1E3103

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1E3103

B.Tech. I Sem. (Main) Examination, April/May - 2022

1FY2-03 Engineering Chemistry

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all ten questions From Part A, five Questions out of seven questions from Part B and three questions out of five questions from Part C .

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination (As mentioned in form No. 205).

PART - A

(Answers should be given up to 25 words only)

All questions are compulsory. **(10×2=20)**

1. What principle is applied to remove the hardness of water by lime-soda process? (2)
2. Why do we express hardness of water in terms of calcium carbonate equivalent? (2)
3. What is sweetening of petrol? (2)
4. Why is net calorific value less than gross calorific value? (2)
5. What is pilling - Bedworth rule? (2)
6. A steel screw in a brass marine hardware corrodes. Give reason. (2)
7. What should be the flash-point of a good lubricant? (2)
8. What will happen, if gypsum is not added during grinding of clinkers? (2)
9. In S_N^1 reaction, racemization occurs if the reaction Occurs at a stereogenic centre. However, 50:50 mixture of enantiomers are rarely obtained , why? (2)
10. Why do substitution reactions occur in benzene? (2)

PART - B

(Analytical/Problem solving questions)

Attempt any five questions: **(5×4=20)**

1. Calculate the temporary and total hardness of a sample of water containing $Mg(HCO_3)_2 = 73mg/L$; $Ca(HCO_3)_2 = 162mg/L$, $MgCl_2 = 95mg/L$, $CaSo_4 = 136mg/L$. **(4)**

2. Calculate the gross and net calorific value of coal sample having the following composition:

   C=80%, H=7%, O=3%, S=3.5%, N=2.1 and as h = 4.4% **(4)**

3. Iron does not rust if the zinc coating is broken in a galvanized iron pipe, but rusting occurs much faster if the tin coating over iron is broken. Explain. **(4)**

4. Under what situations greases are used? What are the main functions of soap in Greases? **(2+2=4)**

5. Write the chemistry of setting and hardening of cement. **(4)**

6. What is annealing of glass? Write significance of annealing of glass. **(2+2=4)**

7. Describe synthesis, properties and uses of Aspirin. **(4)**

PART - C

(Descriptive/Analytical/Problem solving/Design Questions))

Attempt any three questions. **(3×10=30)**

1. a) Describe the calgon and phosphate conditioning of water to overcome the boiler feed problem.

   b) Calculate the amount of lime and soda required for softening 100000 litres of water containing the following:

   $HCl = 7.3mg/L$, $Al_2(SO_4)_3 = 34.2\ mg/L$, $MgCl_2 = 9.5mg/L$, $Nacl = 29.25\,Mg/L$.

   Purity of lime is 90% and that of soda is 98%. 10% of chemicals are to be used in excess in order to complete the reaction quickly. **(5+5=10)**

2. a) Describe the manufacturing of gasoline by Fisher-Tropsch method in detail. Draw neat and labelled diagram of the process.

   b) A sample of coal was found to contain the following constituents; c = 81%, O=8%, S=1%, H = 5%, N=1%, ash=4%. Calculate the minimum weight and volume of air required for the complete combustion of 2 kg of coal.

(5+5=10)

3. a) Describe the mechanism of electrochemical corrosion by hydrogen evolution and oxygen absorption.

   b) Explain impressed current cathodic protection method of controlling corrosion. (7+3=10)

4. Write notes on:

   a) Extreme-pressure lubrication.

   b) Chemical reaction involved during manufacture of portland - cement by rotary kiln method.

   c) Borosilicate glass and glass wool. (3+4+3=10)

5. Explain mechanism of electrophilic and free radical addition in alkenes. (5+5=10)
