NAL1L026010210
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CSE w/s AI & ML

Ques.1 Write a note on Free energy for corrossion reaction.

Sol. In Electrical & Electronical chemical process, electrical work as the product of charge (q) times the potential (E) through which it moved. If this work is done is an Electrochemical Cell in which the potential diff between them is two-half cell is E and the charge is that of one mole of reaction in which n moles of Electron are tranferred then the Electrical work (-w) done by the cell must be nE

$$W = \Delta G = -nFE$$

under standard condition, the standard free Energy of the cell reaction ΔG^0 is directly related to the standard potential difference across the Cell, E^0

$$\Delta G^0 = -nFE^0$$

For Solid or liquid Compound or Element standard condition are the pure compound or Element, for gases they are 100 KPa pressure and for solutes they are ideal 1 molar (mol/L) concentration.

Electrode potential can be combined algebraically to give cell potential for a galvanic cell such as Daniell cell, a positive cell voltage will be obtained if the difference is taken in the usual way, as Equation

$$E_{cell} = E_{cathode} - E_{anode}.$$

The free Energy charge in a galvanic cell, or in a Spontaneous cell reaction, is negative and the cell voltage positive. The opposite is true in an electrolytic cell the requires the application of an External potential to drive the Electrolysis reaction, in which case E_{cell} would be negative.

Ques.2 ~~write~~ Differentiate between Enantiomers & Diasteromers.

Enantiomers	Diastereomers.
• Enantiomers are non-Superimposiable mirror image of Each other. ~~Enantiomers~~	• Diastereomers are also non Superenimopible but are not mirror image of Each other.
• Enantiomers have one or more Sterocentres	• Diasteromes have two or more than two Sterochemist
• All Enantiomers pass optical activity. They have Equal but opposite angle of rotation	• Not all Diasteromers pass the optical activity They do not have an Equal angle of rotation
• In the Enantiomers the shape of molecules are similar	• Diastereoisomers have different molecular shape
• Enantiomers are present in pairs	• There can be several molecule in diastereomers
• They always have a different R, S-configuration	• They have the Same R-S configuration at least at one Stereocentre
• They can not be seprated by crystallization Chromatography, etc.	• They can be seprated by fractional distillation, chromatography, etc.
• All Enantiomers ~~are not~~ have the Same physical and chemical properties. Except, interaction with light and interaction with other compound.	• Diastercomers have two or more than two Stereocentre.
For Example :- Latic acid	For Example :- Tartaric acid.

Ques 3 what is the relation between Enthalpy & internal Energy.

Ans when the system at constant pressure undergo changes from an initial state with H_1, U_1, V_1, P parameter to a final stage with H_2, U_2, V_2, P Parameter the change in Enthalpy ΔH is given as

$$\Delta H = H_2 - H_1$$
$$H_2 - H_1 = (U_2 - U_1) + P(V_2 - V_1)$$
$$\therefore \Delta H = \Delta U + P\Delta V$$

Considering $\Delta U = q - U$ or $q - P\Delta V$; $q_p = \Delta U + P\Delta V$

q_p is the heat absorbed by the system at constant pressure for increasing the volume from V_1 to V_2. This is so because, $-w$ indicate that work is done by the system Therefore, volume increase against constant pressure is considered.

Equation becomes. $q_p = \Delta U + P\Delta V = \Delta H$.

or $\Delta H = q_p$

Heat effects measured at constant pressure indicate change in enthalpy of a system and not in change of internal Energy of the system. Using calorimeters operating at constant pressure, the Enthalpy change of a process can be measured directly.

Considering a system of gases which are chemically reacting to produce product gases with V_γ and V_p as the total volume of the reactant & product gases respectively. and n_γ and n_p as the number of moles of gaseous reactant & product.

$$PV_\gamma = n_\gamma RT \qquad \text{and} \qquad PV_p = n_p RT$$

This considering reactant as initial step and produce as final stage of the system

$$P(V_p - V_\gamma) = RT(n_p - n_\gamma)$$

$\therefore P\Delta V = \Delta n_g RT$ where Δn_g refer to the difference in the no of moles product & reactant gaseous

But, we already know that $\Delta H = \Delta U + P\Delta V$

So, we get $\Delta H = \Delta U + \Delta n_g RT$

Incurtain process internal Energy change $\Delta U = \Delta E$ also.

Ques 4 Explain S_N, mechanism taking an Example.

Ans S_N, reaction Mechanism follows a step by step process where in first, the carbocation is formed from the removal of the leaving group. Then the carbocation is attacked by the nucleophile. Finally, the deprotonation of the protonated nucleophile take place to give the required product.

An Example of reaction taking place with an S_N, reaction mechanism is the hydrolysis of tert-butyl bromide with water forming tert butanol

$$(CH_3)_3 C-Br + 2H_2O \longrightarrow (CH_3)_3 C-OH + Br^- + H_3O^+$$
tert - Butyl bromide $\qquad\qquad$ tert -Butanol
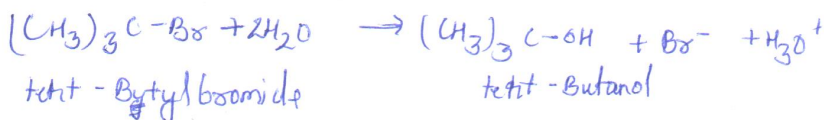
The above S_N, reaction take place in three steps.

Formation of a test butyl carbocation by separation of a leaving group (Br⁻) from the carbon atom.
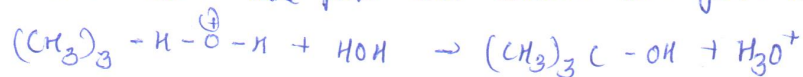
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$$(CH_3)_3 C - Br \rightarrow (CH_3)_3 C^+ + Br^-$$

The carbocation react with the nucleophile. The intermediate is an oxonium ion

$$(CH_3)_3^+ + H-O-H \rightarrow (CH_3)_3 C - H - \overset{\oplus}{O} - H$$

Deprotonation will take place and alcohol will form along with Hydronium ion.

$$(CH_3)_3 - H - \overset{\oplus}{O} - H + HOH \rightarrow (CH_3)_3 C - OH + H_3O^+$$

So finally be get

$$(CH_3)_3 - C - Br + 2H_2O \rightarrow (CH_3)_3 C - OH + Br^- + H_3O$$

Ques 5 Explain E_2 mechanism taking an Example.

Ans   Rate $= [subs][Nucleophile] \rightarrow$ second order reaction

E_2 reaction is also like SN_2 reaction i.e. one step process in which the abstraction of proton from β-carbon & Halide ion from the α carbon occur simultaneously.

For Example.

$$R - \underset{B}{CH} - \underset{\alpha}{CH_2} \quad X \quad \rightarrow \quad R - CH = CH_2 + H_2O + X^-$$

OH⁻