

END TERM EXAMINATION

FIRST SEMESTER [B.TECH.] DEC.-2019

Paper Code: ETCH113

Subject: Applied Chemistry

Time: 3 Hours

Maximum Marks: 75

Note: Attempt five questions in all including Q. No. 1 which is compulsory. Select one question from each unit. Assume suitable missing data if any.

Q1

(2.5 x 10 = 25)

- Why is Net Calorific value less than Gross Calorific value of a fuel?
Under what condition NCV=GCV?
- What is reforming of petrol? How does reforming increase Octane number?
- Explain Auto catalyst with an example.
- Why rough surface of a catalyst is more effective than smooth surface? Explain.
- Define Degree of Freedom. Why Degree of Freedom, $F=0$ at triple point?
- Define Break Point Chlorination with the help of a curve plotted between added chlorine and residual chlorine.
- Explain Electrochemical Corrosion.
- Differentiate between Galvanization and Tinning. Why Galvanized utensils cannot be used for storing acidic food stuffs?
- Write a short note on Caustic embrittlement.
- Write down the colour of the following species--
 - Metal-EDTA Complex
 - Metal-EBT Complex
 - Unionized EBT
 - Ionized EBT at pH 8-11
 - $\text{NH}_3\text{-NH}_4\text{Cl}$ Buffer solution

UNIT I

- Q2. (a) With the help of a neat diagram, explain how the Calorific value of a gaseous fuel can be determined by BOY's Calorimeter? (6.5)
- (b) A sample of coal was found to have the following percentage composition by weight C=70%, H=6.0%, O=16%, N=3.5% and Ash=4.5%. (6)

Calculate

- Minimum amount of oxygen and air required for complete combustion of 1kg of coal.
- Gross and Net Calorific values of given sample using Dulong's formula.

(6)

- Q3. (a) Differentiate between the following

- High and Low Temperature Carbonization.
- Thermal and Catalytical Cracking.
- Proximate and Ultimate Analysis of coal.

- (b) 2.5 gm of a coal sample was analyzed under ultimate analysis. The NH_3 gas thus evolved was absorbed in 50mL of 0.1N H_2SO_4 . After absorption, the excess acid required 9.5mL of NaOH for exact neutralization.

Another 2.5 gm of the same sample gave 1.5gm of BaSO_4 precipitate. Calculate the % of N and S in the given sample of coal.

(6.5)

[P.T.O.]

UNIT II

- Q4. a) Define Gibb's Phase Rule. Discuss The Water System with the help of a well labelled phase diagram. (6.5)
 b) Give well labelled reason why? (4)

i) Eutectic Mixture has a definite composition and a sharp melting point, yet it is not a compound.

ii) $F = C - P + 1$, Condensed Phase Rule is applicable to Two Component System.

c) Calculate no. of phases and no. of components in the following system- (2)

- i) $H_2O(s)$ $H_2(g) + H_2O(g)$
 ii) $I_2(s)$ $I_2(g)$

Q5. a) Explain the kinetics of Enzyme Catalyzed reactions and derive the Michaelis. Menten equation. (6)

b) i) Discuss the Negative Catalyst with an example. (6.5)

ii) State a condition under which a catalyst loses its influence over a reaction.

iii) Why promoters are added along catalyst?

UNIT III

Q6. (a) 100mL of a water sample consumed 25mL of centi molar EDTA for titration using EBT as an indicator. After boiling water sample consumed 5mL of the same EDTA solution for titration. (6.5)
 Calculate total, permanent and temporary hardness in ppm.

(b) Discuss the type and extent of Alkalinity for a water sample if-- (6)

- a) $P = \frac{1}{2} M$
 b) $P < \frac{1}{2} M$
 c) $P > \frac{1}{2} M$

Q7. (a) Calculate the amount of time (92.0%) pure and soda (98.0%) pure required to soften 10 litres of water per day for a year containing the following—

$Ca^{2+} = 80$ ppm, $Mg^{2+} = 36$ ppm, $HCO_3^- = 244$ ppm and added as a coagulant $FeSO_4 \cdot 7H_2O = 73.5$ ppm. (6.5)

(b) Describe the process of demineralization for water softening using ion-exchange resin. Also give necessary reactions involved. (6)

UNIT IV

Q8. (a) Explain the Theory and Mechanism of Chemical or Dry Corrosion in Detailed. (6.5)

(b) Explain the following factors influencing the rate of corrosion. (6)

- i) Temperature
 ii) Nature of the Metal
 iii) pH

Q9. (a) Describe various protective measures used against corrosion. (6.5)

(b) Define the following: (6)

- i) Passivity
 ii) Pilling-Bedworth Rule
 iii) Electroplating