AVIRAL

JEE | NEET | FOUNDATIONS

WEEKLY TEST TYJ-02 TEST 12 RAJPUR ROAD SOLUTION Date 20-10-2019

[PHYSICS]

1. It is the speed of light in free space. Hence, dimension is that of speed, *i.e.*, LT^{-1}.

2. Boltzmann's constant = energy/temperature

$$= \frac{[ML^2T^{-2}]}{[\theta]} = [ML^2T^{-2}\theta^{-1}]$$

3. The only scalar quantity in the given set is pressure.

4. Distance travelled in *n*th second,

$$s_n = u + a\left(n - \frac{1}{2}\right)$$

Distance travelled in 2nd second,

$$s_2 = 0 + a\left(2 - \frac{1}{2}\right) \qquad \ldots(i)$$

Distance travelled in 5th second,

$$s_5 = 0 + a\left(5 - \frac{1}{2}\right) \qquad \ldots(ii)$$

Dividing eqn. (ii) by eqn. (i), $s_5 = 24$ m

5. When the body returns to origin, displacement is zero.

$$s = ut + \frac{1}{2}at^2$$

$$0 = 60t - \frac{1}{2} \times 10 \times t^2$$

Solving, $t = 12$ s

6. $$v \propto \lambda^x \rho^y g^z$$

Putting dimensions,

$$LT^{-1} = L^x(ML^{-3})^y(LT^{-2})^z$$

Solving, we get $v \propto \sqrt{g\lambda}$.

7. Squaring the given equation,

$$A^2 + B^2 + 2\vec{A}\cdot\vec{B} = C^2$$

Moreover, $A^2 + B^2 = C^2$ $\qquad (\because A = 6, B = 8, C = 10)$

$\therefore \quad \vec{A}\cdot\vec{B} = 0,$ *i.e.*, $\vec{A}$ is $\perp$ to $\vec{B}$

8. Using equation of motion,

height reached by first body, $h_1 = \frac{u^2}{2g}$

height reached by second body, $h_2 = \frac{u^2 \sin^2 30°}{2g} = \frac{1}{4} \times \frac{u^2}{2g}$

$\therefore \quad h_1 : h_2 = 4 : 1$

As $\quad$ PE $\propto$ height

$\therefore \quad (PE)_1 : (PE)_2 = 4 : 1$

9. KE of first body at the highest point = 0 ($\because v = 0$) but for 2nd body

$= \frac{1}{2} mu^2 \cos^2 30°$

$\therefore \quad K_1 : K_2 = 0$

10. The given figure (T-2.1) shows the speed-time graph of a body projected vertically up. Speed decreases initially, then reaches zero at the highest point and then increases.

11. Putting equations for T and R, we get

$$g\left(\frac{2u \sin \alpha}{g}\right)^2 = 2 \times \frac{u^2 \sin 2\alpha}{g}$$

or $\quad \tan \alpha = 1 \quad$ or $\quad \alpha = 45°$

12. We know that $T \propto \sqrt{R}$. When R is doubled, T becomes $\sqrt{2}$ times.

13. Let t be the duration of uniform acceleration. Then, $(9 - t)$ is the retardation. As the velocity at the end of uniform acceleration and at the beginning of retardation is same, we have

$$0 + at = 0 - 2a \times (9 - t)$$

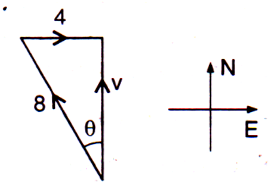
Solving, $\quad t = 6$ s

14. The train is moving with horizontal velocity in a straight line, hence vertical ranges will be same.

For a person inside the train, the horizontal range will be zero, because train is an inertial frame. The coin falls back to his hand. For a person outside the train such as C, the coin has a horizontal velocity and vertical acceleration g. Hence, it appears to follow a parabolic path. Hence, he observes a horizontal range.

15. In order to arrive at the opposite bank, the boat should start at an angle θ with north such that $\sin \theta = \frac{4}{8}$ or $\theta = 30°$. The real velocity of boat will be,

$$v = \sqrt{8^2 - 4^2} = \sqrt{48}, \quad \theta = 30° \text{ W of N}$$



16.
$$R = \frac{u^2 \sin 2\alpha}{g}$$

i.e., $R \propto \sin 2\alpha$ (for a given u)

$$\frac{R_1}{R_2} = \frac{\sin 30°}{\sin 90°} = \frac{1}{2}$$

$\therefore$ $R_2 = 2R_1 = 4$ km.

17. For a given braking force, the stopping distance $s \propto u^2$ ($\because v^2 - u^2 = 2as$). So, when velocity increases to 4 times, the stopping distance would increase to $16s$.

18. The acceleration down the plane $= \dfrac{g \sin\theta}{1 + (k^2/r^2)}$

This value is maximum when k is minimum, which happens for a solid sphere $\left(k^2 = \frac{2}{5} r^2\right)$.

19. Comparing with the equation of trajectory for projectile motion,

$$y = x \tan\theta - \frac{gx^2}{2u^2 \cos^2\theta}$$

We find, $\tan\theta = 16$

It is also given, $u \cos\theta = 2$

So, $\dfrac{u \sin\theta}{u \cos\theta} = 16, \quad \therefore \quad u \sin\theta = 32$

Now $R = \dfrac{2u^2}{g} \sin\theta \cos\theta = \dfrac{2}{g}(u \sin\theta \times u \cos\theta)$

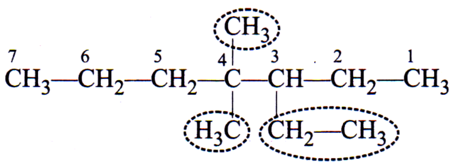
$= \dfrac{2}{10} \times 32 \times 2 = 12.8$ m

20. Work done = force × displacement = $100 \times \sin 50° \times 1$.

20% of this work is used to overcome friction. Hence, energy gained = 80% of this work = 80 sin 50° Joule.

[CHEMISTRY]

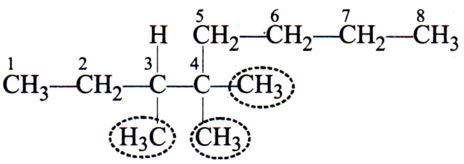
21.



3-Ethyl-4, 4-dimethylheptane

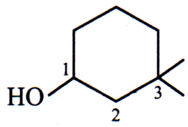
22.

The compound can be expanded as



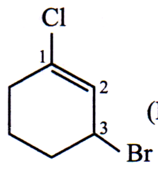
IUPAC name is **3, 4, 4-trimethyloctane.**

23.



3, 3-Dimethyl cyclohexan-1-ol is the proper IUPAC name as per 1993 rules. The given answer is as per the old IUPAC rules, still prevalent.

24.



(Preference to $>C=C<$)

3-Bromo-1-chlorocyclohexene

25.

$$\overset{}{HOOC}-\overset{1}{C}H_2-\overset{2}{C}H(COOH)-\overset{3}{C}H_2-\overset{4}{C}H_2-COOH$$

Butane-1,2, 4-tricarboxylic acid

28. (c) For a reaction E_a for forward reaction $= E_a$ for backward reaction $+ \Delta H$.