PHYSICS

BOOKS - NTA MOCK TESTS
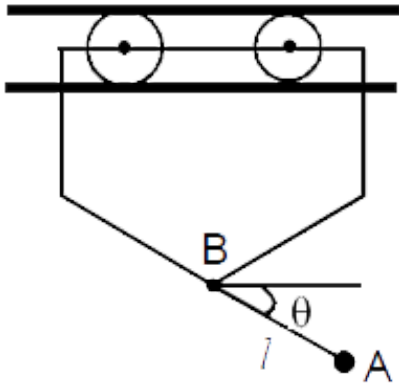
NTA JEE MOCK TEST 89

Physics

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1. The simple pendulum A of mass m_A and length l is suspended from the trolley B of mass m_B. If the system is released from rest at

$\theta = 0$, determine the velocity v_B of the trolley and tension in the string when $\theta = 90°$. Friction is negligible.

A. $v_B = \dfrac{m_A}{m_B} \sqrt{\dfrac{2gl}{1 + m_A/m_B}}$

B. $v_B = \dfrac{m_A}{m_B} \sqrt{\dfrac{4gl}{1 + m_A/m_B}}$

C. $v_B = \dfrac{m_A}{m_B} \sqrt{\dfrac{2gl}{1 - m_A/m_B}}$

D. $v_B = \dfrac{m_A}{m_B} \sqrt{\dfrac{4gl}{1 - m_A/m_B}}$

Answer: A

2. Two coaxial solenoids are made by winding thin insulated wire over a pipe of cross-sectional area $A = 10cm^2$ and length =20cm. If one of the solenoid has 300 turns and the other 400 turns, their mutual inductance is

A. $2.4\pi \times 10^{-4}H$

B. $2.4\pi \times 10^{-5}H$

C. $4.8\pi \times 10^{-4} H$

D. $4.8\pi \times 10^{-5} H$

Answer: A

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3. A little charged bead is inside the hollow frictionless sphere manufactured from the insulting material. Sphere has a daimeter of 50 cm. The mass of the bead is 90mg, its charge is $0.5\mu C$. What minimum charge must carry an

object at the bottom of the sphere to keep hold the charged bead at the vertax of the sphere in stable equilibrium ?

A. $4.9 \times 10^{-8}C$

B. $9.8 \times 10^{-8}C$

C. $19.6 \times 10^{-8}C$

D. $30.2 \times 10^{-8}C$

Answer: B

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4. A body is projected up with a velocity equal to $3/4th$ of the escape velocity from the surface of the earth. The height it reaches is (Radius of the earth is R)

A. $\dfrac{10R}{9}$

B. $\dfrac{9}{7}R$

C. $\dfrac{9}{8}R$

D. $\dfrac{10R}{3}$

Answer: B

5. A polished metal plate with a rough black spot on it is heated to about $1400K$ and quickly taken into dark room Then .

    A. Darker than plate

    B. Brighter thabn plate

    C. Equally bright

    D. Equally dark

Answer: B

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6. A current of 2A is flowing in the sides of an equilateral triangle of side 9 cm. The magnetic field at the centroid of the triangle is

A. $1.66 \times 10^{-6} T$

B. $1.22 \times 10^{-4} T$

C. $1.33 \times 10^{-6} T$

D. $1.44 \times 10^{-4} T$

Answer: C

7. A particle is projected at an angle of $60°$ above the horizontal with a speed of $10m/s$. After some time the direction of its velocity makes an angle of $30°$ above the horizontal. The speed of the particle at this instant is s

A. $\dfrac{5}{\sqrt{3}}ms^{-1}$
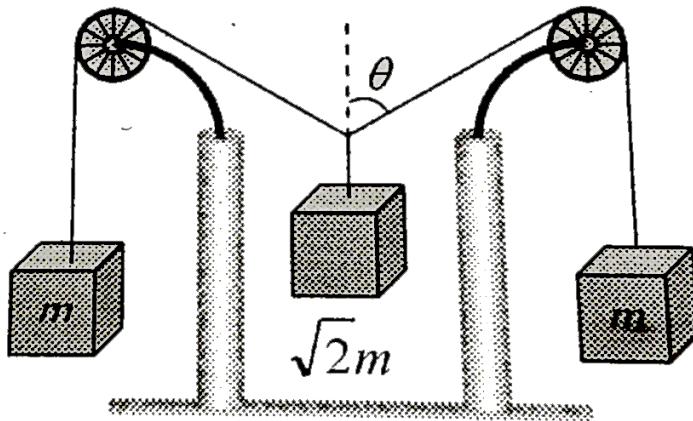
B. $5\sqrt{3}ms^{-1}$

C. $5ms^{-1}$

D. $\dfrac{10}{\sqrt{3}}ms^{-1}$

Answer: D

8. The pulleys and strings shown in the figure are smooth and of negligible mass. For the system to remain in equilibrium, the angle θ

should be

$\sqrt{2}m$

A. $45°$

B. $60°$

C. $0°$

D. $30°$

Answer: A

9. Some amount of a radioactice substance (half-life =10 days) is spread inside a room and consequently the level of radiation become 50 times the permissible level for normal occupancy of the room. After how many days will the room be safe for occupation?.

    A. 20 days

    B. 34.8 days

    C. 56.4 days

D. 62.9 days

Answer: C

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10. A mass (M) is suspended from a spring of negligible mass. The spring is pulled a little and then released so that the mass executes SHM of time period T. If the mass is increased by m, the time period becomes $\frac{5T}{3}$. Then the ratio of $\frac{m}{M}$ is .

A. $3/5$

B. $25/9$

C. $16/9$

D. $5/3$

Answer: C

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11. The de-Broglie wavelength λ_n of the electron in the nth orbit of hydrogen atom is

A. inversely to n

B. Proportional to n^2

C. Proportional to n

D. Inversely proportional to n^2

Answer: A

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12. A coaxial cylinder made of glass is immersed in a-liquid of surface tension S. The radius of the inner and outer surface of the

cylinder are R_1 and R_2 respectively . Height

till which liquid will rise is (Density of liquid is

ρ)

A. $\dfrac{2S}{R_2 \rho g}$

B. $\dfrac{2S}{R_1 \rho g}$

C. $\dfrac{S}{R_2 - R_1 \rho g}$

D. $\dfrac{2S}{R_2 - R_1 \rho g}$

Answer: D

13. An object of length 10 cm is placed at right angles to the principal axis of a mirror of radius of curvature 60 cm such that its image is virtual, erect and has a length 6 cm. What kind of mirror it is and also determine the position of the object ?

    A. -20 cm

    B. 20 cm

    C. -30 cm

    D. 30 cm

Answer: A

14. A constant power is suppied to a rotating disc. The relationship between the angular velocity (ω) of the disc and number of rotations (n) made by the disc is governed by

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

B. $\dfrac{3}{2}$
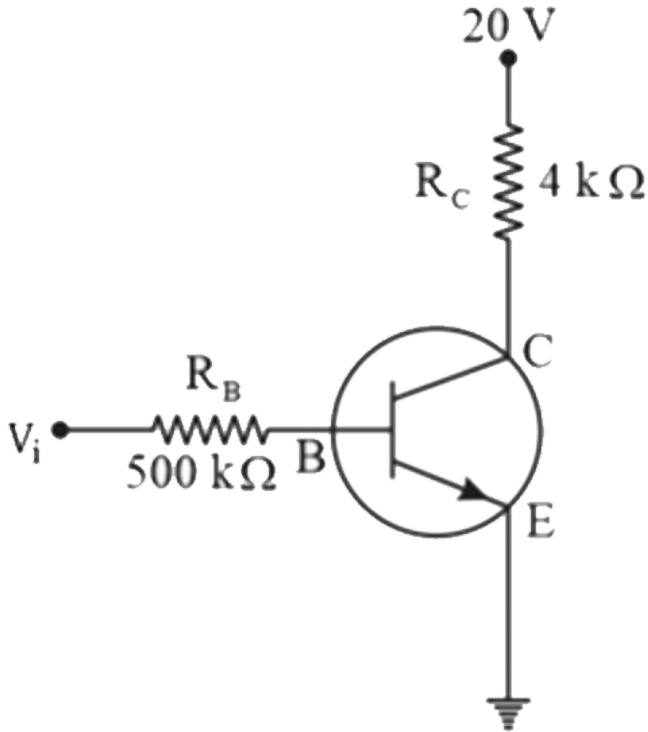
C. $\dfrac{2}{3}$

D. 2

Answer: A

15. In the circuit shows in the figure, the input

voltage

V_i is 20 V, $V_{BE} = 0$ and $V_{CE} = 0$. The values

of l_B, l_C and β are given by

A. $l_B = 20\mu A$, $l_C = 5mA$, $\beta = 250$

B. $l_B = 25\mu A$, $l_C = 5mA$, $\beta = 200$

C. $l_B = 40\mu A$, $l_C = 10mA$, $\beta = 250$

D. $l_B = 40\mu A, l_C = 5mA, \beta = 125$

Answer: D

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16. A metal sphere of radius r and specific heat s is rotated about an axis passing through its centre at a speed of n rotation/s. It is suddenly stopped and 50% of its energy is used in increasing its temperature. Then, the rise in temperature of the sphere is

A. $\dfrac{2}{5}\dfrac{\pi^2 n^2 r^2}{c}$

B. $\dfrac{1}{10}\dfrac{\pi^2 n^2}{r^2 c}$

C. $\dfrac{7}{8}\pi r^2 n^2 c$

D. $\dfrac{1}{8}\dfrac{\pi^2 n^2 r^2}{c}$

Answer: A

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17. Explain coeffecient of viscosity , its units and give its dimensional formula.

A. Dimentional formula : $\left[M^1 L^{-1} T^{-1}\right]$

B. Dimentional formula : $\left[M^2 L^{-3} T^{-1}\right]$

C. Dimentional formula : $\left[M^{-4} L^1 T^{-2}\right]$

D. Dimentional formula : $\left[M^{-1} L^3 T^{-2}\right]$

Answer: A

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18. To demonstrate the phenomenon of interference, we require two sources which emit radiation

A. nearly the same frequency

B. the same frequency

C. different wavelength

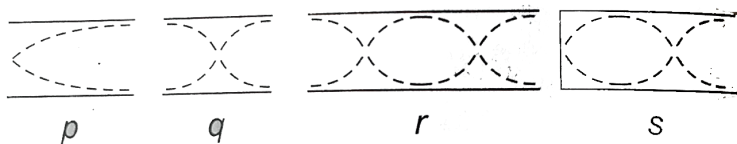D. the same frequency and having a definite phase relationship

Answer: D

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19. The vibrations of four air columns are represented in the adjoining figures. The ratio of frequencies $n_p : n_q : n_r : n_s$ is

A. $12 : 6 : 3 : 5$

B. $1 : 2 : 4 : 3$

C. $4 : 2 : 3 : 1$

D. $6 : 2 : 3 : 4$

Answer: B

20. The power supplied by a force acting on a particle moving in a straight line is constant. The velocity of the particle varies with the displacement x as :

A. $x^{1/2}$

B. x

C. x^2

D. $x^{1/3}$

Answer: D

21. Consider a hydrogen-like atom whose energy in nth excited state is given by

$$E_n = \frac{13.6Z^2}{n^2}$$

When this atom makes a transition from excited state to ground state , most energetic photons have energy

$E_{max} = 52.224eV.$ and least energetic photons have energy

$E_{\max} = 1.224eV$

Find the atomic number of atom and the intial state or excitation.

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22. A simple pendulum swings with angular amplitude θ. The tension in the string when it is vertical is twice the tension in its extreme position. Then, $\cos \theta$ is equal to

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23. A cell of emf E and internal resistance r is connected in series with an external resistance nr. Than what will be the ratio of the terminal potential difference to emf, if n=9.

24. The couple acting on a magnet of length 10cm and pole strength 15A-m, kept in a field of $B = 2 \times 10^{-5}$, at an anlge of $30°$ is

25. A Carnot reversible engine converts $1/6$ of heat input into work. When the temperature of the sink is redused by 62 K, the efficiency of Carnot's cycle becomes $1/3$. The sum of temperature (in kelvin) of the source and sink will be