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**[4756]-102**

**F.E. (First Semester) EXAMINATION, 2015**

**ENGINEERING CHEMISTRY**

**(2012 PATTERN)**

**Time : Two Hours**

**Maximum Marks : 50**

**N.B.** :— (i) Answer *All* questions.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

(iv) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(v) Assume suitable data, if necessary.

1. (a) What are 'zeolites' ? Explain zeolite process of softening of water. Give regeneration reactions, advantages and disadvantages of the process. [6]

(b) Explain titration curve of conductometric titration in case of strong acid and weak base. [3]

(c) Explain the following terms with suitable example : [3]

(i) Chromophore

(ii) Auxochrome.

P.T.O.

Or

2. (a) Explain the pH metric titration of mixture of  $\text{H}_3\text{PO}_4$  (phosphoric acid) and  $\text{HCl}$  (hydrochloric acid) against std.  $\text{NaOH}$ , giving chemical reactions, procedure, titration curve and calculations. [6]
- (b) Explain any *three* principles of Green Chemistry. [3]
- (c) 50 ml of water sample requires 18 ml of 0.05 MEDTA during titration. Whereas 50 ml of boiled water sample requires 12.5 ml of same EDTA in the titration. Calculate total, temporary and permanent hardness of water sample. [3]
3. (a) What is vulcanization of rubber ? Explain chemical reaction involved in vulcanization process. Compare natural rubber with vulcanized rubber [6]
- (b) Define : [3]
- (i) Cetane no.
- (ii) Power alcohol
- (iii) N.C.V.
- (c) Calculate carbon, hydrogen and sulphur percentage present in the coal sample from the following data : [3]
- (i) 0.15 gm coal sample on burning in combustion chamber in current of pure  $\text{O}_2$  was found to increase weight of  $\text{CaCl}_2$  U-tube by 0.08 gm. and  $\text{KOH}$  U-Tube by 0.49 gm.
- (ii) 0.65 gm coal was combusted in Bomb calorimeter. Solution from bomb on treatment with  $\text{BaCl}_2$  solution, forms 0.031 gm  $\text{BaSO}_4$  dry ppt.

*Or*

4. (a) What are fuel cells ? Explain working of phosphoric acid fuel cell (PAFC) with figure and cell reactions. State its advantages. [6]
- (b) Explain with suitable diagram bulk polymerization technique to bring about addition polymerization. [3]
- (c) Give structure, properties and applications of polyphenylenevinylene (PPV). [3]
5. (a) What are carbon nanotubes ? Give types with respect to their structure. Give applications of CNTs. [5]
- (b) What are alanates ? Explain how hydrogen gas is released from sodium alanates when used for hydrogen storage. [4]
- (c) Give structure, one method of preparation and applications of silane. [4]

*Or*

6. (a) Explain industrial production of hydrogen by steam reforming of methane and coke. [5]
- (b) Explain the isotopes of carbon with their applications. [4]
- (c) Explain structure of diamond based on bonding. Give its applications. [4]

7. (a) What is dry corrosion ? Explain mechanism of oxidation corrosion with suitable figure and reactions. [5]
- (b) Explain how nature of metal affects the rate of corrosion. [4]
- (c) What are electroless coatings ? Explain with suitable example. Give its application. [4]

*Or*

8. (a) Define corrosion. State the conditions under which wet corrosion occurs. Explain oxygen absorption mechanism of wet corrosion. [5]
- (b) Explain cementation and cladding methods of applying metallic coatings on base metal. [4]
- (c) Compare : Cathodic protection and Anodic protection. [4]