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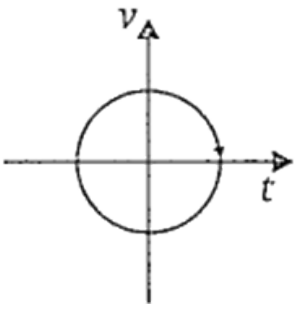
Previous Year Paper

Physics - 2006

Multiple Choice Questions

1. Look at the graphs (a) to (d) carefully and indicate which of these possibly represents one dimensional motion of a particle ?

A.



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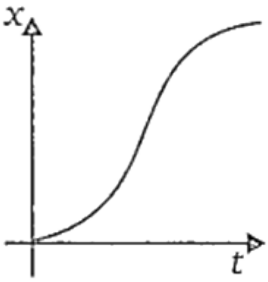

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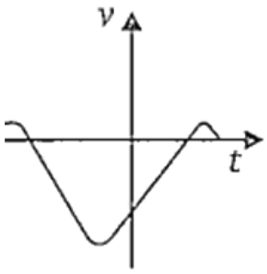
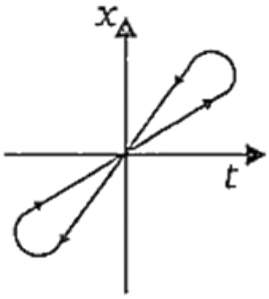
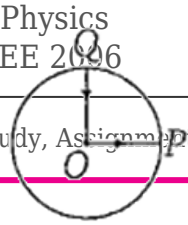


D.



Answer

2. A cyclist starts from the centre O of a circular park ofradius 1 km, reaches the edge P of the park, then cycles along the circumference and returns to the centre along QO as shown in the figure. If the round trip takes 10 mm, the net displacement and average speed of the cyclist (in metre and kilometre per hour) are



A. 0, 1

B. π + 42, 0

C. 21.4, π + 42

D. 0, 21.4

Answer

3. When a low flying aircraft passes over head, we sometimes notice a slight shaking of the picture on our TV screen. This is due to

A. diffraction of the signal received from the antenna

B. interference of the direct signal received by the antenna with the weak signal reflected by the passing aircraft

C. change ofmagenetic flux occuring due to the passage of aircraft

D. vibration created by the passage of aircraft

Answer

4. The physical quantity having the dimensions $[M^{-1}L^{-3}T^{3}A^{2}]$ is

A. resistance

B. resistivity

C. electrical conductivity

D. electromotive force

Answer

5. A satellite in a circular orbit of radius R has a period of 4 h. Another satellite with orbital radius 3 R around the same planet will have a period (in hours)

A. 16

B. 4

C. 427

D. 48

Answer

6. The unit of Stefan's constant is

A. $Wm^{-2}K^{-1}$

B. WmK^{-4}

C. $Wm^{-2}K^{-4}$

D. $Nm^{-2}K^{-4}$

Answer

7. For ordinary terrestrial experiments, the observer in an inertial frame in the following cases is

A. a child revolving in a giant wheel

B. a driver in a sports car moving with a constant high speed of 200 kmh^{-1} on a straight rod

C. the pilot of an aeroplane which is taking off

D. a cyclist negotiating a sharp curve

Answer

8. If white light is used in the Newton's rings experiment, the colour observed in the reflected light is complementary to that observed in the transmitted light through the same point. This is due to

A. 90° change of phase in one of the reflected waves

B. 180° change of phase in one of the reflected waves

C. 145° change of phase in one of the reflected waves

D. 45° change of phase in one of the reflected waves

Answer

9. A simple pendulum has a length l and the mass of the bob is m. The bob is given a charge q coulomb. The pendulum is suspended between the vertical plates of a charged parallel plate capacitor. If E is the electric field strength between the plates, the time period of the pendulum is given by

A. 2πlg

B. 2πlg + qEm

C. 2πlg - qEm

D. 2πlg2 + qEm2

Answer

10. The freezer in a refrigerator is located at the top section so that

A. the entire chamber of the refrigerator is cooled quickly due to convection

B. the motor is not heated

C. the heat gained from the environment is high

D. the heat gained from the environment is low

Answer

11. A monoatomic gas is suddenly compressed to (1/8) of its initial volume adiabatically. The ratio of its final pressure to the initial pressure is : (Given the ratio of the specific heats of the given gas to be 5/3)

A. 32

B. 40/3

C. 24/5

D. 8

Answer

12. A Carnot engine takes heat from a reservoir at 627° C and rejects heat to a sink at 27°C. Its efficiency will be

A. 3/5
B. 1/3
C. 2/3
D. 200/209

Answer

13. A tuning fork A produces 4 beats/s with another tuning fork B of frequency 320 Hz. On filing one of the prongs of A,4 beats/s are again heard when sounded with the same fork B. Then, the frequency of the fork A before filing is

A. 328 Hz
B. 316 Hz
C. 324 Hz
D. 320 Hz

Answer

14. When the length of the vibrating segment of a sonometer wire is increased by 1%, the percentage change in its frequency is

A. 100101
B. 99100
C. 1
D. 2

Answer

15. The sprinkling of water reduces slightly the temperature of a closed room because

A. temperature ofwater is less than that of the room
B. specific heat of water is high
C. water has large latent heat of vaporisation
D. water is a bad conductor of heat

Answer

16. The equation of a simple harmonic wave is given by y = 5 sin π2 100t - x, where x and y are in metre and time is in second. The period of the wave in second will be

A. 0.04
B. 0.01
C. 1
D. 5

Answer

17. The loudness and pitch of a sound note depends on

A. intensity and frequency
B. frequency and number of harmonics
C. intensity and velocity
D. frequency and velocity

Answer

18. A rectangular vessel when full of water, takes 10 min to be emptied through an orifice in its

bottom. How much time will it take to be emptied when half filled with water ?

A. 9 min

B. 7 min

C. 5 min

D. 3 min

Answer

19. If there were no gravity, which of the following will not be there for a fluid ?

A. Viscosity

B. Surface tension

C. Pressure

D. Archimedes' upward thrust

Answer

20. The term liquid crystal refers to a state that is intermediate between

A. crystalline solid and amorphous liquid

B. crystalline solid and vapour

C. amorphous liquid and its vapour

D. a crystal immersed in a liquid

Answer

21. A battery of emf 10 V and internal resistance 3 Ω is connected to a resistor. The current in the circuit is 0.5 A. The terminal voltage of the battery when the circuit is closed is

A. 10 V

B. 0 V

C. 1.5 V

D. 8.5 V

Answer

22. A galvanometer coil has a resistance of 15 Ω and gives full scale deflection for a current of 4 mA. To convertit to an ammeter of range 0 to 6 A

A. 10 m Ω resistance is to be connected in parallel to the galvanometer

B. 10 m Ω resistance is to be connected in series with the galvanometer

C. 0.1 Ω resistance is to be connected in parallel to the galvanometer

D. 0.1 Ω resistance is to be connected in series with the galvanometer

Answer

23. The electron dirft speed is small and the charge of the electron is also small but still, we obtain large current in a conductor. This is due to

A. the conducting property of the conductor

B. the resistance of the conductor is small

C. the electron number density of the conductor is small

D. the electron number density of the conductor is enormous

Answer

24. A straight wire of mass 200 g and length 1.5 m carries a current of 2 A. It is suspended in mid-air

by a uniform horizontal magnetic field B. The magnitude of B (in tesla) is (assume $g = 9.8\ ms^{-2}$)

A. 2

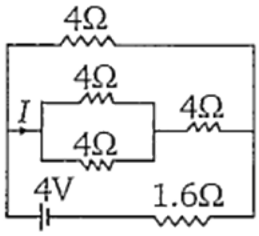
B. 1.5

C. 0.55

D. 0.65

Answer

25. In the circuit shown, the value of I in ampere is



A. 1

B. 0.60

C. 0.4

D. 1.5

Answer

26. A Gaussian sphere encloses an electric dipole within it. The total flux across the sphere is

A. zero

B. half that due to a single charge

C. double that due to a single charge

D. dependent on the position of the dipole

Answer

27. A parallel plate air capacitor has a capacitance C. When it is half filled with a dielectric of dielectric constant 5, the percentage increase in the capacitance will be

A. 400 %

B. 66.6 %

C. 33.3 %

D. 200 %

Answer

28. A comb run through one's dry hair attracts small bits of paper. This is due to

A. comb is a good conductor

B. paper is a good conductor

C. the atoms in the paper get polarised by the charged comb

D. the comb possesses magnetic properties

Answer

29. The top of the atmosphere is about 400 kV with respect to the surface of the earth, corresponding to an electric field that decreases with altitude. Near the surface of the earth, the

field is about 100 Vm^{-1}. Still, we do not get an electric shock as we step out of our house into the open house because (assume the house to be a steel cage so that there is no field inside)

A. there is a potential difference between our body and the ground

B. 100 Vm^{-1} is not a high electric field so that we do not feel the shock

C. our body and the ground forms an equipotential surface

D. the dry atmosphere is not a conductor

Answer

30. The specific charge of a proton is 9.6×10^7 C kg^{-1}. The specific charge of an alpha particle will be

A. 9.6×10^7 C kg^{-1}

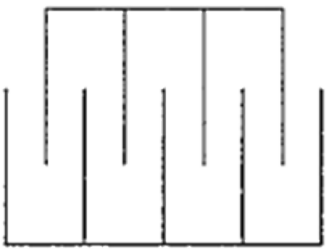
B. 19.2×10^7 C kg^{-1}

C. 4.8×10^7 C kg^{-1}

D. 2.4×10^7 C kg^{-1}

Answer

31. A gang capacitor is formed by interlocking a number of plates as shown in figure. The distance between the consecutive plates is 0.885 cm and the overlapping area of the plates is 5 cm. The capacity of the unit is



A. 1.06 pF

B. 4 pF

C. 6.36 pF

D. 12.72 pF

Answer

32. A 30 V, 90 W lamp is to be operated on a 120 V DC line. For proper glow, a resistor of ..... Ω should be connected in series with the lamp.

A. 40

B. 10

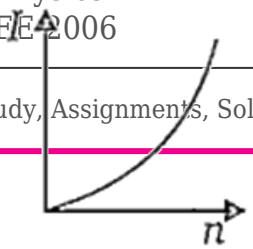
C. 20

D. 30

Answer

33. A battery consists of a variable number (n) of identical cells, each having an internal resistance r connected in series. The terminals of the battery are short-circuited. A graph of current (I) in the circuit versus the number of cells will be as shown in figure

A.



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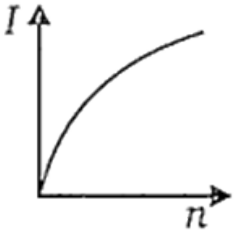

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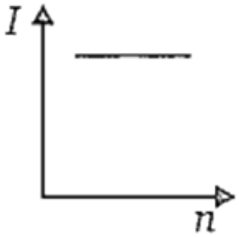
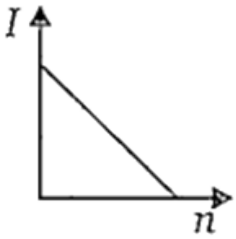


D.



Answer

34. In a LCR series circuit, the potential difference between the terminals of the inductance is 60 V between the terminals of the capacitor is 30 V and that across the resistance is 40 V. Then, supply voltage will be equal to

    A. 50 V

    B. 70 V

    C. 130 V

    D. 10 V

    Answer

35. When deuterium and helium are subjected to an accelerating field simultaneously then

    A. both acquire same energy

    B. deuterium accelerates faster

    C. helium accelerates faster

    D. neither of them is accelerated

    Answer

36. A solenoid 1.5 m long and 0.4 cm in diameter possesses 10 turns per cm length. A current of 5 A falls through it. The magnetic field at the axis inside the solenoid is

A. $2\pi \times 10^{-3}$ T

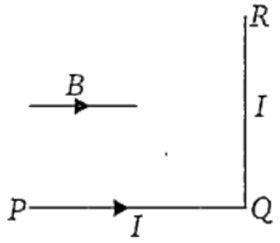
B. $2\pi \times 10^{-5}$ T

C. $4\pi \times 10^{-2}$ T

D. $4\pi \times 10^{-3}$ T

Answer

37. A wire PQR is bent as shown in figure and is placed in a region of uniform magnetic field B. The length of PQ = QR = l. A current I ampere flows through the wire as shown. The magnitude of the force on PQ and QR will be



A. BIl, 0

B. 2 BIl, 0

C. 0, BIl

D. 0,0

Answer

38. A choke is preferred to a resistance for limiting current in AC circuit because

A. choke is cheap

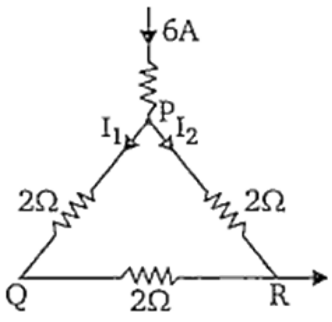
B. there is no wastage of power

C. choke is compact in size

D. choke is a good absorber of heat

Answer

39. A current of 6 A enters one corner P of an equilateral triangle PQR having 3 wires of resistances 2 Ω each and leaves by the comer R. Then the current I_1 and I_2 are



A. 2 A, 4 A

B. 4 A, 2 A

C. 1 A, 2 A

D. 2 A, 3 A

Answer

40. The twinkling effect of star light is due to

A. total internal reflection

B. high dense matter of star

C. constant burning of hydrogen in the star

D. the fluctuating apparent position of the star being slightly different from the actual position of the star

Answer

41. The width of the diffraction band varies

A. inversely as the wavelength

B. directly as the width of the slit

C. directly as the distance between the slit and the screen

D. inversely as the size of the source from which the slit is illuminated

Answer

42. An unpolarised beam of intensity I_0 is incident on a pair of nicols making an angle of 60° with each other. The intensity of light emerging from the pair is

A. I_0

B. $I_0/2$

C. $I_0/4$

D. $I_0/8$

Answer

43. A beam of light of wavelength 600 nm from a distant source falls on a single slit 1 mm wide and the resulting diffraction pattern is observed on a screen 2 m away. The distance between the first dark fringes on either side of the central bright fringe is

A. 1.2 cm

B. 1.2 mm

C. 2.4 cm

D. 2.4 mm

Answer

44. When light of wavelength 300 nm falls on a photoelectric emitter, photoelectrons are liberated. For another emitter, light of wavelength 600 nm is suffcient for liberating photoelectrons. The ratio of the work function of the two emitters is

A. 1 : 2

B. 2 : 1

C. 4 : 1

D. 1 : 4

Answer

45. White light is passed through a dilute solution of potassium permanganate. The specturm produced by the emergent light is

A. band emission spectrum

B. line emission spectrum

C. band absorption spectrum

D. line absorption spectrum

Answer

46. If λ_1 and λ_2 are the wavelengths of the first members of the Lyman and Paschen series respectively, then $\lambda_1 : \lambda_2$, is

A. 1 : 3

B. 1 : 30

C. 7 : 50

D. 7 : 108

Answer

47. Activity of a radioactive sample decreases to $(1/3)^{rd}$ of its original value in 3 days. Then,in 9 days its activity will become

A. (1/27) of the original value

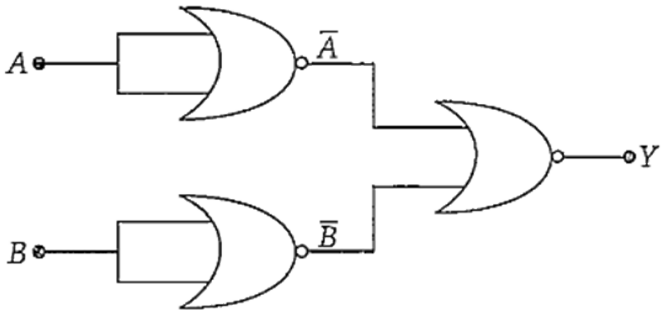
B. (1/9) of the original value

C. (1/18) of the original value

D. (1/3) of the original value

Answer

48. Identify the operation performed by the circuit given below



A. NOT

B. AND

C. OR

D. NAND

Answer

49. The working of which of the following is similar to that of a slide projector ?

A. Electron microscope

B. Scanning electron microsope

C. Transmission electron microscope

D. Atomic force microscope

Answer

50. In a transistor the collector current is always less than the emitter current because

A. collector side is reverse biased and the emitter side is forward biased

B. a few electrons are lost in the base and only remaining ones reach the collector

C. collector being reverse biased, attracts less electrons

D. collector side is forward biased and emitter side is reverse biased

Answer

51. A transparent cube of 0.21 m edge contains a small air bubble. Its apparent distance when viewed through one face of the cube is 0.10 m and when viewed from the opposite face is 0.04m. The actual distance of the bubble from the second face of the cube is

A. 0.06 m

B. 0.17 m

C. 0.05 m

D. 0.04 m

Answer

52. White light is incident on one of the refracting surfaces ofa prism ofangle 5°. Ifthe refractive indices for red and blue colours are 1.641 and 1.659 respectively, the angular separation between these two colours when they emerge out of the prism is

A. 0.9°

B. 0.09°

C. 1.8°

D. 1.2°

Answer

53. For a given lens, the magnification was found to be twice as large as when the object was 0.15 m distant from it as when the distance was 0.2 m. The focal length of the lens is

A. 1.5 m

B. 0.20 m

C. 0.10 m

D. 0.05 m

Answer

54. To a fish under water, viewing obliquely a fisherman standing on the bank of a lake, the man looks

A. taller than what he actually is

B. shorter that what he actually is

C. the same height as he actually is

D. depends on the obliquity

Answer

55. A thin prism P_1 with angle 4° made from a glass of refractive index 1.54 is combined with another thin prism P_2 made from glass of refractive index 1.72 to produce dispersion without deviation.The angle of the prism P_2 is

A. 5.33°

B. 4°
C. 3°
D. 2.6°

Answer

56. Specific rotation of sugare solution is 0.5 deg m^2/kg. 200 kgm^{-3} of impure sugar solution is taken in a sample polarimeter tube of length 20 cm and optical rotation is found to be 19°. The percentage of purity of sugar is

A. 20 %
B. 80 %
C. 95 %
D. 89 %

Answer

57. To a germanium crystal equal number of aluminium and indium atoms are added. Then

A. it remains an intrinsic semiconductor
B. it becomes a n-type semiconductor
C. it becomes a p-type semiconductor
D. it becomes an insulator

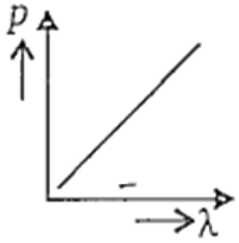
Answer

58. Maxium velocity of the photoelectrons emitted by a metal surface is 1.2 x 10^6 ms^{-1}. Assuming the specific charge of the electron to be 1.8 x 10^{11} C kg^{-1}, the value of the stopping potential in volt will be

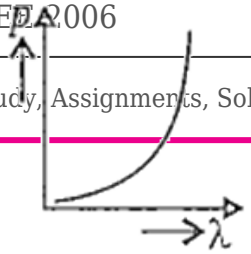
A. 2
B. 3
C. 4
D. 6

Answer

59. Which of the following figures represents the variation of particle momentum and associated de-Broglie wavelength ?



A.



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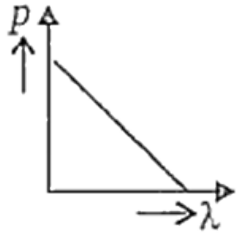

C.

D.

Answer

60. If r_1 and r_2 are the radii of the atomic nuclei of mass numbers 64 and 125 respectively, then the ratio (r_1/r_2) is

A. 64125

B. 64125

C. 54

D. 45

Answer