



COLLEGE OF ENGINEERING, PUNE

(An Autonomous Institute of Government of Maharashtra.)
SHIVAJI NAGAR, PUNE - 411 005

END Semester Examination

(AS103) Engineering Chemistry Theory

Course: B.Tech

Branch: Applied Science

Semester: Sem I

Year: 2014-2015

Max.Marks:60

Duration:3Hours

Time:- 10-1 p.m

Date:25/11/2014

MIS No.

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Instructions:

1. Figures to the right indicate the full marks.
2. Mobile phones and programmable calculators are strictly prohibited.
3. Writing anything on question paper is not allowed.
4. Exchange/Sharing of anything like stationery, calculator is not allowed.
5. Assume suitable data if necessary.
6. Write your MIS Number on Question Paper

- Q.1 A. Discuss the steam reforming process for the production of hydrogen gas. 3
B. Explain Pourbaix (E-ph) diagram of Fe. 3.
C. Discuss how the 'Ion exchange method' is useful for the deionization of water with suitable chemical reactions and well labeled schematic diagram. 4
- OR**
- C. Explain how synthetic petrol is obtained from Fischer-Tropsch method with the help of well labeled diagram. 4
- Q.2A. Give reason: (Any 4) 4
1. Small anodic areas results in intense corrosion.
 2. Oxygen free water is used in boilers for steam generation.
 3. Net calorific value is less than gross calorific value of a fuel.
 4. Electrolysis of water is generally not preferred for Hydrogen production
 5. Carbonates, bicarbonates and hydroxide cannot be present together in water
 6. There is deviation observed from absorption law, when dichromate ions are diluted
- B. Differentiate between the following: (Any 3) 6
1. Cathodic and anodic coatings
 2. Octane number and Cetane number
 3. Carbonate conditioning and Phosphate conditioning
 4. Diamond and Graphite
- Q.3A. Explain why tetra ethyl lead (TEL) is used as an antiknocking agent along with ethylene dibromide in I.C. engine. 4

- B. The lubricating oil contained Vanadium. Discuss the principle, instrumentation, working of the appropriate method to find Vanadium concentration in the oil. 6
- OR**
- B. How do IR spectra originate? Describe working of an IR spectrometer. 6
- Q.4A. A sample of water on analysis has been found to contain the following in ppm : 3
 $\text{Ca}(\text{HCO}_3)_2 = 10.5$; $\text{Mg}(\text{HCO}_3)_2 = 12.5$; $\text{CaSO}_4 = 7.5$; $\text{CaCl}_2 = 8.2$; $\text{MgSO}_4 = 2.6$.
 Calculate temporary, permanent and total hardness present in sample in degree French.
 (Atomic weights of elements are Ca=40, Mg=24, S=32, Cl=35.5, H=1, O=16, C=12)
- B. 200ml of a sample required 20ml of N/50 HCl using methyl orange as indicator. Another 200ml of the same sample required 8ml of N/50 HCl using phenolphthalein as indicator. Express the alkalinity in terms of mg of CaCO_3 per litre. 3
- C. The molar extinction coefficient of phenanthroline complex of iron(II) is, $1200 \text{ dm}^3 \text{ mol}^{-1} \text{ cm}^{-1}$ and the minimum detectable absorbance is 0.01. Calculate the minimum concentration of the complex that can be detected in a Lambert-Beer Law cell of path length 1.00cm 4
- OR**
- C. Calculate the Pilling-Bedworth ratio for the following oxide obtained from Fe 4
 $\text{Fe} \rightarrow \text{FeO}$
 Given: oxide density= 5.70gm/cc; At.wt. of Fe= 55.8; At.wt.of O=16;
 metal density=7.87gm/cc
 Also, state whether the film is protective or non protective.
- Q.5A. Discuss fullerenes with respect to its properties and applications. 4
- B. What is proximate analysis? Describe the method to assess the quality of coal. 4
- OR**
- B. What is refining of crude oil? Discuss the fractional distillation of crude oil 4
- C. Discuss how nature of metal affects corrosion. 2
- Q.6A. Write Short notes on 'Potentiostatic anodic protection' used to protect chemical reactors from corrosion. 3
- OR**
- A. Discuss the mechanism of wet corrosion (with chemical reactions) 3
- B. Explain caustic embrittlement and how it can be prevented. 3
- C. Give one method to chemically store hydrogen. 2
- D. Explain how instrumental methods are more advantageous than classical methods to carry out the same chemical analysis. 2
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