. $[M^1L^0T^{-2}A^{-1}]$

   B. $[M^1L^2T^{-1}A^{-1}]$

   C. $[M^1L^2T^{-2}A^{-1}]$

   D. $[M^1L^2T^0A^{-1}]$

   Answer

2. A physical quantity A is related to four observables a, b, c and d as follows

   A = a2b3cd

   The percentage errors of measurement in a, b, c and d are 1 %, 3%, 2% and 2% respectively. What is the percentage error in the quantity A ?

   A. 12 %

   B. 7 %

   C. 14 %

   D. 16 %

   Answer

3. A body starting from rest moves with constant acceleration. The ratio of distance covered by the body during the 5th second to that covered in 5 s is

   A. 925

   B. 35

   C. 255

   D. 125

   Answer

4. The area under acceleration-time graph gives

   A. distance travelled

   B. change in acceleration

   C. force acting

   D. change in velocity

   Answer

5. A particle is displaced from a position 2i^ - j^ + k^ to another position 3i^ + 2j^ - 2k^ under the action of the force of 2i^ + j^ - k^. The work done by the force in an arbitrary unit is

   A. 8

B. 12
C. 12
D. 16

Answer

6. From the top of tower, a stone is thrown up. It reaches the ground in t_1 second. A second stone thrown down with the same speed reaches the ground in t_2 second. A third stone released from rest reaches the ground in t_3 second. Then

   A. t3 = t1 + t22
   B. t3 = t1t2
   C. 1t3 = 1t1 - 1t2
   D. t32 = t22 - t12

   Answer

7. An object is projected at an angle of 45° with the horizontal. The horizontal range and maximum height reached will be in the ratio

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

   Answer

8. If the length of the second's hand in a stop-clock is 3 cm, the angular velocity and linear velocity of the tip is

   A. 0.2047 rad/s, 0.0314 ms^{-1}
   B. 0.2547 rad/s, 0.314 ms^{-1}
   C. 0.1472 rad/s, 0.06314 ms^{-1}
   D. 0.1047 rad/s, 0.00314 ms^{-1}

   Answer

9. A player caught a cricket ball of mass 150 g moving at the rate of 20 ms^{-1}. If the catching process be completed in 0.1 s, the force of the blow exerted by the ball on the hands of the player is

   A. 0.3 N
   B. 30 N
   C. 300 N
   D. 3000 N

   Answer

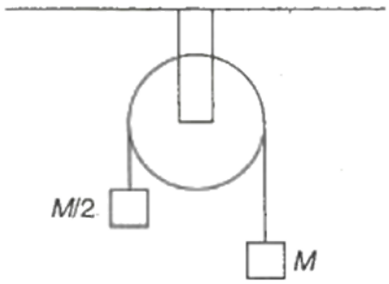
10. A uniform metal chain is placed on a rough table such that one end of it hangs down over the edge of the table. When one-third of its length hangs over the edge, the chain starts sliding. Then, the coefficient of static friction is

    A. 34

B. 11
C. 12
D. 13

Answer

11. Two masses M and M/2 are joined together by means of light inextensible string passed over a frictionless pulley as shown in the figure. When the bigger mass is released, the small one will ascend with an acceleration of



A. g3
B. 3g2
C. g2
D. g

Answer

12. In elastic collision
    A. both momentum and kinetic energies are conserved
    B. both momentum and kinetic energies are not conserved
    C. only energy is conserved
    D. only mechanical energy is conserved

Answer

13. A ball is released from the top of a tower. The ratio of work done by force of gravity in first, second and third second of the motion of the ball is
    A. 1 : 2 : 3
    B. 1 : 4 : 9
    C. 1 : 3 : 5
    D. 1 : 5 : 3

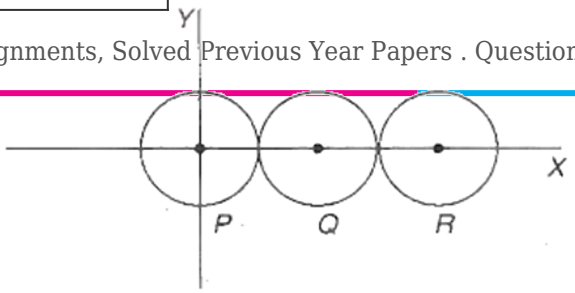
Answer

14. When the kinetic energy of a body is doubled, its momentum increases by times
    A. 2
    B. 2
    C. 4
    D. 22

Answer

15. Three identical spheres, each of mass 1 kg are kept as shown in figure below, touching each other. Their centres are marked P, Q, R respectively. The

distance of centre of mass of the system from P is



A. PQ + PR + QR3

B. PQ + PR3

C. PQ + QR3

D. PR + QR3

Answer

16. The moment of inertia of a thin rod of mass M and length L, about an axis perpendicular to the rod at a distance L4 from one end is

A. ML26

B. ML212

C. 7ML248

D. 7ML212

Answer

17. A body rolls down an inclined plane. If its kinetic energy of rotation is 40% of its kinetic energy of translation, then the body is

A. solid cylinder

B. solid sphere

C. disc

D. ring

Answer

18. Which of the following statements about the gravitational constant is true ?

A. It is a force

B. It has no unit

C. It does not depend on the nature of the medium in which the bodies are kept

D. It depends on the value of the masses

Answer

19. Four particles each of mass M, are located at the vertices of a square with side L. The gravitational potential due to this at the centre of the square is

A. -32 GML

B. -64 GML2

C. zero

D. 32 GML

Answer

20. Two identical solid copper spheres of radius R are placed in contact with each other. The gravitational attraction between them is proportional to

A. R^2

B. R^{-2}

C. R^4

D. R^{-4}

Answer

21. The modulus of elasticity is dimensionally equivalent to

A. strain

B. force

C. stress

D. coefficient of viscosity

Answer

22. Radius of an air bubble at the bottom of the lake is r and it becomes 2r when the air bubble rises to the top surface of the lake. If P cm of water be the atmospheric pressure, then the depth of the lake is

A. 2P

B. 8P

C. 4P

D. 7P

Answer

23. A manometer connected to a closed tap reads 4.5×10^5 Pa. When the tap is opened the reading of the manometer falls to 4×10^5 Pa. Then the velocity of flow of water is

A. 7 ms^{-1}

B. 8 ms^{-1}

C. 10 ms^{-1}

D. 12 ms^{-1}

Answer

24. What is the velocity v of a metallic ball of radius r falling in a tank of liquid at the instant when its acceleration is one-half that of a freely falling body ? (The densities of metal and of liquid are ρ and σ respectively, and the viscosity of the liquid is η)

A. r2g9η ρ - 2σ

B. r2g9η 2ρ - σ

C. r2g9η ρ - σ

D. 2r2g9η ρ - σ

Answer

25. The value of PV/T for one mole of an ideal gas is nearly equal to

    A. 2 J mol^{-1} K^{-1}

    B. 8.3 mol^{-1} K^{-1}

    C. 4.2 mol^{-1} K^{-1}

    D. 2 cal mol^{-1} K^{-1}

    Answer

26. The volume of a metal sphere increases by 0.24 % when its temperature is raised by 40°C. The coefficient of linear expansion of the metal is

    A. 2×10^{-5}

    B. 6×10^{-5}

    C. 18×10^{-5}

    D. 1.2×10^{-5}

    Answer

27. The temperature of equal masses of three different liquids A, B and C are 12°C, 19°C and 28°C respectively. The temperature when A and B are mixed is 16°C and when B and C are mixed is 23°C. The temperature when A and C are mixed is

    A. 18.2°C

    B. 22°C

    C. 20.2°C

    D. 24.2°C

    Answer

28. The time period of the second's hand of a watch is

    A. 1 h

    B. 1 s

    C. 12 h

    D. 1 min

    Answer

29. A particle starts SHM from the mean position. Its amplitude is a and total energy E. At one instant its kinetic energy is 3E4. Its displacement at that instant is

    A. a2

    B. a2

    C. a32

    D. a3

    Answer

30. A particle executes linear simple harmonic motion with an amplitude of 2 cm. When the particle is at 1 cm from the mean position the magnitude of its velocity is equal to that of its acceleration. Then its time period in second is

A. $12\pi^3$

B. $2\pi^3$

C. $2\pi^3$

D. 32π

Answer

31. A closed organ pipe and an open organ pipe are tuned to the same fundamental frequency. The ratio of their lengths is

A. 1 : 1

B. 2 : 1

C. 1 : 4

D. 1 : 2

Answer

32. An observer standing near the sea shore os 54 /min. If the wavelength of the water wave is 10 m then the velocity of water wave is

A. 540 ms^{-1}

B. 5.4 ms^{-1}

C. 0.184 ms^{-1}

D. 9 ms^{-1}

Answer

33. A set of 24 tuning forks are so arranged that each gives 6 beats/s with the previous one. If the frequency of the last tuning fork is double that of the first, frequency of the second tuning fork is

A. 138 Hz

B. 132 Hz

C. 144 Hz

D. 276 Hz

Answer

34. A 10 Ω electric heater operates on a 110 V line. The rate at which heat is developed in watts is

A. 1310 W

B. 670 W

C. 810 W

D. 1210 W

Answer

35. For a certain thermocouple, if the temperature of the cold junction is 0°C, the neutral temperature and inversion temperatures are 285°C and 570°C respectively. If the cold junction is brought to 10°C, then the new neutral and inversion temperatures are respectively

A. 285°C and 560°C

B. 285°C and 570°C

C. 295°C and 560°C

D. 275°C and 560°C

Answer

36. The frequency of X-rays, γ-rays and ultraviolet rays are respectively a, b and c then
    A. a < b, b > c
    B. a > b, b > c
    C. a > b, b < c
    D. a < b, b < c

Answer

37. If c is the speed of electromagnetic waves in vacuum, its speed in a medium of dielectric constant K and relative permeability μ_r is
    A. v = 1μrK
    B. v = cμrK
    C. v = cμrK
    D. v = Kμrc

Answer

38. The waves relevant to telecommunications are
    A. visibe light
    B. infrared
    C. ultraviolet
    D. microwave

Answer

39. The electrostatic field due to a charged conductor just outside the conductor is
    A. zero and parallel to the surface at every point inside the conductor
    B. zero and is normal to the surface at every point inside the conductor
    C. parallel to the surface at every point and zero inside the conductor
    D. normal to the surface at every point and zero inside the conductor

Answer

40. A point charge + q is placed at the midpoint of a cube of side a. The electric flux emerging from the cube is
    A. zero
    B. 3qa2ε0
    C. qε0
    D. ε04qa2

Answer

41. Figure below shows four plates each of area A and separated from one another by a distance d. What is the capacitance between P and Q ?

A. ε0Ad
B. 2ε0Ad
C. 3ε0Ad
D. 4ε0Ad

Answer

42. A soap bubble is charged to a potential of 16 V. Its radius is, then doubled. The potential of the bubble now will be
    A. 16 V
    B. 8 V
    C. 4 V
    D. 2 V

    Answer

43. A parallel plate capacitor of capacitance 10 F is charged to 1 μC. The charging battery is removed and then the separation between the plates is doubled. Work done during the process is
    A. 5 mJ
    B. 0.05 mJ
    C. 1 mJ
    D. 10 mJ

    Answer

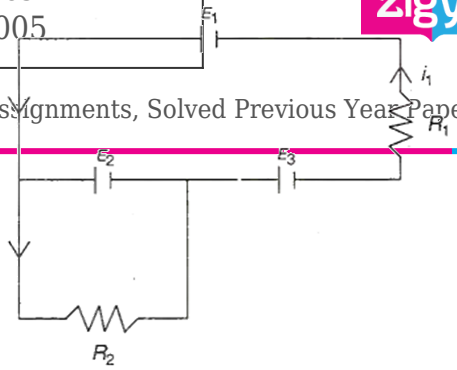
44. In which of the following substances does resistance decrease with increase in temperature ?
    A. Copper
    B. Carbon
    C. Constantant
    D. Silver

    Answer

45. Resistors P and Q are connected in the gaps of the meter bridge. The balancing point is obtained 13 m from the zero end. If a 6 Ω resistance is connected in series with P the balance point shifts to 23 m from the same end. P and Q are
    A. 4, 2
    B. 2, 4
    C. both (a) and (b)
    D. neither (a) nor (b)

    Answer

46. The currents i_1 and i_2 through the resistors R_1 (= 10 Ω) and R_2 (= 30 Ω) in the circuit diagram with E_1 =3V, E_2 = 3V and E_3 = 2V are respectively



A. 0.2 A, 0.1 A

B. 0.4 A, 0.2 A

C. 0.1 A, 0.2 A

D. 0.2 A, 0.4 A

Answer

47. An α-particle with a specific charge of 2.5 × 10^7 C kg^{-1} moves with a speed of 2 x 10^5 ms^{-1} in a perpendicular magnetic field of 0.05 T. Then the radius of the circular path described by it is

A. 8 cm

B. 4 cm

C. 16 cm

D. 2 cm

Answer

48. A cyclotron can be used to accelerate

A. α-particles

B. β-particles

C. neutrons

D. neutrino

Answer

49. The magnitude of the earth's magnetic field at a place is B_0 and the angle of dip is δ. A horizontal conductor of length l lying magnetic north-south moves eastwards with a velocity v. The emf induced across the conductor is

A. zero

B. B_0 lv sin δ

C. B_0 lv

D. B_0 lv cos δ

Answer

50. A milliammeter of range 0- 30 mA has internal resistance of 20 Ω. The resistance to be connected in series to convert it into a voltmeter of maximum reading 3V is

A. 49 Ω

B. 80 Ω

C. 40 Ω

D. 30 Ω

Answer

51. A straight conductor of length l carrying a current I, is bent in the form of a semicircle. The magnetic field (in tesla) at the centre of the semicircle is

    A. π2Il × 10-7

    B. πIl × 10-7

    C. πIl2 × 10-7

    D. πI2l × 10-7

    Answer

52. A coil having an inductance of 0.5 H carries a current which is uniformly varying from 0 to 10 A in 2 s. The emf (in volts) generated in the coil is

    A. 10

    B. 5

    C. 2.5

    D. 1.25

    Answer

53. If an alternating voltage is represented as E = 141 sin (628 t), then the rms value of the voltage and the frequency are respectively

    A. 141 V, 628 Hz

    B. 100 V, 50 Hz

    C. 100 V, 100 Hz

    D. 141 V, 100 Hz

    Answer

54. A step-down transformer is used on a 1000 V line to deliver 20 A at 120 V at the secondary coil. If the efficiency of the transformer is 80%, the current drawn from the line is

    A. 3 A

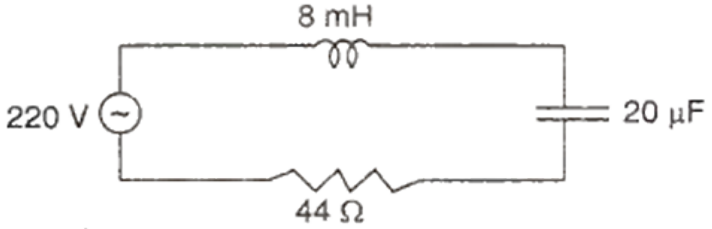
    B. 30 A

    C. 0.3 A

    D. 2.4 A

    Answer

55. For the series LCR circuit shown in the figure, what is the resonance frequency and the amplitude of the current at the resonating frequency ?



    A. 2500 rad s^{-1} and 5.2 A

    B. 2500 rad s^{-1} and 5 A

C. 2500 rad s^{-1} and 52 A

D. 250 rad s^{-1} and 52 A

Answer

56. A red coloured object illuminated by mercury vapour lamp, when seen through a green filter, will appear

A. red

B. blue

C. black

D. white

Answer

57. Time taken by sunlight to pass through a window of thickness 4 mm whose refractive index is 32 is

A. 2×10^{-4} s

B. 2×10^{4} s

C. 2×10^{-11} s

D. 2×10^{11} s

Answer

58. Two thin lenses of focal length 20 cm and 25 cm are in contact. The effective power of the combination is

A. 4.5 D

B. 18 D

C. 9 D

D. 2.5 D

Answer

59. The magnification of the image when an object is placed at a distance x from the principal focus of a mirror of focal length f

A. xf

B. 1 + fx

C. fx

D. 1 - fx

Answer

60. In the Young's double slit experiment, the central maxima is observed t0 be I_0. If one of the slits is covered, then the intensity at the central maxima will become

A. I02

B. I02

C. I04

D. I_0

Answer

61. The ratio of the de-Broglie wavelength of an α-particle and a proton of same kinetic energy is

A. 1 : 2

B. 1 : 1

C. 1 : 2

D. 4 : 1

Answer

62. Which of the following is not conserved in nuclear reaction ?

A. Total energy

B. Mass number

C. Number of fundamental particles

D. Nucleon number

Answer

63. The number of α-particles and β-particles respectively emitted in the reaction $_{88}A^{196} \rightarrow {}_{78}B^{164}$ are

A. 8 and 8

B. 8 and 6

C. 6 and 8

D. 6 and 6

Answer

64. The counting rate observed from a radioactive source at t = 0 s was 1600 count/s and at t = 8 s it was 100 counts/s. The counting rate observed as counts per second at t = 6 s, will be

A. 400

B. 300

C. 250

D. 200

Answer

65. If D_e, D_b and D_c are the doping levels of emitter, base and collector respectively of a transistor, then

A. $D_e = D_b = D_c$

B. $D_e < D_b = D_c$

C. $D_e > D_c > D_b$

D. $D_e < D_b < D_c$

Answer

66. The relation between α and β parameters of a transistor is

A. α = 1 + ββ

B. α = 1 - ββ

C. α = β1 + β

D. α = β1 - β

Answer

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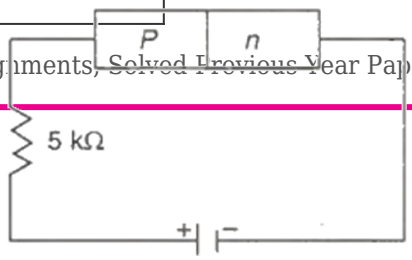
forward bias resistance of the junction is 5Ω. If the forward bias current is



A. 8.8 mA

B. 1 mA

C. 9.9 mA

D. 20 mA

Answer

68. A transistor connected at common-emitter mode contains load resistance of 5 kΩ and an input resistance of 1 kΩ. If the input peak voltage is 5 mV and the current gain is 5O, find the voltage gain

A. 250

B. 500

C. 125

D. 50

Answer

69. If n_1 and n_2 are the refractive indices of the core and the cladding respectively of an optic fibre, then

A. $n_1 = n_2$

B. $n_1 < n_2$

C. $n_2 < n_1$

D. $n_2 = 2n_1$

Answer

70. If a radio receiver amplifies all the signal frequencies equally well, it is said to have high

A. fidelity

B. distortion

C. sensibility

D. sensitivity

Answer

71. A TV tower has a height of 100 m. What is the maximum distance up to which the TV transmission can be received ($R = 8 \times 10^6$ m) ?

A. 34.77 km

B. 32.70 km

C. 40 km

D. 40.70 km

Answer

72. A black body has maximum wavelength λ_m at 2000 K. Its corresponding wavelength at 3000 K will be

A. 32 λm

B. 23 λm

C. 1681 λm

D. 8116 λm

Answer