PHYSICS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

PRACTICE SET 12

Paper 1 Physics Chemistry

1. The S.I. unit of gravitational potential is

A. J

B. J/kg

C. Jkg

D. Jkg^2

Answer: B

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2. A wheel has moment of inertia $5 \times 10^{-3} kgm^2$ and is making $20 \text{rev} s^{-1}$. The

torque needed to stop it in $10s$ is.....

$\times 10^{-2} N - m$

A. $2\pi \times 10^{-2}$

B. $2.5\pi \times 10^{-3}$

C. $4\pi \times 10^{-2}$

D. $4.5\pi \times 10^{-4}$

Answer: A

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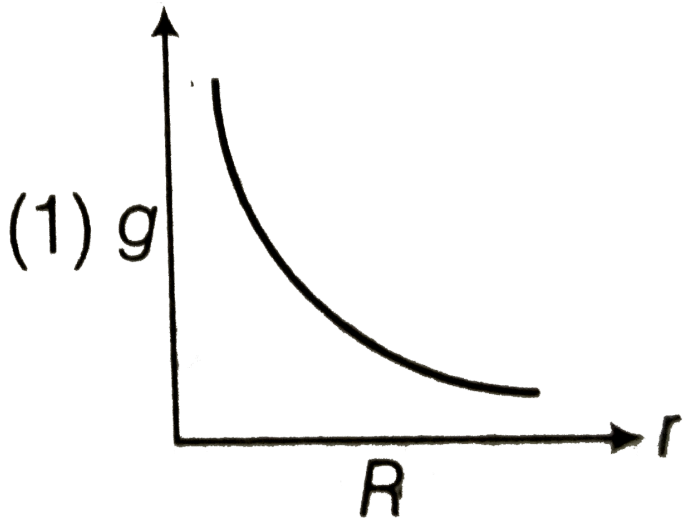
3. The dependence of acceleration due to gravity g on the distance r from the centre of the earth, assumed to be sphere of radius R of uniform density is a shown in figures along side.



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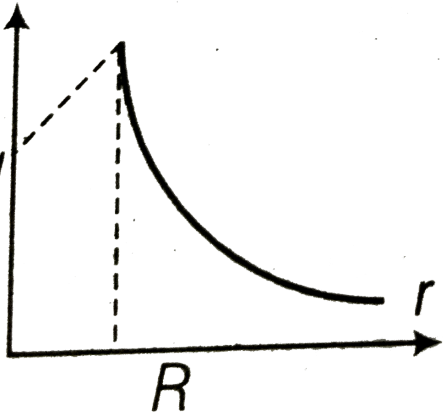

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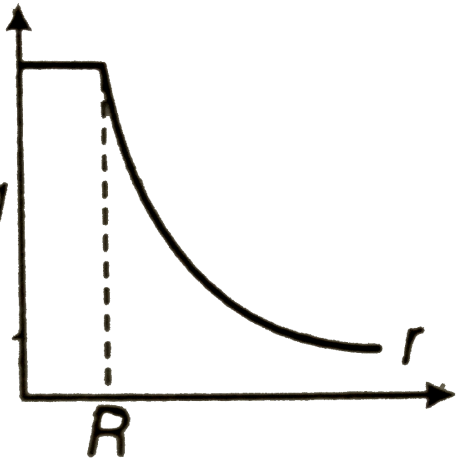

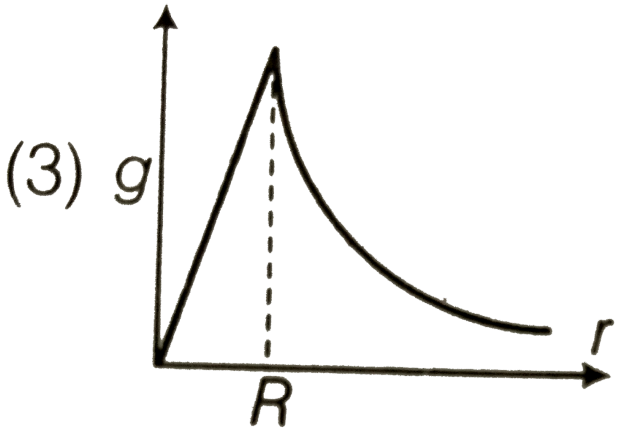

The correct figure is

A. -4

B. -1

C. -2

D. -3

Answer: A

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4. Two resistors 4Ω and 800Ω are connected in series with a $6V$ battery. The potential difference measured by voltmeter of $10k\Omega$ across 400Ω resistor is

A. $2V$

B. $1.95V$

C. $3.8V$

D. $4V$

Answer: B

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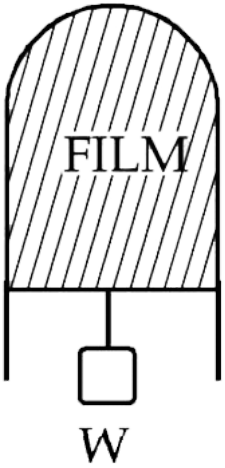
5. A thin liquid film formed between a U-shaped wire and a light slider supports a weight of $1.5 \times 10^{-2} N$ (see figure). The length of the slider is 30cm and its weight negligible. The surface tension of the liquid

film is



A. 0.1 N/m

B. 0.05 N/m

C. 0.025 N/m

D. 0.0125 N/m

Answer: C

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6. For the higher sensitivity which of the following is essential for the potentiometer?

A. Larger length of the wire

B. Higher resistivity of the wire

C. Higher emfof auxiliary battery

D. None of the above

Answer: A

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7. A $100\mu F$ capacitor is to have an energy content of $50J$ in order to operate a flash lamp. The voltage required to charge the capacitor is

A. $500V$

B. $1000V$

C. $1500V$

D. $2000V$

Answer: B

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8. Two vibrating tuning forks produce progressive waves given by , $y_1 = 4\sin(500\pi t)$ and $y_2 = 2\sin(506\pi t)$. These tuning forks are held near the ear of person . The person will hear

A. 3 beats/s with intensity ratio of maxima to minima $= 9$

B. 3 beats/s with intensity ratio of maxima to minima $= 2$

C. 6 beats/s with intensity ratio of maxima to minima $= 2$

D. 6 beats/s with intensity ratio of maxima to minima $= 9$

Answer: A

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9. The work done by surface tension on rising water do height of h in a capillary tube of radius r is

A. $\frac{2\pi T^2}{\rho g}$

B. $\frac{\rho g}{2\pi T^2}$

C. $\frac{4\pi T^2}{\rho g}$

D. $\frac{2\pi T^2}{\rho}$

Answer: C

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10. λ_a and λ_m are the wavelengths of light in air and medium respectively. If i_p is the polarising angle, the correct relation between λ_a, λ_m and i_p is

A. $\lambda_a = \lambda_m \tan^2\theta$

B. $\lambda_m = \lambda_a \tan^2\theta$

C. $\lambda_a = \lambda_m \cot\theta$

D. $\lambda_m = \lambda_a \cot\theta$

Answer: D

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11. The dimensions of coefficient of self inductances are

A. $[ML^2T^{-2}A^{-2}]$

B. $[ML^2T^{-2}A^{-1}]$

C. $[MLT^{-2}A^{-1}]$

D. $[MLT^{-2}A^{-1}]$

Answer: A

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12. Three liquids of equal masses are taken in three identical cubical vessels A,B and C. Their densities are ρ_A, ρ_B and ρ_C respectively but $\rho_A < \rho_B < \rho_C$. The force exerted by the liquid on the base of the cubical vessel is

A. maximum in vessel C

B. minimum in vessel C

C. the same in all the vessels

D. maximum in vessel A

Answer: C

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13. If the amplitude of a wave at a distance r from a point source is A, the amplitude at a distance $2r$ will be

A. $2A$

B. A

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

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

Answer: C

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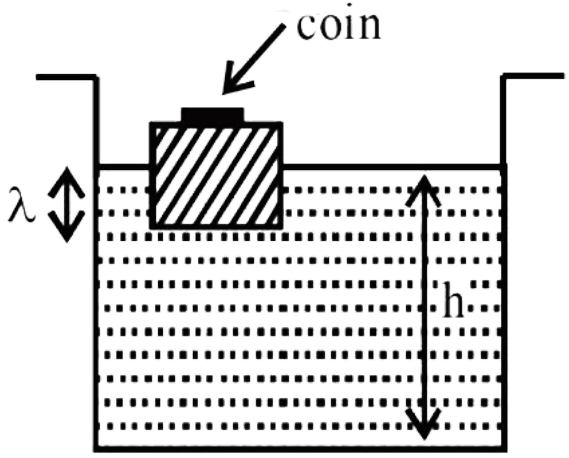
14. A wooden block, with a coin placed on its top, floats in water as shown in figure. The distance l and h are shown here. After some time the coin falls into water. Then



A. both l and h increase

B. Both l and h decrease

C. l decreases and h increases

D. l increases and h decreases

Answer: B

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15. If 200 MeV energy is released per fission of $._{92}U^{235}$ How many fissions must occur per second to produce a power of 1m W?

A. 3.12×10^{13}

B. 3.12×10^{3}

C. 3.1×10^{17}

D. 3.12×10^{19}

Answer: A

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16. How many minimum number of coplanar vector having different magnitudes can be added to give zero resultant?

A. 2

B. 3

C. 4

D. 5

Answer: B

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17. A uniform disc of radius R lies in xy-plane with its centre at origin. Its moments of inertia about the axis $X = 2R$ and $Y = 0$ is equal to

the moment of inertia about the axis $Y = d$ and $Z = 0$. What is the value of d?

A. $\frac{\sqrt{17}}{2}R$

B. $\sqrt{13}R$

C. $\sqrt{\frac{15}{2}}R$

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

Answer: A

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18. The equation $y = 4\cos\left(\frac{2\pi x}{50}\right)\sin(200\pi t)$ represents a stationary wave, where x and y are in cm and t in s.

Then a node occurs at a distance of origin

A. 12.5 cm

B. 50 cm

C. 20 cm

D. $100/2\pi cm$

Answer: A

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19. The Young's double slit experiment the wavelength of light $\lambda = 4 \times 10^{-7} m$ and separation between the slits is $d = 0.1mm$. If the frintge width is $4mm$ then the seperation between the slits and the screen will be

A. 100 mm

B. 1m

C. $10^6 m$

D. 10Å

Answer: B

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20. A neutron is confined to a nucleus of size $2 \times 10^{-14} m$. The minimum momentum of the electron may be

A. $6.6 \times 10^{-20} kgm/s$

B. $3.3 \times 10^{-20} kgm/s$

C. $3.3 \times 10^{-48} kgm/s$

D. $6.6 \times 10^{-48} kgm/s$

Answer: B

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21. An electron makes transition inside a hydrogen atom. The orbital angular momentum of the electron may change by

A. h

B. $\frac{h}{3\pi}$

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

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

Answer: C

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22. A carnot engine has an efficiency of 20%. The energy is supplied to the engine at the rateof $2kW$. What is the output power of the engine?

A. $300W$

B. $400W$

C. $500W$

D. $600W$

Answer: B

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23. In a p-type semiconductor the acceptor level is situated 60 m eV above the valence band. The maximum wavelength of light required to produce a hole will be [use hc $= 12400eV\text{Å}$].

A. $0.207 \times 10^{-5}m$

B. $2.07 \times 10^{-5} m$

C. $20.7 \times 10^{-5} m$

D. $2075 \times 10^{-5} m$

Answer: B

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24. A transistor is used in common emitter configuration. Given its $\alpha = 0.9$, calculate the change in collector current when the base current changes by $2\mu A$.

A. $1\mu A$

B. $0.9\mu A$

C. $30\mu A$

D. $18\mu A$

Answer: D

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25. In Young's double slit experiment, slit separation is $0.6mm$ and the separation between slit and screen is $1.2m$. The angular

width is (the wavelength of light used is $4800Å$)

A. 4×10^{-4} rad

B. 10×10^{-4} rad

C. 8×10^{-4} rad

D. 12×10^{-4} rad

Answer: C

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26. A parallel plate condenser has a unifrom electric field $E(V/m)$ in the space between the plates. If the distance between the plates is $d(m)$ and area of each plate is $A\left(m^2\right)$ the energy (joule) stored in the condenser is

A. kE^2Ad/ε_0

B. $\frac{1}{2}\varepsilon_0 E^2 k$

C. $k\varepsilon_0 EAd$

D. $\frac{1}{2k}\varepsilon_0 E^2 AD$

Answer: D

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27. The magnetic needle of a tangent galvanometer is deflected at an angle 30° due to a magnet. The hoeizontal component of earth's magnetic field $0.34 \times 10^{-4}T$ is along the plane of the coil. The magnetic intensity is

A. $1.96 \times 10^{-4}T$

B. $1.96 \times 10^{4}T$

C. $1.96 \times 10^{-5}T$

D. $1.96 \times 10^5 T$

Answer: C

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28. A toroidal solenoid with an air core has an average radius of 15 cm , area of cross-section 12cm^2 and 1200 turns . Ignoring the field variation across the cross-section of the toroid the self-inductance of the toroid is

A. 4.6mH

B. 6.9mH

C. 2.3mH

D. 9.2mH

Answer: C

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29. Two potons of energy $2.5eV$ each are incident on a metal plate whose work function is $4.0eV$, then the number of emitted from the metal surface will be

A. 1

B. 2

C. more than 2

D. none of these

Answer: D

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30. A particle P is moving in a circle of radius r with a uniform speed u. C is the centre of the

circle and AB is diameter. The angular velocity of P about A and V are in the ratio :

A. $1:1$

B. $1:2$

C. $2:1$

D. $4:1$

Answer: B

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31. A simple pendulum has a time period T. The pendulum is completely immersed in a non-viscous liquid whose density is one-tenth of that of the material of the bob. The time period of the pendulum immersed in liquid is

A. T

B. $\sqrt{\frac{9}{10}}T$

C. $\sqrt{\frac{10}{9}}T$

D. $\frac{T}{10}$

Answer: C

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32. A particle is moving eastwards with a velocity $5ms^{-1}$, changes its direction northwards in 10 seconds and moves with same magnitude of velocity. The average acceleration is

A. $\frac{1}{\sqrt{2}}ms^{-2}$ toward North-East

B. $\frac{1}{2}ms^{-2}$ towards North

C. zero

D. $\frac{1}{\sqrt{2}} ms^{-2}$ towards North -West

Answer: D

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33. A body is moving in a vertical circle of raius $2r$ such that, the string is just taut at its highest point. The speed of the particle when the string is horizontal, is

A. $\sqrt{gr}$

B. $\sqrt{gr}$

C. $\sqrt{6gr}$

D. $\sqrt{5gr}$

Answer: C

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34. If there are six loops for 1m length in transverse mode of Melde's experiment, the number of loops in longitudinal mode under the indentical conditions would be

A. 3

B. 6

C. 12

D. 8

Answer: A

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35. A student unable to answer a question on Newton's laws of motion attempts to pull

himself up by tugging on her hair. He will not succeed.

A. as the force exerted is small

B. the frictional force while gripping, is small

C. Newton's law of inertia is not applicable to living beings

D. as the internal force applied is to the system

Answer: D

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36. A mass M, attached to a spring, oscillates with a period of $2s$. If the mass is increased by $4kg$, the time period increases by one second. Assuming that Hooke's law is obeyed, find the initial mass M.

A. 3.2 kg

B. 1 kg

C. 2 kg

D. 8 kg

Answer: A

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37. A wire is vibrating in the second overtone.

In the wire there are

A. two nodes and two antinodes

B. one node and two antinodes

C. four nodes and three antinodes

D. three nodes and three antinodes

Answer: C

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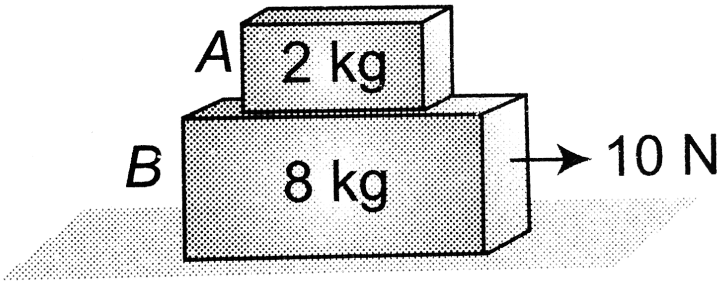
38. Block A of mass $2kg$ is placed over a block B of mass $8kg$. The combination is placed on a rough horizontal surface. If $g = 10ms^{-2}$, coefficient of friction between B and floor $= 0.5$, coefficient of friction between B and floor $= 0.5$, coefficient of friction between A

and $B = 0.4$ and a horizontal force of $10N$ is applied on $8kg$ block, then the force of friction between A and B is.



A. zero

B. 50N

C. 40N

D. 100N

Answer: B

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39. A cylinderical block of wood of mass m and area cross-section A is floating in water (density = ρ) when its axis vertical. When dressed a little and the released the block starts oscillating. The period oscillations is

A. $2\pi\sqrt{\frac{m}{\rho Ag}}$

B. $2\pi\sqrt{\frac{mg}{\rho a}}$

C. $2\pi\sqrt{\frac{\rho A g}{m}}$

D. $2\pi\sqrt{\frac{\rho A}{mg}}$

Answer: A

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40. A ray of light travelling in the direction $\frac{1}{2}\left(\hat{i}+\sqrt{3}\hat{j}\right)$ is incident on a plane mirror. After reflectiion, it travels along the direction $\frac{1}{2}\left(\hat{i}+\sqrt{3}\hat{j}\right)$. The angle of incidence is

A. 30°

B. 45°

C. 60°

D. 75°

Answer: A

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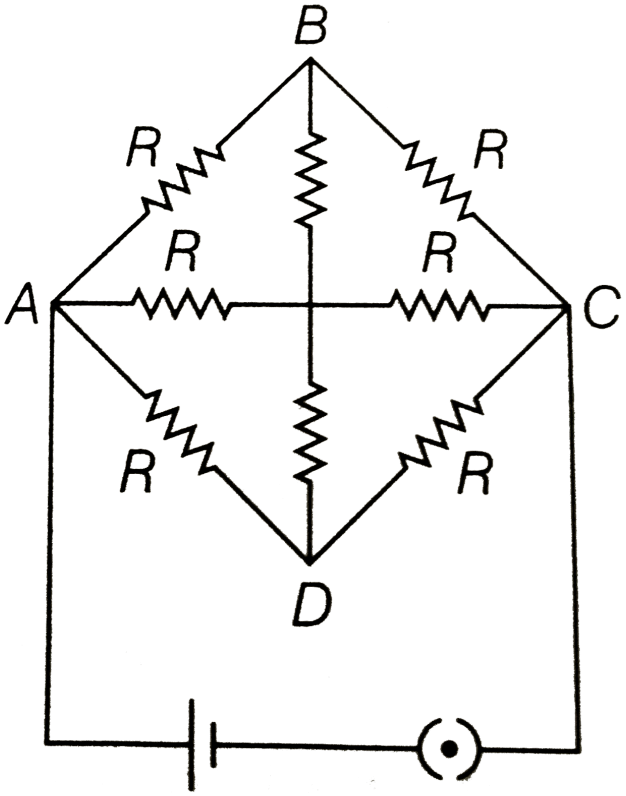
41. What is the effective resistance between the points A and C in the following network?



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

B. $\frac{2R}{3}$

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

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

Answer: B

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42. In a communication system, operating at $\lambda = 700nm$, only 1% of the optical source frequency is the available channel band width. How many channels can be accommodated for transmitting the signal requiring an approximate band width of $4.5MeV$?

A. 8.5×10^5

B. 9.5×10^6

C. 9.5×10^5

D. 8.5×10^4

Answer: C

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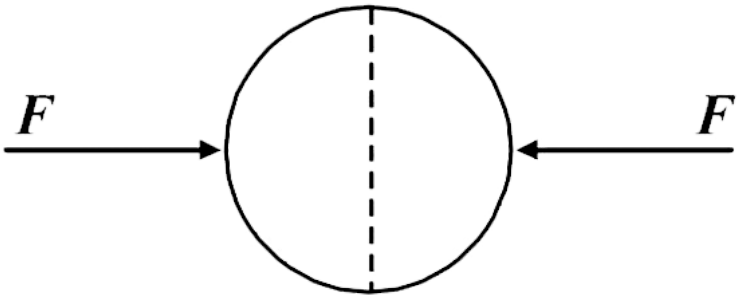
43. A uniformly charged thin spherical shell of radius R carries uniform surface charge denisty of $isgma$ per unit area. It is made of two hemispherical shells, held together by

presisng them with force F(see figure). F is proportional to



A. $\frac{1}{\varepsilon_0}\sigma^2 R^2$

B. $\frac{1}{\varepsilon_0}\sigma^2 R$

C. $\frac{1}{\varepsilon_0}\frac{\sigma^2}{R}$

D. $\frac{1}{\varepsilon_0}\frac{\sigma^2}{R^2}$

Answer: A

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44. Magnetic moment of an electron of charge e moving in a circular orbit of radius r with speed `v is given by

A. evr

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

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

D. $\frac{evr}{2}$

Answer: C

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45. If the temperature of a hot body is increased by 50%, then the increase in the quantity of emitted heat radiation will be

A. 1.25

B. 2

C. 3

D. 4

Answer: D

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46. A $220V$ input is supplied to a transformer. The output circuit draws a current of $2.0A$ at $440V$. If the efficiency of the transformer is 80%, the current drawn by the primery winding of the transformer is

A. 3.6 ampere

B. 2.8 ampere

C. 2.5 ampere

D. 5.0 ampere

Answer: D

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47. A hot and a cold body are kept in vacuum separated from each other. Which of the following cause decrease in temperature of the hot body

A. Radiation

B. Convection

C. Conduction

D. Temperature remains unchanged

Answer: A

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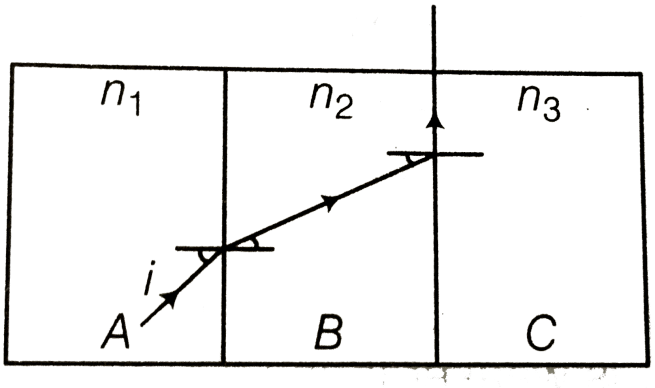
48. A,B, and C are the parallel sided transparent media of refractive indices n_1, n_2 and n_3 respectively. They are arranged as

shown in the figure. A ray is incident at an angle i on the surface of separation of A and B which is as shown in the figure. After the refraction into the medium B the ray grazes the surfaces of separation of the media B and C. then $\sin i$ equal to



A. $\frac{n_3}{n_1}$

B. $\frac{n_1}{n_3}$

C. $\frac{n_2}{n_3}$

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

Answer: A

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49. The Young's modulus of brass and steel are respectively $1.0 \times 10^{11} N/m^2$ and $2.0 \times 10^{11} N/m^2$. A brass wire and steel wire of the same length are extended by $1mm$ each

under the same force. If radii of brass and steel wires are R_B and R_S respectively,. then

A. $R_S = \sqrt{2}R_B$

B. $R_S = \frac{R_B}{\sqrt{2}}$

C. $R_S = 4R_B$

D. $R_S = \frac{R_B}{2}$

Answer: B

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50. Two coils X and Y are placed in a circuit such that when the current changes by 2 A in coil X. The magnetic flux changes by 0.4 Wb in Y. The value of mutual inductance of the coils is

A. $0.8H$

B. $0.2H$

C. $0.5H$

D. $5H$

Answer: B

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