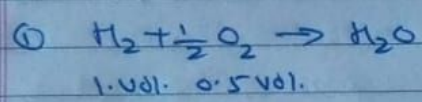
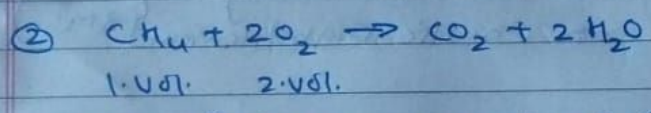


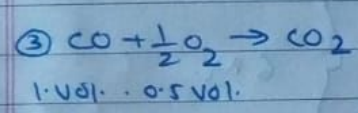
Constituents	% by volume	Vol per each kg	O ₂ Reqd.
H ₂	50	0.5	0.25 m ³
CH ₄	30	0.3	0.6 m ³
N ₂	2	—	—
CO	7	0.07	0.035 m ³
C ₂ H ₆	5	0.05	0.175 m ³
w.p.	3	—	—
			— (1M)



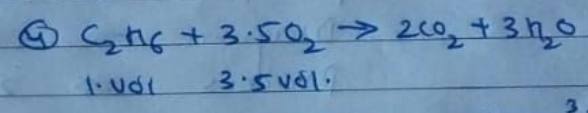
$\therefore 0.5 \text{ vol. } H_2 = 0.5 \times 0.5 = \underline{0.25 \text{ m}^3}$



$0.3 \text{ vol of } CH_4 = 2 \times 0.3 = \underline{0.6 \text{ m}^3} \Rightarrow (2M)$



$0.07 \times 0.5 = \underline{0.035 \text{ m}^3}$



$0.05 \text{ vol} = 0.05 \times 3.5 = \underline{0.175 \text{ m}^3}$

$\therefore \text{Vol. of } O_2 \text{ reqd for complete combustion of } 1 \text{ m}^3 \text{ of gaseous fuel.}$
 $= (0.25 + 0.6 + 0.035 + 0.175)$
 $= \underline{1.06 \text{ m}^3 \text{ of } O_2}$

① $\therefore \text{Vol of air reqd for complete combustion of } 1 \text{ m}^3 \text{ fuel} = \frac{100}{21} \times 1.06$
 $= \underline{5.048 \text{ m}^3}$

$\therefore \text{Hence vol. of air for } 2 \text{ m}^3 \text{ of fuel.} = 5.048 \times 2$
 $= \underline{10.095 \text{ m}^3} \quad (1M)$

② $\text{Wt of Air for complete combustion} = \frac{10.095 \times 28.949}{22.4}$
 $= \underline{13.04 \text{ Kg}} \quad (1M)$

③ Factors affecting Rate of Corrosion :-

- ① Humidity in Air $\rightarrow 2M$
 - ② Influence of pH $\rightarrow 2M$
 - ③ Relative area of cathode/anode $\rightarrow 2M$
- } 6M

END SEMESTER EXAMINATION.

SECOND HALF - 2021

BRANCH: FE (COMP/IT).

Date _____
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Q.1 a) Principle of EDTA Method:-

Equation \rightarrow 1M. } 3M.
Explanation \rightarrow 2M.

b) Diff: between octane no & cetane no.

Any 3 or 4 points \rightarrow 3M.

c) Defn and significance VI \rightarrow 1M

cloud pt. & pour pt \rightarrow 1M

API Value \rightarrow 1M.

d) Reason. Explanation \rightarrow 3M.

$$e) GCV = \frac{1}{100} (8080C + 34500(H - \frac{O}{8}) + 2240S)$$

$$= \frac{1}{100} (8080 \times 80 + 34500(7 - \frac{3}{8}) + 2240 \times 3.5)$$

$$= \frac{1}{100} (666400 + 34500(7 - 0.375) + 2240 \times 3.5)$$

$$= \frac{1}{100} [\dots] \quad \left. \vphantom{\frac{1}{100}} \right\} 2M.$$

$$= \frac{1}{100} [882802.5]$$

$$GCV = 8828.025 \text{ Kcal/Kg}$$

$$NCV = [GCV - 0.09 H \times 587]$$

$$= 8828.025 - 0.09 \times 7 \times 587$$

$$= 8828.025 - 369.81$$

$$= 8458.215 \text{ Kcal/Kg}$$

} 1M

2

a) Cathodic protection = Defn \rightarrow 1M.

Impressed current cathodic protection \Rightarrow Diagram - 1M

Explanation - 2M

3 (a) (i) $\% N = \frac{(Y-X) \times 1.4 \times N}{W} = \frac{12.7 \times 1.4 \times 0.5}{2.5} = 3.55\% \Rightarrow (2M)$

$\% S = \frac{32 \times 2 \times 100}{233.4 \times W} = \frac{32 \times 0.28 \times 100}{233.4 \times 1.5} = \frac{896}{350.1} = 2.56\% \Rightarrow (2M)$

(b) STRESS CORROSION:-

Explanation $\Rightarrow (2M)$
 Example \Rightarrow Season cracking } 3M
 \Rightarrow Caustic Embrittlement } 5M.

(c) Ion Exchange process.

principle $\Rightarrow 1M$
 Diagram $\Rightarrow 1M$
 Process $\Rightarrow 2M$ } 6M.
 2 Advantage $\Rightarrow 1M$
 2 Disadvantage $\Rightarrow 1M$

(d) Factors affecting Rate of corrosion:-

- (1) Humidity in Air $\rightarrow 2M$
 - (2) Influence of pH $\rightarrow 2M$
 - (3) Relative area of Cathode/Anode $\rightarrow 2M$
- } 6M.

(e) fluid film Lubrication:-

Explanation $\rightarrow 2M$
 Diagram $\rightarrow 1M$
 Example $\rightarrow 1M$ } 4M.

b) ① Strength of SHW

$$0.25 \text{ gm } \text{CaCO}_3 \equiv 250 \text{ ml.}$$

$$\therefore 250 \text{ mg } \text{CaCO}_3 \equiv 250 \text{ ml D/w.}$$

$$\therefore 1 \text{ ml SHW} = \frac{250}{250} \text{ mg } \text{CaCO}_3 \text{ Eq.}$$

$$1 \text{ ml of SHW} \equiv 1 \text{ mg } \text{CaCO}_3 \text{ Eq.} \Rightarrow \textcircled{1\text{M}}$$

2) 50 ml of SHW = 40 ml EDTA.

$$50 \text{ ml SHW} \equiv 50 \times 1 \text{ mg } \text{CaCO}_3 \text{ Eq} = 40 \text{ ml EDTA}$$

$$\therefore 1 \text{ ml EDTA} = \frac{50}{40} \text{ mg } \text{CaCO}_3 \text{ Eq.}$$

$$\therefore 1 \text{ ml EDTA} = 1.25 \text{ mg } \text{CaCO}_3 \text{ Eq.} \Rightarrow \textcircled{1\text{M}}$$

3) Total Hardness

$$50 \text{ ml Hard water} \equiv 10 \text{ ml EDTA}$$

$$\therefore \text{Total Hardness in 1 lt} = \frac{10 \times 1.25 \times 1000}{50}$$

$$= \underline{250 \text{ mg } \text{CaCO}_3 \text{ Eq.}}$$

4) Permanent Hardness.

$$50 \text{ ml B/F water} = 5 \text{ ml EDTA.}$$

$$\therefore \text{Permanent Hardness in 1 lt} = \frac{5 \times 1.25 \times 1000}{50}$$

$$= \underline{125 \text{ ppm.}} \Rightarrow \textcircled{1\text{M}}$$

5) Temporary Hardness = Total Hardness - perm. H.

$$= 250 - 125$$

$$= \underline{125 \text{ ppm.}} \Rightarrow \textcircled{1\text{M}}$$

c) • Origin of Paint \rightarrow 1 M.

function of constituents \Rightarrow 5 constituent = 5 M } 6 M.
1 M Each.