PHYSICS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

MOCK TEST 3

Mcqs

1. The position vector of a point is $R = x\hat{i} + y\hat{i} + z\hat{k}$ and another vector is

$A = 3\hat{i} + 2\hat{j} + 5\hat{}$. Which of the mathematical relationns is correct?

A. $\nabla(A \cdot R) = 0$

B. $\nabla(A \cdot R) = A$

C. $\nabla(A \cdot R) = R$

D. none of these

Answer: B

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2. Inside a bar magnetic the magnetic field lines

A. do not exist

B. depend upon area of cross-section of the magnetic

C. are from S pole to N pole of the magnet

D. are from N pole to S pole of the magnet

Answer: C

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3. A spherical liquid drop of radius R is divided into eight equal droplets. If the surface tension is T, then the work done in this process will be

A. $2\pi R^2 T$

B. $3\pi R^2 T$

C. $4\pi R^2 T$

D. $2\pi R T^2$

Answer: C

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4. A small bar magnet has a magnetic moment $1.2A - m^2$. The magnetic field at a distance $0.1m$ on its axis will be:

$\left(\mu_0 = 4\pi \times 10^{-7} T - m / A\right)$

A. $2.4 \times 10^5 T$

B. $1.2 \times 10^4 T$

C. 2.4×10^{-5}T

D. $2.4 \times 10^{-4} T$

Answer: D

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5. A radio can tune into any station in the $7.5MHz$ to $12MHz$ band. What is the corresponding wavelength of band?

A. 7.5m-12 m

B. 25m-40m

C. 75m-120m

D. 250m-400m

Answer: B

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6. In Huygen's wave theory, the locus of all points in the same state of vibration is called :

A. a half period zone

B. a wavefront

C. a ray

D. vibrator

Answer: B

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7. In a adiabatic process pressure is increased by $2/3\,\%$ if $C_P/C_V = 3/2$. Then the volume decreases by about

A. $\frac{4}{9}\,\%$

B. $\frac{2}{3}\,\%$

C. $4\,\%$

D. $\frac{9}{4}\,\%$

Answer: A

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8. Two organ pipes are emitting their fundamental notes, when each closed at end, give 5 beat/s if their foundamental frequencies are 250 Hz and 255 Hz. Then find the ratio of their lenghts.

A. $\frac{49}{50}$

B. $\frac{49}{51}$

C. $\frac{50}{51}$

D. $\frac{51}{50}$

Answer: C

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9. A simple harmonic oscillator has amplitude A, angular velocity ω, and mass m . Then, average energy in one time period will be

A. $\frac{1}{4}m\omega^2 A^2$

B. $\frac{1}{2}m\omega^2 A^2$

C. $m\omega^2 A$

D. zero

Answer: A

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10. A wire of length L and radius r is fixed at one end. When a stretching force F is applied at free end, the elongation in the wire is l. When another wire of same material but of

length $2L$ and radius $2r$, also fixed at one end is stretched by a force $2F$ applied at free end, then elongation in the second wire will be

A. l

B. $2l$

C. $l/2$

D. $4l$

Answer: A

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11. Three identical balls each of radius 10 cm and mass 1 kg each are placed touching one another on a horizontal surface. Where is their centre of mass located?

A. On the horizontal surface

B. At the point of contact of any two spheres

C. At the centre of one ball

D. none of these

Answer: D

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12. A alternating voltage varies with time (t) as $V = 100\sin(50\pi t)$. The rms voltage and the frequency respectively, are

A. $\frac{100}{\sqrt{2}}V, 50Hz$

B. $100V, 25Hz$

C. $100\sqrt{2}V, 50Hz$

D. $\frac{100}{\sqrt{2}}V, 25Hz$

Answer: D

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13. Two satellites are revolving around the earth in circular orbits of same radii. Mass of one satellite is 100 times that of the other. Then their periods of revolutions are in the ratio

A. $100:1$

B. $1:100$

C. $10:1$

D. $1:1$

Answer: D

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14. Two rods of different materials having coefficient of thermal expansion α_1, α_2 and young's modulii Y_1, Y_2 respectively are fixed between two rigid massive walls. The rods are heated such that they undergo the same increase in temperature. There is no bending

of rods. If $\alpha_1 : \alpha_2 = 2:3$, the thermal stresses developed in the two rods are equal provided $Y_1 : Y_2$ is equal to

A. $2:3$

B. $1:1$

C. $3:2$

D. $4:9$

Answer: C

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15. A point mass of $1kg$ collides elastically with a stationary point mass of $5kg$. After their collision, the $1kg$, mass reverses its direction and moves with a speed of $2ms^{-1}$. Which of the following statement(s) is (are) correct for the system of these two masses?

A. Total momentum of the system is 3 $kg - ms^{-1}$

B. momentum of 5 kg mass after collision is 4 $kg - ms^{-1}$

C. Kinetic energy of the centre of mass is 0.75 J

D. Total kinetic energy of the system is 4 J.

Answer: B

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16. An organ pipe closed at one end restonates with a tuning fork of frequencies 180 Hz and 300 Hz it will also resonate with tuning fork of frequencies

A. 360 Hz

B. 420 Hz

C. 480 Hz

D. 540 Hz

Answer: B

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17. If a gas is compressed adiabatically

A. the internal energy of gas increases

B. the internal energy of gas decreases

C. the internal energy of gas does not change

D. the work done is positive

Answer: A

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18. A metallic surface is irradiated by a monochromatic light of frequency v_1 and stopping potential is found to be V_1. If the

light of frequency v_2 irradiates the surface, the stopping potential will be

A. $V_1 - \frac{h}{e}(v_2 + v_1)$

B. $V_1 + \frac{h}{e}(v_1 - v_2)$

C. $V_1 + \frac{h}{e}(v_2 - v_1)$

D. $V_1 - \frac{h}{2e}(v_1 - v_2)$

Answer: C

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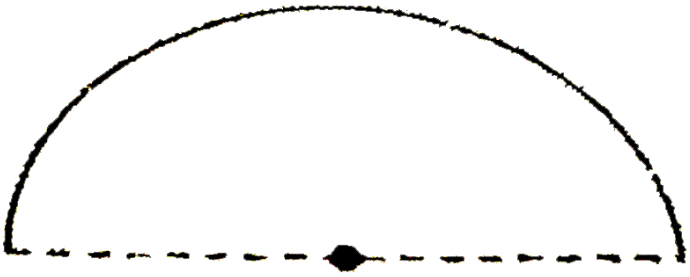
19. A semicirxular wire of radius a having λas charge per unit length Is shown in the figure. Find the electric potential at the centre of the semicircular wire.



A. $\frac{\lambda}{\varepsilon_0}$

B. $\frac{\lambda}{4\pi\varepsilon_0 R}$

C. $\frac{\lambda}{4\varepsilon_0}$

D. none of these

Answer: C

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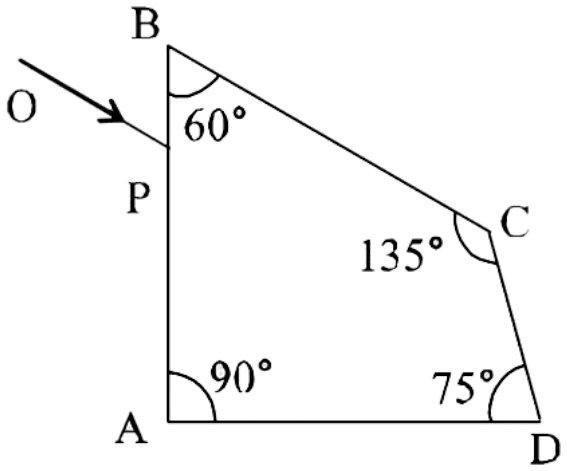
20. A ray OP of monochromatic light is incident on the face AB of prism ABCD mear vertex B at an incident angle of $60 degree$ (see figure). If the refractive index of the material of the prism is $\sqrt{3}$, which of the following is (are)

are correct? `



A. The ray gets totally internally reflected at face CD

B. the ray comes out through face AD

C. The angle between the incident ray and the emergent ray is 90°

D. the angle between the incident ray and the emergent ray is 120°.

Answer: D

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21. The kinetic energy K of a particle moving along a circle of radius R depends on the distance covered a as $K = as^2$. The force acting on the particle is

A. $2as^2 / R$

B. $2as\left[1 + \left(s^2 / R^2\right)\right]^{1/2}$

C. $2as$

D. $2aR^2 / s$

Answer: B

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22. The motion of a particle varies with time according to the relation $y = a(\sin \omega t + \cos \omega t)$,then

A. the motion is oscillatory but not SHM

B. the motion is SHM with amplitude a

C. the motion is SHM with amplitude $\sqrt{2a}$

D. none of these

Answer: C

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23. The equation of a wave travelling on a stretched string is y = 4 sin

$$2\pi\left(\frac{t}{0.02}-\frac{x}{100}\right)$$

Here, x and y are in cm and t is in second. The speed of wave is

A. 50 m/s

B. 40 m/s

C. 50 cm/s

D. 40 cm/s

Answer: A

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24. If two slightly, different wavelengths are present in the light used in Young's double-slit experiment, then

A. the sharpness of fringes will increase everywhere (compared to the case when monochromatic light is used)

B. there will be no fringes at all

C. the sharpness of fringes will decrease as we move away from central fringe

D. the central fringe will be white

Answer: C

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25. A student performed the experiment of determination of focal length of a concave mirror by $u - v$ method using an optical bench of length 1.5 meter. The focal length of the mirror used is 24 cm. The maximum error in the location of the image can be 0.2 cm. The 5 sets of (u, v) values recorded by the student (in cm) are:

$(42, 56), (48, 48), (60, 40), (66, 33), (78, 39)$.

The data set (s) that cannot come from experiment and is (are) incorrectly recorded, is (are)

A. (42,56)

B. (48,48)

C. (66,32)

D. (78,39)

Answer: D

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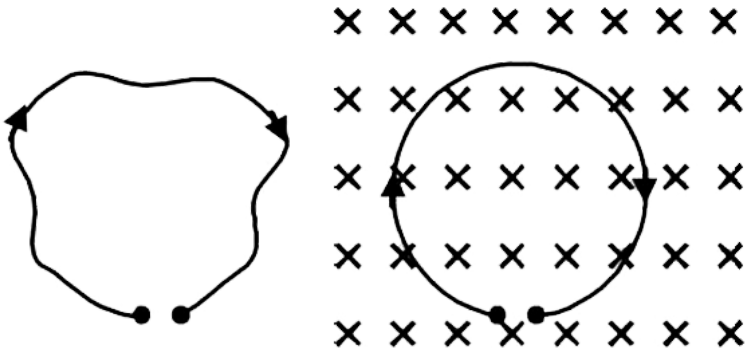
26. A thin wire of length L is connected to two adjacent fixed points and carries a current I in the clockwise direction , as shown in the figure. When the system is put in a uniform magnetic field of strength B going into the plane of the paper , the wire takes the shape of a circle . The tension in the wire is



A. IBL

B. $\frac{lBL}{\pi}$

C. $\frac{IBL}{2\pi}$

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

Answer: C

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27. An (α)-particle and a proton are both simultaneously projected in opposite direction into a region of constant magnetic field

perpendicular to the direction of the field. After some time it is found that the velocity of the (α)-particle has changed in a direction by 45°. Then at this time, the angle between velocity vectors of (α)-particle and proton is

A. 90°

B. 45°

C. $45^{\circ}+90^{\circ}$

D. $\frac{(45^{\circ}+90^{\circ})}{2}$

Answer: C

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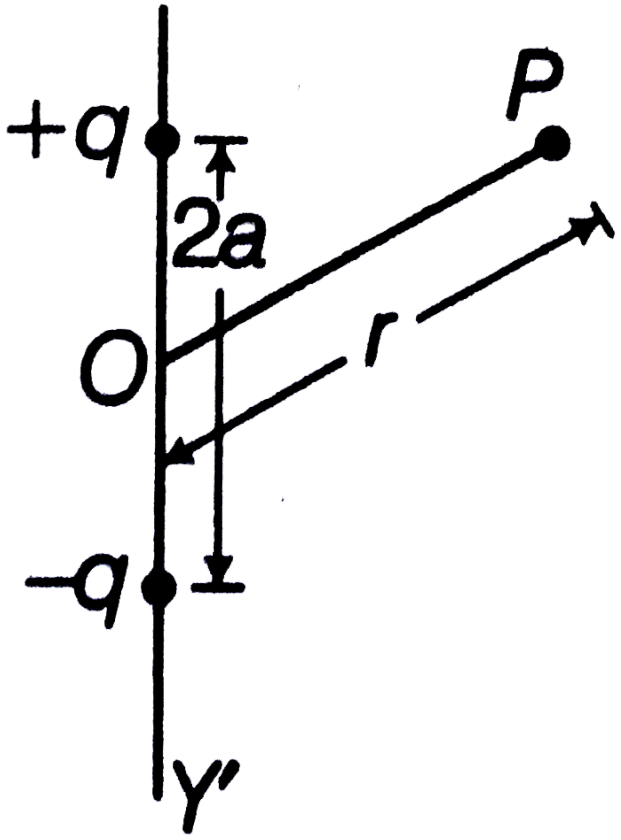
28. What is the electric potential at a point P, distance r from the mid-point of ann electric

dipole of moment p(=2aq) ?



A. $V = \frac{1}{4\pi\varepsilon_0}\frac{P\cos\theta}{r^2}$

B. $V = \frac{1}{4\pi\varepsilon_0}\frac{2P\cos\theta}{r^3}$

C. $\frac{1}{4\pi\varepsilon_0}\frac{2P\cos\theta}{r^2}$

D. none of these

Answer: A

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29. A ball is dropped from a height of $20m$ above the surface of water in a lake. The refractive index of water is $4/3$. A fish inside the lake, in the line of fall of the ball, is looking at the ball. At an instant, when the ball is

$12.8m$ above the water surface, the fish sees the speed of ball as $\left(g = 10m/\sec^2\right)$

A. $9ms^{-1}$

B. $12ms^{-1}$

C. $16ms^{-1}$

D. $21.33ms^{-1}$

Answer: C

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30. Choose the correct statement.

A. The Brewster's angle is independent of wavelength of light

B. The Brewster's angle is independent nature of reflecting surface.

C. The Brewster's angle is different for different wavelengths.

D. Brewster's angle depends on wavelength but not on the nature of reflected

surface.

Answer: C

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31. The real angle of dip, if a magnet is suspended at an angle of 30° to the magnetic meridian and the dip needle makes an angle of 45° with horizontal, is:

A. $\tan^{-1}\left(\frac{\sqrt{3}}{2}\right)$

B. $\tan^{-1}(\sqrt{3})$

C. $\tan^{-1}\left(\sqrt{\frac{3}{2}}\right)$

D. $\tan^{-1}\left(\frac{2}{\sqrt{3}}\right)$.

Answer: A

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32. A tank is filled with water of density $10^3 kg/m^3$ and oil of density $9 \times 10^3 kg/m^3$ .The height of water layer is $1m$ and that of

the oil layer is $4m$. The velocity of efflux front an opening in the bottom of the tank is

A. $\sqrt{900 \times 980}\text{cm} \quad s^{-1}$

B. $\sqrt{1000 \times 980}\text{cm} \quad s^{-1}$

C. $\sqrt{920 \times 980} \quad \text{cm} \quad s^{-1}$

D. $\sqrt{950 \times 980} \quad \text{cm} \quad s^{-1}$

Answer: C

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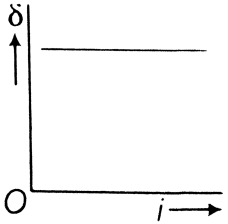
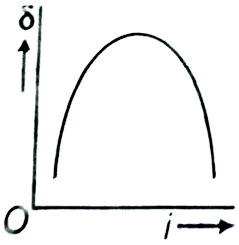
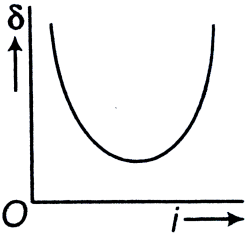
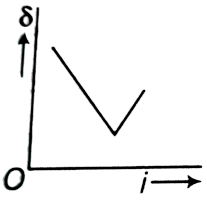
33. The graph between angle of deviation (δ) and angle of incidence (i) for a triangular prism is represented by

A. 

B. 

C. 

D. 

Answer: C

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34. Two satellites of same are orbiting round the earthh at heights of r_1 and r_2 from the centre of earth. Their potential energies are in the ratio of

A. r_2 / r_1

B. r_1 / r_2

C. $r_1 / (r_1 + r_2)$

D. $r_2 / (r_1 + r_2)$

Answer: A

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35. A body of mass m is movinng in a circlee off radius r with a constant speed v. the work done by the centripetal force in moving the

body over half the circumference of the circle is

A. mv^2/r

B. zero

C. mv^2/r

D. r^2/mv^2

Answer: B

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36. A thin circular ring of mass M and radius R is rotating in a horizontal plane about an axis vertical to its plane with a constant angular velocity ω. If two objects each of mass m be attached gently to the opposite ends of a diameter of the ring, the ring will then rotate with an angular velocity

A. $\frac{\omega(M-2m)}{M+2m}$

B. $\omega M(M-m)$

C. $\frac{\omega(M+2m)}{M}$

D. $\frac{\omega M}{M+2m}$

Answer: D

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37. A thin rectangular magnet suspended freely has a period of oscillation equal to T. Now it is broken into two equal halves (each having half of the original length) and one piece is made to oscillate freely in the same

field. If its period of oscillation is T', then ratio $\frac{T'}{T}$ is

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

B. 2

C. $\frac{1}{4}$

D. $(1)\left(2\sqrt{2}\right)$

Answer: A

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38. The plane face of a plano convex lens is silvered.If μbe the refrative index and R, the radius of curvature of curved suraface, then system will behave like a concave mirror of curvature

A. μR

B. $\frac{R}{(\mu - 1)}$

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

D. $\left[\frac{(\mu + 1)}{(\mu - 1)}\right] R$

Answer: B

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39. A 6×10^{-4} F parallel plate air capacitor is connected to a 500 V battery. When air is replaced by another dielectric material, 7.5×10^{-4}C charge flows into the capacitor. The value of the dielectric constant of the material is

A. 1.5

B. 2

C. 1.0025

D. 3.5

Answer: C

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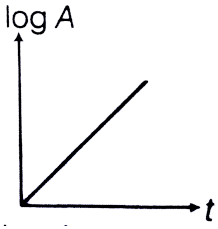
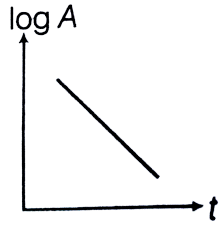
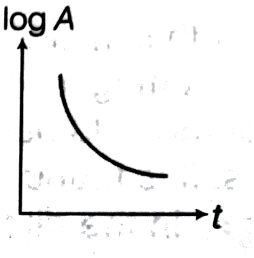
40. The graph obtained by plotting $\log_e(A)$ [A is the activity of a radioactive sample] against t (time) out of the following

A. 

B. 

C. 

D. 

Answer: B

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41. Water rises in a capillary tube through a height l. If the tube is inclined to the liquid surface at 30° the liquid will rise in the tube upto it's length equal to

A. $h/\sqrt{2}$

B. h

C. $\sqrt{2}h$

D. 2h

Answer: C

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