PHYSICS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

MOCK TEST 4

Mcqs

1. Excess of pressure inside a soap bubble is

A. inversely proportional to its radius

B. directly proportional to its radius

C. directly proportional to square root of its radius

D. independent of its radius

Answer: A

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2. Point A and B are situated along the extended axis of $2cm$ long bar magnet at a distance x and $2xcm$ respectively. From the pole nearer to the points, the ratio of the magnetic field at A and B will be

A. $4:1$ exactly

B. $4:1$ approximately

C. $8:1$ exactly

D. $8:1$ approximately

Answer: D

3. A particle of mass m is moving in a circular path of constant radius r such that its centripetal acceleration a_c is varying with time t as $a_c = k^2 r t^2$, where k is a constant. The power delivered to the particle by the forces acting on it is :

A. $2\pi m k^2 r^2 t$

B. $m k^2 r^2 t$

C. $\dfrac{\left(m k^4 r^2 t^5\right)}{3}$

D. zero

Answer: B

4. One end of uniform wire of length L and of weight W is attached rigidly to a point in the roof and a weight W_1 is suspended from its lower end. If s is the area of cross section of the wire, the stress in the wire at a height ($3L/4$) from its lower end is

A. $\dfrac{w_1}{S}$

B. $\left(w_1 + \dfrac{w}{4}\right)S$

C. $\left(w_1 + \dfrac{3w}{4}\right)S$

D. $(w_1 + w)/S$

Answer: C

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5. In the relation, $P = \dfrac{\alpha}{\beta}e^{\frac{\alpha Z}{k\theta}}$ P is pressure, Z is

distance, k is Boltzmann constant and θ is the

temperature. The dimensional formula of β will be-

A. $\left[M^0 L^2 T^0\right]$

B. $\left[ML^2 T\right]$

C. $\left[ML^0 T^{-1}\right]$

D. $\left[ML^2 T^{-1}\right]$

Answer: A

6. A particle executes SHM with an amplitude of $10cm$ and frequency $2Hz$. At $t = 0$, the particle is at a point where potential energy and kinetic energy are same. The equation for its displacement is

A. $0.1\sin\left(4\pi t + \dfrac{\pi}{4}\right)$

B. $0.1\sin 4\pi t$

C. $0.1\cos\left(4\pi t + \dfrac{\pi}{4}\right)$

D. none of these

Answer: A

7. The wave travels along a string whose

equation is $y = \dfrac{p^3}{p^2 + (px - qt)^2}$, where p = 2

unit and q = 0.5 units.

Find the direction of propagation of wave.

A. along+Y-axis

B. along-X-axis

C. along+X-axis

D. none of these

Answer: C

8. A glass slab $(\mu = 1.5)$ of thickness 6 cm is placed over a paper. What is the shift in the letters?

    A. 4 cm

    B. 2 cm

    C. 1 cm

    D. none of these

Answer: B

9. Image of an object approaching a convex mirror of radius of curvature 20m slong its optical axis is observed to move from $\frac{25}{3}$m to $\frac{50}{7}$m in 30 seconds. What is the speed of the object in km per hour?

A. 3

B. 4

C. 5

D. 6

Answer: A

10. At what angle must the two forces $(x + y)$

and $(x - y)$ act so that the resultant may be

$\sqrt{(x^2 + y^2)}$:-

A. $\cos^{-1}\left[-\dfrac{(x^2 + y^2)}{2(x^2 - y^2)} \right]$

B. $\cos^{-1}\left[\dfrac{-2(x^2 - y^2)}{(x^2 + y^2)}\right]$

C. $\cos^{-1}\left[-\dfrac{(x^2 + y^2)}{(x^2 - y^2)}\right]$

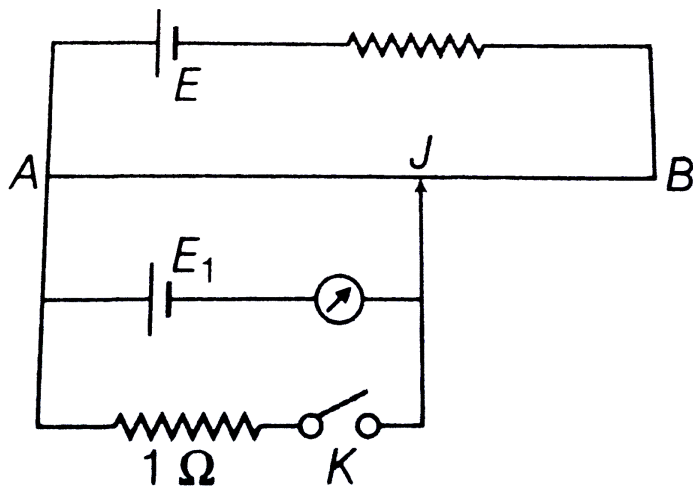D. $\cos^{-1}\left[-\dfrac{(x^2 - y^2)}{(x^2 + y^2)}\right]$

Answer: A

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11. In the givenn figure AB is a potentiometer wire of length 10 m and resistance 1Ω with key K open the balancing length is 5.5 m. however

on closing key K the balancing length reduces

to 5m. The initial resistance of the cell E_1 is

A. 0.01Ω

B. 0.1Ω

C. 0.2Ω

D. 1Ω

Answer: B

12. At a given place where acceleration due to gravity is $g\ m/\sec^2$, a sphere of lead of density $d\ kg/m^3$ is gently released in a column of liquid of density $'\rho'kg/m^3$. If $d > \rho$, the sphere will

A. fall vertically with an acceleration gms^{-2}

B. fall vertically with no acceleration

C. fall vertically with an acceleration $g\left(\dfrac{d-\rho}{d}\right)$

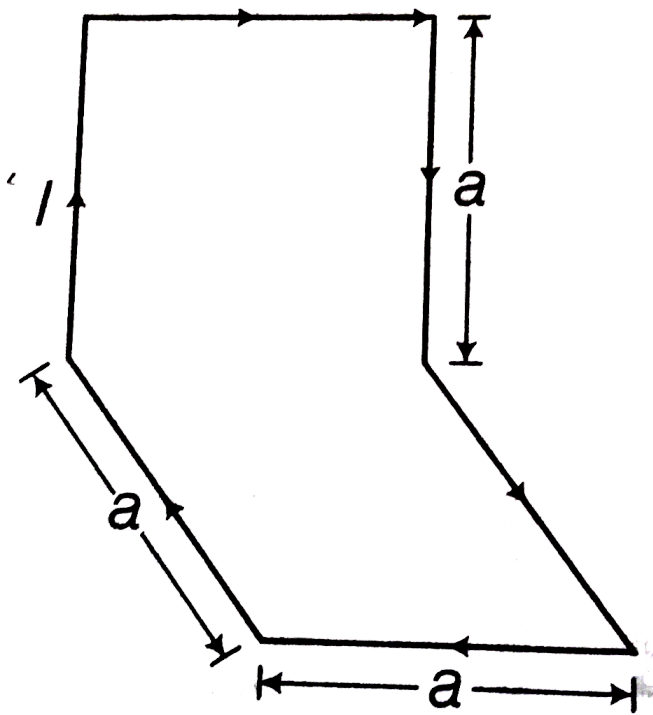D. fall vertically with an acceleration $g\left(\dfrac{\rho}{d}\right)$

Answer: C

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13. The magnitude off magnetic moment of the current loop in the figure is

A. la^1

B. $\sqrt{2}la^2$

C. zero

D. none of these

Answer: B

14. The 90 pF capacitor is connected to a 12 V battery. How many electrons a transferred from one plate to another?

    A. 1.1×10^9

    B. 6.9×10^9

    C. 4×10^{19}

    D. 5×10^{19}

Answer: B

15. Let E_k and E_p represent kinetic energy and potential energy respectively of the electron in a hydrogen atom. If the electron transits from the orbit n=2 to the orbit n=1 and the value of kinetic energy is $E_k{}'$ and that of potential energy is $E_p{}'$, then

A. $E_k{}' = \dfrac{E_k}{2}, E_p{}' = 2E_p$

B. $E_k' = 4E_k$, $E_p' = \dfrac{E_p}{4}$

C. $E_k' = 2E_k$, $E_p' = \dfrac{E_p}{2}$

D. $E_k' = \dfrac{E_k}{4}$, $E_p' = 4E_p$

Answer: B

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16. Light of wavelength λ is incident on a slit of width d. the resulting diffraction pattern is observed on a screen at a distance D. the

linear width of the principal maximum is, then

equal to the width of the slit if D equals

A. $\dfrac{d}{\lambda}$

B. $\dfrac{2\lambda}{d}$

C. $\dfrac{d^2}{2\lambda}$

D. $\dfrac{2\lambda^2}{d}$

Answer: C

17. Four molecules of ags have speeds 1,2,3 and 4 km/s.The volue of the root mean square speed of the gas molecules is

A. $\frac{1}{2}\sqrt{15}kms^{-1}$

B. $\frac{1}{2}\sqrt{10}kms^{-1}$

C. $2.5kms^{-1}$

D. $\sqrt{\left(\frac{15}{2}\right)}kms^{-1}$

Answer: D

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18. An elastic string of length 2 m is fixed at its end. The string starts to vibrate in third overtone with a frequency 1200 Hz. The ratio of frequency of lower overtone and fundamental is

   A. 1

   B. 2

   C. 3

   D. 4

Answer: B

19. A spring of force constant k is cut into two pieces such that one piece is double the length of the other. Then the long piece will have a force constant of:

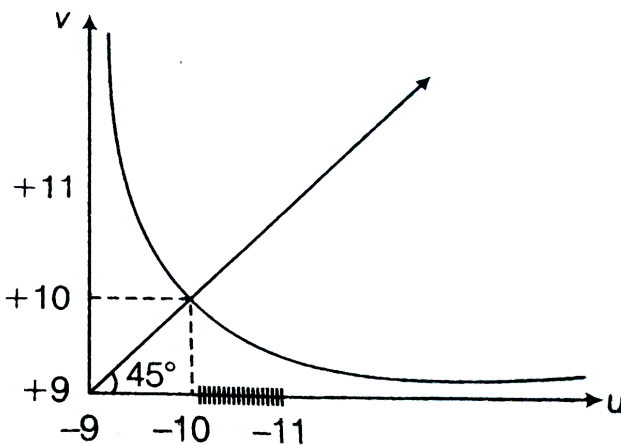A. $\dfrac{2}{3}k$

B. $\dfrac{3}{2}k$

C. $3k$

D. 6k

Answer: B

20. The graph between objecct distance u and image distance v for lens is givenn beow. The focal length of the lens is

A. 5 ± 0.1

B. 5 ± 0.05

C. 0.5 ± 0.1

D. 0.5 ± 0.05

Answer: B

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21. A particle moves in the xy plane under the influence of a force such that its linear momentum is

$$\vec{P}(t) = A\left[\hat{i}\cos(kt) - \hat{j}\sin(kt)\right], \quad \text{where} \quad A$$

and k are constants. The angle between the force and momentum is
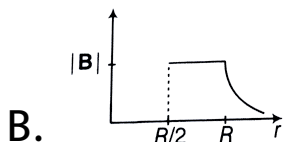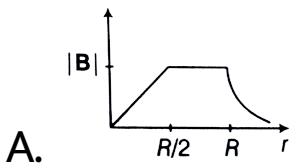
A. $0°$

B. $30°$

C. $45°$

D. $90°$
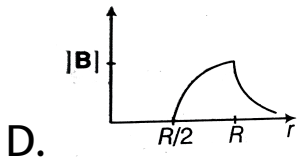
Answer: D

22. An infinitely long hollow conducting cylinder with inner radius $\dfrac{r}{2}$ and outer radius R carries a uniform current ra density along its length . The magnitude of the magnetic field , $\left|\overrightarrow{B}\right|$ as a function of the radial distance r from the axis is best represented by

A.

B.

C.

D.
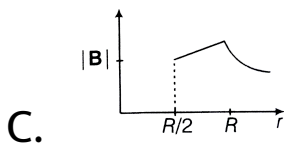
Answer: D

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23. The gravitational force between two objects is proportional to $1/R$ (and not as $1/R^2$) where R is separation between them, then a particle in circular orbit under such a force would have its orbital speed v proportional to

A. $\dfrac{1}{R^2}$

B. R^0

C. R^1

D. $\dfrac{1}{R}$

Answer: B

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24. A steel wire of length 20 cm and uniform cross-section $1mm^2$ is tied rigidly at both the ends. If the temperature of the wire is altered

from $40°C$ to $20°C$, the change in tension.

[Given coefficient of linear expansion of steel is $1.1 \times 10^5.°C^{-1}$ and Young's modulus for steel is $2.0 \times 10^{11} Nm^{-2}$]

A. $2.2 \times 10^6 N$

B. $16N$

C. 8N

D. 44N

Answer: D

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25. If a string is stretched with a weight 4 kg then the fundamental frequency is equal to 256 Hz. What weight is needed to produce its octave?

A. 4 kg-wt
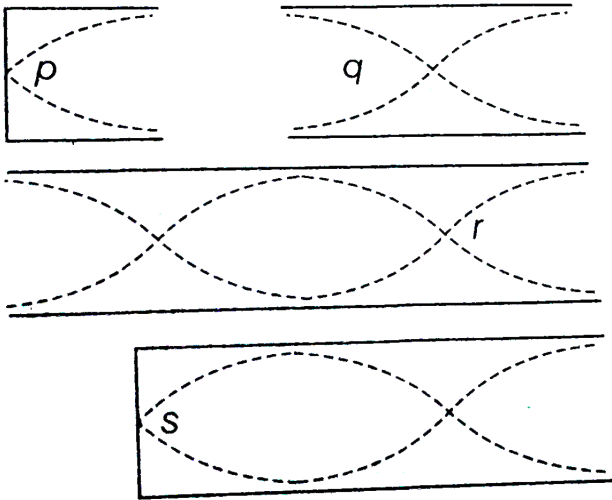
B. 12 kg-wt

C. 16 kt-wt

D. 24 kg-wt

Answer: C

26. Figures shows the vibrations of four air column. The ratio of frequencies $n_p : n_q : n_r : n_s$ is

A. $12 : 6 : 3 : 4$

B. $1:2:4:3$

C. $4:2:3:1$

D. $4:3:2:1$

Answer: B

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27. During an isothermal expansion of an ideal gas

A. its internal energy decreases

B. its internal energy does not change

C. the work done by the gas is equal to the

quantity of heat absorbed by it

D. both b. and (c) are correct.

Answer: D

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28. When unpolarised light is incident on a

plane glass plate at Brewster's angle, then

which of the following statements is correct?

A. Reflected and refracted rays are completely polarised with their planes of polarisation parallel to each other

B. Reflected and refracted rays are completely polarised with their planes of polarisation perpendicular to each other

C. The reflected light is plane polarised but transmitted light is partially polarised annd are perpendicular to each other

D. the reflected light is partially polarised

but refracted light is plane polarised.

Answer: C

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29. A particle of mass 4m at rest decays into

two particles of masses m and 3m having non-

zero velocities. The ratio of the de Broglie

wavelengths of the particles 1 and 2 is

A. $\dfrac{m_1}{m_2}$

B. $\dfrac{m_2}{m_1}$

C. 1

D. $\dfrac{\sqrt{m_2}}{\sqrt{m_1}}$

Answer: C

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30. What is the electric potential at a point distance 100 cm from the centre of an electric

dipole of moment $2 \times 10^{-4}C - m$ on a line

laking an angle of $60°$?

A. $7 \times 10^5 V$

B. $8 \times 10^5 V$

C. $9 \times 10^5 V$

D. $10 \times 10^5 V$

Answer: C

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31. A charged particle of mass m and charge q is accelerated through a potential difference of V volts. It enters a region of uniform magnetic field which is directed perpendicular to the direction of motion of the particle. Find the radius of circular path moved by the particle in magnetic field.

A. $\sqrt{\left(\dfrac{Vm}{qB^2}\right)}$

B. $\dfrac{2Vm}{qB^2}$

C. $\sqrt{2qV_m}\left(\dfrac{1}{B}\right)$

D. $\sqrt{\left(\dfrac{Vm}{q}\right)\left(\dfrac{1}{B}\right)}$

Answer: C

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32. A charge Q is uniformly distributed over the surface of two conducting concentric spheres of radii R and r (Rgtr). Then, potential at common centre of these spheres is

A. $\dfrac{kQ(R+r)}{Rr}$

B. $\dfrac{kQ(R + r)}{(R^2 + r^2)}$

C. $\dfrac{kQ}{\sqrt{R^2 + r^2}}$

D. $kQ\left(\dfrac{1}{R} - \dfrac{1}{r}\right)$

Answer: B

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33. The axes of the polariser and analyser are inclined to each other at $60°$. If the amplitude of polarised light emergent through analyser

is A. The amplitude of unpolarised light incident polariser is

A. $\dfrac{a}{2}$

B. $\dfrac{a}{\sqrt{2}}$

C. $\left(\dfrac{\sqrt{\sqrt{3}}}{2}\right)a$

D. $\left(\dfrac{3}{4}\right)a$

Answer: A

34. A car is fitted with a convex side-view mirror of focal length 20 cm. A second car 2.8m behind the first car is overtaking the first car at a relative speed of 15 $\frac{m}{s}$. The speed of the image of the second car as seen in the mrror of the first one is:

A. $\dfrac{1}{15}$ m/s

B. 10 m/s

C. 15 m/s

D. $\dfrac{1}{10}$ m/s

Answer: A

35. A closed organ pipe and an open organ pipe of same length produce 4 beats when they are set into vibrations simultaneously. If the length of each of them were twice their initial lengths, the number of beats produced will be

A. 2

B. 4

C. 1

D. 8

Answer: A

36. A metal bar of length L and area of cross-section A is clamped between two rigid supports. For the material of the rod. It Young's modulus is Y and Coefficient if linear

expansion is α. If the temperature of the rod is increased by $\Delta t^\circ C$, the force exerted by the rod on the supports is

A. Y A α t

B. Y A L t

C. Y A α L t

D. T α L t/A

Answer: A

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37. If M be the mass of the earth, R its radius (assumed spherical) and G gravitational constant, then the amount of work that must be done on a body of mass m, so that it completely escapes from the gravity of the earth of the earth is given by

A. $\dfrac{GmM}{R}$

B. $\dfrac{GmM}{2R}$

C. $\dfrac{3GmM}{2R}$

D. $\dfrac{4GmM}{3R}$

38. The needle of a deflection galvanometer shows a deflection of $60°$ due to a short bar magnet at a certain distance in tan A position. If the distance is doubled, the deflection is

A. $\sin^{-1}\left[\dfrac{\sqrt{3}}{2}\right]$

B. $\cos^{-1}\left[\dfrac{\sqrt{3}}{8}\right]$

C. $\tan^{-1}\left[\dfrac{\sqrt{3}}{8}\right]$

D. $\cot^{-1}\left[\dfrac{\sqrt{3}}{8}\right]$

Answer: C

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39. Two bodies A and B initially at rest are attrached towards each other due to gravitation. Given that A is much heavier than B. Which of the followings correctly describes

the relative motion of the centre of mass of the bodies ?

A. It moves towards A

B. It moves towards B

C. It moves perpendicular to the line joining the particles

D. It remains at rest w.r.t A as well as B.

Answer: D

40. In an ac circuit $l = 100 \sin 200\pi t$. The time required for the current to achieve its peak value will be

A. $\dfrac{1}{300} s$
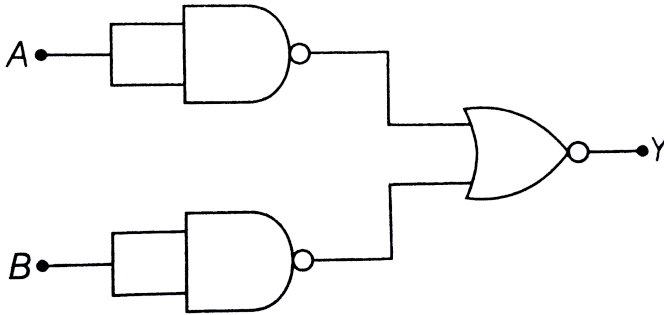
B. $\dfrac{1}{400} s$

C. $\dfrac{1}{100} s$

D. $\dfrac{1}{200} s$

Answer: B

41. The combination of the gates shown in the figure results in

A. OR gate

B. AND gate

C. NOR gate

D. XOR gate

Answer: B

42. Huygen's principle of secondary waves

    A. allows us to find the focal length of a

       thick lens

    B. is a geometrical method to find a

       wavelength

    C. is used to determine the velocity of light

    D. is used to explain polarisation

Answer: B

43. A modulated carrier wave has maximum and minimum amplitudes of 800 m v and 200 m V. What is the percentage modulation?

A. 0.2

B. 0.8

C. 1

D. 1.25

Answer: B

44. A positively charged ball hangs from a long silk thread. Electric filed at a certain point (at the same horizontal level of ball) due to this charge is E. Let us put a positive test charge q_0 at this point and measure F/q_0 on this charges. then E

A. $> \dfrac{F}{q_0}$

B. $= \dfrac{F}{q_0}$

C. $< \dfrac{F}{q_0}$

D. none of these

Answer: A

45. A frame made of metalic wire enclosing a surface area A is covered with a soap film. If the area of the frame of metallic wire is

reduced by 50% the energy of the soap film will be changed by:

A. 1

B. 0.75

C. 0.5

D. 0.25

Answer: C