WEEKLY TEST OYM TEST - 17 Balliwala
SOLUTION Date 11-08-2019

[PHYSICS]

1. (b) Effective length between A and B remains same.

2. (a) The mutual inductance between two coils depends on their degree of flux linkage, *i.e.*, the fraction of flux linked with one coil which is also linked to the other coil. Here, the two coils in arrangement (a) are placed with their planes parallel. This will allow maximum flux linkage.

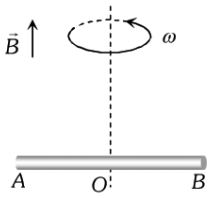
3. (d) Both AD and BC are straight conductors moving in a uniform magnetic field and emf will be induced in both. This will cause electric fields in both, but no net current flows in the circuit.

4. (d) Potential difference between

O and A is $V_0 - V_A = \frac{1}{2}Bl^2\omega$

O and B is $V_0 - V_B = \frac{1}{2}Bl^2\omega$

so $V_A - V_B = 0$



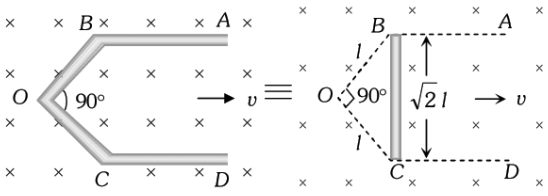
5. (a) Induced current in the circuit $i = \frac{Bvl}{R}$

Magnetic force acting on the wire $F_m = Bil = B\left(\frac{Bvl}{R}\right)l$

$\Rightarrow F_m = \frac{B^2v l^2}{R}$ External force needed to move the rod with constant velocity

$(F_m) = \frac{B^2v l^2}{R} = \frac{(0.15)^2 \times (2) \times (0.5)^2}{3} = 3.75 \times 10^{-3} N$

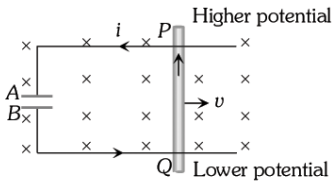
6. (b) There is no induced emf in the part AB and CD because they are moving along their length while emf induced between B and C *i.e.* between A and D can be calculated as follows



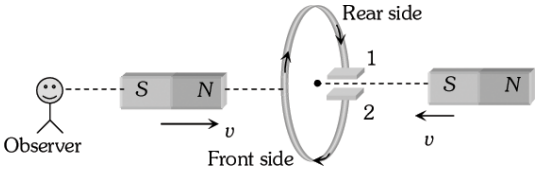
Induced emf between B and C = Induced emf between A and B = $Bv(\sqrt{2}\,l) = 1 \times 1 \times 1 \times \sqrt{2} = 1.41\,volt.$

7. (a) $Q = CV = C(Bvl) = 10 \times 10^{-6} \times 4 \times 2 \times 1 = 80\ \mu C$

According to Fleming's right hand rule induced current flows from Q to P. Hence P is at higher potential and Q is at lower potential. Therefore A is positively charged and B is negatively charged.



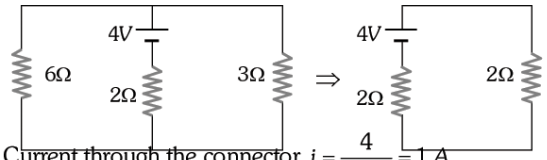
8. (b) By the movement of both the magnets, current will be anticlockwise, as seen from left side *i.e.* plate 1 will be positive and 2 will be negative.



9. (c) Motional emf $e = Bvl \Rightarrow e = 2 \times 2 \times 1 = 4\ V$

This acts as a cell of emf $E = 4\ V$ and internal resistance $r = 2\Omega$.

This simple circuit can be drawn as follows



Current through the connector $i = \dfrac{4}{2+2} = 1\ A$

$\therefore$ magnetic force on connector $F_m = Bil = 2 \times 1 \times 1 = 2\ N$

(Towards left)

10. (b) Due to magnetic field, wire will experience an upward force $F = Bil = B\left(\dfrac{Bvl}{R}\right)l \Rightarrow F = \dfrac{B^2v l^2}{R}$

If wire slides down with constant velocity then

$$F = mg \Rightarrow \frac{B^2vl^2}{R} = mg \Rightarrow v = \frac{mgR}{B^2l^2}$$

11. (c) By using $e = \dfrac{1}{2}Bl^2\omega$

For part AO ; $e_{OA} = e_O - e_A = \dfrac{1}{2}Bl^2\omega$

For part OC; $e_{OC} = e_O - e_C = \dfrac{1}{2}B(3l)^2\omega$

12. D

13. $e_0 = NAB\omega$

$= 30 \times 400 \times 10^{-4} \times 1 \times 3 \times 2\pi$

$= 226$ volt.

14.

$$e = \frac{d\phi}{dt} = \frac{dB}{dt} A = A_0 \frac{dB}{dt}$$
$$= A_0 \left[\frac{4B_0 - B_0}{t}\right] = \frac{3A_0B_0}{t}.$$

15.

Average value of 5 sin 100 ωt is zero. But average value of 5 A (= constant current) is 5 A. Hence, average value of total given function is 5 A.

[CHEMISTRY]

16.

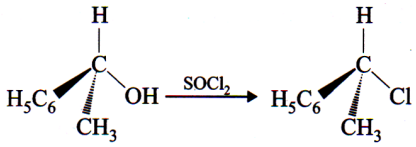
17. RCl > RF > RBr > RI

Exception

due to bond length

Polarity $\propto$ EN difference.

18.



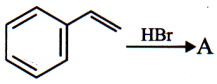
It is S_N1 mechanism so retentfor of configuration

19. Gem-dihalides are those in which two halogen atoms are attached on the same carbon atom.

20.

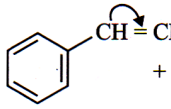
21. $CH - \underset{\underset{CH_3}{|}}{CH} = CH_2 + HBr \rightarrow CH_3 - \underset{\underset{CH_3}{|}}{\overset{\overset{Br}{|}}{C}} - CH_3$

2-Bromo, 2-methyl propane

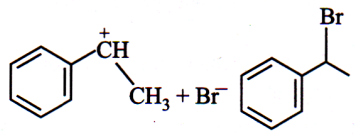
22. (c) 

Formation of A is an electrophilic addition reaction

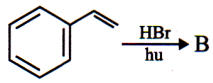
(i) $HBr \rightarrow H^+ + Br^-$

(ii) 

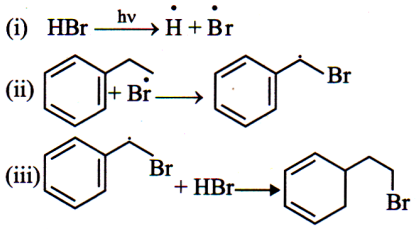
$+ H^+ \rightarrow C_6H_5\overset{+}{C}HCH_3$



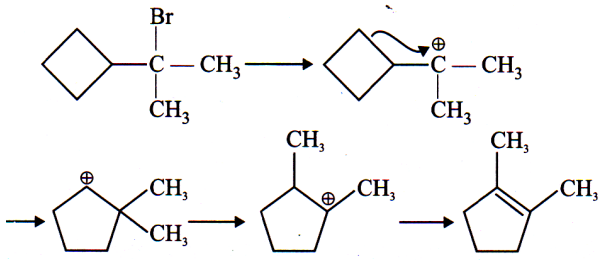
(A)



Formation of B is a free radical addition reaction

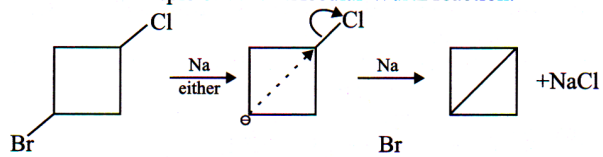


23. The order of reactivity of alkyl halides in SN^1 or SN^2 reaction is:
$(R - I) > (R - Br) > (R - Cl) > (R - F)$
I^{Θ} is a better nucleophile and a better leaving group. Leaving group order: $I^{\Theta} > Br^{\Theta} > Cl^{\Theta} > F^{\Theta}$

24. 

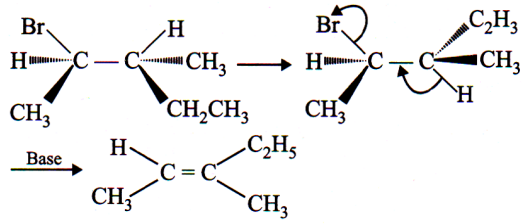
25. With ethoxide base, most substituted alkene (I) is formed as the major product. In the formation of (II), $C_2H_5O^-$ takes proton from less hindered β-carbon, hence less activation energy and greater rate of reaction although stability of product determines it content at equilibrium. Also, since E2 reaction is an elementary reaction in which halogen leaves in the rate determining step, iodide leaves most easily and fluoride with maximum difficulty.

26. It is an example of intramolecular Wurtz reaction.



Br^- is a better leaving group than chloride. In this reaction alkali metal (Na) is electron donor.

27. $(CH_3)_2\,CHCH_2MgBr \xrightarrow{C_2H_5OH} (CH_3)_2\,CHCH_3 + C_2H_5O$
MgBr as R of Grignard's reagent will take proton and form alkane.

28. 

29. $C_6H_5.CH_2Br \xrightarrow{Mg/ether} C_6H_5.CH_2MgBr$

$\xrightarrow{H_3O^+} C_6H_5 . CH_3 + Mg(Br)(OH)$

30. SN_1 reaction gives racemic mixture with slight predominance of that isomer which corresponds to inversion because SN_1 also depends upon the degree of 'shielding' of the front side of the reacting carbon.