



PHYSICS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

PRACTICE SET 13

Paper I Objective Type

1. 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 mirror of the first one is:

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

B. $10m / s$

C. $15m / s$

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

Answer: A



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2. A car of mass m moves in a horizontal circular path of radius r meter. At an instant its speed is $V m/s$ and is increasing at a rate of a m/sec^2 . Then the acceleration of the car is:

A. $\frac{v^2}{r}$

B. a

C. $\sqrt{a^2 + \left(\frac{v^2}{r}\right)^2}$

D. $\sqrt{u + \frac{v^2}{r}}$

Answer: C



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3. In children's park using the part ride the visitors can be made to rotate in a vertical circle. At the top of the circle, a rider has an effective weight of magnitude $1000N$. If his actual weight is $500N$ then what is the effective at the bottom of the circle?

A. $1500N$

B. $2000N$

C. $2500N$

D. $1800N$

Answer: B



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4. If the distance between the sun and the earth is increased by three times, then attraction between two will

A. remain constant

B. decrease by 63%

C. increase by 63%

D. decrease by 89%

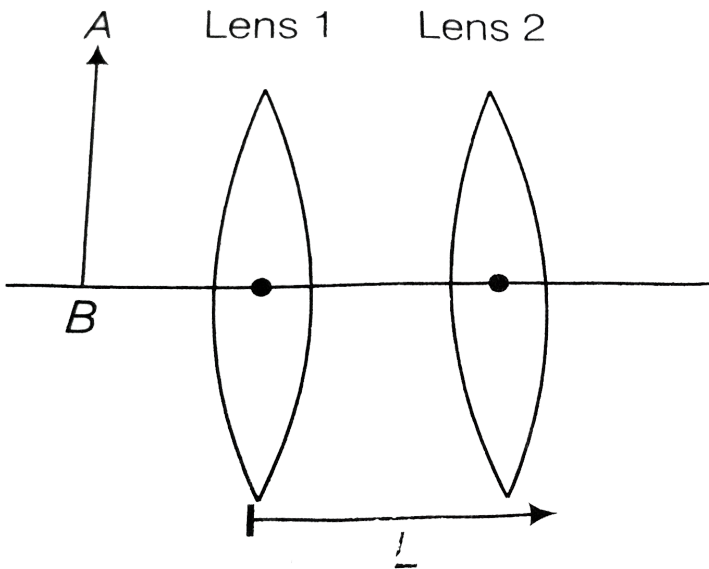
Answer: D



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5. Figure shows an object AB placed in front of two thin coaxial lenses 1 and 2 with focal lengths 24 cm and 9.0 cm, respectively. The

object is 6.0 cm from the lens/and the lens separation is $L = 10\text{ cm}$. Where does the system of two lenses produce an image of the object AB?



A. $+18\text{ cm}$

B. -18 cm

C. $+24cm$

D. $-24cm$

Answer: A



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6. The moment of inertia of a circular loop of radius R , at a distance of $R/2$ around a rotating axis parallel to horizontal diameter of loop is

A. MR^2

B. $\frac{1}{2}MR^2$

C. $2MR^2$

D. $\frac{3}{4}MR^2$

Answer: D



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7. Two pendulums have time period T and $5T/4$.

They starts SHM at the same time from the mean position. What will be the phase

difference between them after the bigger
pendulum completed one oscillation ?

A. 45°

B. 90°

C. 60°

D. 30°

Answer: B



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8. For a particle executing *S. H. M.*, the kinetic energy K is given $K = K_0 \cos^2 \omega t$. The maximum value of potential energy is:

A. K_0

B. zero

C. $K_0 / 2$

D. not obtainable

Answer: A



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9. A string of mass 2.50kg is under a tension of 200N. The length of the stretched string is 20.0m. If the transverse jerk is struck at one end of the string, how long does the disturbance take to reach the other end?

A. 1s

B. 0.5s

C. 1.5s

D. 2.5s

Answer: B



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10. When a metal wire elongates by hanging a load Mg on it the gravitational potential energy of mass M decrease by Mgl . This energy appears

A. as elastic potential energy appears

B. as thermal energy completely

C. half as elastic potential energy and half as thermal energy

D. as kinetic energy of the load completely.

Answer: C



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11. The bus moving with a speed 42km/h is brought to a stop by brakes after 6m . If the same bus is moving at a speed of 90km/h , then the minimum stopping distance is

A. 15.48m

B. $18.64m$

C. $22.13m$

D. $27.55m$

Answer: D



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12. A water drop is divided into 8 equal droplets. The pressure difference between the inner and outer side of the big drop will be

- A. same as for smaller droplet
- B. $\frac{1}{2}$ of that for smaller droplet
- C. $\frac{1}{4}$ of that for smaller droplet
- D. twice that for smaller droplet

Answer: B



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13. Two polaroids are kept crossed to each other. Now one of them is rotated through an

angle of 45° . The percentage of incident light now transmitted through the system is

A. 0.15

B. 0.25

C. 0.5

D. 0.6

Answer: C



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14. A satellite orbiting the circular orbit of radius R complete one revolution in $3h$. If orbital radius of geostationary satellite is $36000km$, then the orbital radius R of satellite is

A. 6000 km

B. 9000 km

C. 12000 km

D. 15000 km

Answer: B



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15. The displacement y of a particle executing periodic motion is given by

$$y = 4 \cos^2\left(\frac{1}{2}t\right) \sin(1000t)$$

This expression may be considered to be a result of the superposition of

- A. two motions
- B. three motions
- C. four motions

D. five motions

Answer: B



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16. Change in frequency due to Doppler's effect is produced when

A. the source and the observer are moving
in the same direction

B. the source and the observe are both at rest

C. there is a relative motion between the source and the observer

D. there is a resultant motion between the source and observer.

Answer: C



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17. Three blocks of masses 4 kg, 2 kg and 1 kg respectively are in contact on a frictionless table as shown in the figure. If a force of $14N$ is applied on the 4 kg block, the contact force between the 4 kg and the 2 kg block will be

A. $2N$

B. $6N$

C. $8N$

D. $14N$

Answer: B



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18. The equation of the stationary wave is

$$y = 2A \sin\left(\frac{2\pi ct}{\lambda}\right) \cos\left(\frac{2\pi x}{\lambda}\right)$$

Which of the following statements is wrong?

- A. The unit of ct is same as that of λ .
- B. The unit of x is same as that of λ .
- C. The unit of $2\pi c/\lambda$ is same as that of

$$2\pi \frac{x}{\lambda} t$$

- D. The unit of c/λ is same as that of x/λ .

Answer: D



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19. A moving coil galvanometer has 10 turns each of length 12 cm and breadth 8 cm the coil of MCG carries a current of $125 \mu\text{ A}$ The coil is kept perpendicular to uniform magnetic field of induction 10^{-2} T the twist constant of phosphor bronze fibre is $12 \times 10^{-9} \text{ Nm/degree}$ calculate the deflection produced

A. 10°

B. 20°

C. 30°

D. 40°

Answer: A



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20. A moving coil galvanometer gives full scale deflection when a current of 0.005 A is passed through its coil it is converted in to a

voltmeter reading up to 5V by using an external resistance of 975Ω what is the resistance of the galvanometer coil ?

A. 5

B. 10

C. 15

D. 25

Answer: D



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21. A balloon contains $500m^3$ of He at $27^\circ C$ and 1 atm pressure. Then , the volume of He at $-3^\circ C$ and 0.5 atm pressure will be

A. 700^3

B. $900m^3$

C. $1000m^3$

D. $500m^3$

Answer: B



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22. A body cools from $50^{\circ}C$ to $49^{\circ}C$ in 5 s. How long will it take to cool from $40^{\circ}C$ to $39.5^{\circ}C$? Assume the temperature of surroundings to be $30^{\circ}C$ and Newton's law of cooling to be valid:

A. $2.5s$

B. $10s$

C. $20s$

D. $5s$

Answer: B



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23. What is the torque of a force $3\hat{i} + 7\hat{j} + 4\hat{k}$ about the origin if the force acts on a particle whose position vector is $2\hat{i} + 2\hat{j} + 1\hat{k}$?

A. $\hat{i} - \hat{j} + 8\hat{k}$

B. $2\hat{i} + 2\hat{j} + 2\hat{k}$

C. $\hat{i} + \hat{j} + \hat{k}$

D. $3\hat{i} + 2\hat{j} + 3\hat{k}$

Answer: A



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24. On increasing the plate separation of a charged condenser, the energy

- A. increases
- B. decreases
- C. remains unchanged
- D. becomes zero

Answer: A



25. Two waves having intensities in the ratio of 16:1 produce interference. The ratio of maximum to minimum intensities is equal to

A. 10:8

B. 9:1

C. 25:9

D. 4:1

Answer: C



26. A man standing on a road has to hold his umbrella at 30° with the vertical to keep the rain away. He throws the umbrella and starts running at 10 km/h. He finds that raindrops are hitting his head vertically. Find the speed of raindrops with respect to a. the road, b. the moving man.

A. 20kmh^{-1}

B. $10\sqrt{3}\text{kmh}^{-1}$

C. $20\sqrt{3}kmh^{-1}$

D. $10kmh^{-1}$

Answer: A



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27. A capacitor having capacity of $2\mu F$ is charged to $200V$ and then the plates of the capacitor are connected to a resistance wire. The heat produced in joule will be

A. 2×10^{-2}

B. 4×10^{-2}

C. 4×10^4

D. 4×10^{10}

Answer: B



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28. The compressibility of water is $4.5 \times 10^{-10} \text{ m}^2 / \text{N}$. 1 L of water is subjected

to pressure of $2 \times 10^7 \text{ N/m}^2$. The decrease in its volume is

A. 1 cc

B. 4cc

C. 5cc

D. 9cc

Answer: D



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29. A charge q is located at the centre of a cube. The electric flux through any face is

A. $\frac{\pi q}{6(\pi\epsilon_0)}$

B. $\frac{q}{6(4\pi\epsilon_0)}$

C. $\frac{2\pi q}{6(4\pi\epsilon_0)}$

D. $\frac{4\pi q}{6(4\pi\epsilon_0)}$

Answer: D



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30. A soap film is formed on a frame of area $4 \times 10^{-3} \text{m}^2$. If the area of the film is reduced to half, then the change in the potential energy of the film is (surface tension of soap solution = $40 \times 10^{-3} \text{N/m}$)

A. $32 \times 10^{-5} \text{J}$, $16 \times 10^{-5} \text{J}$

B. $16 \times 10^{-5} \text{J}$, $8 \times 10^{-5} \text{J}$

C. $48 \times 10^{-5} \text{J}$, $12 \times 10^{-5} \text{J}$

D. $36 \times 10^{-5} \text{J}$, $2 \times 10^{-5} \text{J}$

Answer: A





31. The maximum electron density in the ionosphere in the morning is $10^{10} m^{-3}$. At noon time it increases to $2 \times 10^{10} m^{-3}$. Find the ratio of critical frequency at noon and the critical frequency in the morning.

A. 2.00

B. 2.82

C. 4.00

D. 1.414

Answer: D



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32. If the difference between the frequencies of two sound notes is $8Hz$, then the time interval between successive maximum intensity, is

A. $125s$

B. $0.0125s$

C. $5s$

D. $0.125s$

Answer: D



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33. The length of a sonometer wire between two fixed ends is 110cm . Where should the two bridges be placed so as to divide the wire into three segments, whose fundamental frequencies are in the ratio $1:2:3$?

A. 30 cm and 90 cm

B. 40 cm and 80 cm

C. 60 cm and 90 cm

D. 30 cm and 60 cm

Answer: C



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34. The magnetic susceptibility of a paramagnetic substance at $-173.^\circ C$ is 1.5×10^{-2} then its value at

A. 7.5×10^{-1}

B. 7.5×10^{-2}

C. 7.5×10^{-3}

D. 7.5×10^{-4}

Answer: C



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35. A voltmeter of range 2 V and resistance 300Ω cannot be converted into ammeter of range

A. $1A$

B. $1mA$

C. $100mA$

D. $10mA$

Answer: B



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36. If the momentum of a body is increased by 50%, then the percentage increase in its kinetic energy is

A. 1

B. 2.5

C. 4

D. 5

Answer: C



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37. A ray of light is incident on the surface of a glass plate at an angle of incidence equal to Brewster's angle ϕ . If μ represents the

refractive index of glass with respect to air, then the angle between reflected and refracted rays is

A. $90^\circ + \phi$

B. $\sin^{-1}(\mu \cos \phi)$

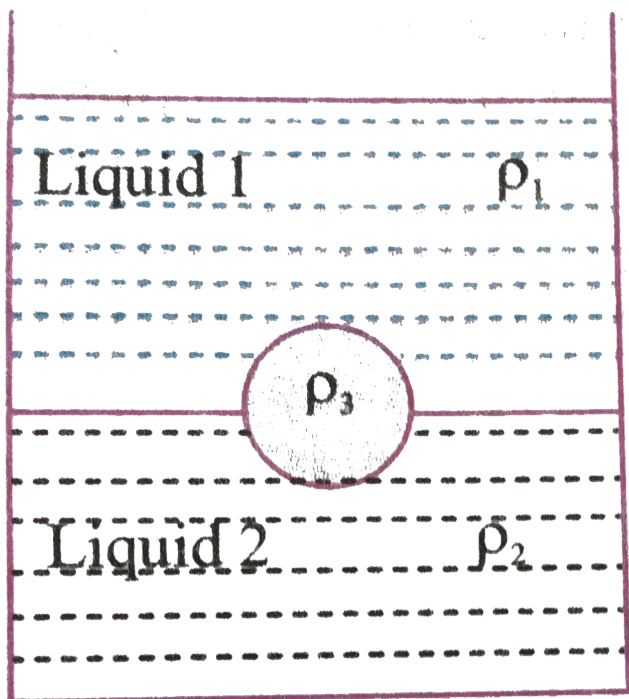
C. 90°

D. $90^\circ - \sin^{-1}(\sin \phi / 4)$

Answer: C



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38.

A jar filled with two non-mixing liquid 1 and 2 having densities ρ_1 and ρ_2 respectively. A solid ball, made of a material of density ρ_3 is dropped in the jar. It come to equilibrium in the position shown in the figure. Which of the following is true for ρ_1 , ρ_2 and ρ_3 ?

A. $\rho_3 < \rho_1 < \rho_2$

B. $\rho_1 > \rho_3 > \rho_2$

C. $\rho_1 < \rho_2 < \rho_3$

D. $\rho_1 < \rho_3 < \rho_2$

Answer: A



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39. A coil has a inductance of 0.7H and is joined in series with a resistance of 220Ω . When an alternating emf of 220V at 50 cps is

applied to it, then the wattless component of the current in the circuit is

A. $5A$

B. $0.5A$

C. $0.7A$

D. $7A$

Answer: B



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40. what should be the velocity of an electron so that its momentum becomes equal to that of a photon of wavelength 5200\AA

A. $700m / s$

B. $1000m / s$

C. $1400m / s$

D. $2800m / s$

Answer: C



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41. A proton accelerated through a potential V has de-Broglie wavelength λ . Then, the de-Broglie wavelength of an alpha-particle, when accelerated through the same potential V is

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

B. $\frac{\lambda}{\sqrt{2}}$

C. $\frac{\lambda}{2(\sqrt{2})}$

D. $\frac{\lambda}{8}$

Answer: C



42. If the series limit of wavelength of the Lyman series for the hydrogen atoms is 912\AA , then the series limit of wavelength for the Balmer series of the hydrogen atom is :

A. 3600\AA

B. 1800\AA

C. 1200\AA

D. 1600\AA

Answer: A



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43. A fringe width in Young's experiment is 0.8 mm for a certain source when the screen is at a distance of 50 cm from the slits. If the distance of screen from the slits is increased to 200 cm, other things remaining same the new fringe width is

A. 3.2 mm

B. 1.2 mm

C. 1 mm

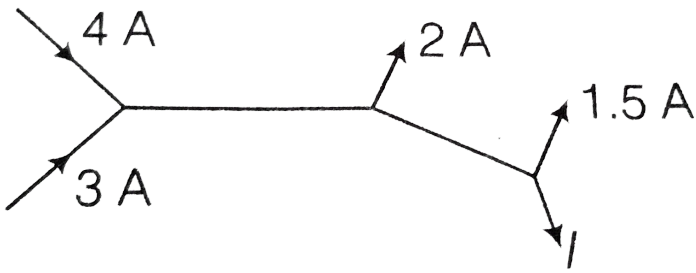
D. 4 mm

Answer: A



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44. Figure shows currents in a part of an electric circuit, then current I is



A. 17 A

B. 35 A

C. 1.3 A

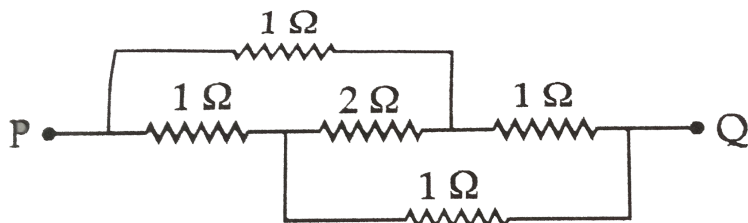
D. 3 A

Answer: B



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45. The equivalent resistance across P and Q in the given electric circuit will be



A. $1\ \Omega$

B. $2\ \Omega$

C. $3\ \Omega$

D. $5\ \Omega$

Answer: A



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46. Pure Si at 300 K has equal electron (n_e) and hole (n_h) concentrations of $1.5 \times 10^{16} m^{-3}$. Doping by indium increases n_h to $4.5 \times 10^{22} m^{-3}$. Calculate n_e in the doped Si-

A. 9×10^5

B. 5×10^9

C. 2.25×10^{11}

D. 3×10^{10}

Answer: B



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47. if a ball of steel (density $\rho = 7.8g/cm^3$) attains a terminal velocity of $10cm/s$ when falling in a tank of water (coefficient of viscosity, $\eta_{water} = 8.5 \times 10^{-4}Ps$ s), then its terminal velocity in glycerine ($\rho = 1.2g/cm^2$, $\eta = 13.2Pas$) would be nearly

A. $1.6 \times 10^{-5} \text{ cm s}^{-1}$

B. $6.25 \times 10^{-4} \text{ cm s}^{-1}$

C. $6.45 \times 10^{-4} \text{ cm s}^{-1}$

D. $1.5 \times 10^{-5} \text{ cm s}^{-1}$

Answer: B



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48. Capacitance of a capacitor becomes $\frac{7}{6}$ times of its original value if a dielectric slab of thickness $t = \frac{2}{4}d$ is introduced in between the

plates, d is the separation between the plates.

The dielectric constant of the dielectric slab is

A. $\frac{14}{11}$

B. $\frac{11}{14}$

C. $\frac{7}{11}$

D. $\frac{11}{7}$

Answer: A



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49. The unit of physical quantity obtained by the line integral of electric field is

A. NC^{-1}

B. Vm^{-1}

C. JC^{-1}

D. $C^2N^{-1}m^{-2}$

Answer: C



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50. A student uses a simple pendulum of exactly $1m$ length to determine g , the acceleration due to gravity. He uses a stop watch with the least count of 1 sec for this and record 40 seconds for 20 oscillations for this observation, which of the following statement (s) is (are) true?

A. Error $D\eta T$ in measuring T , the time period is $0.05s$.

B. Error ΔT in measuring T , the time period is $1s$

C. Percentage error in the determination of

g is 5 %

D. Percentage error in the determination of

g is 3.5 %

Answer: C



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