CLA-2

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Q1

a) $NaBH_4$

It is a reducing agent used in organic reactions. It is used as selective reducing agent to reduce an aldehyde or Keto group in a compound.

Ex- 1) $CH_3-\overset{O}{\overset{\|}{C}}-CH_2CH_2-\overset{O}{\overset{\|}{C}}-CH_3 \xrightarrow[H_2O]{NaBH_4} CH_3-\overset{OH}{\overset{|}{C}}-CH_2-CH_2-\overset{O}{\overset{\|}{C}}-CH_3$

2) $CH_3-\overset{O}{\overset{\|}{C}}-CH=CH-CH_3 \xrightarrow[H_2O]{NaBH_4} CH_3-\overset{OH}{\overset{|}{C}}-CH=CH-CH_3$

b) $KMnO_4$

It is a strong oxidising agent. It is used to convert alcohols into carboxylic acids. It is a very strong oxidising agent that it is not preferred to convert alcohols into Keto or aldehyde groups as reaction does not stop there and convert them into carboxylic acids.

Ex- 1) $CH_3-OH \xrightarrow{KMnO_4} CH_3-COOH$

2) $CH_3-OH \xrightarrow{KMnO_4} CH_3-\overset{O}{\overset{\|}{C}}-H$ ✗ Not possible

Q2

[redacted]

Under general conditions

$$\Delta G = -nFE \quad \text{— (1)}$$

Under standard condition

$$\Delta G^\circ = -nFE^\circ \quad \text{— (2)}$$

$$\Delta G = \Delta G^\circ + RT\ln Q \quad \text{— (3)}$$

Substituting (1) & (2) in Eqn (3)

$$-nFE = -nFE^\circ + RT\ln Q.$$

$$E = E^\circ - \frac{RT}{nF}\ln Q$$

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$$E = E^\circ - \frac{2.303RT}{nF} \log Q.$$

Using $T = 298K$, $R = 8.314$, $F = 96500$ C i.e standard conditions.

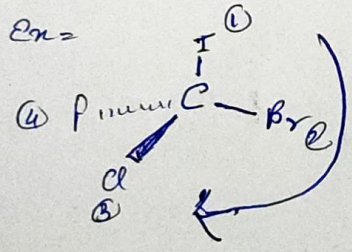
$$E = E^\circ - \frac{0.0592}{n} \log Q$$

**Q3**

CIP rule to determine the configuration on a chiral center

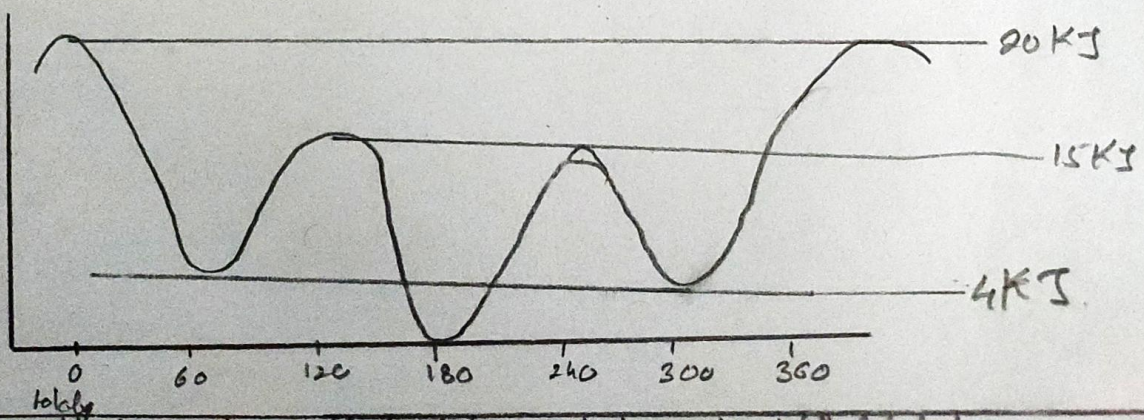
1) Locate the chiral center.
2) Assign priority to each substituent in order of decreasing atomic number such substrate with highest atomic number gets priority 1
3) Orient the molecule in such a way that lowest priority substrate is on dash position in wedge-dash projection.
4) Read the priority order.
5) If the reading is clockwise, then configuration is R and if it is anticlockwise then configuration is S.

Ex =




configuration is R.

**Q5** Potential Energy diagram for n-butane



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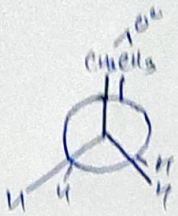
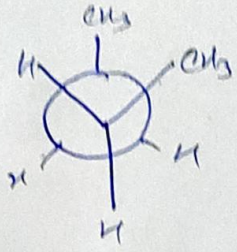
In n-butane there 4 conformers namely -> totally eclipsed, gauche, eclipsed, anti

Totally eclipsed form

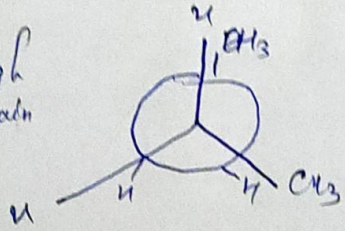
- There is high steric hinderance and repulsion



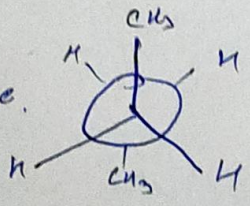

Gauche




Eclipsed
↳ There is high torsional strain




Anti
↳ most stable form of n-butane.




Q4 Markovnikov's rule

In addition reaction of an unsymmetrical alkenes with hydrohalides, the hydrogen atom forms a bond with the doubly bonded carbon atom in the alkene, bearing the greater number of hydrogen atoms

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Ex

$$CH_3-CH=CH_2 \xrightarrow{HCl} CH_3-\underset{Cl}{CH}-CH_3$$

Antimarkovnikov's rule

In addition reaction of unsymmetrical alkenes with hydrohalides the halide atom will form a bond with the doubly bonded carbon atom in the alkene, bearing the greater number of hydrogen atoms

$$CH_3-CH=CH_2 \xrightarrow{HCl} CH_3-CH_2-\underset{Cl}{CH_2}$$