JEE-Main-22-01-2025 (Memory Based)
[MORNING SHIFT]
Physics

Question: Find the dimensions of- $\frac{B}{\mu_0}$
Options:
(a) [AL]
(b) [AL-1]
(c) [MAL]
(d) [MALT-1]
Answer: (b)

Question: Solid sphere of mass M, radius R exerts force F on a point mass. Now a concentric spherical mass M/7 is removed. What is new force?
Options:
(a) F/7
(b) 6/7 F
(c) 5F/7
(d) 3F/7
Answer: (b)

Question: Two drops of radii 2 cm and 8 cm are in contact. The radius of common surface is
Options:
(a) 8/3 cm
(b) 2 cm
(c) 8 cm
(d) 5/3 cm
Answer: (b)
Solution :

$$\frac{1}{r}=\frac{1}{2}-\frac{1}{8}$$
$$\frac{1}{r}=\frac{3}{8}$$
$$r=\frac{8}{3}$$

Question: The 7th harmonic of a closed organ pipe has same frequency as that of 4th harmonic of an open pipe. If two different gases with same bulk modulus with ratio of density ⅓ and length of closed pipe is 10 cm. Find the length of open pipe
Options:

(a) $\frac{80}{7\sqrt{3}}$ cm

(b) $\frac{20}{7\sqrt{3}}$ cm

(c) $\frac{40}{7\sqrt{3}}$ cm

(d) $\frac{10}{7\sqrt{3}}$ cm

Answer: (b)

Solution :

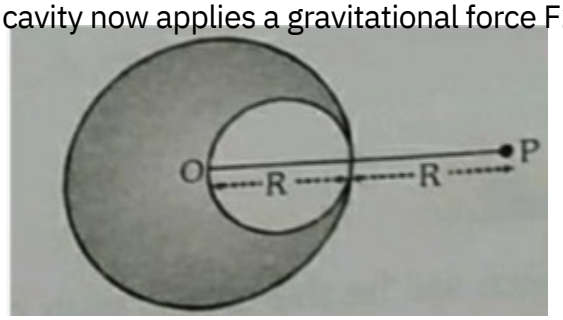
$$\frac{3.5}{2l_c}\sqrt{\frac{B}{p_c}} = \frac{4}{2l_0} = \sqrt{\frac{B}{p_0}} \qquad \frac{p_c}{p_0} = \frac{1}{3}$$

$$l_0 = \frac{40}{3.5}\sqrt{\frac{p_c}{p_0}}$$

$$= \frac{80}{7} \times \sqrt{\frac{1}{3}}$$

$$l_0 = \frac{80}{7\sqrt{2}}$$

Question: A solid sphere of uniform density and radius R exerts a gravitational force of attraction F1 on the particle P, distant 2R from the centre of the sphere. A spherical cavity of radius R/3 is now formed in the sphere as shown in figure. The sphere with cavity now applies a gravitational force F2 on the same particle P. Find the ratio F2/F1.



Options:

(a) 7/9

(b) 9/7

(c) 11/12

(d) 12/11

Answer: (c)

Question: A wire of length a/2 and charge density λ is kept along one of a cube of side length a. The wires mid point is at the midpoint of the edge. Find the flux through the whole cube

Options:

(a) $\frac{\lambda a}{4\in_0}$

(b) $\frac{\lambda a}{8\in_0}$

(c) $\frac{\lambda a}{16\in_0}$

(d) $\frac{\lambda a}{32\in_0}$

Answer: (b)

Question: If a ball is thrown at 60 m/s at an angle of 30.The ratio of height travelled in 1st second to the height travelled in the last second before reaching the maximum height is?

Options:

(a) 1:5

(b) 5:1

(c) 2:7

(d) 7:2

Answer: (b)

Solution :

$$\text{Height travelled in first 2 seconds} = ut + \frac{1}{2}at^2$$

$$= 30(2) - \frac{1}{2} \times 10 \times (2)^2$$

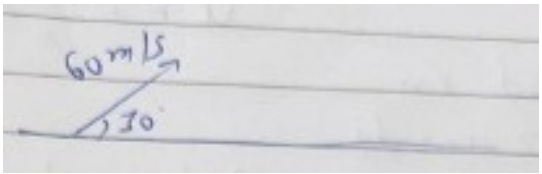
$$= 60 = 20.40$$

Height travelled in last second before reaching more height

$$= 45\,m - 40\,m$$

$$= 5\,m$$

$$\frac{\text{Height in 1 second}}{\text{Height in last second}} = \frac{25}{5} = \frac{5}{1}$$



$$\text{Height in 1seconds} = ut + \frac{1}{2}at^2$$

$$= 60\sin 30(1) + \frac{1}{2}\times(-10)\times(1)^2$$

$$= 60\times\frac{1}{2} - \frac{1}{2}\times 10$$

$$= 30 - 5 = 25\,m$$

Time taken for reaching max height

$$= \frac{4\sin\theta}{g}$$

$$= \frac{60\times\frac{1}{2}}{10} = 3$$

$$\text{Max Height} = ut + \frac{1}{2}at^2$$

$$= 30(3) + \frac{1}{2}\times(-10)\times(-9)$$

$$= 90 - 45 : 45\,m$$

Question: When a YDSE set up is immersed in a denser medium, then

(A) Assertion : Fringe width will decrease (R) Reason : Speed of the wave will decrease but frequency remains constant Options: (a) Both (A) and (R) are correct and (R) explains (A) (b)Both (A) and (R) are correct but (R) does not explains (A) (c) (A) Is correct but (R) is wrong (d) (A) is wrong but (R) is correct Answer: (a)

Question: If B represents magnetic field and μ represents permeability, then dimension

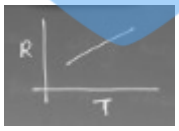
$$\frac{B}{\mu}$$

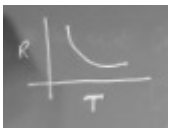
of Optionsis same as that of
(a) Length per unit current
(b)Current per unit length
(c) Length per unit charge
(d) Charge per unit length
Answer: (b)

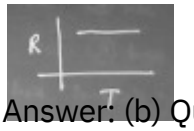
Question: Moment of inertia if uniform disc of radius R and mass M about an axis passing through its centre and perpendicular to plane is l1 If a circular hole of diameter R whose rim passes through the centre is cut. The moment of inertia of the remaining part of the disc about a perpendicular axis, passing through the centre is I2 Find ratio of I1 and I2

Options:
(a)16/13
(b) 32/13
(c)13/31
(d) 13/32
Answer: (a)
Question: Two metals A and B having work function as 2.2 eV and 1.9 eV respectively are illuminated by monochromatic light of wavelength 550 nm. Which metal will show Photoelectric effect ?
Options:
(a) Only Metal A
(b) Only Metal B
(c) Both
(d) None
Answer: (c)
Question: The correct graph of resistance vs temperature of a standard conducting wire will look like :
Options:

(a) 

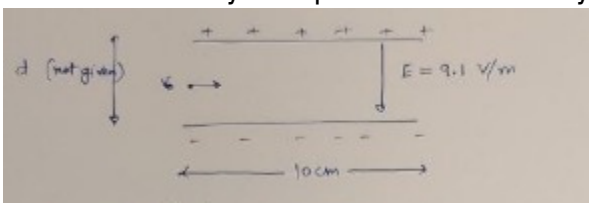
(b) 

(c) 



(d) Answer: (b) Question: Ice at -10°C is to be converted into steam at 110°C. Mass of ice is 10-1 kg. What amount of heat is required? Options: (a) ΔQ= 730 cal (b) ΔQ= 900 cal (c) ΔQ= 1210 cal (d) ΔQ= 870 cal Answer: (a)

Question: An electron is projected at V_0= 106 m/s parallel to the plates of capacitor as shown. Find the y-compartment of velocity of electron as it comes out of plates.



Options:
(a) 1.6 × 104 m/s
(b) 1.6 × 106 m/s
(c) 1.6 × 105 m/s
(d) 1.6 × 103 m/s
Answer: (c)

Question: If two spherical black bodies of radii 0.2m and 0.8m which are at maintained at 400K and 800K respectively. Find ratio of power radiated by bodies.
Options:
(a) 1/16
(b) 1/256
(c) 1/128
(d) 1/144
Answer: (b)

Question: A capacitor is charged by battery to charge Q1. Now the battery is disconnected and dielectric slab of dielectric constant K is inserted between the gaps of the plates. Now charge on capacitor is Q2. Find Q1/Q2
Options:
(a) **1**
(b) 1/2
(c) 2
(d) 2/3
Answer: (a)

Question: Find out equivalent capacitance for the situation show in figure.
Options:

(a) $C_{eq} = \frac{A\varepsilon_0}{d}\left(\frac{K_1K_2 + K_2K_3 + K_3K_1}{K_1 + K_2}\right)$

(b) $C_{eq} = \frac{A\varepsilon_0}{d}\left(\frac{2K_1K_2 + K_2K_3 + K_3K_1}{2(K_1 + K_2)}\right)$

(c) $C_{eq} = \frac{A\varepsilon_0}{d}\left(\frac{K_1K_2 + K_2K_3 + K_3K_1}{2(K_1 + K_2)}\right)$

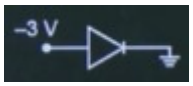
(d) $C_{eq} = \frac{A\varepsilon_0}{2d}\left(\frac{K_1K_2 + K_2K_3 + K_3K_1}{(K_1 + K_2)}\right)$

Answer: (b)

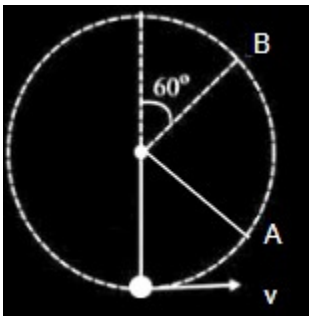
Question: From the given option, identify the diode connected in forward bias.
Options:
(a) 

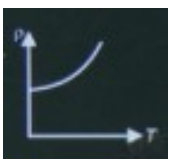
(b) 

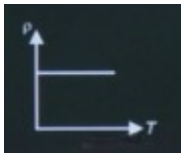
(c) 

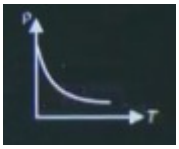
(d) 

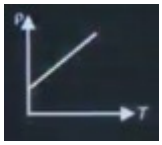
Answer: (b)
Question: Radius of electron in ground state for hydrogen is a0, then radius of electron in He+ ion in 3rd excited state is a. Then a0/a is
Options:
(a) **1/2**
(b) 1/4
(c) 1/16
(d) 1/8
Answer: (d)
Question: The particle shown in figure is just able to complete the vertical circular motion. Find the ratio of kinetic energy at A to the kinetic energy at B.



Options:
(a)
(b)
(c)
(d)
Answer: ()
Question: Which of the following graphs correctly represents the variation of resistivity (ϱ) with temperature (T)?
Options:
(a) 

(b) 

(c) 

(d) 

Answer: (a)