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## EXPERIMENT - 4

### Post Lab Questions

Q.1 A solution is made up to contain 0.01 M HCl what is its pH?

$$\begin{aligned}\rightarrow \text{pH} &= -\log (\text{H}^+) \\ &= -\log (0.01) \\ &= \underline{\underline{2}}\end{aligned}$$

Q.2 A solution is made to contain 0.01 M NaOH what is its pH?

$$\text{pH} = -\log (0.01) = 2$$

$$\underline{\text{pOH}} = 14 - \text{pH}.$$

$$\text{pH} + \text{pOH} = 14$$

$$\text{pH} + 2 = 14$$

$$\underline{\underline{\text{pH}}} = 12$$

Q.3 A pure metal rod half immersed vertically in water starts corrosion at bottom. Justify.

→ O<sub>2</sub> concentration cell is formed part of electrode which is immersed in water is less oxygenated and behaves like anode to undergo oxidation reaction & starts corroding at the bottom portion while as part which is protected because of more availability of oxygen and reduction.

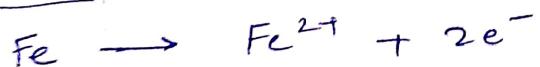
Q.4. What is the effect of temperature on the rate of wet corrosion?

→ Usually, a temperature or pressure increased directly lead to a higher corrosion rate because electrochemical reactions generally occur faster at higher temperature.

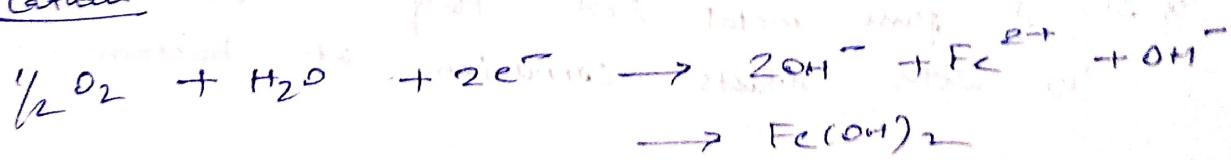
Q.5 Will there be corrosion in alkaline & neutral medium? Justify.

→ Yes, Rusting of Iron happens because of dissolved oxygen in water by O<sub>2</sub> adsorption mechanism. Anodic part goes into oxidation reaction which takes place & electrons flow to cathodic area to combine with O<sub>2</sub> & forms ferrous hydroxide which oxidizes into ferric hydroxide.

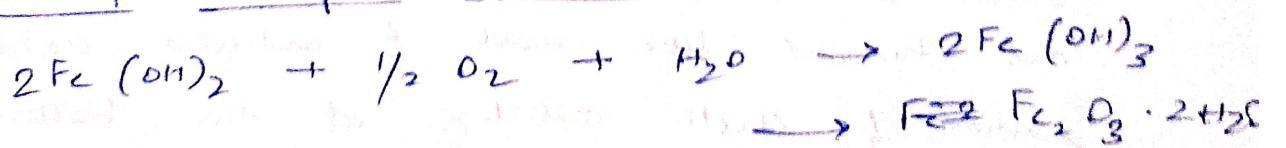
Anode



Cathode



In presence of enough O<sub>2</sub>



In presence of limited O<sub>2</sub>

~~Fe<sub>3</sub>O<sub>4</sub>~~ forms black anhydrous magnetic.

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EXPERIMENT - 5ECE of copper

Q. 1 Define Electrochemical equivalent (ECE).

→ Electrochemical equivalent is the mass of a substance liberated or deposited at an electrode during electrolysis is directly proportional to the quantity of charge passed through ~~the~~ the electrolyte.

Faraday's First law of electrolysis states —

"The weight of substance deposited on an electrode during electrolysis is directly proportional to the quantity of electricity passed ~~the~~ through the electrolyte."

Q. 2 Explain the significance of Electrochemical Determination

→ ECE is mainly used for determination of the kinetics of corrosion rates and to establish estimate the oxidising power in specific environment.

Q. 3 What is the effect of temperature on the determination of ECE?

→ The results obtained showed that the membrane potential increased with temperature as well as with increasing order of polarization tendency of the

divalent metals used, and decreased with an increase of potassium bound to the membrane

Q.4. What do you understand from the values of electrochemical equivalent (ECE) of the following elements?

- 1) Silver  $\rightarrow 0.0011181$
- 2) Copper  $\rightarrow 0.0003281$
- 3) Hydrogen  $\rightarrow 0.0000104$

$\rightarrow$  ECE is the mass of substance deposited to one of the electrodes when a current of amp is passed for 1 second.

$$\text{so } 1.11 \times 10^{-6} \text{ kg/L Ag is deposited in 1s.}$$

$$3.28 \times 10^{-7} \text{ kg/L Cu is deposited in 1s}$$

$$1.04 \times 10^{-8} \text{ kg/L H}_2 \text{ is deposited in 1s.}$$

Q.5. Name and state the law that forms the basis of Electrochemical Equivalent.

$\rightarrow$  Faraday's First law of electrolysis.

$\Rightarrow$  "The weight of substance deposited on an electrode during electrolysis is directly proportional to the quantity of electrically passed through the electrolyte."

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## EXPERIMENT - 6

(A) To prepare Nylon and draw them in the form of threads.

(Q) Explain:

1. Addition Polymerization: It is the addition of one monomer to another monomer to form along a long chain polymer. This does not produce any by-products and the molecular weight of the polymer will be an integral multiple of monomers molecule weight.

Eg. PVC, Teflon, etc.

2. Condensation Polymerization: It is the process of intermolecular condensation of two different monomers to form a large chain of polymers molecule. In this process, linking of every 2 monomers molecules will result in a simple molecule like  $HCl$ ,  $NH_3$ ,  $H_2O$ , etc. as a by-product.

Eg. Bakelite, Nylon, poly-esters.

Q. 2 What is Kevlar? Name its monomers.

→ Kevlar: It is a polyamide, a type of synthetic polymers, in which the amide groups are separated by para phenylene group, meaning that the amide groups are attached to each other on opposite side of the phenyl group.

Monomers: 1,4 - phenylene - diamine

{ Terephthaloyl - chloride

Q. 3 Name the polymers that can be synthesized by interfacial polymerization technique.

⇒ Conductive polymers synthesized by interfacial polymerization ~~technique~~ such as (PANI), (Polyaniline)

Polypyrrole (PPy), Poly (3,4 - ethyl - enediony thiophene)

and polythiophene (PTH) +

Q. 4 Why instead of Nylon can be drawn from the reaction mixture is interfacial polymer.

→ It happens because a solution of decane-dio in cyclohexane is floated on an aqueous solution of 1,6-diamino hexane. As nylon forms at the interface, it can be pulled out as fast as it is produced.

Q.5 Is stoichiometric balance important for the success of interfacial polymerization? why?

→ Yes, the stoichiometric balance at the scattering zone is important for high MW poly amide formation.

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## EXPERIMENT - 7

### Fe conc using Calorimeter

Q.1 What is Beer's and Lambert's law?

→ Beer's law:

When a beam of monochromatic light is allowed to fall pass through a transparent medium, the rate of decrease of radiant power with the concentration of medium is directly proportional to radiant power.

→ Lambert's Law:

When a beam of monochromatic light is allowed to be passed through a transparent medium, the rate of decrease of radiant power with thickness of the medium is directly proportional to thickness of medium or path length.

Q.2 What is the significance of determination of Fe conc?

→ Although Iron is toxic only at high levels, it acts as a surrogate for other heavy metals, whose presence in drinking water is a real danger to public health.

Q(3) Explain the terms Absorbance and Transmittance

→ Absorbance: is a measure of the quantity of light absorbed by a sample.

Transmittance: is the quantity of light that passes through a solution. It's relatively easy to determine.

$$A = -\log_{10}(T)$$

Q(4) Explain the basic principle behind colorimetry

→ The colorimeter is based on Beer's-Lambert's law, according to which the absorption of light transmitted through the medium is directly proportional to the medium concentration.

→ In a colorimeter, a beam of light with a specific wavelength which navigate the coloured light to the measuring device.

→ This analyzes the colour compound to an existing standard. A micro processor then calculates the absorbance & present transmittance.

Q(5) Iron is present in water in what forms? What is their source in drinking water?

→ Iron can be present in water in 2 forms  
1. Soluble ferrous Iron  
2. Insoluble ferric Iron.

water containing ferrous Iron is clear and colourless and when exposed to air, in water turns cloudy causing a reddish brown ppt of Ferric oxide to appear.

→ Iron exists naturally in rivers, lakes, underground water. It may also be released to water from natural sources, industrial waste, corrosion of Iron - containing metals

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## EXPERIMENT - 9

To determine the weight of polymer using Ostwald

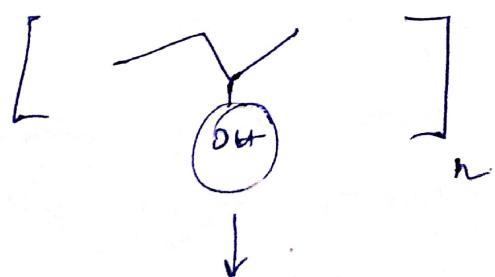
Viscometer

Q.1. What do you understand by viscosity?

→ Viscosity describes the internal friction of a moving fluid. It quantitatively measures a fluid's resistance to flow.

Q.2. Why is PVA soluble in water?

PVA's have an abundance of hydroxyl groups that make them soluble in water as these groups tend to form hydrogen bonds with the water molecules they interact with, generating a sense of solubility. Varying weights and the degree of hydrolysis determines the extent of solubility for specific poly vinyl alcohols.



These OH groups enhance the solubility.

Q. 3- Explain the significance of molecular weights of polymers with respect to its various properties.

→ Almost all properties of a polymer are dependent on its molecular weight and distribution.

Lower the number of repeating units, the softer the units turn to be. Because of this, they are very low is their viscosity or will and possess little to no strength.

On the other hand, higher molecular weight observed high impact resistance of the material improved mechanical properties, like allowing stretchability before rupturing as well as improved chemical resistance to a certain extent.

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## EXPERIMENT - 10

### Estimation

Dissolved Oxygen in given sample  
by Winkler's method

Q.1. What do you understand by 'dissolved Oxygen'?



The dissolved oxygen in the sample is then fixed by adding a series of reagents that form an acid compound that is then titrated with a neutralizing compound that results in a color change.

Q.2. What is the effect of oxidizing impurities like  $\text{NO}_2^-$  and  $\text{Fe}^{3+}$  (if not removed) on DO ~~result~~ result?



These Oxidising ions ( $\text{NO}_2^-$  &  $\text{Fe}^{3+}$ ) might convert the water molecule into ~~gas~~ oxygen gas by interacting with them in the form of oxidising impurities to generate more dissolved oxygen which would interfere with more of the existing oxygen present in ~~the~~ dissolved form, altering its quantity and disturbing the existing fixation.

Q.3. What is the effect of seducing impurities like  $\text{SO}_4^{2-}$ ,  $\text{S}^-$ , and  $\text{Fe}^{2+}$  (if not removed) on DO determination?

→ Reducing impurities much like oxidizing on mentioned before would interfere with the existing quantity of dissolved oxygen by reducing the DO; into  $\text{OH}^-$  ions, affecting the existing DO formation.

Q.4. What is the optimum value for drinking water as per standard WHO norms?

→ Permissible drinking water range as per WHO guidelines is 75 mg/L.

Q.5. What is the significance of DO measurement?

→ DO is one of the most important indicators of water quality. It is essential for the survival of fish and other aquatic animals.

→ If DO becomes too low, fish and other aquatic organisms cannot survive.