PHYSICS

NTA MOCK TESTS ENGLISH

NTA JEE MOCK TEST 56

Physics

1. A hydrogen - like neutral species in some excited state A, on absorbing a photon of energy 3.066 eV get excited to a new state B. When the electron from state B returns back, photons of a maximum ten different wavelengths can be observed in which some photons are of energy smaller than 3.066 eV, some are of equal energy and only four photons are having energy greater than 3.066 eV. The ionization energy of this atom is

A. 14.6 eV

B. 3.066 eV

C. 6.132 eV

D. 9.2 eV

Answer: A

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2. A ball (initially at rest) falls vertically for 2 s and hits a smooth plane inclined at 30° to the horizontal. The coefficient of restitution is $\frac{5}{8}$. The distance along the plane between the first and second impact of the ball is

A. 40.63 m

B. 20.63 m

C. 30.63 m

D. 50.63

Answer: A

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3. The kinetic energy K of a particle moving along a circle of radius R depends upon the distance s as $K = as^2$. The force acting on the particle is

A. $2a\frac{s^2}{R}$

B. $2as\left(1+\frac{s^2}{R^2}\right)^{\frac{1}{2}}$

C. $2as$

D. $2a$

Answer: B

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4. A target is made of two plates, one of wood and the other of iron. The thickness of the wooden plate is 4 cm and that of iron plate is 2 cm. A bullet fired goes through the wood first and then penetrates 1 cm into iron. A similar bullet fired with the same velocity from opposite direction goes through iron first and then penetrates 2 cm into wood. If a_1 and a_2 be the retardations offered to the bullet by wood and iron plates, respectively, then

A. $a_1 = 2a_2$

B. $a_2 = 2a_1$

C. $a_1 = a_2$

D. Data insufficient

Answer: B

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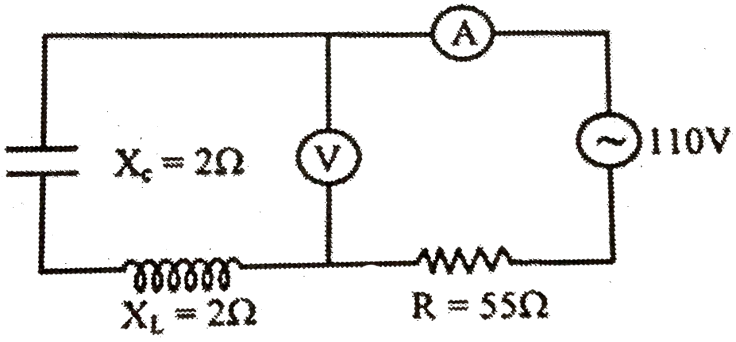
5. The reading of the ammeter and voltmeters are (Both the instruments are ac meters and measures rms value)-



A. 2A, 110 V

B. 2A, 0 V

C. 2 A, 55 V

D. 1 A, 0 V

Answer: B

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6. A circle of radius a has charge density given by $\lambda = \lambda_0 \cos^2 \theta$ on its circumference, where λ_0 is a positive constant and θ is the angular position of a point on the circle with respect to some reference line. The potential at the centre of the circle is

A. $\frac{\lambda_0}{4\varepsilon_0}$

B. zero

C. $\frac{\lambda_0}{2\varepsilon_0}$

D. $\frac{\lambda_0}{\varepsilon_0}$

Answer: A

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7. Find the minimum attainable pressure of an ideal gas in the process $T = T_0 + \alpha V^2$, Where T_0 and α are positive constant and V is the volume of one mole of gas. Draw the approximate $T - V$ plot of this process.

A. $2R\sqrt{\alpha T_0}$

B. $3R\sqrt{\alpha T_0}$

C. 3R

D. $3R\sqrt{\frac{\alpha T_0}{2}}$

Answer: A

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8. A current I is flowing in a straight conductor of length L. The magnetic induction at a point distant $\frac{L}{4}$ from its centre will be

A. $\frac{\mu_0 j_0 i}{\pi}\tan^{-1}\left(\frac{d}{2h}\right)\left(-\hat{k}\right)$

B. $\frac{\mu_0 j_0 i}{\pi}\tan^{-1}\left(\frac{2h}{d}\right)\left(-\hat{k}\right)$

C. $\frac{j_0 i}{\mu_0 \pi}\tan^{-1}\left(\frac{2h}{d}\right)\left(-\hat{k}\right)$

D. $\frac{j_0 i}{\mu_0 \pi}\tan^{-1}\left(\frac{d}{2h}\right)\left(-\hat{k}\right)$

Answer: A

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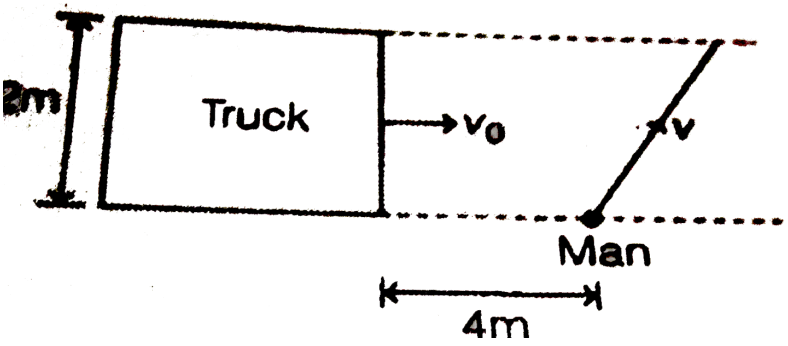
9. A $2m$ wide truck is moving with a uniform speed $v_0 = 8m/s$ along a straight horizontal road. A pedestrian starts to cross the road with a uniform speed v when the truck is $4m$ away from him. The minimum value of v so that he can cross the road safely

is



A. $\frac{6}{\sqrt{5}} ms^{-1}$

B. $\frac{4}{\sqrt{5}} ms^{-1}$

C. $\frac{8}{\sqrt{5}} ms^{-1}$

D. $\frac{2}{\sqrt{5}} ms^{-1}$

Answer: C

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10. The wavelength of a photon and de - Broglie wavelength an electron have the same value. Given that v is the speed of electron and c is the velocity of light. E_e, E_p is the kinetic energy of electron and energy of photon respectively while p_e, p_h is the momentum of electron and photon respectively. Then which of the following relation is correct?

A. $\frac{E_e}{E_p} = \frac{v}{2c}$

B. $\frac{E_e}{E_p} = \frac{2c}{v}$

C. $\frac{p_e}{p_h} = \frac{v}{2c}$

D. $\frac{p_e}{p_h} = \frac{2c}{v}$

Answer: A

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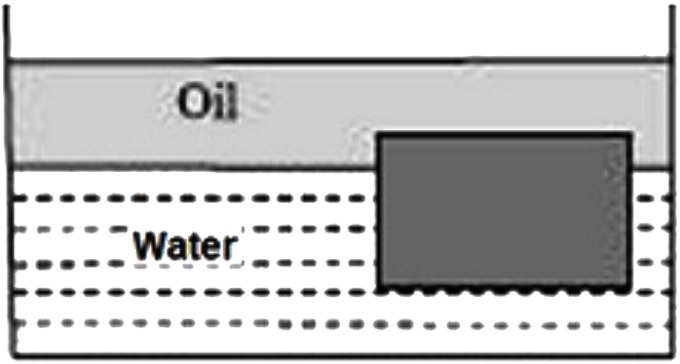
11. A layer of oil with density 724 kg m^{-3} floats on water of density $1000 kgm^{-3}$. A block floats on the oil-water interface with $1/6$ of its volume in oil and $5/6$ of its volume in water, as shown in the figure. What is the density of the block?



A. $1024\ \mathrm{kg\ m^{-3}}$

B. $1276\ \mathrm{kg\ m^{-3}}$

C. $776\ \mathrm{kg\ m^{-3}}$

D. $954\ \mathrm{kg\ m^{-3}}$

Answer: D

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12. An object 2.4 m in front of a lens forms a sharp image on a film 12cm behind the lens. A glass plate 1 cm thick, of refractive index 1.50 is interposed between lens and film with its plane faces parallel to film. At what distance (from lens) should object be shifted to be in sharp focus on film?

A. 2.4 m

B. 3.2 m

C. 5.6 m

D. 7.2 m

Answer: C

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13. A TV tower has a height of $150m$. The area of the region covered by the TV broadcast is (Radius of earth $= 6.4 \times 10^6 m$)

A. $9.6\pi \times 10^8 km^2$

B. $19.2\pi \times 10^8 km^2$

C. $19.2\pi \times 10^8 km^2$

D. $1.92\pi \times 10^8 km^2$

Answer: D

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14. The co-efficient of thermal expansion of a rod is temperature dependent and is given by the formula $\alpha = aT$, where a is a

positive constant at T $\text{in}^\circ C$. if the length of the rod is l at temperature $0^\circ C$, then the temperature at which the length will be $2l$ is

A. $10^\circ C$

B. $20^\circ C$

C. $200^\circ C$

D. $100^\circ C$

Answer: C

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15. If E and B denote electric and magnetic fields respectively, which of the following is dimensionless?

A. $\sqrt{\mu_0 \varepsilon_0} \frac{E}{B}$

B. $\mu_0 \varepsilon_0 \frac{E}{B}$

C. $\mu_0 \varepsilon_0 \left(\frac{B}{E}\right)^2$

D. $\frac{\mu_0 E}{B e_0}$

Answer: A

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16. Frequency of the em signal emitted by a rocket I $4 \times 10^7 Hz$. If apparent frequency observed on earth is $3.2 \times 10^7 Hz$, then velocity with which rocket is moving away is [speed of light = c]

A. 0.5 c

B. 0.7 c

C. 0.9 c

D. 0.2 c

Answer: D

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17. Two plane harmonic sound waves are expressed by the equations.

$y_1(x,t) = A\cos(0.5\pi x - 100\pi t), y_2(x,t) = A\cos(0.46\pi x - 92\pi t)$

(All parameters are in MKS) :

At x=0 how many times the amplitude of $y_1 + y_2$ is zero in one second :-

A. 46

B. 48

C. 192

D. 100

Answer: D

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18. A body of mass m, accelerates uniformly from rest to V_1 in time t_1. The instantaneous power delivered to the body as a function of time t is.

A. $\frac{mv_1 t}{t_1}$

B. $\frac{v_1^2 t}{t_1^2}$

C. $\frac{mv_1 t^2}{t_1}$

D. $\frac{mv_1^2 t}{t_1}$

Answer: B

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19. A satellite is launched into a circular orbit of radius R around earth while a second satellite is launched into an orbit of radius 1.02R. The percentage difference in the time period is

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20. A body cools in 7 minutes from $60^\circ C$ to $40^\circ C$. What will be its temperature after the next 7 minutes? The temperature of the surroundings is $10^\circ C$.

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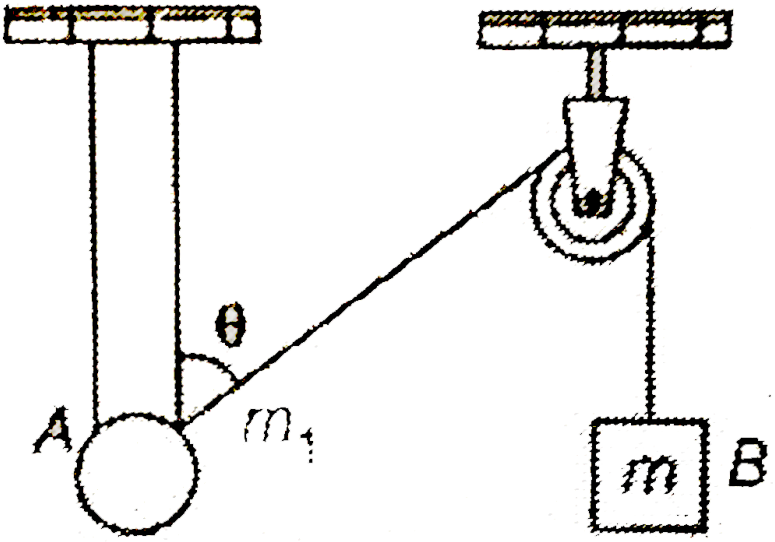
21. A ring of mass 5 kg sliding on a frictionless vertical rod connected by a clock B of mass 10 kg by the help of a massless string.

Then, at the equilibrium of the system, the value of θ is



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22. $A^{238}U$nucleus decays by emitting an alpha particle of speed ums^{-1} The recoil speed of the residual nucleus is: (in ms^{-1})

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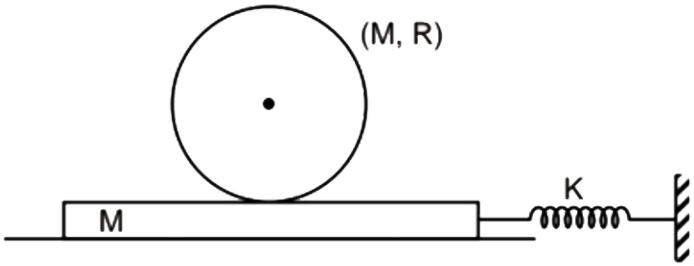
23. A cylinder of mass M and radius R lies on a plank of mass M as shown. The surface between plank and ground is smooth, and between cylinder and plank is rough. Assuming no slipping between cylinder and plank, the time period of oscillation (When displaced from equilibrium) of the system is



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