WEEKLY TEST TYJ-02 TEST - 6 RAJPUR ROAD
SOLUTION Date 01-09-2019

[PHYSICS]

1. $$\text{Average speed} = \frac{\text{total distance covered}}{\text{total time taken}}$$

$$v_{av.} = \frac{\frac{x}{2}+\frac{x}{2}}{\frac{x/2}{40}+\frac{x/2}{60}} = \frac{x}{\left(\frac{x}{80}+\frac{x}{120}\right)}$$

$$= \frac{80\times 120}{(120+80)} = 48 \text{ km/h}$$

2. $200 = u \times 2 - (1/2)\, a(2)^2$ or $u - a = 100$ ....(i)

$200 + 220 = u(2+4) - (1/2)\,(2+4)^2 a$

or $u - 3a = 70$ .....(ii)

Solving eqns. (i) and (ii), we get; $a = 15$ cm/s^2 and $u = 115$ cm/s.

Further, $v = u - at = 115 - 15 \times 7 = 10$ cm/sec.

3. When a body slides on an inclined plane, component of weight along the plane produces an acceleration

$$a = \frac{mg\sin\theta}{m} = g\sin\theta = \text{constt.}$$

If s be the length of the inclined plane, then

$$s = 0 + \frac{1}{2}at^2 = \frac{1}{2}g\sin\theta \times t^2$$

$$\therefore \quad \frac{s'}{s} = \frac{t'^2}{t^2} \text{ or } \frac{s}{s'} = \frac{t^2}{t'^2}$$

Given t = 4 sec and $s' = \frac{s}{4}$

$$\therefore \quad t' = t\sqrt{\frac{s'}{s}} = 4\sqrt{\frac{s}{4s}} = \frac{4}{2} = 2\,\text{sec}$$

4. Given that; a = 3t + 4 or $\frac{dv}{dt} = 3t + 4$

$$\therefore \quad \int_0^v dv = \int_0^t (3t+4)dt \text{ or } v = \frac{3}{2}t^2 + 4t$$

$$v = \frac{3}{2}(2)^2 + 4(2) = 14 \text{ ms}^{-1}$$

5. **For first body** :

$\frac{1}{2}gt^2 = 176.4$ or $t = \sqrt{\frac{176.4 \times 2}{10}}$

or t = 5.9 s

For second body : t = 3.9 s

$$u(3.9) + \frac{1}{2}g(3.9)^2 = 176.4$$

$$3.9u + \frac{10}{2}(3.9)^2 = 176.4$$

or u = 24.5 m/s

6. The resultant velocity of the boat and river is 1.0 km/0.25 h = 4 km/h.

Velocity of the rive $= \sqrt{5^2 - 4^2} = 3 \text{ km/h}$

7. Let he be the height of the tower.
Using $v^2 - u^2 = 2as$, we get;
Here, u = u, a = – g, s = – h and v = – 3u (upward direction + ve)
$\therefore$ $9u^2 - u^2 = 2gh$ or $h = 4u^2/g$

8. $t = \sqrt{\frac{2h}{g}}$

$$s = 10 \times \frac{t}{2} - \frac{1}{2}g \times \frac{t^2}{4} = 5\sqrt{\frac{2h}{g}} - \frac{g}{8}\frac{2h}{g}$$

$v^2 - u^2 = 2gh$ or $100 = 2gh$ or $10 = \sqrt{2gh}$

$$s = \sqrt{\frac{2gh \times 2h}{4 \times g}} - \frac{h}{4} = h - \frac{h}{4} = \frac{3h}{4}$$

9. $t = \frac{1}{u+v} = \frac{1}{\frac{l}{t_1} + \frac{l}{t_2}}$

or $\frac{1}{t} + \frac{1}{t_1} + \frac{1}{t_2}$ or $t = \frac{t_1 t_2}{(t_1 + t_2)}$

10. **For first body** :
$v^2 = u^2 + 2gh$ or $(3)^2 = 0 + 2 \times 9.8 \times h$

or $h = \frac{(3)^2}{2 \times 9.8} = 0.46$ m

For second body :
$v^2 = (4)^2 + 2 \times 9.8 \times 0.46$

$\therefore$ $v = \sqrt{(4)^2 + (2 \times 9.8 \times 0.46)} = 5$ m/s

11. Given y = 0
Distance travelled in 10 s,

$$S_1 = \frac{1}{2}a \times 10^2 = 50a$$

Distance travelled in 20 s,

$$S_2 = \frac{1}{2}a \times 20^2 = 200a$$

$\therefore$ $S_2 = 4S_1$

12. During the first 5 seconds of the motion, the acceleration is – ve and during the next 5 seconds it becomes positive. (Example : a stone thrown upwards, coming to momentary rest at the highest point). The distance covered remains same during the two intervals of time.

13. Gain in angular KE = loss in PE

If l = length of the pole, moment of inertial of the pole about the edge $= M\left[\frac{l^2}{12}+\frac{l^2}{4}\right] = \frac{Ml^2}{3}$

Loss in potential energy $= \frac{Mgl}{2}$

Gain in angular $KE = \frac{1}{2}I\omega^2 = \frac{1}{2}\times\frac{Ml^2}{3}\times\omega^2$

$\therefore \quad \frac{1}{2}\frac{Ml}{3}\omega^2 = \frac{Mgl}{2}$ or $(l\omega)^2 = 3gl$

or $l\omega = v = \sqrt{3gl}$

$= \sqrt{3\times10\times30} = 30ms^{-1}$

14. Let the velocity of the scooter be v ms^{-1}. Then $(v-10)100 = 100$ or $v = 20\ ms^{-1}$

15. Let x be the distance between the particles after t second. Then

$x = vt - \frac{1}{2}at^2$ .....(i)

For x to be maximum,

$\frac{dx}{dt} = 0$

or $v - at = 0$

or $t = \frac{v}{a}$

Putting this value in eqn. (i), we get;

$x = v\left(\frac{v}{a}\right) - \frac{1}{2}a\left(\frac{v}{a}\right)^2 = \frac{v^2}{2a}$

[CHEMISTRY]

16. 34 electrons

17.

18. Bond orders are : $He_2^+ = 0.5;\ O_2^- = 1.5;\ NO = 2.5;C_2^{2-} = 3.0$

19.

20. XeF has 8 electrons in valence shell. In XeF_2, XeF_4 and XeF_6, two sigma bonds, four sigma bonds and six sigma bonds are respectively formed. Hence, in XeF_2 3 pairs of electrons are left, in XeF_4 2 pairs of electron are left and in XeF_6 only 1 pair of electron is left.

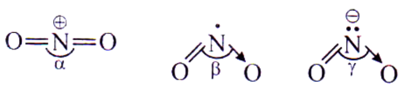
21. Each f C^1 and C^2 are forming two sigma bonds. Hence, both are sp-hybridised.

22. CO has triple bond $:\overset{-}{C}\equiv\overset{+}{O}:$, CO_2 has double bonds O=C=O,

CO_3^{2-} has C–O bond intermediate between single and double bond.

23. In methane C-atom is sp^3-hybridized with 25 s-character. In ethene, it is sp^2 with 33 s-character has to be less than 25 (actual value is 21.43)

24. Bond orders are : $O_2^- = 1.5,\ NO = 2.5,\ C_2^{2-} = 3.0$

25.  ; $\alpha > \beta > \gamma$

26.

27. Bond order of N_2^{2-} and N_2^{2+} is 2.

Bond order of N_2^{2-} and N_2^{2+} is 2.5

Bond order of N_2 is 3

28. Bond orders of O_2^{2-}, O_2^-, O_2 and O_2^+ are 1, 1.5, 2 and 2.5 respectively. (Please, refer to the text article no. 7.15)