PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 87

Physics

1. A T.V. tower has a height of $100m$. How much population is covered by T.V. broadcast, if the

population density around the tower is $1000/km^2$?

A. 39.5×10^5 units

B. 19.5×10^5 units

C. 29.5×10^5 units

D. 9.4×10^5 units

Answer: A

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2. A highly rigid cubical block (A) of small mass (M) and slide (L) is fixed rigidly on to another cubical block (B) of the same dimesions and of low modulus of rigidity (eta) such that the lower face of (A) completely covers the upper face of (B). The lower face of (B) is rigidly held on a horizontal surface. (A) small force (F) is applied perpendicular to one of the sides faces of (A). After the force is withdrawn, block (A) executes small oscillations the time period of which is given by.

A. $2\pi\sqrt{M\eta L}$

B. $2\pi\sqrt{\frac{M\eta}{L}}$

C. $2\pi\sqrt{\frac{ML}{\eta}}$

D. $2\pi\sqrt{\frac{M}{\eta L}}$

Answer: D

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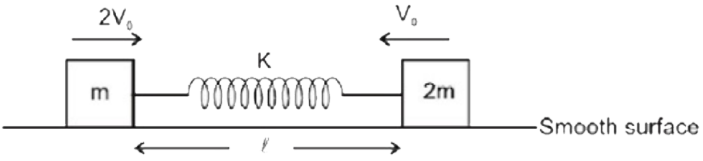
3. Two blocks A and B of masses m and 2m respectively, attached at opposite ends of a

spring of constant K, placed on a smooth horizontal surface. Spring is initially at its natural length l. A is given a velocity $2V_0$ and B given velocity V_0 as shown.



Maximum separation between m and centre of mass of the system will be :

A. $\frac{l}{3}+\sqrt{\frac{8mV_0^2}{3K}}$

B. $\frac{l}{3}+\sqrt{\frac{2mV_0^2}{3K}}$

C. $\frac{2l}{3}+\sqrt{\frac{2mV_0^2}{3K}}$

D. $\frac{2l}{3} + \sqrt{\frac{8mV_0^2}{3K}}$

Answer: D

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4. Consider an ideal gas confined in an isolated closed chamber. As the gas undergoes an adiabatic expansion, the average time of collision between molecules increase as V^q, where V is the volume of the gas. The value of q is : $\left(\gamma = \frac{C_p}{C_v}\right)$

A. $\frac{\gamma - 1}{2}$

B. $\frac{3\gamma + 1}{6}$

C. $\frac{3\gamma - 5}{6}$

D. $\frac{\gamma + 1}{2}$

Answer: D

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5. When the temperature of a black body increases, it is observed that the wavelength corresponding to maximum energy changes

from $0.26\mu m$ to $0.13\mu m$. The ratio of the emissive powers of the body at the respective temperatures is

A. $\frac{16}{1}$

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

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

D. $\frac{1}{16}$

Answer: D

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6. A radioactive material decays by simulataneous emission of two particle from the with respective half - lives 1620 and 810 year . The time , in year , after which one - fourth of the material remains is

A. 4860 yr

B. 3240 yr

C. 2340 yr

D. 1080 yr

Answer: D

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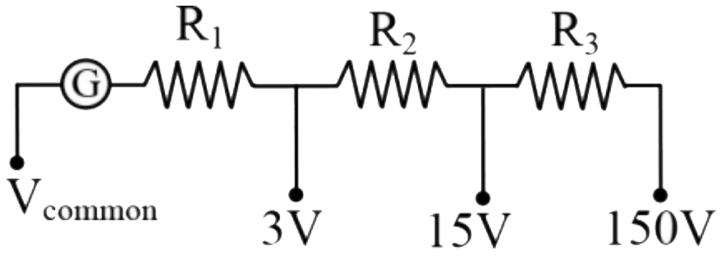
7. A voltmeter of variable ranges 3V, 15V, 150 V is to designed by connecting resistances R_1, R_2, R_3 in series with a galvanometer of resistance $G = 20\Omega$, as shown in the figure. The galvanometer gives full pass through its coil. Then, the resistances R_1, R_2 and R_3 (in kilo ohms) should be, respectively



A. 3, 12, 135

B. 2.98, 12, 135

C. 2.98, 14.98, 149.98

D. 3.86, 12.55, 122.97

Answer: B

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8. If two lenses of $+5$ dioptres are mounted at some distance apart, the equivalent power will always be negative if the distance is

A. Greater than 40 cm

B. Equal to 10 cm

C. Greater than 80 cm

D. Less than 10 cm

Answer: A

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9. Find the ratio of energies of photons produced due to transition of electron of hydrogen atom form its (i) second permitted

energy level to the first level (ii) highest permitted energy level to the first permitted level.

A. $3:2$

B. $2:3$

C. $1:4$

D. $3:4$

Answer: D

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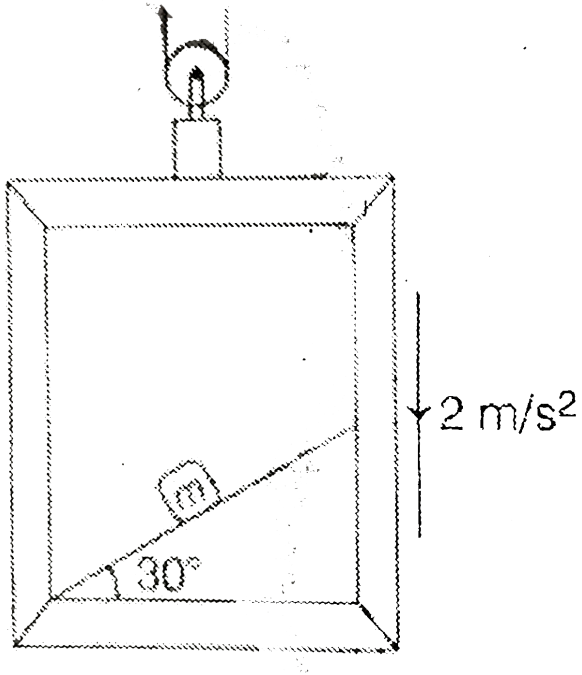
10. A block of mass m is kept on an inclined plane of a lift moving down with accelration of $2m/s^2$ .what should be the coefficient of friction for the block to move down with constant velocity relative relative to lift?



A. $\mu = \frac{1}{\sqrt{3}}$

B. $\mu = 0.4$

C. $\mu = 0.8$

D. $\mu = 0.5$

Answer: A

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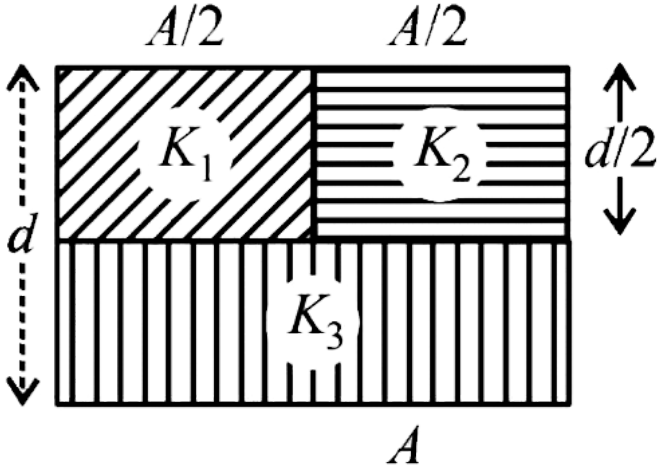
11. A parallel plate capacitor of area A, plate separation d and capacitance C is filled with three different dielectric materials having dielectric constants k_1, k_2 and k_3 as shown. If

a isngle dielectric material is to be used to have the same capacitance C in this capacitor, then its dielectic constant k is given by



A. $k = k_1 + k_2 + 2k_3$

B. $k = \dfrac{k_1 k_2}{k_1 + k_2} + 2k_3$

C. $\dfrac{1}{k} = \dfrac{1}{k_1} + \dfrac{1}{k_2} + \dfrac{1}{2k_3}$

D. $\dfrac{1}{k} = \dfrac{1}{k_1 + k_2} + \dfrac{1}{2k_3}$

Answer: D

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12. In a conical pendulum arrangement, a string of length 1 m is fixed at one end with a bob of mass 100 g and the string makes $\frac{2}{\pi} mvs^{-1}$ around a vertical axis through a fixed point. The angle of inclination of the string with vertical is: (Take $g = 10ms^{-1}$)

A. $\tan^{-1}(5/8)$

B. $\tan^{-1}(3/5)$

C. $\cos^{-1}(8/5)$

D. $\cos^{-1}(5/8)$

Answer: D

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13. Let M be the mass and L be the length of a thin uniform rod. In first case, axis of rotation is passing through centre and perpendicular to the length of the rod. In second case, axis of

rotation is passing through one end and perpendicular to the length of the rod. The ratio of radius of gyration in first case to second case is

A. 1

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

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

D. $\frac{1}{8}$

Answer: B

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14. A red bulb and violet bulb of equal power emits n_R and n_v number of photons in a given time, then

A. $n_R = n_V$

B. $n_R > n_V$

C. $n_R < n_V$

D. $n_R \leq n_V$

Answer: B

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15. A body is thrown from the surface of the earth with velocity u m/s. The maximum height in metre above the surface of the earth upto which it will reac is (where, R = radish of earth, g=acceleration due to gravity)

A. $\frac{u^2R}{2gR-u^2}$

B. $\frac{2u^2R}{gR-u^2}$

C. $\frac{u^2R^2}{2gR^2-u^2}$

D. $\frac{u^2R}{gR-u^2}$

Answer: A

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16. A cyclist is moving with a constant acceleration of 1.2 m/s2 on a straight track. A racer is moving on a circular path of radius 150 m at constant speed of 15 m/s. Find the magnitude of velocity of racer which is measured by the cyclist has reached a speed of 20 m/s for the position represented in the

figure -

A. $18.03ms^{-1}$

B. $25ms^{-1}$

C. $20ms^{-1}$

D. $15ms^{-1}$

Answer: A

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17. If the earth shrinks such that its density becomes 8 times to the present values, then new duration of the day in hours will be

A. 24

B. 12

C. 6

D. 3

Answer: C

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18. Water from a tap emerges vertically downwards with an initial velocity V_0. Assume pressure is constant throughout the stream of water and the flow is steady. Find the distance form the tap at which cross-sectional area of stream is half of the cross-sectional area of stream at the tap.

A. $\frac{V_0^2}{2g}$

B. $\frac{3V_0^2}{2g}$

C. $\frac{2V_0^2}{g}$

D. $\frac{5V_0^2}{2g}$

Answer: B

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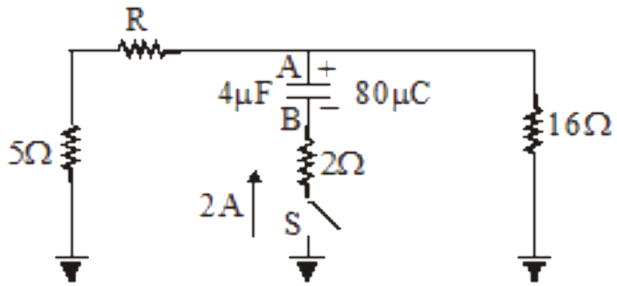
19. An $80\mu C$ charge is given to the $4\mu F$ capacitor in the circuit shown in the figure so that the upper plate A is positively charged. An unknown resistance R is connected in the left limb. As soon as the switch S in the central limb is closed, a current of 2 A flows through

the 2Ω resistor in the central limb. The capacitive time constant for the circuit is



A. $56\mu s$

B. $8\mu s$

C. $200\mu s$

D. $40\mu s$

Answer: D

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20. A proton moves with a speed of $5.0 \times 10^6 ms^{-1}$ along the x -axis.It enters a region where there is a magnetic field of magnitude 2.0 tesla directed at an angle of 30° to the x -axis and lying in the xy plane.The magnitude of the magnetic force on the proton is

A. $0.8 \times 10^{-13} N$

B. $1.6 \times 10^{-13} N$

C. $8.0 \times 10^{-13} N$

D. $16.0 \times 10^{-13} N$

Answer: C

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21. Initially, a beaker has 100 g of water at temperature $90^{\circ} C$. Later another 600g of water at temperature $20^{\circ} C$ was poured into the beaker. The temperature, T of the water $(\text{in } .^{\circ} C)$ after mixing is

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22. Let $x = \left[\frac{a^2b^2}{c}\right]$ be the physical quantity. If the percentage error in the measurement of physical quantities a,b, and c is 2,3 and 4 per cent respectively, then percentage error in the measurement of x is

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23. Light of wavelength 600 nm is incident normally on a slit of width 0.2 mm. The angular width of central maxima in the diffraction pattern is

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24. A stationary source is emitting sound at a fixed frequency f_0, which is reflected by two cars approaching the source. The difference between the frequencies of sound reflected

from the cars is $1.2\,\%$ of f_0. What is the difference in the speeds of the cars (in km per hour) to the nearest integer ? The cars are moving at constant speeds much smaller than the speed of sound which is $330 ms^{-1}$.

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25. Power applied to a particle varices with time as $P = \left(3t^2 - 2t + 1\right)$ watt, where t is in second. Find the change in its kinetic energy between time $t = 2s$ and $t = 4s$.

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