



PHYSICS

BOOKS - KVPY PREVIOUS YEAR

MOCK TEST 4

Exercise

1. A bimetallic strip is formed out of two identical strips one of copper and the other of brass. The co-efficients of linear expansion of the two metals

are α_C and α_B . On heating, the the strip bends to form an arc of radius of curvature R . Then R is

- A. Proportional of ΔT
- B. Inversely proportion a to ΔT
- C. Proportional to $|\alpha_B - \alpha_C|$
- D. Inversely proportional to $|\alpha_B - \alpha_C|$

Answer:



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2. The displacement of a article starting from rest and moving with constant acceleration is calculated by the formula, $s = \frac{1}{2}at^2$. If there occurs an error 10% in the measurement of time, then the error in the calculation of s is:

A. 0.1

B. 0.19

C. 0.2

D. 0.21

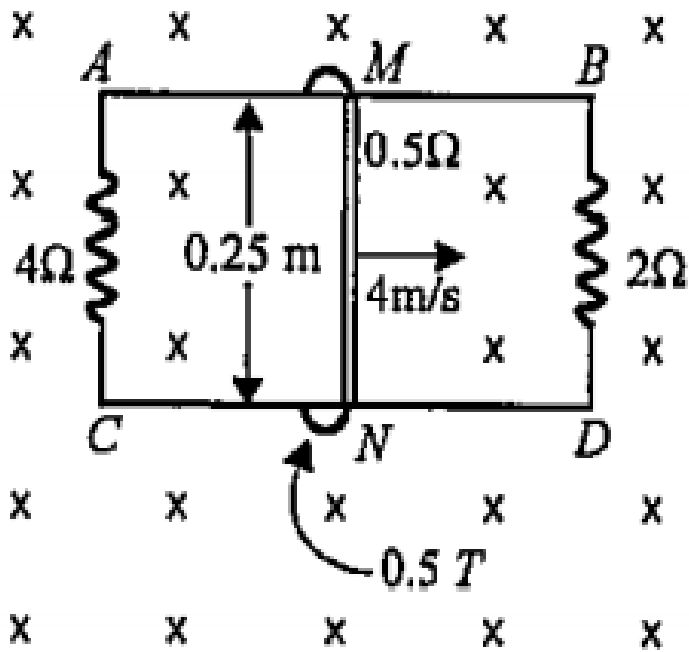
Answer:



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3. A sliding wire of length 0.25 m and having a resistance of 0.5Ω moves along conducting guiding rails AB and CD with a uniform speed of 4m/s. A magnetic field of 0.5 T exists normal to the plane of ABCD directed into the page. The guides are short-circuited with resistances of 4 and 2Ω as

shown. The current through the sliding wire is:



- A. 0.27 A
- B. 0.37 A
- C. 1.0 A
- D. 0.72 A

Answer:



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4. The energy of a particle executing simple harmonic motion is given by $E = Ax^2 + Bv^2$ where x is the displacement from mean position $x=0$ and v is the velocity of the particle at x then choose the correct statement(s)

A. amplitude of SHM is $\sqrt{\frac{2E}{A}}$

B. maximum velocity of the particle during

S.H.M. is \sqrt{EB}

C. Time period of motion is $2\pi\sqrt{\frac{B}{A}}$

D. displacement of the particle is proportional to the velocity of the particle.

Answer: C



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5. Two small identical metal balls of radius r are at a distance a ($a < 2r$) from each other and are charged, one with a potential V_1 and the other with a potential V_2 . The charges on the balls are:

A. $q_1 = V_1 a, q_2 = V_2 a$

B. $q_1 = V_1 r, q_2 = V_2 r$

C. $q_1 = \left(\frac{V_1 + V_2}{2} \right) a, q_2 = \left(\frac{V_1 + V_2}{2} \right) r$

D.

$$q_1 = -\frac{r}{a}(rV_2 - aV_1), q_2 = -\frac{r}{a}(rV_1 - aV_2)$$

Answer:



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6. Two plane mirrors M_1 and M_2 each have length $1m$ and are separated by $1cm$. A ray of light is

incident on one end of mirror M_1 at angle 45° .

How many reflections the ray will have before going from the other end?



- A. 100
- B. 200
- C. 101
- D. 201

Answer:



7. A parallel plate capacitor with air between the plates has capacitance of 9pF . The separation between its plates is 'd'. The space between the plates is now filled with two dielectrics. One of the dielectrics has dielectric constant $k_1 = 3$ and thickness $\frac{d}{3}$ while the other one has dielectric constant $k_2 = 6$ and thickness $\frac{2d}{3}$. Capacitance of the capacitor is now

A. 45 pF

B. 40.5 pF

C. 20.25 pF

D. 1.8 pF

Answer:



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8. In Fresnel's biprism ($\mu = 1.5$) experiment the distance between source and biprism is $0.3m$ and that between biprism and screen is $0.7m$ and angle of prism is 1° . The fringe width with light of wavelength 6000\AA will be

A. 3 mm

B. 0.11 mm

C. 2 mm

D. 4 mm

Answer:



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9. A bullet loses $\left(\frac{1}{n}\right)^{th}$ of its velocity passing through one plank. The number of such planks that are required to stop the bullet can be:

A. $\frac{n^2}{2n - 1}$

B. $\frac{2n^2}{n - 1}$

C. infinite

D. n

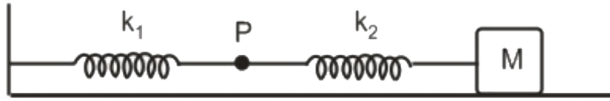
Answer:



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10. The mass M shown in figure oscillates in simple harmonic motion with amplitude A .

The amplitude of the point P is



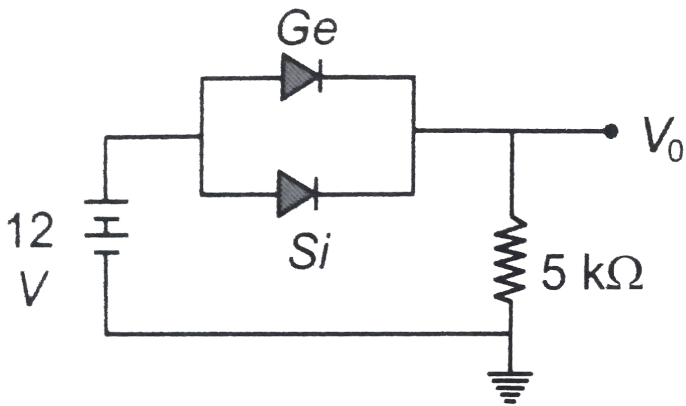
- A. $\frac{k_1 A}{k_2}$
- B. $\frac{k_2 A}{k_1}$
- C. $\frac{k_1 A}{k_1 + k_2}$
- D. $\frac{k_2 A}{k_1 + k_2}$

Answer:



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11. *Ge* and *Si* diodes conduct at $0.3V$ and $0.7V$ respectively. In the following figure if *Ge* diode connection are reversed, the value of V_0 changes by



- A. 0.2 V
- B. 0.4 V
- C. 0.6 V

D. 0.8 V

Answer:



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12. In a hydrogen like atom electron make transition from an energy level with quantum number n to another with quantum number $(n - 1)$ if $n > 1$, the frequency of radiation emitted is proportional to :

A. $f \propto \frac{1}{n}$

B. $f \propto \frac{1}{n^2}$

C. $f \propto \frac{1}{n^3}$

D. $f \propto \frac{1}{n^{3/2}}$

Answer:



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13. Let there be a spherically symmetric charge distribution with charge density varying as

$$\rho(r) = \rho \left(\frac{5}{4} - \frac{r}{R} \right) \text{ upto } r = R, \text{ and } \rho(r) = 0$$

for $r > R$, where r is the distance from the origin.

The electric field at a distance r ($r < R$) from the origin is given by

A. $\frac{\rho_0 r}{4\epsilon_0} \left(\frac{5}{3} - \frac{r}{R} \right)$

B. $\frac{4\pi\rho_0 r}{3\epsilon_0} \left(\frac{5}{3} - \frac{r}{R} \right)$

C. $\frac{\pi\rho_0 r}{4\epsilon_0} \left(\frac{5}{4} - \frac{r}{R} \right)$

D. $\frac{\pi\rho_0 r}{3\epsilon_0} \left(\frac{5}{4} - \frac{r}{R} \right)$

Answer:



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14. A radioactive sample of U^{238} decay to Pb through a process for which half-life is 4.5×10^9 years . The ratio of number of nuclei of Pb to U^{238} after a time of 1.5×10^9 Years
(given $2^{1/3} = 1.26$)

A. 0.12

B. 0.26

C. 1.2

D. 0.37

Answer:



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15. What is the maximum height of a mountain on the earth can be provided by considering the elastic properties of rocks?

- A. 6 km
- B. 19 km
- C. 10 km
- D. 15

Answer:



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