Studentpad

MHT-CET-XII PHYSICS 2022-23

Time : 150 Min	Phy : Full Portion Paper	Marks : 50

01) From the top of a tower of height 40 m, a ball is projected upwards with a speed of 20 m/s at an angle of elevation of 30^0. Then what is the ratio of the total time taken by the ball to hit the ground to its time f fight? (Take g = 10 m/s^2)
A) 3:2
B) 4:1
C) 3:1
D) 2:1

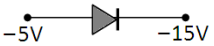
02) A beam of light consisting of two wavelengths 650 nm and 520 nm is used to illuminate the slit of a Young's double slit experiment, then the order of the bright fringe of the longer wavelength that coincide with a bright fringe of the shorter wavelength at a least distance from the central maximum is
A) 4
B) 3
C) 2
D) 1

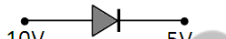
03) A body cools at the rate of $0.6^0C/s$, when it is 40^0C above surrounding. What will be its rate of cooling, when it is 20^0C above the same surroundings?
A) $0.2^0C/s$
B) $0.4^0C/s$
C) $0.15^0C/s$
D) $0.3^0C/s$

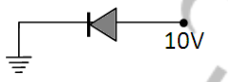
04) What must be the size of objective in compound microscope?
A) Equal to eyepiece
B) Smaller than eyepiece
C) Larger than eyepiece
D) May small or large than eyepiece

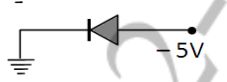
05) Force experienced by charge particle in magnetic field will be ___
A) lorentz's force
B) fleming's force
C) faraday's force
D) oersted's force

06) A closely wound coil of 100 turns and area of cross-section $1\,cm^2$ has a coefficient of self-induction 1 mH. The magnetic induction in the center of the core of the coil when a current of 2 A flows in it, will be
A) $1\,Wb\,m^{-2}$
B) $0.8\,Wb\,m^{-2}$
C) $0.4\,Wb\,m^{-2}$
D) $0.022\,Wbm^{-2}$

07) Which of the following semi-conductor diodes is reverse biased?
A) 

B) 

C) 

D) 

08) An electron (mass = 9.1×10^{-31} kg; charge $=1.6\times10^{-19}$ C) experiences no deflection if subjected to an electric field of 3.2×10^5 V/m, and a magnetic fields of 2.0×10^{-3} Wb/m^2. Both the fields are normal to the path of electron and to each other. If the electric field is removed, then the electron will revolve in an orbit of radius
A) 0.045 m
B) 0.45 m
C) 4.5 m
D) 45 m

09) In a hydrogen atom, the total energy of an electron in a given orbit is -1.5 eV. What is the potential energy in the same orbit?
A) 1.5 eV
B) 3.0 eV
C) -1.5 eV
D) -3.0 eV

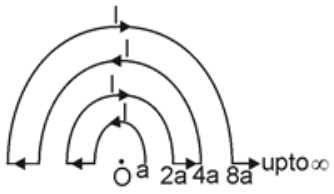
10) A fish in water and a bird in air appears to be at 30 cm from the surface. Find the true distance of the bird from the surface if R.I. of water is 4/3.
A) 40 cm
B) 22.5 cm
C) 30 cm
D) 50 cm

11) The radius of hydrogen atom in its ground state is 5.3×10^{-11} m. After collision with an electron it is found to have a radius of 21.2×10^{-11} m. What is the principal quantum number n of the final state of an atom?
A) n = 2
B) n = 3
C) n = 4
D) n = 16

12) Rest mass energy of an electron is 0.51 M eV. If this electron is moving with a velocity 0.8 c (where

c is velocity of light in vacuum), then kinetic energy of the electron should be.
A) 0.46 MeV
B) 0.39 MeV
C) 0.34 MeV
D) 0.28 MeV

13) A conductor is bent in the form of concentric semicircles as shown in the figure. What is the magnetic field at the point O?

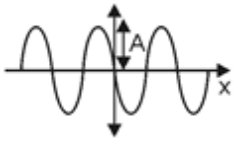


A) $\frac{\mu_0 I}{a}$
B) $\frac{\mu_0 I}{6a}$
C) $\frac{\mu_0 I}{4a}$
D) zero

14) The length of a wire of a potentiometer is 100 cm, and the e. m. f. of its standard cell is E volt. It is employed to measure the e. m. f of a battery whose internal resistance is $0.5\,\Omega$. If the balance point is obtained at l = 30 cm from the positive end, the e. m. f. of the battery is (where i is the current in the potentiometer)
A) $\frac{30(E-0.5i)}{100}$
B) $\frac{30E}{(100-0.5)}$
C) $\frac{30E}{100.5}$
D) $\frac{30E}{100}$

15) A particle moves with constant angular velocity in circular path of certain radius and is acted upon by a certain centripetal force F. If the angular velocity is doubled, keeping radius the same, the new force will be
A) F/2
B) 2F
C) 4F
D) F^2

16) A progressive wave travelling along the positive x-direction is represented by $y(x,t) = A\sin(kx - \theta t + \phi)$. Its sanpshot at $t = 0$ is given in the figure.



For this wave, what is the phase ϕ?
A) $\frac{\pi}{2}$
B) π
C) 0
D) $-\frac{\pi}{2}$

17) The electrons are emitted in the photoelectric effect from a metal surface
A) with a maximum velocity proportional to the frequency of the incident radiation
B) at a rate that is independent of the nature of the metal
C) only if the temperature of the surface is high
D) only if the frequency of the incident radiation is above a certain threshold value

18) What is the shape of liquid meniscus in a capillary tube dipped in mercury?
A) Convex upward
B) Concave upward
C) Plane
D) Neither convex nor concave

19) 27 drops of same size are charged at 200 V each. They coalesce to form a bigger drop. What will be the ratio capacity of bigger drop to a small drop?
A) 1 : 3
B) 3 : 1
C) 27 : 1
D) 1 : 27

20) The frequencies of two sound sources are 256 Hz and 260 Hz. At t = 0, the intensity of sound is maximum. Then the phase difference at the time t = 1/16 s will be
A) $\pi/4$
B) $\pi/2$
C) π
D) Zero

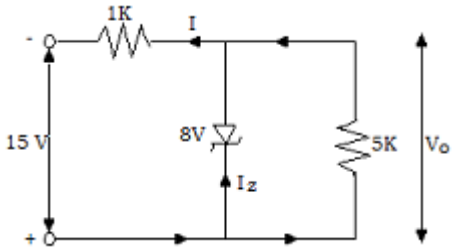
21) Two identical rings P and Q of radius 0.1 m are mounted co-axially at a distance of 0.5 m apart. The charges on two rings are $2\,\mu C$ and $4\,\mu C$ respectively. How much work is done in transferring a charge of $5\,\mu C$ from the centre of P to that of Q?
A) 2 J
B) 0.72 J
C) 1.44 J
D) 1.28 J

22) A large horizontal surface moves up and down in S. H. M. with an amplitude of 1 cm. If a mass of 10 kg (which is placed on the surface) is to remain continually in contact with it, the maximum frequency of S. H. M. will be
A) 10 Hz
B) 5 Hz
C) 1.5 Hz
D) 0.5 Hz

23) In steady state, quantity of heat conducted through solid is proportional to ___
A) volume
B) density
C) length
D) cross sectional area

24) Three liquids of densities d, 2d and 3d are mixed in equal proportions of weights. The relative density of the mixture is
A) $\frac{23d}{18}$
B) $\frac{18d}{11}$
C) $\frac{13d}{9}$
D) $\frac{11d}{7}$

25) Find the value of the output vol-tage V_0 in the following ze-ner circuit.



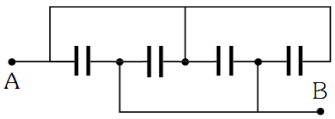
A) 23 V
B) 15 V
C) 8 V
D) 7 V

26) The orbital angular momentum of a satellite revolving at a distance r from the centre is L. If the distance is increased to 16r, then the new angular momentum will be
A) $\frac{L}{4}$
B) 4 L
C) 16 L
D) 64 L

27) A ray of light is incident normally on a plane mirror. What will be the angle of reflection?
A) 0^0
B) 180^0
C) 90^0
D) none of the above

28) The phase (at a time t) of a particle in simple harmonic motion tells
A) only the direction of motion of the particle at time t.
B) only the position of the particle at time t.
C) neither the position of the particle nor its direction of motion at time t.
D) both the position and direction of motion of the particle at time t.

29) Four condensers are joined as shown in the figure below. The capacity of each is $8\,\mu F$. The equivalent capacity between the points A and B will be



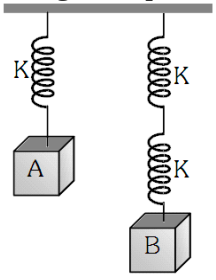
A) $2\,\mu F$
B) $8\,\mu F$
C) $16\,\mu F$
D) $32\,\mu F$

30) Atomic power station at Tarapore has a generating capacity of 200 MW. The energy generated in a day by this station is
A) 1728×10^{10} J
B) 4800×10^{6} J
C) 200 J
D) 200 MW

31) An alternating voltage is represented as $E = 20 \sin 300\,t$. The average value of voltage over one cycle will be
A) $\frac{20}{\sqrt{2}}$ volt
B) $20\sqrt{2}$ volt
C) 10 volt
D) Zero

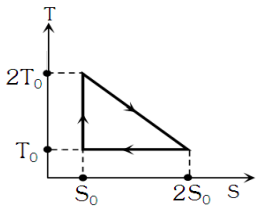
32) The magnetic field due to a current carrying circular loop of radius 3 cm at a point on the axis at a distance of 4 cm from the centre is $54\mu T$. Its value at the centre of the loop will be
A) $75\mu T$
B) $150\mu T$
C) $125\mu T$
D) $250\mu T$

33) The springs shown are identical. When A=4 kg, the elongation of spring is 1 cm. If B=6 kg, the elongation produced by it is



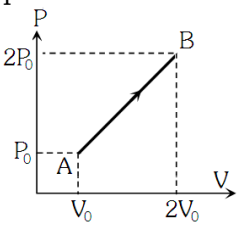
A) 1 cm
B) 2 cm
C) 3 cm
D) 4 cm

34) The temperature - entropy diagram of a reversible engine cycle is given in the figure below. Its efficiency is



A) 1 / 4
B) 1 / 2
C) 2 / 3
D) 1 / 3

35) The P-V diagram of 2 gm of helium gas for a certain process $A \rightarrow B$ is shown in the figure. what is the heat given to the gas during the process $A \rightarrow B$?



A) $2P_oV_o$
B) $4.5P_oV_o$
C) $6P_oV_o$
D) $4P_oV_o$

36) A 50 ohm galvanometer gets full scale deflection when a current of 0.01 A pass through the coil. When it is converted to a 10 A ammeter, what is the shunt resistance?
A) $0.05\,\Omega$
B) $0.01\,\Omega$
C) $2000\,\Omega$
D) $5000\,\Omega$

37) A coil having n turns and resistance $R\ \Omega$ is connected with a galvanometer of resistance $4R\,\Omega$. This combination is moved in time t seconds from a magnetic field W_1 weber to W_2 weber. The induced current in the circuit is

A) $-\frac{n(W_2 - W_1)}{Rt}$

B) $-\frac{(W_2 - W_1)}{Rnt}$

C) $-\frac{n(W_2 - W_1)}{5Rt}$

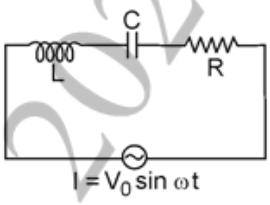
D) $-\frac{W_2 - W_1}{5Rnt}$

38) Choose the correct option: A body is rolling down an inclined plane. If the rotational K.E. of the body is 40% of its translational K.E., then the body is
A) solid sphere
B) ring
C) hollow sphere
D) cylinder

39) Which of the following processes depends on gravity?
A) Radiation
B) Conduction
C) Convection
D) All the above

40) A bullet of mass 2 gm is having a charge of $2\mu C$. Through what potential difference must it be accelerated, starting from rest, to acquire a speed of 10 m/s?
A) 5 V
B) 50 V
C) 5 kV
D) 50 kV

41) For the LCR circuit shown below, the current is observed to lead the applied voltage. An additional capacitore C', when joined with the capacitor C present in the circuit, makes the power factor of the circuit unity. How the capacitor C' must have been connected?



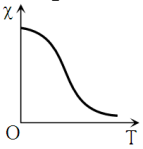
A) In series with C and has a magnitude $\frac{C}{\left(\omega^2 LC - 1\right)}$
B) In series with C and has a magnitude $\frac{\left(1 - \omega^2 LC\right)}{\omega^2 L}$
C) In parallel with C and has a magnitude $\frac{C}{\left(\omega^2 LC - 1\right)}$
D) In parallel with C and has a magnitude $\frac{\left(1 - \omega^2 LC\right)}{\omega^2 L}$

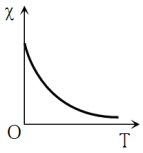
42) Tuning fork F_1 has a frequency of 256 Hz and it is observed to produce 6 beats/second with another tuning fork F_2. When F_2 is loaded with wax, it still produces 6 beats/second with F_1. The frequency of F_2 before loading was
A) 262 Hz
B) 259 Hz
C) 253 Hz
D) 250 Hz

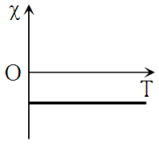
43) A column of air and a tuning fork produce 4 beats per second when sounded together. The tuning fork gives the lower note. The temperature of air is 15^0C. When the temperature falls to 10^0C, the two produce 3 beats per second. Find the frequency of the fork

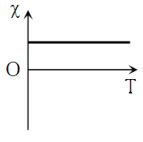
A) 110 Hz
B) 210 Hz
C) 113 Hz
D) 112 Hz

44) The variation of magnetic susceptibility (χ) with temperature for a diamagnetic substance is best represented by

A) 

B) 

C) 

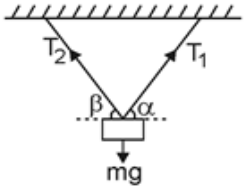
D) 

45) The volume of air increases by 5% in its adiabatic expansion, then the percentage decrease in its pressure will be
A) 8%
B) 7%
C) 6%
D) 5%

46) The temperature of the mixture of one mole of helium and one mole of hydrogen is increased from $0^{o}C$ to $100^{o}C$ at constant pressure. The amount of heat delivered will be
A) 3600 cal
B) 1800 cal
C) 1200 cal
D) 600 cal

47) A gas is enclosed in a closed pot. By keeping this pot in a train moving with high speed, the temperature of the gas
A) will increase.
B) will remain the same.
C) will decrease.
D) will change according to the nature of the gas.

48) A body of mass m is suspended by two strings making angles α and β with the horizontal. What are the tensions in the two strings?



A) $T_1 = \dfrac{mg\sin\beta}{\sin(\alpha+\beta)} = T_2$

B) $T_1 = \dfrac{mg\cos\beta}{\sin(\alpha+\beta)}, T_2 = \dfrac{mg\cos\alpha}{\sin(\alpha+\beta)}$

C) $T_1 = \dfrac{mg\cos\beta}{\sin(\alpha+\beta)} = T_2$

D) None of these

49) A body having M.I. of $5\ kg\ m^2$ about its axis of rotation is rotating with angular velocity of $6\ rad/s$. Identify the speed of rotating body, whose kinetic energy is the same as that of a body of mass $5kg$.
A) 6 m/s
B) 8 m/s
C) 2 m/s
D) 4 m/s

50) In P-N junction, avalanche current flows in circuit when biasing is
A) reverse.
B) forward.
C) zero.
D) excess.