PHYSICS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

PRACTICE SET 11

Paper 1 Physics

1. An object is placed infront of a convex mirror of focal length f. Find the maximum and

minimum distance of two object from the mirror such that the image is real and magnified.

A. $20 \text{ and } \infty$

B. f and 2f

C. f and 0

D. None of these

Answer: D

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2. A rope is wound around a hollow cylinder of mass $3kg$ and radius $40cm$. What is the angular acceleration of the cylinder if the rope is pulled with a force of $30N$?

A. $10ra\frac{d}{s^2}$

B. $15ra\frac{d}{s^2}$

C. $20ra\frac{d}{s^2}$

D. $25ra\frac{d}{s^2}$

Answer: D

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3. A body of mass m is situated on the earth in the gravitational field of sun. For the body to escape from the gravitation pull of the solar system the body must be imparted an escape velocity of (assume earth to be stationary)

A. 11 .2 km/s

B. 22.4 km/s

C. 33.6 km/s

D. 42 km/s

Answer: D

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4. The root mean square velocity of the molecules in a sample of helium is $5/7th$ that of the molecules in a sample of hydrogen. If the temperature of hydrogen sample is $0^\circ C$, then the temperature of the helium sample is about

A. 100°

B. $273^\circ C$

C. 173 K

D. $0^\circ C$

Answer: D

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5. The refractive index of water and glycerine are 1.33 and 1.47 respectively. What is the critical angle for a light ray going from the latter to the former?

A. $60^\circ 48'$

B. $64^\circ 48'$

C. $74^\circ 48'$

D. None of these

Answer: B

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6. A stone tied to a string of length L is whirled in a vertical circle with the ofter end of the string at the centre . At a certin instant of

time , the stone is at its lowest position , and has a speed is , the magintube of the change in its velocity as it reached a positive when the string is horizontal is

A. $\sqrt{u^2 - 2gL}$

B. $\sqrt{2gL}$

C. $\sqrt{u^2 - gL}$

D. $\sqrt{2(u^2 - gL)}$

Answer: D

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7. What is the smallest radius of a circle at which a cyclist can travel if its speed is 36 km/h, angle of inclination 45° and $g = 10m/s^2$?

A. 20 m

B. 10 m

C. 30 m

D. 40 m

Answer: B

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8. A 10 kg stone is suspended with a rope of breaking strength 30 kg-wt. The minimum time in which the stone can be raised through a height 10 m starting from rest is (Take, $g = 10Nkg^{-1}$).

A. 0.5 s

B. 1s

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

D. 2s

Answer: B

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9. A pendulum bob has a speed of $3ms^{-1}$ at its lowest position. The pendulum is 0.5 m long. The speed of the bob, when string makes an angle of 60° to the vertical is $(\text{take, g} = 10ms^{-1})$

A. $\frac{3}{2}m/s$

B. 2m/s

C. $\frac{1}{2} m / s$

D. 3m/s

Answer: B

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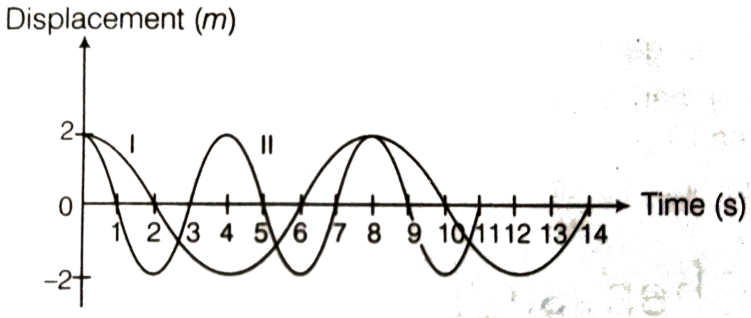
10. Figure shows the displacement time graphs of two simple harmonic motions I and

II. From the graph it follows that



A. curve I has same frequency as that of curve II

B. curve I has frequency twice that of curve II

C. curve I has frequency half that of curve II

D. curve I has frequency four times that of curve II

Answer: C

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11. A ray of light is Incident on a glass plate at 60°. The reflected and refracted rays are found to be mutually perpe:ndiwlar. The refractive index of the glass is

A. 2

B. 1.73

C. 1.5

D. 1.15

Answer: B

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12. In the interference pattern produced by two identical slits, the intensity of central

maximum is I. What will the intensity of light at the same spot, if one of the slits is closed?

A. I

B. I/2

C. I/4

D. I/8

Answer: C

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13. A geostationary satellite orbites around the earth in a circular orbit of radius 36000 km Then, the time period of a spy satellite orbiting a few hundred km above the earth's surface $(R_e = 6400km)$ will approximately be

A. 1h

B. 2h

C. 24h

D. 36 h

Answer: B

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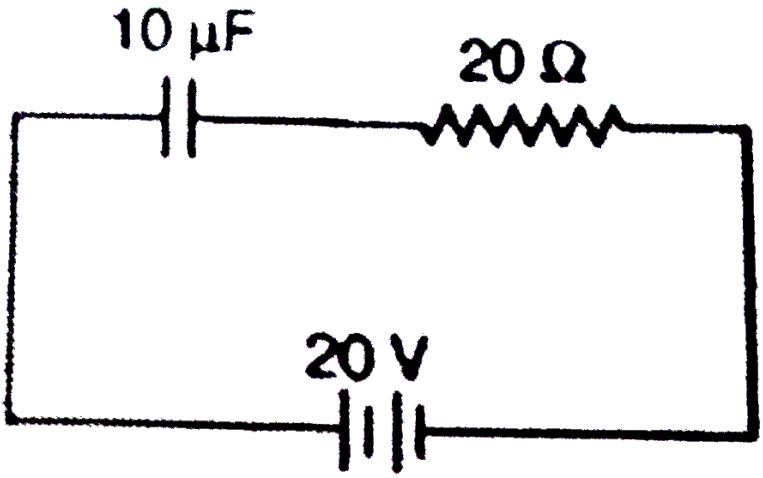
14. A capacitor of capacitance $10\mu F$ is charged by connecting through a resistance of $20Omga$ and battery of 20 V. What is the energy supplied by the battery?



A. Less than 2 mJ

B. 2mJ

C. More than 2 mJ

D. Cannot be predicted

Answer: C

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15. Consider the following statement. When jumping from some height, you should bend your knees as you come to rest instead of

keeping your legs stiff. Which of the following relations can be useful in explaining the statement?

A. $\Delta p_1 = -\Delta p_2$

B. $\Delta E = -0\Delta(PE + KE) = 0$

C. $F\Delta t = m\Delta v$

D. $\Delta x \propto \Delta F$

Answer: C

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16. Two equal forces (P each) act at a point inclined to each other at an angle of 120°. The magnitude of their resultant is

A. $P/2$

B. $P/4$

C. P

D. 2P

Answer: C

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17. In a potentiometer experiment for measuring the emf of a cell the null point is at 240 cm when we have a 400ω resistor in series with the cell and galvanometer. If the series resistance is reduced to half, the null point will be at

A. 120 cm

B. 240 cm

C. 480 cm

D. 600 cm

Answer: B

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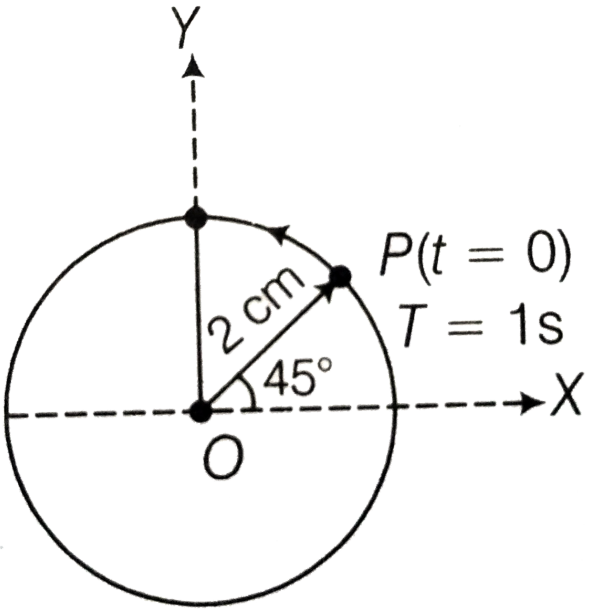
18. Figure shows the circular motion of a particle. The radius of the circle, the period, sense of revolution and the initial position are indicated in the · figure. The simple harmonic motion of the X-projection of the radius vector

of the rotating particle Pis



A. $x = 2\cos\left(2\pi t + \frac{\pi}{4}\right)$

B. $x = 2\sin\left(2\pi t + \frac{\pi}{4}\right)$

C. $x = 2\sin\left(2\pi t - \frac{\pi}{4}\right)$

D. $x = 2\cos\left(2\pi t - \frac{\pi}{4}\right)$

Answer: A

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19. A frame made of metallic wire enclosing a surface area A is covered with a soap film. If the area of the frame of metallic wire is reduced by 25%, the energy of the soap film will be changed by

A. 1

B. 0.75

C. 0.5

D. 0.25

Answer: D

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20. A plane wave of wavelength 6250 $\mathring{A}$ is incident normally on a slit of width 2×10^{-2} cm. The width of the principal maximum on a screen distant 50 cm will be

A. $312.5 \times 10^{-3} cm$

B. $312.5 \times 10^{-3} m$

C. 312.5×10^{-2}m

D. 312.5 xx 10^(-3)`m

Answer: A

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21. The susceptibility of a paramagnetic material is Kat $27^{\circ} C$. At what temperature will its susceptibility be K/2?

A. 600° C

B. $287^\circ C$

C. 54° C

D. 327° C

Answer: D

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22. If the frequency of first harmonic of a closed pipe is in unison with the third harmonic of an open pipe. Then, the ratio of

lengths of the pipe closed at one end to the open at both the ends is

A. $\frac{1}{12}$

B. $\frac{3}{4}$

C. $\frac{1}{6}$

D. $\frac{6}{7}$

Answer: C

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23. Consider a collection of a large number of particles each with speed v. The direction of velocity is randomly distributed in the collection. Show that the magnitude of the relative velocity between a pair of particles averaged over all the pairs in the collection is greater than v.

A. $4v/\pi$

B. greater than $4v/\pi$

C. less than $4v/\pi$

D. zero

Answer: A

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24. In a semiconductor diode p-side is earthed and N-side is applied a potential of -2V, the diode shall

A. conduct

B. not conduct

C. conduct partially

D. break down

Answer: A

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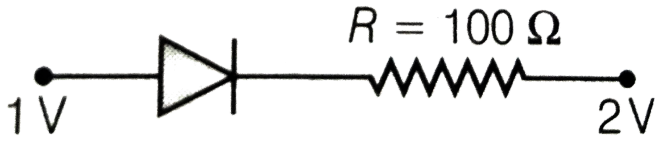
25. Assuming that the function diode is ideal, the current in the arrangement shown in figure is .



A. zero

B. 2 mA

C. 10 mA

D. 30 mA

Answer: A

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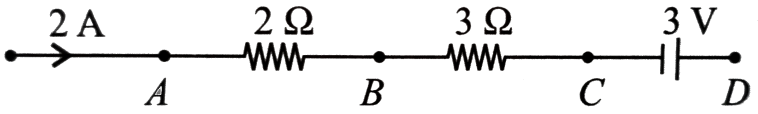
26. In the given circuit the potential at point B is zero, the potential at points A and D will be



A. $V_A = 4V, V_D = 9V$

B. $V_A = 3V, V_D = 4V$

C. $V_A = 9V, V_D = 3V$

D. $V_A = 4V, V_D = -3V$

Answer: D

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27. The magnetic flux ϕ (in weber) in a closed circuit of resistance 10Ω varies with time t (in secnod) according to equation $\phi = 6t^2 - 5t + 1$. The magnitude of induced current at $t = 0.25$ s is

A. $0.2A$

B. 0.6A

C. 1.2A

D. 0.8A

Answer: A

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28. 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. 10 mA

B. 22 mA

C. 40 mA

D. 80 mA

Answer: B

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29. The sun with surface t,emper'ature of 6000 K has maximum emlssion at 5000 A. The temperature of a star whose maximum emission is at 4500Å will be

A. 5500 k

B. 6500 k

C. 6000 k

D. 6666.7 k

Answer: D

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30. Energy required to remove an electron from aluminium surface is $4.2eV$. If light of wavelength 2000Å falls on the surface , the velocity of the fastest electron ejected from the surface will be

A. $2.5 \times 10^6 m/s$

B. $2.5 \times 10^9 m/s$

C. $6.7 \times 10^8 m/s$

D. None of these

Answer: A

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31. A liquid X of density $3.36 g/cm^3$ poured in a U-tube which contains Hg. Another liquid Y is poured in left arm with heght 8 cm upper

levels of X and Y are same. What is density of Y?

A. $0.8gcc^{-1}$

B. $1.2gcc^{-1}$

C. $1.4gcc^{-1}$

D. $1.6gcc^{-1}$

Answer: A

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32. Ionization potential of hydrogen atom is $13.6V$. Hydrogen atoms in the ground state are excited by monochromatic radiation of photon energy $12.1eV$. The spectral lines emitted by hydrogen atoms according to Bohr's theory will be

A. 1

B. 2

C. 3

D. 4

Answer: C

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33. Water is flowing continuously from a tap having an internal diameter 8×10^{-3} m. The water velocity as it leaves the tap is 0.4 m/s. The diameter of the water stream at a distance 2×10^{-1} m below the tap is close to

A. $7.5 \times 10^{-3} m$

B. $9.6 \times 10^{-3} m$

C. $3.6 \times 10^{-3} m$

D. $5.0 \times 10^{-3} m$

Answer: C

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34. A galvanometer of resistance 98 ohms is shunted by a resistance of 2 ohms. The fraction of the total current that pass through is.

A. $1/50$

B. $1/49$

C. $1/2$

D. $1/98$

Answer: A

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35. The equations of two SH M's are

$X_1 = 4\sin(\omega t + \pi/2).\ X_2 = 3\sin(\omega t + \pi)$

A. 6 units

B. 5 units

C. 1 units

D. 7 units

Answer: B

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36. A proton passes undeviated through a ~eg_ion ~here both the electric and magnetic fields exlst m sUltable directions. Its velocity is

v. If an alpha particle of double the charge of proton passes through the same region with the velocity $\frac{V}{2}$ it will

A. remain stationary

B. be deflected towards the driection of magnetic field

C. path udeviated.

D. be deflected towards the direction of electric filed

Answer: C

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37. A wire elongates by l mm when a load W is hanged from it. If the wire goes over a pulley and two weights W each are hung at the two ends, the elongation of the wire will be (in mm)

A. l/2

B. l

C. 2l

D. zero

Answer: B

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38. A wire of length $2m$ is made from $10cm^2$ of copper. A force F is applied so that its length increases by $2mm$. Another wire of length $8m$ is made from the same volume of copper. If the force F is applied to it, its length will increase by

A. 0.8 cm

B. 1.6cm

C. 2.4 cm

D. 3.2 cm

Answer: D

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39. In a stationary wave, all particles of the medium cross the mean position with (

A. different velcoities at different instants

B. different velocities at same instant

C. same speed at all instant

D. different speeds at all instant

Answer: A

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40. When a capillary is dipped in water, water rises 0.015 m in it. If the surface tension of

water is $75 \times 10^{-3} N/m$, the radius of capillary is

A. $0.1mm$

B. $0.5mm$

C. 1 mm

D. 2 mm

Answer: C

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41. A boat at anchor is rocked by waves whose crests are $100m$ apart and whose speed is $25m/s$. These waves reach the boat once every :

A. 2500s

B. 75s

C. 4s

D. $0.25s$

Answer: C

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42. A source of sound S is moving with a velocity of $50m/s$ towards a stationary observer. The observer measures the frequency of the source as 1000 Hz. What will be the apparent frequency of the source as 1000 Hz. What will be the apparent frequency of the source when it is moving away from the observer after crossing him? The velocity of the sound in the medium is $350m/s$

A. 1330 Hz

B. 1140 Hz

C. 750 Hz

D. 850 Hz

Answer: C

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43. A standing wave having 3 nodes and 2 antinodes is formed between two atoms having a distance 1.21Å between them. The wavelength of the standing wave is

A. 3.63Å

B. 6.05Å

C. 1.12Å

D. 2.42Å

Answer: C

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44. The dimensions of gravitational constant G and the moment of inertia are, respectively

A. $\left[ML^3T^{-2}\right], \left[ML^2T^0\right]$

B. $\left[M^{-1}L^3T^{-2}\right], \left[ML^2T^0\right]$

C. $\left[M^{-1}L^3T^{-2}\right], \left[M^{-1}L^2T\right]$

D. $\left[ML^3T^{-2}\right], \left[M^{-1}L^2T\right]$

Answer: B

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45. If the length of rod A is 3.25 ± 0.01 cm and that of B is 4.19 ± 0.01 cm then the rod B is longer than rod A by

A. $(0.94 \pm 0.00)cm$

B. $(0.94 \pm 0.01)cm$

C. $(0.94 \pm 0.02)cm$

D. $(0.95 \pm 0.005)cm$

Answer: C

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46. A 50 ohm galvanometer gets full scale deflection when a current of 0.01 A passes

through the coil. When it is converted to a 10 A ammeter, the shunt resistance is

A. 0.01Ω

B. 0.05Ω

C. 200Ω

D. 5000Ω

Answer: B

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47. The reflection coefficient and absorption coefficient of a body are 0.3 and 0.2 respectively. The percentage of radiation transmitted

A. 0.1

B. 0.5

C. 0.2

D. 0.3

Answer: B

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48. An alpha nucleus of energy $\frac{1}{2}mv^2$ bombards a heavy nucleus of charge Ze . Then the distance of closed approach for the alpha nucleus will be proportional to

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

B. v^2

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

D. $\frac{1}{v^2}$

Answer: C

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49. The voltage between the plates of a parallel plate capacitor of capacitance $1\mu F$ is changing at the rate of 8 V/s. What is the displacement current in the capacitor?

A. $3\mu A$

B. $8\mu A$

C. $5\mu A$

D. $10\mu A$

Answer: B

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50. An AM radio station operating at 630 kHz is permitted to broadcast audio frequencies up to 6 kHz. The band pass filter in its modulation circuit can retain the frequencies

A. 636 kHz , 624 kHz

B. 12 kHz, 6kHz

C. 1260 kHz, 6kHz

D. 1260 kHz, 630 kHz

Answer: A

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