Silicon

Silicon Institute of Technology

Silicon Hills, Bhubaneswar

| An Autonomous Institute |

1st Semester B.Tech. End Term Examination 2019-2020

ENGINEERING CHEMISTRY(18BS1T05)

Duration: 03:00 Full Marks: 60

1 *Answer All*

a Mineral acid should be removed from the water before it is used for softening by the Zeolite process. Give reason. 1

b Corrosion always occurs at the anode. Give reason. 1

c Which apparatus is used to determine the kinematic viscosity of lubricating oil? 1

d Mention the unit of absorbance and transmittance. 1

e What is the relationship between HCV and LCV? 1

f Give an example of a reducing agent used in the synthesis of nanomaterials. 1

2 *Answer All*

a Differentiate between soft water and hard water. 2

b Differentiate between electrochemical series and Galvanic series. 2

c What is cutting fluid? What are the functions of cutting fluid? 2

d λ_{max} for aniline shifts from 230 nm in neutral medium to 203 nm in acidic medium. State the reason. 2

e Briefly discuss the various characteristics of an ideal fuel. 2

f What is the need for a capping agent in the synthesis of the nanoparticles? 2

3 *Answer any One*

a Give a comparative account on the 'Ion-exchange resin process' & 'Zeolite process' of the softening of water. A water sample contains the following constituents; $MgSO_4$ = 12 mg/lit, $CaSO_4$ = 13.6 mg/lit & Ca(HCO3)2 = 162 mg/lit. Calculate the total hardness of the water sample (as $CaCO_3$ equivalent) in ^{0}Cl unit. 7

b Calculate the amount of soda (90% pure) required for the treatment of 10^5 L of water containing $CaCl_2$ (111 ppm) & $CaSO_4$ (272 ppm). 7

4 *Answer any One*

a Write the mechanism of corrosion of Fe that takes place in a neutral medium. How can corrosion of the ship hull be controlled? 7

b What is differential aeration corrosion? Discuss its mechanism of waterline corrosion with a suitable example. 7

[P. T. O.]

5 ***Answer any One***

a Explain the following properties of lubricants & their significance; (i) Viscosity & Viscosity index, (ii) Flash & fire point, (iii) Acid value 7

b How are lubricants classified? Write the functions(4) of a lubricant. Write the names of additives used to improve the following properties of a lubricant; (i)Extreme pressure, (ii)Viscosity index 7

6 ***Answer any One***

a What is 'Electronic spectroscopy'? Write the applications of electronic spectroscopy. Define the following terms: i. Hypsochromic shift, ii. Bathochromic shift, iii. Hypochromic shift, iv. Hyperchromic shift 7

b Which types of molecules are IR active? Calculate the vibrational energy & force constant of HF if its frequency of oscillation is $4 \times 10^{14} sec^{-1}$. (Atomic mass of H = 1.0078u & F = 18.9984u) 7

7 ***Answer any One***

a A producer gas has the following average composition by volume %: CO = 30%, N_2 = 55%, H_2 = 8%, and CO_2 = 7%. Give a reason why the producer gas has low calorific value compared to water gas. Find (i) volume of air required for combustion of 100 m^3 of this gas, and (ii) volume of air required if 50 % excess air was used for combustion. 7

b How to select a good coal sample for a thermal power plant? Discuss the proximate analysis of coal and its significance. 7

8 ***Answer any One***

a Discuss the method of preparation, characterization, and some applications of zinc oxide nanoparticles. 7

b Write short notes on (a) Top-down method, (b) Bottom-up method, and (c) Green synthetic route to synthesize nanomaterials. 7

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