PHYSICS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

MHTCET 2019 PAPER 1

Physics

1. A stone of mass 1 kg is tied to a string 2m long and it's rotated at constant speed of 40

ms^{-1} in a vertical circle. The ratio of the tension at the top and the bottom is

[Take g=10ms^2]

A. $\frac{81}{79}$

B. $\frac{79}{81}$

C. $\frac{19}{12}$

D. $\frac{12}{19}$

Answer: B

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2. Two coils have a mutual inductance of 0.01 H. The current in the first coil changes according to equation, I = 5 sin 200πt. The maximum value of emf induced in the second coil is

A. $10\pi V$

B. $0.1\pi V$

C. πV

D. $0.01\pi V$

Answer: A

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3. The radius of the earth and the radius of orbit around the sun are 6371 km and 149×10^6 km respectively. The order of magnitude of the diameter of the orbit is greater than that of earth by

A. 10^3

B. 10^2

C. 10^4

D. 10^5

Answer: C

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4. Two open organ pipes of fundamental frequencies n_1 and n_2 are joined in series. The fundamental frequency of the new pipes so obtained will be

A. $\frac{n_1 + n_2}{n_1 n_2}$

B. $\frac{n_1 n_2}{2n_2 + n_1}$

C. $\frac{2n_2 + n_1}{n_1 n_2}$

D. $\frac{n_1 n_2}{n_1 + n_2}$

Answer: D

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5. The molar specific heats of an ideal gas at constant pressure and volume are denotes by C_P and C_v respectively. If $\gamma = \frac{C_P}{C_v}$ and R is the universal gas constant, then C_v is equal to

A. $\frac{R\gamma}{\gamma - 1}$

B. γR

C. $\frac{1+\gamma}{1-\gamma}$

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

Answer: A

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6. In a series circuit $R = 300\Omega, L = 0.9H, C = 2.0\mu F$ and $\omega = 1000 rad/\sec$. The impedence of the circuit is

A. 500Ω

B. 1300Ω

C. 400Ω

D. 900Ω

Answer: A

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7. The quantity which does not vary periodically for a particle performing SHM is

A. acceleration

B. total energy

C. displacement

D. velocity

Answer: B

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8. Which of the following combinations of 7 identical capacitors each of 2 μF gives a resultant capacitance of 10/ 11 μF?

A. 3 in parallel and 4 in series

B. 2 in parallel and 5 in series

C. 4 in parallel and 3 in series

D. 5 in parallel and 2 in series

Answer: D

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9. If one were to apply Bohr model to a particle of mass $'m'$ and charge $'q'$ moving in a plane under the influence of a mgentic filed $'B'$, the

energy of the cahrged particle in the n^{th} level will be :-

A. 2nhq B/π m

B. nhq B/2π m

C. nhq B/4π m

D. nhq B/π m

Answer: C

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10. The purpose of soft iron cylinder between the pole pieces of the horse – shoe magnet in a moving coil galvanometer is

A. increase space for rotation of coil

B. reduce weight of galvanometer

C. produce magnetic field which is parallel to plane of coil at any position

D. make magnetic induction weak at the centre.

Answer: C

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11. Two identical wires of substances 'P' and 'Q' are subjected to equal stretching force along the length. If the elongation of 'Q' is more than that of 'P', then

A. both P and Q are equally elastic

B. P is more elastic than Q

C. P is plastic and Q is elastic

D. Q is more elastic than P

Answer: B

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12. If W_1, $W_2$and W_3 represent the work done in moving a particle from A to B along three different paths 1 ,2 and 3 (as shown in fig) in the gravitational field of the point mass 'm'. Find the correct relation between $'W_1'$, $'W_2'$

and $'W_3'$

A. $W_1 < W_3 < W_2$

B. $W_1 < W_2 < W_3$

C. $W_1 = W_2 = W_3$

D. $W_1 > W_3 > W_2$

Answer: C

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13. Assuming that the junction diode is ideal, the current in the arrangement shown in figure is

A. 30 mA

B. 40 mA

C. 20 mA

D. 10 mA

Answer: C

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14. When a wave travels in a medium, the particle displacement is given by the equation $y = a \sin 2\pi(bt - cx)$, where a, b and c are constants. The maximum particle velocity will be twice the wave velocity. If

A. $c = \pi a$

B. $c = \dfrac{1}{2\pi a}$

C. $c = \dfrac{1}{\pi a}$

D. $c = 2\pi a$

Answer: C

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15. In the fundamental mode , time taken by the wave to reach the closed end of the air filled pipe is 0.01 s . The fundamental frequency is

A. $(2t)^{-1}$

B. $4(t)^{-1}$

C. $2(t)^{-1}$

D. $(4t)^{-1}$

Answer: D

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16. Two small drops of mercury, each of radius R, coalesce to form a single large drop. The ratio of the total surface energies before and after the change is

A. $2^{2/3}:1$

B. $\sqrt{2}:1$

C. $\sqrt{1/3}:1$

D. $2:1$

Answer: C

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17. A solid aluminimum sphere of radius R has moment of inertia I about an axis through its centre. The moment of inertia about a central

axis of a solid aluminimum sphere of radius $2R$ is.

A. $1:8$

B. $2:5$

C. $2:3$

D. $1:4$

Answer: D

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18. For a metallic wire, the ratio $\frac{V}{i}$ ($V =$ applied potential difference and $i =$ current flowing) is

A. independent of temperature.

B. increases with rise in temperature.

C. increases or decreases with rise in temperature depending upon the metal.

D. decreases with rise in temperature.

Answer: B

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19. In air, a charged soap bubble of radius 'R' breaks into 27 small soap bubbles of equal radius 'r '. Then the ratio of mechanical force acting per unit area of big soap bubble to that of a small soap bubble is

A. $\frac{1}{81}$

B. $\frac{3}{1}$

C. $\frac{1}{3}$

D. $\frac{9}{1}$

Answer: C

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20. The two linear parallel conductors carrying currents in the opposite direction..... each other.

A. neither attract nor repel each other

B. repel each other

C. attract each other

D. will have rotational motion.

Answer: C

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21. A layer of atmosphere that reflects medium frequency radio waves which is ineffective during night, is

A. F-layer

B. E-layer

C. stratosphere

D. thermosphere

Answer: B

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22. The linear density of a vibrating string is $1.3 \times 10^{-4} kg/m$ A transverse wave is propagating on the string and is described by the equation $y = 0.021 \sin(x + 30t)$ where x and y are measured in meter and tt in second the tension in the string is :-

A. 0.2 N

B. 0.250 N

C. 0.225 N

D. 0.325 N

Answer: C

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23. A satellite of mass , os revolving round the eartj at height of $10R$, where R is the radius of earth. What is the kinetic energy of satellite.

A. $\frac{mgR}{8}$

B. $\frac{mgR}{16}$

C. $\frac{mgR}{2}$

D. $\frac{mgR}{4}$

Answer: A

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24. The distance moved by a particle in simple harmonic motion in one time period is

A. $\frac{A}{2}$

B. A

C. 2A

D. 4A

Answer: D

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25. In full scale deflection current in galvanometer of $100 ohm$ resistance is 1 mA.

Resistance required in series to convert it into voltmeter of range 10 V.

A. Iodoform

B. 4000Ω

C. 4600Ω

D. 4900Ω

Answer: D

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26. The angle made by orbital angular momentum of electron with the direction of the orbital magnetic moment is

A. 120°

B. 60°

C. 180°

D. 90°

Answer: C

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27. The current in 1 Ω resistor in the following circuit is

A. 1 A""

B. 0.5 A

C. 1.1 A

D. 0.8 A

Answer: A

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28. The wavelength of the first line in blamer series in the hydrogen spectrum is λ. What is the wavelength of the second line:

A. 20/27 λ

B. 3/16 λ

C. 5/36 λ

D. 3/4 λ

Answer: A

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29. If the work done in stretching a wire by 1 mm is 2J, then work necessary for stretching another wire of same material but with double radius of corss-section and half the length by 1 mm is

A. 2 J

B. 4 J

C. 8 J

D. 16 J

Answer: D

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30. The resultant R of vector P andQ is perpendicular to P and R=P both , then angle betwwen $|P|$ and $|Q|$is

A. $\frac{5\pi}{4}$

B. $\frac{7\pi}{4}$

C. $\frac{\pi}{4}$

D. $\frac{3\pi}{4}$

Answer: D

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31. Resolving power of a telescope will be more, fi the diameter (a) of the objective is

A. independent of the diameter of the objective

B. low

C. zero

D. high

Answer: D

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32. A uniform rod of length '6L' and mass '8 m' is pivoted at its centre 'C'. Two masses 'm' and '2m' with speed 2v, v as shown strikes the rod and stick to the rod. Initially the rod is at rest. Due to impact, if it rotates with angular velocity $'\omega'$ then $'\omega'$ will be

A. $\frac{v}{5L}$

B. zero

C. $\frac{8v}{6L}$

D. $\frac{11v}{3L}$

Answer: A

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33. If $\sqrt{A^2 + B^2}$ represents the magnitude of resultant of two vectors (A+ B) and (A - B),then the angle between two vectors is

A. $\cos^{-1}\left[-\frac{2(A^2-B^2)}{(A^2+B^2)}\right]$

B. $\cos^{-1}\left[-2\frac{A^2-B^2}{A^2B^2}\right]$

C. $\cos^{-1}\left[-\frac{(A^2+B^2)}{2(A^2-B^2)}\right]$

D. $\cos^{-1}\left[-\frac{(A^2-B^2)}{A^2+B^2}\right]$

Answer: C

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34. A thin metal wire of length 'L' and uniform linear mass density 'p' is bent into a circular

coil with 'O' as centre. The moment of inertia of a coil about the axis XX' is

A. $\frac{3pL^3}{8\pi^2}$

B. $\frac{pL^3}{4\pi^2}$

C. $\frac{3pL^3}{4\pi^2}$

D. $\frac{pL^3}{8\pi^2}$

Answer: A

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35. The dimensions of torque are same as that of

A. moment of force

B. pressure.

C. acceleration

D. impulse

Answer: A

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36. For a transistor, the current ratio β_{dc} is defined as the ratio of

A. collector current to emitter current.

B. collector current to base current.

C. base current to collector current.

D. emitter current to collector current.

Answer: B

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37. A pendulum clock, made of a material having coefficient of linear expansion $\alpha = 9 \times 10^{-7} /.^{\circ} C$ has a period of 0.500 sec at $20^{\circ} C$. If the clock is used in a climate where temperature averages $30^{\circ} C$, what correction is necessary at the end of 30 days to the time given by clock?

A. 2.5×10^{-7} s

B. $5 \times 10^{-7} s$

C. $1.125 \times 10^{-6} s$

D. 2.25×10^{-6} s

Answer: D

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38. When two capillary tubes of different diameters are dipped vertically, the rise of the liquid is

A. zero in both the tubes.

B. same in both the tubes.

C. more in the tube of larger diameter.

D. more in the tube of smaller diameter.

Answer: D

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39. A thin hollow prism of refracting angle 3^{o}, filled with water gives a deviation of 1^{o}. The refractive index of water is

A. 1.59

B. 1.33

C. 1.46

D. 1.51

Answer: B

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40. Maximum height reached by a bullet fired vertically upward with a speed equal to 50% of the escape velocity from earth's surface is (R is radius of earth):

A. $\frac{R}{5}$

B. $\frac{R}{3}$

C. $\frac{R}{2}$

D. $\frac{R}{4}$

Answer: B

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41. In biprism experiment ,the distance between source and eyepiece is 1.2 m,the distance between two virtual sources is 0.84 mm. Then the wavelength of light used if eyepiece is to be moved transversely through a distance of 2. 799 cm to shift 30 fringes is

A. 6535 Å

B. 6527 Å

C. 6535 Å

D. 6351 Å

Answer:

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42. When photons of energy hv fall on a metal plate of work function 'W_0' , photoelectrons of maximum kinetic energy 'K' are ejected. If the

frequency of the radiation is doubted, the maximum kinetic energy of the ejected photoelectrons will be

A. $K + W_0$

B. K+hv

C. K

D. 2K

Answer: B

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43. A star is going away from the earth. An observer on the earth will see the wavelength of light coming from the star

A. becoming orange

B. shining yellow

C. gradually changing to blue

D. gradually changing to red

Answer: C

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44. Find the magnetic field induction at a point on the axis of a circular coil carrying current and hence find the magnetic field at the centre of circular coil carrying current.

A. $B_{\text{axis}} = \frac{\mu_0}{4\pi} \frac{n\dot{A}}{Ir^3}$

B. $B_{\text{axis}} = \frac{\mu_0}{4\pi} \frac{2n\dot{I}A}{r^3}$

C. $B_{\text{axis}} = \frac{\mu_0}{4\pi} \frac{2n\dot{I}}{Ar^3}$

D. $B_{\text{axis}} = \frac{\mu_0}{4\pi} \frac{n\dot{I}A}{r^3}$

Answer: B

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45. A sphere of radius R and density ρ_1 is dropped in a liquid of density σ. Its terminal velocity is v_1. If another sphere of radius R and density ρ_2 is dropped in the same liquid, its terminal velocity will be:

A. $v[p_2 + \sigma) / p_1 + \sigma)]$

B. $v[p_1 + \sigma) / p_2 + \sigma)]$

C. $v[p_2 - \sigma) / p_1 - \sigma)]$

D. $v[p_1 - \sigma) / p_2 - \sigma)]$

Answer: C

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46. If α is the coefficient of performance of a refrigerator and $'Q_1'$ is heat released to the hot reservoir, then the heat extracted from the cold reservoir $'Q_2'$ is

A. $\frac{\alpha Q_1}{\alpha - 1}$

B. $\frac{\alpha - 1}{\alpha} Q_1$

C. $\frac{\alpha Q_1}{1 + \alpha}$

D. $\frac{1+\alpha}{\alpha}Q_1$

Answer: C

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47. The real force 'F' acting on a particle of mass 'm' performing circular motion acts along the radius of circle 'r' and is directed towards the centre of circle. The square root of magnitude of such force is (T=periodic time)

A. $\frac{2\pi}{T}\sqrt{mr}$

B. $\frac{Tmr}{4\pi}$

C. $\frac{2\pi T}{\sqrt{mr}}$

D. $\frac{T^2 mr}{4\pi}$

Answer: A

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48. Dimensions of Gyromagnetic ratio are

A. $\left[L^1 M^0 T^1 I^1\right]$

B. $\left[L^0 M^{-1} T^1 I^1\right]$

C. $\left[L^1M^0T^0I^{-1}\right]$

D. $\left[L^{-1}M^0T^1I^1\right]$

Answer: B

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49. Maximum velocity of photoelectron emitted is $4.8ms^{-1}$. If e/m ratio of electron is $1.76 \times 10^{11}Ckg^{-1}$, then stopping potential is given by

A. $\frac{v^2}{2\left(\frac{m}{e}\right)}$

B. $\frac{v^2}{2\left(\frac{e}{m}\right)}$

C. $\frac{v^2}{\left(\frac{e}{m}\right)}$

D. $\frac{v^2}{\left(\frac{m}{e}\right)}$

Answer: B

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50. The equiconvex lens has focal length f. If is cut perpendicular to the principal axis passin

through optical centre, then focal length of each half is

A. $\frac{f}{2}$

B. 2f

C. $\frac{3f}{2}$

D. f

Answer: B

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