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Chemistry question Bank

1)

option
A)

Dipole moment of molecules must change during vibration

2)

option
A)

Reduction potential must be higher.

3)

option
C)

Cell can work indefinitely

4)

option
C)

rioting

5)

option
D)

Moderate ignition temp and high calorific value

6)

option
C)

±.

7)

option
B)

Negative.

8)

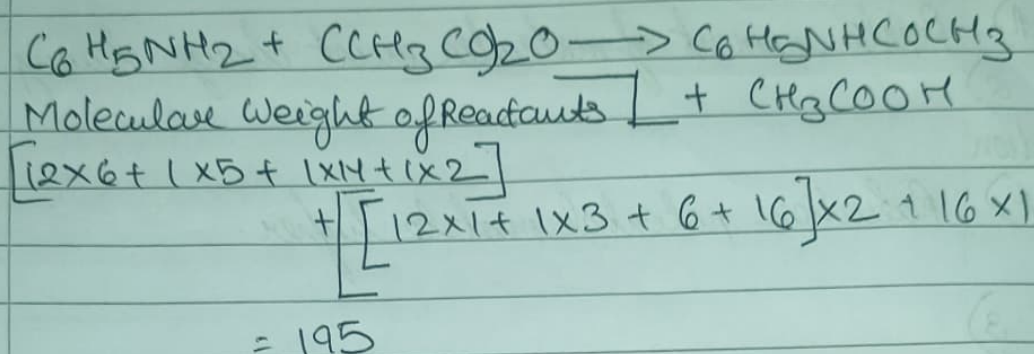
option
B)

9)

option
B)

Stress corrosion.

⑩ Calculate the atom economy,



Molecular weight of end product

$$12 \times 6 + 1 \times 5 + 1 \times 14 + 1 \times 1 + 12 \times 1 + 16 \times 1 + 12 \times 1 + 1 \times 3$$
$$= 133$$

$$\text{Atom economy} = \frac{\text{Molecular weight of product}}{\text{Total molecular weight of reactant}} \times 100$$

$$= \frac{133}{195} \times 100 = 68.20\%$$

option C) 68.23%,

11)

option

B) D-glucose.

(12) option C It enhances electrical contact with surrounding soil

(13)

(14) Mayad "C"

(15)

Given

$$C = 83\%, H = 6\%, O = 3\%$$

$$S = 3.7\%, N = 2.5\%, ash = 1.8\%$$

formula used

$$HCV = \frac{1}{100} [8080C + 34500(H - \frac{O}{8}) + 2240S] \text{ kcal/kg}$$

$$\frac{1}{100} [8080 \times 83 + 34500(6 - \frac{3}{8}) + 2240 \times 3.7] \text{ kcal/kg}$$

option E) 8729.90 Kcal/kg

16)

option A) They can reduce the percentage atom economy of the desired products.

(17)

option

B) When surface area of anode is greater than surface area of cathode.

$$18) E_{\text{cell}} = E_{\text{cathode}} - E_{\text{anode}} \\ = 0.257 - (0.337V)$$

option D = 0.594V

20
option) loaded petrol has better anti-knocking properties.

Q19

Q2) Solve the following,

2) Nernst Equation

$$\Rightarrow E = E^0 - \frac{0.059}{n} \log \frac{[Mg^{2+}]}{[Cu^{2+}]}$$

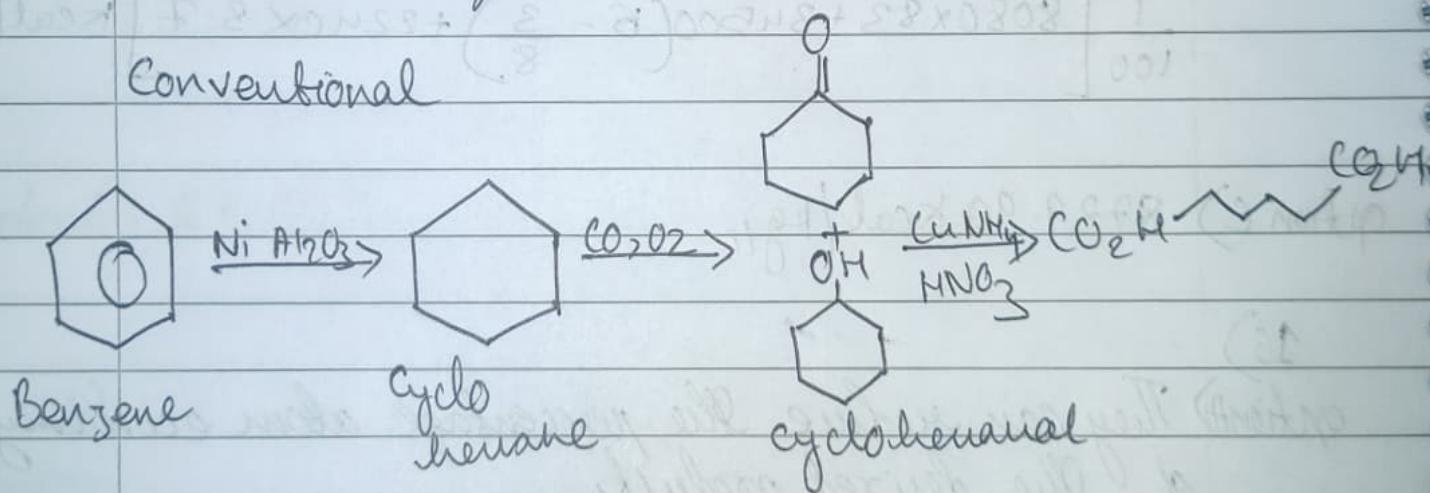
$$E^0 = 0.34 - (-2.37) = 2.71V //$$

$$E = 2.71 - \frac{0.059}{n} \log \frac{0.001}{0.0001}$$

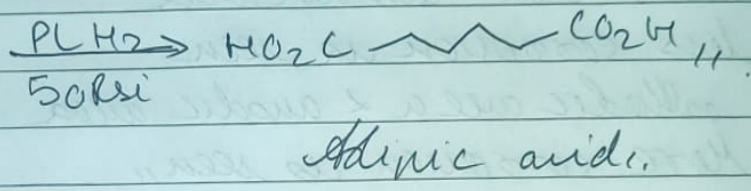
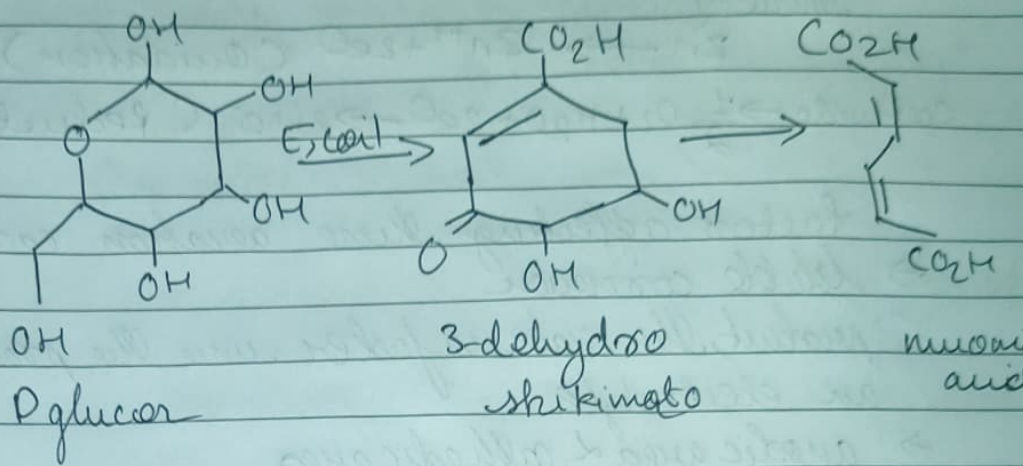
$$E = 2.68V$$

③ The greener route for the synthesis of adipic acid is as follows

Conventional



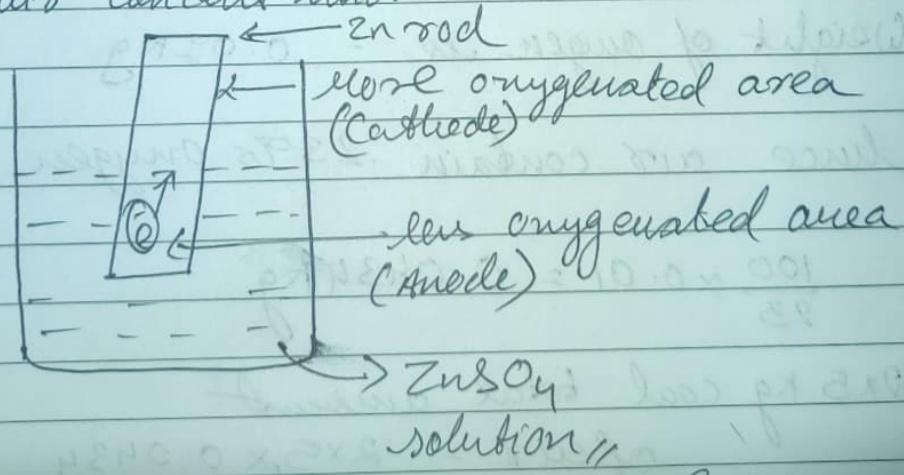
Greenhouse gases



"Raw material or feedstock should be renewable"

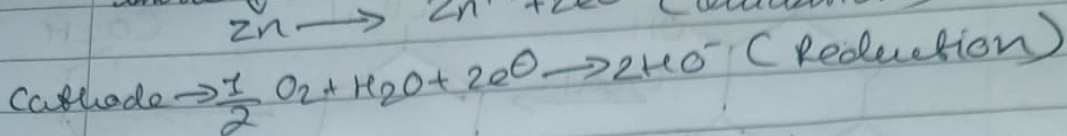
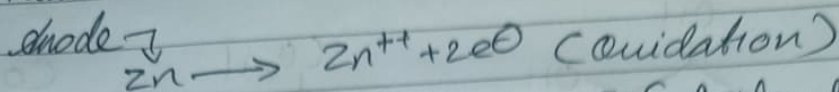
(Q.4)

→ Differential aeration corrosion, it is the corrosion that occurs when a metal is subjected to different amount of air concentration.



The part which is submerged in the liquid is less oxygenated therefore it is anode and gets corroded.

Reaction



→ factor affecting the aeration corrosion

soluble corrosion
product, the rate is faster since the product is an electrolyte

→ anodic area & cathodic area

less corrosion is seen

→ cathodic area & anodic area

More corrosion is seen.

⑤ Given

C = 80%

H = 5%

O = 1%

N = 2%

S = 5%

ash = 7%

formula used.

GCV

$$= \frac{1}{100} \left[8080C + 34500 \left(H - \frac{O}{8} \right) + 2240S \right]$$

$$8257.875 \text{ Kcal/Kg},$$

Weight of oxygen is = 0.01 Kg

since air contain 23% oxygen

$$\frac{100}{23} \times 0.01 = 0.0434 \text{ Kg}$$

2x5 kg coal total amount

$$\text{of air} = 2 \times 5 \times 0.0434$$

$$= 0.434 \text{ Kg} //$$

$$0.434 \times 22.4 = 0.972 \text{ m}^3 //$$

$$28.949$$

Q.6 → SS.

Q.7)

anodic coating
Coating material
is at lower potential
than base metal

If the coating break
the base metal
is still protected

Zn continues to
protect the metal
due to galvanic
cell action

Can't be used
on food product

To protect roof
sheet, nails, bolts

Cathodic coating
Coating material
is at higher potential

If the coating breaks
the base metal
is not protected.

Sn (Sn) continues
to protect the
metal till the
coating is perfect

Can be used.

Cookware, food
containers.

⑧ ~~12~~

12 principles of green chemistry,

- ① Prevent waste
- ② Increase atom economy
- ③ Use of non-hazardous chemical
- ④ Use of safer chemicals
- ⑤ Use of catalysts
- ⑥ Avoid chemical derivation
- ⑦ Use of renewable feedstock
- ⑧ Minimize of auxiliary substances
- ⑨ Increase the efficiency
- ⑩ Product that degrades after use
- ⑫ Analytical methods
- ⑪ Minimize accidents

Prevention of waste

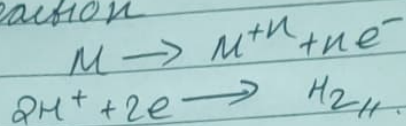
- 1) Better to prevent waste than to treat or clean-up
- 2) Best to carry-out synthesis by designing such a pathway that reduces by-products
- 3) Disposal of toxic water and CO_2 harm living organism including human beings.

⑨ Cathodic protection.

→ Cathodic protection method of corrosion control. The metal which is to be protected is forced to act as a cathode.

→ This is explained by metal reaction in acidic medium

→ Reaction



→ Cathodic protection is achieved by supplying external current to the metal. Additional electron suppresses the metal dissolution.

33

(10) $H = \frac{2}{18} \times \frac{\text{Increase in weight of water}}{\text{coal sample}} \times 100$

Given

$C = 0.25g$

$CaCl_2 = 0.09g$

$KOH = 0.8g$

N

$= \frac{V_2 V_1 \times \text{Normal} \times 1.4}{\text{weight of coal}}$

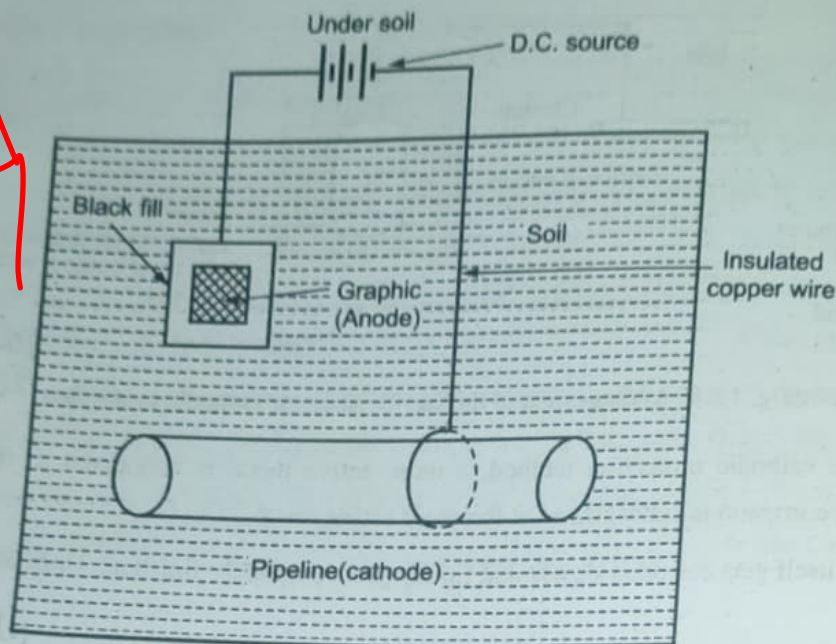
$36.5 - 49.5 \times 0.12 \times 1.4 = 5.$

0.42

$H = \frac{2}{18} \times \frac{0.09}{0.25} \times 100 = 4\%$

$C = \frac{12}{44} \times \frac{\text{increase in weight of } CO_2}{\text{coal sample}}$

$C = \frac{12}{44} \times \frac{0.8}{0.25} \times 100 = 87.27\%$



(2017) Fig. 4.5.5 : Arrangement of the impressed current cathodic protection

- (2) In the impressed current cathodic protection method, a current is applied in the opposite direction to that of the corrosion current, thereby nullifying the effect of the corrosion current on the base metal that means converting the base metal into cathode.
- (3) The impressed current is obtained by using a d.c. source such as a wet battery or a dry cell alongwith an insoluble anode made up of platinum, stainless steel, graphite etc which is embedded underground and to this impressed current is applied.
- (4) The whole assembly is connected to the metallic structure to be protected.
- (5) The anode can be single for a small structure like water tank or there can be many series connected such anode, if the structure to be protect is big like long pipeline, oil-rig platforms on the sea etc.
- (6) The insoluble anode is kept inside back-fill made up of mostly gypsum which increases the electrical contact with the soil.
- (7) **Advantage :** This method can protect very large and long structures. Further, its maintenance is easy.
- (8) **Disadvantage :** The anode needs frequent replacement.

4.2.2 Wet or Electrochemical Corrosion

UQ 4.2.6 Define electrochemical conversion.

UQ 4.2.7 What is electrochemical conversion?

► Ref.: (MU - Q. 2(a), May 18, 1 Mark)

► Ref.: (MU - Q. 2(a), Dec. 14, 2 Marks)

✓ Ans.:

Definition and explanation of electrochemical conversion

(1) This type of corrosion occurs under the following 2 conditions:

- (i) When the metal surface is in immediate contact with aqueous acidic/alkaline/neutral/electrolytic solutions forming the short circuited galvanic cells. *ki (e-) Release short circuit noty hai*
- (ii) When 2 dissimilar metals or alloys are either immersed or dipped partially in the aqueous solutions. *toh iska he metal hai*

(2) The corrosion is due to the formation of anodic and cathodic area between which current flows through the conducting solution. *Do dissimilar metals, metal ions hota hai*

(3) The anodic reaction involves dissolution of metal as corresponding metallic ions with the liberation of free electrons.

Thus, at anode: $M \longrightarrow M^{n+} + ne^{-}$

*Anodic reaction
dissolution of metal and corrodes*

(4) Conversely, the cathodic reaction consume electrons with either by (a) evolution by H_2 or (b) absorption of O_2 depending upon the nature of corrosive environment (a) and (b) are called as the mechanisms of the wet corrosion. *ponding*

(5) When 2 different metals are in contract with a common conducting liquid (medium), metal which has higher oxidation potential acts as an anode and it undergoes corrosion while the second metal with lower oxidation potential acts as a cathode and remains protected. *anodic reaction release karbi metal*

current flows through

*Metal surface
Is in a immediate
contact with aqueous
acidic/alkaline/neutral*

UQ. 4.2.13 What is Electrochemical corrosion? With suitable diagram and electrode reactions explain electrochemical mechanism of rusting of iron in neutral, aqueous medium.

UQ. 4.2.14 What is 'Oxidation corrosion'? Why do Gold and platinum metal not get corroded in atmospheric oxygen.

UQ. 4.2.15 With a suitable diagram, and electrode reactions, explain electrochemical mechanism of rusting of iron in neutral, aqueous medium.

► Ref. : (MU - Q. 2(a), Dec. 14, 3 Marks, Q. 6(a), May 16, 4 Marks)

► Ref. : (MU - Q. 1(a), Dec. 15, 2 Marks)

► Ref. : (MU - Q. 4(b), May 14, 5 Marks)

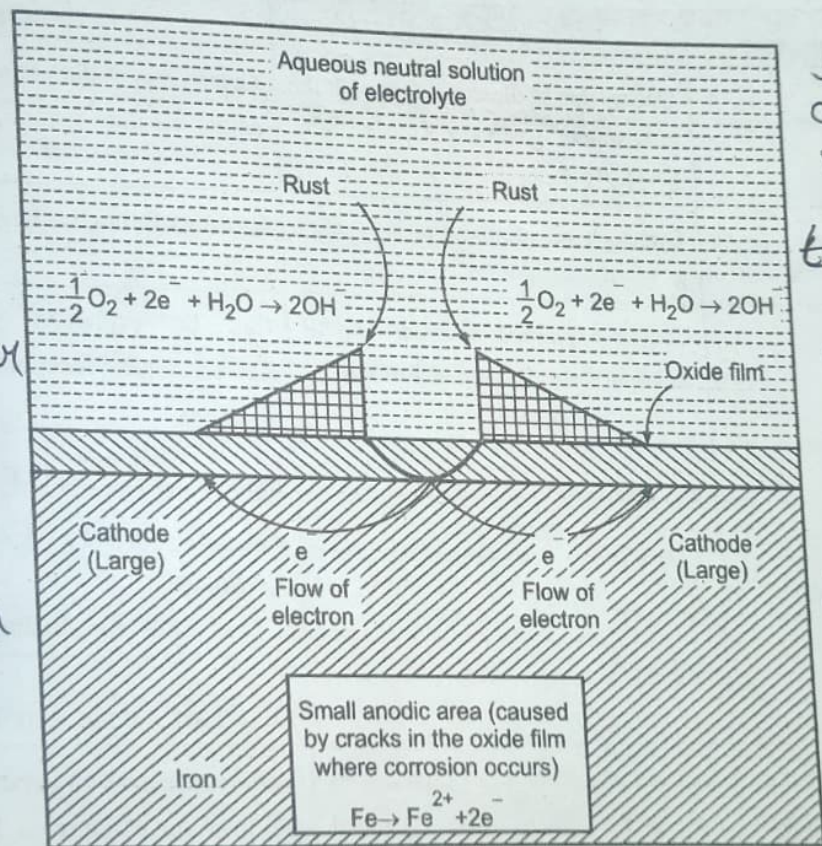
Ans. : *absorption of oxygen occurs when the metal is in contact with aqueous acidic*

(1) In the case of wet or electrochemical corrosion, absorption of oxygen occurs when the metal is in contact with aqueous acidic or alkaline/neutral or electrolytic solution and this causes corrosion.

(2) Wet corrosion with oxygen absorption also takes place where two dissimilar metals or alloys are either immersed fully or dipped partially in the solutions mentioned above.

(3) Let us consider an iron tank having its inner surface coated with a thin film of iron oxide (Fe_2O_3) as shown in the Fig. 4.2.3.

Wet corrosion In oxygen Tabhi hota hai jabh Do dissimilar metal ko ek saath electrolyte me darsa ho



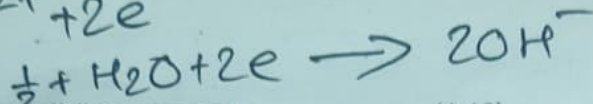
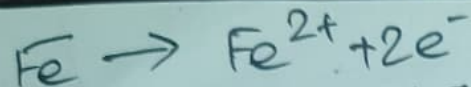
let us consider Ye jo Iron tank hai isse to Fe2O3 se cover kiya hai Agar ye film me crack aye toh Anodic area

(208) Fig. 4.2.3 : Schematic diagram for wet or electrochemical corrosion with absorption of oxygen

(4) Explanation :

- (i) If this film develops some cracks, anode areas are created on the surface, while the metal acts as cathode.
- (ii) Here the anodic areas are small surfaces while rest of the surface of the metal forms large cathode.

banat hai

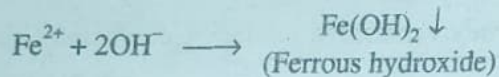
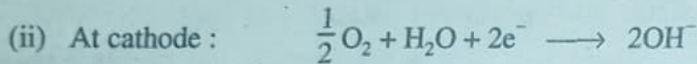


(5) Reactions :

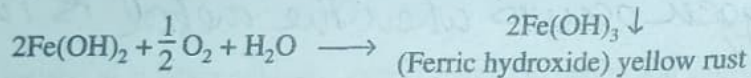
$\text{Fe}(\text{OH})_2 \downarrow$ yellow rust,



The electrons flow to cathodic area through the metal and will be accepted by O_2 .



If enough O_2 is present, ferrous hydroxide easily oxidizes to ferric hydroxide as follows :



If O_2 is limited, the corrosion product will be black anhydrous magnetite Fe_2O_4 .

- (6) Since the oxide film is porous in nature the surface of iron exposed to atmosphere acts as an anode while rest of the surface acts as a cathode.