WEEKLY TEST TYJ -1 TEST - 16 BALLIWALA
SOLUTION Date 11-08-2019

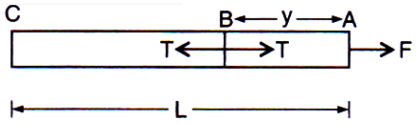
[PHYSICS]

1. Suppose the force on the block be P and acceleration of the system be a. Then

$$a = \frac{F}{(M+m)} \text{ and } P = Ma = \frac{MF}{(M+m)}$$

2. Acceleration of the rope a = (F/M) .....(i)

Now, considering the motion of the part AB of the rope [which has mass $\left(\frac{M}{L}\right)y$ and acceleration given by eqn. (i) assuming that tension at B is T.



$$F - T = \left(\frac{M}{L}y\right) \times a$$

or $$F - T = \frac{M}{L}y \times \frac{F}{M} = \frac{Fy}{L}$$

or $$T = F - F\frac{y}{L} = F\left(1 - \frac{y}{L}\right)$$

3. Equations of motion are :

$F - T_1 = 2a$ .....(i)
$T_1 - T_2 = 3a$ ....(ii)
$T_2 = 5a$ ....(iii)

Adding all above equations, we get;
F = 10a = 10 × 1 = 10 N

4. The tension in the string between P and Q accelerates double the mass as compared to that between A and R. Hence, tension between P and Q = 2 × tension between Q and R

5.

6. Thension, T = M(g – a). When climbing down very fast, T can be less than Mg/2, i.e., less than breaking load

7. As the lift moving downwards, stops after travelling a distance of 50 ft, hence from equation $v^2 = u^2 + 2as$, we get;
$0 + 20^2 + 2a \times 50$ or $a = -4 ft/s^2$
i.e., lift is accelerated up with an acceleration 4ft/sec
W = m(g + a) = 1600(32 + 4)

$$= \frac{57600}{32} = 1800 \text{ pound force}$$

8. Giventhat mg sinθ = 8. In order to move it upwards with same acceleration, we need to play a force F such that
F – mg sinθ = mg sinθ
∴ F = 2 mgsinθ = 16 N

9.

10. Reading of spring balance = tension

Thension, $T = \frac{2m_1m_2g}{m_1+m_2} = \frac{2\times2\times2\times2\times9.8}{2+2}$

$= 19.6N = \frac{19.6}{9.8}kgf = 2kgf$

11. One of the weights gives a reading and the other prevents the acceleration of the system. Therefore, the reading is not zero but 10 N

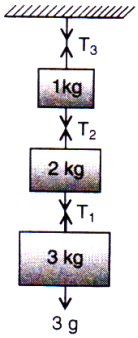
12. From the figure, it follows that

$T_1 = 3g$

$2g + T_1 = T_2$

or $T_2 = 2g + 3g$

$= 5g$



13. As discussed in questions 9, tension in the arms will be minimum, when $\cos\theta$ is maximum (=1) or $\theta = 0^o$, i.e., angle between arms = 0^o($T_{min} = W/2$)

14.

15. $\vec{F} = 6\hat{i} - 8\hat{j} + 10\hat{k}$

$|\vec{F}| = \sqrt{36+64+100} = \sqrt{200}N = 10\sqrt{2}N$

Acceleration, $a = 1\ ms^{-2}$

∴ Mass, $M = \frac{10\sqrt{2}}{1} = 10\sqrt{2}kg$

[CHEMISTRY]

16.

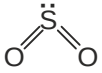
17. CH_2=CH–CH_2–C≡CH has 10σ-bonds are 3π-bonds

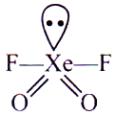
18. SiF_4 is tetrahedral and SF_4 is see-saw shaped.

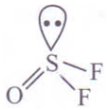
19. $BrO_3^{\ominus}$ and XeO_3 both have sp^3-hybridisation and pyramidal shape.

20. $\overset{\otimes}{N}O_2$ is $O=\overset{\otimes}{N}=O$ linear ion.

21. BF_3 and NO_2^- have sp^2-hybridised central atom while NH_2^- and H_2O have sp^3 hybridised central atom.

22.  sp^2-hybridisation

23. 

24. 

26. 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. 5.25)

28. NO has 15 electrons : KK $(\sigma_{15})^2 (\pi^*_{1s})\ (\pi_{2p_x})^2(\pi_{2p_y})^2(\sigma_{2p_z})^2(\pi^*_{2p_x})^1$ with bond order 2.5, paramagnetic nature.

NO^+ has 14 electrons, where $(\pi^*_{2p_z})^1$ electron is lost. The bond order increases to 3 and diamagnetic nature is attained.