PHYSICS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

MHTCET 2018

Physics

1. The path length of oscillation of simple pendulum of length 1 m is 16 cm. Its maximum velocity is (take, $g = \pi^2 m/s^2$)

A. $2\pi\, cm/s$

B. $4\pi\, cm/s$

C. $8\pi\, cm/s$

D. $16\pi\, cm/s$

Answer: C

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2. A vessel completely filled with water has holes 'A' and 'B' at depths 'h' and '2h' from the top, respectivel. Hole 'A' is a square of side 'L' and 'B' is circle of radish 'r' The water flowing out per second from both the holes is same Then, 'L'is equal to

A. $r^{\frac{1}{2}}(\pi)^{\frac{1}{2}}(3)^{\frac{1}{2}}$

B. $r \cdot (\pi)^{\frac{1}{4}}(3)^{\frac{1}{4}}$

C. $r \cdot (\pi)^{\frac{1}{2}}(3)^{\frac{1}{4}}$

D. $r^{\frac{1}{2}}(\pi)^{\frac{1}{3}}(3)^{\frac{1}{2}}$

Answer: C

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3. A transistor is used as a common emitter amplifier with load resistance $2k\Omega$. The changed by $20\mu A$ which results in a change in collector current by 1.5 mA. The voltage gain of the amplifier is

A. 900

B. 1000

C. 1100

D. 1200

Answer: B

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4. A disc has mass 'M' and radius 'R'. How much tangential force should be applied to the rim of the disc, so as to rotate with angular velocity $'\omega'$ in time 't' ?

A. $\dfrac{MR\omega}{4t}$

B. $\dfrac{MR\omega}{2t}$

C. $\dfrac{MR\omega}{t}$

D. $MR\omega t$

Answer: B

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5. A circular coil of radius R carries a current i. The magnetic field at its centre is B. The distance from the centre on the axis of the coil where the magnetic field will be $B/8$ is

A. $R\sqrt{2}$

B. $R\sqrt{3}$

C. $2R$

D. $3R$

Answer: B

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6. Two periodic waves of intensities I_1 and I_2 pass through a region at the same time in the same direction. The sum of the maximum and minimum intensities is:

A. $(l_1 + l_2)$

B. $2(l_1 + l_2)$

C. $\left(\sqrt{l_1} + \sqrt{l_2} \right)$

D. $\left(\sqrt{l_1} - \sqrt{l_2} \right)$

Answer: B

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7. An alternating voltage $E = 200\sqrt{2}\sin(100t)$ is connected to a 1 microfarad capacitor through an AC ammeter. The reading of the ammeter shall be

A. 5 mA

B. 10 mA

C. 15 mA

D. 20 mA

Answer: D

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8. In the following network, the current flowing through

15Ω resistance is

   A. 0.8 A

   B. 1.0 A

   C. 1.2 A

   D. 1.4 A

Answer: C

9. The angle made by incident ray of light with the reflecting surface is called

    A. glancing angle

    B. angle of incidence

    C. angle of deviation

    D. angle of refraction

Answer: A

10. In a non - uniform circular motaion the ratio of tangential to radial acceleration is (where, r= radius of circle, v= speed of the particle, $\alpha =$ angular acceleration)

A. $\dfrac{\alpha^2 r^2}{v}$

B. $\dfrac{\alpha^2 r}{v^2}$

C. $\dfrac{\alpha r^2}{v^2}$

D. $\dfrac{v^2}{r^2 \alpha}$

Answer: C

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11. If numerical aperture of a microscope is increased, then its

    A. resolving power remanis constant

    B. resolving power becomes zero

    C. limit of resolution is decreased

    D. limit of resolution is increased

Answer: C

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12. In amplitude modulation

A. amplitude remains constant but frequency changes

B. both amplitude and frequency do not change

C. both amplitude and frequency change

D. amplitude of the carrier wave changes according to the information single

Answer: D

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13. If M_z = magnetisation of paramagnetic sample B= external magnetic field T= absolute temperature, C=

curie constant then according to Curie's law in magnetism, the correct relation is

A. $M_z = \dfrac{T}{CB}$

B. $M_z = \dfrac{CB}{T}$

C. $C = \dfrac{M_z B}{T}$

D. $C = \dfrac{T^2}{M_z B}$

Answer: B

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14. An electron of stationary hydrogen atom jumps from 4th energy level to ground level. The velocity that the photon acquired as a result of electron transition will be

(where, h= Planck's constant, R=Rydberg's constant m = mass of photon)

A. $\dfrac{9Rh}{16m}$

B. $\dfrac{11hR}{16m}$

C. $\dfrac{13hR}{16m}$

D. $\dfrac{15hR}{16m}$

Answer: D

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15. A metal wire of density ρ floats on water surface horozontally. If is NOT to sink in water, then maximum

radius of wire is proportional to (where, T=surface tension of water, g=gravitational acceleration)

A. $\sqrt{\dfrac{T}{\pi \rho g}}$

B. $\sqrt{\dfrac{\pi \rho g}{T}}$

C. $\dfrac{T}{\pi \rho g}$

D. $\dfrac{\pi \rho g}{T}$

Answer: A

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16. A sphere of mass m moving with velocity v collides head -on on another sphere of same mass which is at

rest. The ratio of final velocity of second sphere to the initial velocity of the first sphere is (where, e is coefficient of restitution and collision is inelastic)

A. $\dfrac{e-1}{2}$

B. $\dfrac{e}{2}$

C. $\dfrac{e+1}{2}$

D. e

Answer: C

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17. For a particle performing linear SHM, its average speed over one oscillation is (where, a= amplitude of

SHM, n=frequency of oscillation)

A. 2 an

B. 4 an

C. 6 an

D. 8 an

Answer: B

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18. An ideal transformer converts 220 V AC to 3.3 kV AC

to transmit a power of 4.4 kW. If primary coil has 600

turns, then alternating current in secondary coil is

A. $\dfrac{1}{3}A$

B. $\dfrac{4}{3}A$

C. $\dfrac{5}{3}A$

D. $\dfrac{7}{3}A$

Answer: B

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19. A conducting wire has length L_1 and diameter d_1. After stretching the same wire length becomes L_2 and diameter d_2, The ratio of resistances before and after stretching is

A. $d_2^4 : d_1^4$

B. $d_1^4 : d_2^4$

C. $d_2^2 : d_1^2$

D. $d_1^2 : d_2^2$

Answer: A

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20. The molar specific heat of an ideal gas at constant pressure and constant volume is C_p and C_v respectively. If R is the universal gas constant and the ratio of C_p to C_v is γ, then C_v.

A. $\dfrac{1-\gamma}{1+\gamma}$

B. $\dfrac{1+\gamma}{1-\gamma}$

C. $\dfrac{\gamma-1}{R}$

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

Answer: D

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21. In a capillary tube having area of cross - section A, water rises to a height h. If cross-sectional area is reduced to $\dfrac{A}{9}$, the rise of water in the capillary tube is

A. 4h

B. 3h

C. 2h

D. h

Answer: B

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22. On adjusting the $P - N$ junction diode in forward

biased

A. is one in which width of depletion layer increases

B. is one in which potential barrier increases

C. acts as closed switch

D. atcs as open switch

Answer: C

23. An alternating electric field, of frequency v, is applied across the dees (radius=R) of a cyclotron that is being used to accelerate protons (mass=m) the operating magnetic field (B) used in the cyclotron and the kinetic energy (K) of the proton beam, produced by it, are given by:

A. $\dfrac{2\pi mv}{e}$, $2\pi^2 mv^2 R^2$

B. $\dfrac{2\pi^2 mv}{e^2}$, $4\pi^2 mv^2 R^2$

C. $\dfrac{\pi m v}{e}$, $\pi^2 m v^2 R^2$

D. $\dfrac{2\pi^2 m^2 v^2}{e}$, $2\pi^2 m v^2 R^2$

Answer: A

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24. A ray of light is incident normally on a glass slab of thickness 5 cm and refractive index 1.6. The time taken to travel by a ray from source to surface of slab is same as to travel through glass slab. The distance of source from the surface is

A. 4 cm

B. 8 cm

C. 12 cm

D. 16 cm

Answer: B

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25. A string is vibrating in its fifth overtone between two rigid supports 2.4 m apart. The distance between successive node and antinode is

A. 0.1 m

B. 0.2 m

C. 0.6 m

D. 0.8 m

Answer: B

26.
If
$$A = 3\hat{i} - 2\hat{j} + \hat{k}, B = \hat{i} - 3\hat{j} + 5\hat{k} \text{ and } C = 2\hat{i} + \hat{j} - 4\hat{k}$$

form a right angled triangle, then out of the following which one is satisfed ?

A. $A = B + C$ and $A^2 = B^2 + C^2$

B. $A = B + C$ and $B^2 = A^2 + C^2$

C. $B = A + C$ and $B^2 = A^2 + C^2$

D. $B = A + C$ and $A^2 = B^2 + C^2$

Answer: B

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27. A square frame ABCD is formed by four identical rods

each of mass m and length l.

This frame is in

xy-plane such that side AB coincides with X-axis and side

AD along Y-axis. The moment of inertia of the frame

about X-axis is

A. $\dfrac{5ml^2}{3}$

B. $\dfrac{2ml^2}{3}$

C. $\dfrac{4ml^2}{3}$

D. $\dfrac{ml^2}{12}$

Answer: A

28. A unit vector is represented as $\left(0.8\hat{i} + b\hat{j} + 04\hat{k}\right)$.

Hence, the value of b must be

A. 0.4

B. $\sqrt{0.6}$

C. 0.2

D. $\sqrt{0.2}$

Answer: D

29. Magnetic susceptibility for a paramagnetic and diamagnetic materials is respectively,

A. small, positive and small, positive

B. large, positive and small, negative

C. small, positive and small, negative

D. large, negative and large, positive

Answer: C

30. A mass is suspended from a vertica spring which is executing SHM of frequency 5 Hz.

The spring is unstretched at the highest point of oscillation. Maximum speed of the mass is (take, acceleration due to gravity, $g = 10m/s^2$)

A. $2\pi m/s$

B. $\pi m/s$

C. $\dfrac{1}{2\pi} m/s$

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

Answer: D

31. The moment of inertia of a ring about an axis passing though the centre and perpendicular to its plane is I. It is rotating ring is gently placed ω Another identical ring is gently placed on it, so that their centres coincide. If both the rings are rotating about the same axis, then loss in kinetic energy is

A. $\dfrac{I\omega^2}{2}$

B. $\dfrac{I\omega^2}{4}$

C. $\dfrac{I\omega^2}{6}$

D. $\dfrac{I\omega^2}{8}$

Answer: B

32. A bomb at rest explodes into 3 parts of same mass. The momentum of two parts is $-3p\hat{i}$ and $2p\hat{j}$. Respectively. The magnitude of momentum f the third part is

A. p

B. $\sqrt{5}p$

C. $\sqrt{11}p$

D. $\sqrt{13}p$

Answer: D

33. In aphotocell frequency of incident radiation is increased by keeping other factors constant $(v > v_0)$, the stopping potential

    A. decreases

    B. increases

    C. becomes zero

    D. first decreases and then increases

Answer: B

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34. A mass attached to one end of a string crosses top - most point on a vertical circle with critical speed. Its centripetal acceleration when string becomes horizontal will be

(where, g=gravitational acceleration)

    A. glancing angle

    B. 3g

    C. 4g

    D. 6g

Answer: B

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35. The expression for electric field intensity at a points outside uniformly charged thin plane sheet is (where, d is the distance of point from plane sheet)

    A. independent of d

    B. directly proportional to $\sqrt{d}$

    C. directly proportional to d

    D. directly proportional to $\dfrac{1}{\sqrt{d}}$

Answer: A

36. When source of sound moves towards a stationary observer, the wavelength of sound received by him

    A. decreases while frequency increases

    B. remains the same, whereas frequency increase

    C. increase and frequency also increases

    D. decreases while frequency remains the same

Answer: A

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37. The deflection in galvanometer falls to $\left(\dfrac{1}{4}\right)^{th}$ when it is shunted by 3Ω. If additional shunt of 2Ω is

connected to earlier shunt in parallel, the deflection in galvanometer falls to

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

B. $\left(\dfrac{1}{3}\right)^{rd}$

C. $\left(\dfrac{1}{4}\right)^{th}$

D. $\left(\dfrac{1}{8.5}\right)^{th}$

Answer: D

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38. A body is thrown from the surface of the earth with velocity u m/s. The maximum height in metre above the

surface of the earth up to which it will reach is (where, R

= radish of earth, g=acceleration due to gravity)

A. $\dfrac{u^2 R}{2g(R - u^2)}$

B. $\dfrac{2u^2 R}{gR - u^2}$

C. $\dfrac{u^2 R^2}{2gR^2 - u^2}$

D. $\dfrac{u^2 R}{gR - u^2}$

Answer: A

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39. A series combination of N_1 capacitors (each of

capacity C_1) is charged to potential difference 3V.

Another parallel combination of N_2 capacitors (each of

capacity C_2) is charged to potential difference V. The total energy stored in both the combinations is same, The value of C_1 in terms of C_2 is

A. $\dfrac{C_2 N_1 N_2}{9}$

B. $\dfrac{C_2 N_1^2 N_2^2}{9}$

C. $\dfrac{C_2 N_1}{9 N_2}$

D. $\dfrac{C_2 N_2}{9 N_1}$

Answer: A

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40. Heat energy is incident on the surface at the rate of 1000J/min. If coefficient of absorption is and coefficient

of reflection is 0.5 the heat energy transmitted by the surface in 5 min is

A. 100J

B. 500J

C. 700 J

D. 900J

Answer: B

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41. Two metal wires P and Q of same length and material are stretched by same load. Yheir masses are in the ratio $m_1 : m_2$. The ratio of elongation of wire P to that of Q is

A. $m_1^2 : m_2^2$

B. $m_2^2 : m_1^2$

C. $m_2 : m_1$

D. $m_1 : m_2$

Answer: C

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42. Let $x = \left[\dfrac{a^2 b^2}{c}\right]$ be the physical quantity. If the percentage error in the measurement of physical quantities a,b, and c is 2,3 and 4 per cent respectively, then percentage error in the measurement of x is

A. 7 %

B. 14 %

C. 21 %

D. 28 %

Answer: B

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43. Following graphs show the variation of stopping potential corresponding to the frequency of incident radiation (F) for a given metal. The correct variation is shown in graph (where, v_0 = thershold frequency)

A. 1

B. 2

C. 3

D. 4

Answer: A

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44. In compound microscope, the focal ,ength and aperture of the objective used isrespectively

A. large and large

B. large and small

C. short and large

D. short and small

Answer: D

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45. The energy of an electron having de-Brogilie

wavelength λ is

(hwere, h=Plank's constant, m = mass of electron)

A. $\dfrac{h}{2m\lambda}$

B. $\dfrac{h^2}{2m\lambda^2}$

C. $\dfrac{h^2}{2m^2\lambda^2}$

D. $\dfrac{h^2}{2m^2\lambda}$

Answer: B

46. n number of waves are produced on a string in 0.5 s. Now, the tention in the string is soubled (Assume length and radius constant), the number of waves produced in 0.5s for the same harmonic will be

A. n

B. $\sqrt{2}n$

C. $\dfrac{n}{\sqrt{2}}$

D. $\dfrac{n}{\sqrt{5}}$

Answer: B

47. The increase in energy of a metal bar of length L and cross-sectional area A when compressed with a load M along its length is (where, Y= Young's modulus of the material of metal bar)

A. $\dfrac{FL}{2AY}$

B. $\dfrac{F^2 L}{2AY}$

C. $\dfrac{FL}{AY}$

D. $\dfrac{F^2 L^2}{2AY}$

Answer: B

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48. The ratio of magnetic fields due to a bar magnet at the two axial points P_1 and P_2 which are separated from each other by 10 cm is 25 : 2 . Point P_1 is situated at 10 cm from the centre of the magnet. Magnetic length of the bar magnet is (Points P_1 and P_2 are on the same side of magnet and distance of P_2 from the centre is greater than distance of P_1 from the centre of magnet)

A. 5 cm

B. 10 cm

C. 15 cm

D. 20 cm

Answer: B

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49. A satelite is revolving in a circular orbit at a height h above the surface of the earth of radius R. The speed of the satellite in its orbit is one-fourth the escape velocity from the surface of the earth. The relation between h and R is

A. h=2R

B. h=3R

C. h=5R

D. h=7R

Answer: D

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50. A pipe closed at one end has length 83 cm. The number of possible natural oscilations of air column whose frequencies lie below 1000 Hz are (take, velocity of sound in air 332 m/s)

A. 3

B. 4

C. 5

D. 6

Answer: C

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