PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 55

Physics

1. The speed (v) of ripples on the surface of water depends on surface tension (σ), density

(ρ) and wavelength (λ). The square of speed (v) is proportional to

A. $\sqrt{\frac{\gamma a}{\rho}}$

B. $\sqrt{\frac{\gamma}{\rho\lambda}}$

C. $\left(\frac{\gamma}{\rho\lambda}\right)^{\frac{1}{3}}$

D. $\frac{\gamma}{\rho\lambda}$

Answer: B

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2. In a biprism experiment, the fifth dark fringe is formed opposite to one of the slits. What is the wavelength of light?

A. $\frac{d^2}{6D}$

B. $\frac{d^2}{5D}$

C. $\frac{d^2}{15D}$

D. $\frac{d^2}{9D}$

Answer: D

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3. The apparent coefficients of volume expansion of a liquid when heated filled in vessel A and B of identical volumes, are found to be γ_1 and γ_2 respectively. If α_1 be the coefficient of liner expansion for A, then what will be the be the coefficient of linear expansion for B? (True expansion - vessel expansion = app.exp)

A. $\frac{(\gamma_1 - \gamma_2)}{3} - \alpha_1$

B. $\frac{(\gamma_2 - \gamma_1)}{3} + \alpha_1$

C. $\frac{(\gamma_2 - \gamma_1)}{3} - \alpha_1$

D. $\frac{(\gamma_1 - \gamma_2)}{3} + \alpha_1$

Answer: B

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4. The gravitational potential of two homogeneous spherical shells A and B of same surface density at their respective centres are in the ratio $3:4$. If the two shells collapse into a single one such that surface charge density remains the same, then the

ratio of potential at an internal point of the new shell to shell A is equal to

A. $3:2$

B. $4:3$

C. $5:3$

D. $5:6$

Answer: C

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5. A point moves with uniform acceleration and $v_1, v_2,$ and v_3 denote the average velocities in the three successive intervals of time $t_1. t_2,$ and t_3 Which of the following Relations is correct?.

A. $\frac{v_1 - v_2}{v_2 - v_3} = \frac{t_1 - t_2}{t_2 + t_3}$

B. $\frac{v_1 - v_2}{v_2 - v_3} = \frac{t_1 - t_2}{t_1 - t_3}$

C. $\frac{v_1 - v_2}{v_2 - v_3} = \frac{t_1 - t_2}{t_2 - t_3}$

D. $\frac{v_1 - v_2}{v_2 - v_3} = \frac{t_1 + t_2}{t_2 + t_3}$

Answer: D

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6. A small ring of mass m is constrained to slide along a horizontal wire fixed between two rigid supports. The ring is connected to a particle of same mass by an ideal string & the whole system is released from rest as shown in the figure. If the coefficient of friction between ring A and wire is $\frac{3}{5}$, the ring will start sliding when the connecting string will make an angle θ with the vertical, then θ will be (particle is free to move and ring can slide

only)

A. 30°

B. 45°

C. 60°

D. None of these

Answer: B

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7. Suppose the earth was covered by an ocean of uniform depth $h, (h << R)$ Let σ be density of ocean and p be mean density of earth. Let Δg be the approximate difference of value of net acceleration duet to gravity between the bottom of the ocean and top $(\Delta g = g + (\text{top}) - g_{\text{bottom}})$. Choose the correct option.

A. $\Delta g = \frac{4}{3}\pi G h[2\rho - 3\sigma]$

B. $\Delta g = \frac{4}{3}G\pi h[3\sigma - 2\rho]$

C. $\Delta g = \frac{4}{3}G\pi h[2\sigma - 3\rho]$

D. $\Delta g = \frac{4}{3} G\pi h[3\rho - 3\sigma]$

Answer: B

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8. Two uniform wires of a the same material are vibrating under the same tension. If the first overtone of the first wire is equal to the second overtone of the second wire and radius of the first wire is twice the radius of

the second wire, then the ratio of the lengths of the first wire to second wire is

A. $\frac{1}{3}$

B. $\frac{1}{4}$

C. $\frac{1}{5}$

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

Answer: A

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9. An inductor coil and a capacitor and a resistance of 5Ω are connected in series to an a.c. source of rms voltage 30 V. When the frequency of the source is varied, a maximum r.m.s. current of 5 A is observed. If this inductor is connected in parallel with a resistance 5Ω to a battery of emf 25 V and internal resistance 2.0Ω, the current drawn from the battery is

A. $\frac{150}{17}A$

B. $2.5A$

C. $\frac{125}{33}A$

D. $\frac{125}{99}A$

Answer: A

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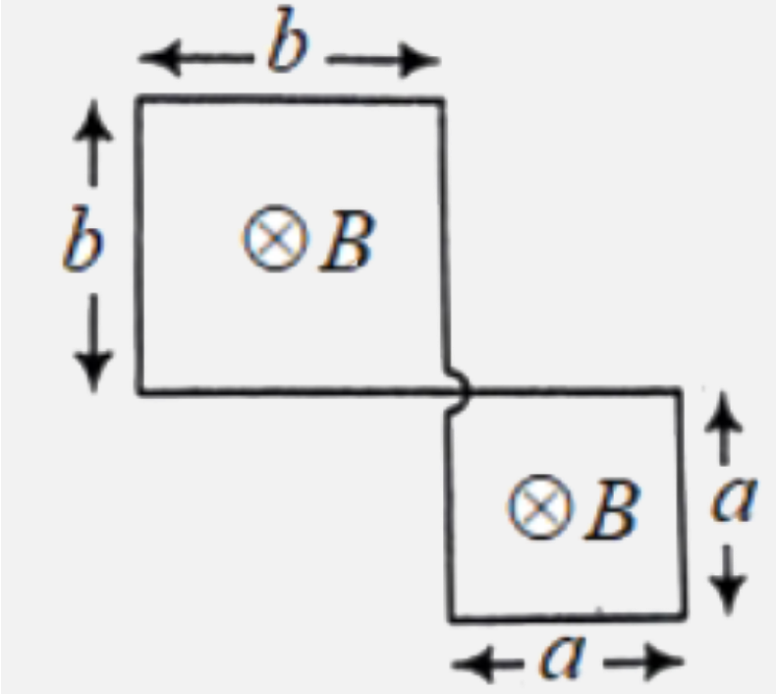
10. A conducting loop (as shown) has total resistance R. A uniform magnetic field $B = \gamma t$ is applied perpendicular to plane of the loop where γ is a constant and t is time. The

induced current flowing through loop is



A. $\frac{(b^2 + a^2)\gamma t}{R}$

B. $\frac{(b^2 - a^2)\gamma}{R}$

C. $\frac{(b^2 - a^2)\gamma t}{R}$

D. $\frac{(b^2 + a^2)\gamma}{R}$

Answer: B

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11. Two identical parallel plate air capacitors are connected in series to a battery of emf V. If one of the capacitor is completely filled with dielectric material of constant K, then potential difference of the other capacitor will become

A. $\frac{KV}{(K+1)}$

B. $\frac{V}{K+1}$

C. $\frac{(K-1)V}{K}$

D. $\frac{V}{K(K+1)}$

Answer: A

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12. The ratio of minimum wavelengths of Lyman and Balmer series will be

A. 1.25

B. 0.25

C. 5

D. 10

Answer: B

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13. When $._{90}Th^{228}$ transforms to $._{83}Bi^{212}$, then the number of the emitted $\alpha -$ and $\beta -$ particles are, respectively.

A. $8\alpha, 7\beta$

B. $4\alpha, 7\beta$

C. $4\alpha, 4\beta$

D. $4\alpha, 1\beta$

Answer: D

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14. Two particles are executing simple harmonic motion of the same amplitude (A) and frequency ω along the x-axis . Their mean

position is separated by distance X_0(X_0>A). If the maximum separation between them is (X_0 +A), the phase difference between their motion is:

A. $\frac{2\pi}{3}$

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

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

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

Answer: A

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15. An electron of mass m has de Broglie wavelength λ when accelerated through a potential difference V . When a proton of mass M is accelerated through a potential difference 9V, the de Broglie wavelength associated with it will be (Assume that wavelength is determined at low voltage) .

A. $\frac{\lambda}{3}\sqrt{\frac{M}{m}}$

B. $\frac{\lambda}{3}.\frac{M}{m}$

C. $\frac{\lambda}{3}\sqrt{\frac{m}{M}}$

D. $\frac{\lambda}{3} \cdot \frac{m}{M}$

Answer: C

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16. The minimum force required to move a body up an inclined plane is three times the minimum force required to prevent it from sliding down the plane. If the coefficient of friction between the body and the inclined

plane is $\frac{1}{2\sqrt{3}}$, the angle of the inclined plane is

A. 60°

B. 45°

C. 30°

D. 15°

Answer: C

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17. A concrete sphere of radius R has cavity of radius r which is packed with sawdust. The specific gravities of concrete and sawdust are respectively $2.4 \text{ and } 0.3$ for this sphere to float with its entire volume submerged under water. Ratio of mass of concrete to mass of swadust will be

A. 2

B. 3

C. 4

D. 6

Answer: C

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18. The pressure applied from all direction on a cube is P. How much its temperature should be raised to maintain the original volume ? The volume elasticity of the cube is β and the coefficient of volume expansion is α

A. $\frac{p}{\alpha\beta}$

B. $\frac{p\alpha}{\beta}$

C. $\frac{p\beta}{\alpha}$

D. $\frac{\alpha\beta}{p}$

Answer: A

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19. Particle of masses $m, 2m, 3m, \ldots, nm$ grams are placed on the same line at distance $l, 2l, 3l, \ldots\ldots, nlcm$ from a fixed point. The

distance of centre of mass of the particles from the fixed point in centimeters is :

A. $\frac{(2n+1)L}{4}$

B. $\frac{L}{(2n+1)}$

C. $\frac{n\left(n^2+1\right)L}{2}$

D. $\frac{(2n+1)L}{3}$

Answer: D

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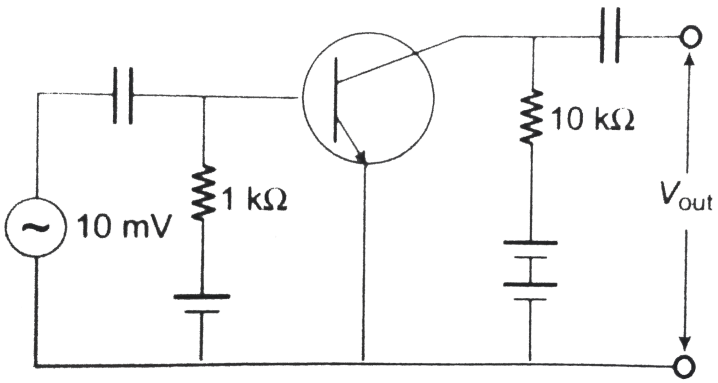
20. In the following common emitter configuration an NPN transistor with current gain $\beta = 100$ is used. The output voltage of the amplifier will be



A. 10 mV

B. 0.1 mV

C. 1.0 V

D. 10 V

Answer: C

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21. In balanced meter bridge, the resistance of bridge wire is $0.1\Omega cm$. Unknown resistance X is connected in left gap and 6Ω in right gap, null point divides the wire in the ratio 2:3 . Find the current drawn the battery of 5V having negligible resistance

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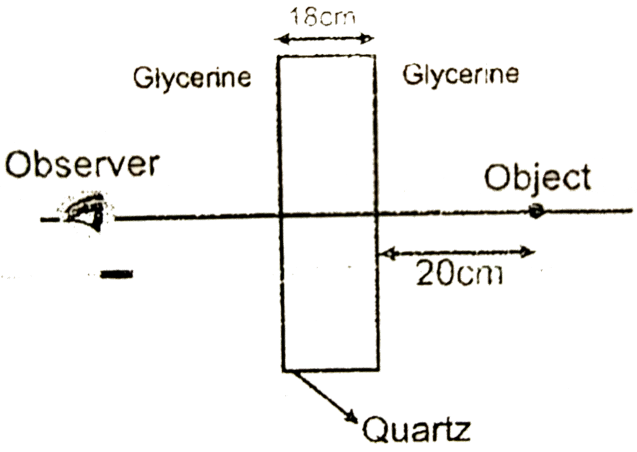
22. Given that, velocity of light in quartz $= 1.5 \times 10^8 m/s$ and velocity of light in glycerine $= (9/40 \times 10^8 m/s$. Now a slab made of quartz is placed in glycerine as shown. The shift of the object produced by slab is



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23. A rod AB is 1m long. The temperature of its one end A is maintained at 100°C and other end B at 10°C, the temperature at a distance of 60 cm from point B is

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24. A boy throws a ball at an angle θ with the vertical. If the vertical component of the initial

velocity is $20ms^{-1}$ and the wind imparts a horizontal acceleration of $8ms^{-2}$ to the left, the angle at which the ball must be thrown so that the ball returns to the boy's hand is θ. What is the value of $10(\tan\theta)$

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25. One mole of a monatomic ideal gas undergoes an adiabatic expansion in which its volume becomes eight times its initial value. If the initial temperature of the gas is 100

universal gas constant 8.0, the decrease in its internal energy, in , is_____.

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