(Please write your Exam Roll No.)

Exam Roll No. .....

END TERM EXAMINATION

SECOND SEMESTER [B.TECH] JUNE 2024

Paper Code: BS-104 **Subject: Applied Chemistry**

Time: 3 Hours **Maximum Marks: 60**

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

Q1 Do **any six** parts: **(2x6=12)**

(a) All coking coals are caking coals but all caking coals are not coking coals.

(b) Hydrocarbons that are poor gasoline fuels are quite good diesel fuels. Explain

(c) A eutectic mixture has a definete composition and asharpmelting point, yet it is not a compound. Justify.

(d) Describe the method of preparation of the polymer, Nylon-6, 6.

(e) Why is phosphate conditioning better than the carbon aye conditioning?

(f) A water sample contains 248 mg $CaSO_4$ per liter. Calculate the hardness in terms of $CaCO_3$ equivalent.

(g) Why impure metals corrode faster than pure metal under identical conditions?

(h) A pure metal rod half immersed in water starts corroding at the bottom. Give reason.

UNIT-I

Q2 (a) A sample of coal was tested for its calorific value using Bomb's Calorimeter. Following data was obtained.
Weight of coal burnt = 0.920 gm.
Weight of water taken = 550 gm.
Water equivalent of bomb and calorimeter = 2200 gm.
Rise in temperature = 2.42 °C
Fuse wire correction = 10 Cal
Acid Correction = 50 Cal
Assuming coal to contain C = 93%, H = 6% and ash = 1%, Calculate gross and net calorific value of coal if the latent heat of condensation of steam is 580 Cal/gm. **(4)**

(b) What are the advantages of catalytic cracking over thermal cracking? **(4)**

(c) What do you understand by the term knocking in IC engine? Explain the relation between chemical structure and knocking in petrol engine. **(4)**

Q3 (a) A sample of coal was analyzed as follows. Exactly 2.5 g was weighed into a silica crucible. After heating for an hour at 110 °C, the residue weighed 2.415 g. The crucible was then covered with a vented lid and strongly heated for exactly 7 min at 950 ± 20 °C. The residue weighed 1.528 g. The crucible was then heated without the cover, until a constant weight was obtained. The last residue was found to weigh 0.245 gm. Calculate the percentage of moisture, volatile matter, ash and fixed carbon in the coal sample. **(4)**

(b) What are gaseous fuels? Give some examples. What are the merits and demerits of gaseous fuels over solid and liquid fuels? **(4)**

P.T.O.

(c) The composition by weight of a coal sample is: C = 80%; H = 6%; O = 8%, S = 1%; N = 2% and ash = 3%. Calculate minimum amount of air required for complete combustion of 1.0 kg of the coal. **(4)**

UNIT-II

Q4 (a) What is a phase diagram? With the help of a well labelled diagram, explain the phase diagram of the water system. **(6)**

(b) Describe the method of preparation, properties and application of the following. **(Any two)** **(6)**

i. Teflon (PTFE),
ii. Polyacrylonitrile (PAN),
iii. Bakelite,
iv. Glyptal.

Q5 (a) Explain the lead–silver system. How can this system be applied to the process of desilverisation of argent iferous lead? **(6)**

(b) What are addition and condensation polymerization processes? Explain with examples. **(6)**

UNIT-III

Q6 (a) 15g of $CaCO_3$ was dissolved in HCl and the solution was diluted to 1000 mL. 50 ml of this solution required 48 ml of EDTA solution, while 50 ml of sample water required 15 ml of the EDTA solution. On the other hand, 50 ml of boiled water sample, when titrated against EDTA, consumed 10 ml of the solution. Calculate each type of hardness. **(5)**

(b) A sample of water on analysis has been found to contain the following impurities
Mg $(HCO_3)_2$ = 14.6 mg/L; Mg $(NO_3)_2$ = 44.4 mg/L; $MgSO_4$ = 36 mg/L;$MgCl_2$ = 19.0 mg/L and $CaCO_3$ = 30 mg/L. Calculate the temporary and permanent hardness in ppm. **(5)**

(c) What are the disadvantages of Zeolite process? **(2)**

Q7 (a) 200 ml of a sample required 20 ml of N/50 HCl using methyl orange as indicatior. Another 200 ml of the sample required 8 ml of N/50 HCl using phenolphthalein as an indicator. Express the alkalinity in terms of $CaCO_3$ equivalents. **(5)**

(b) Write the principle of lime soda process and give the chemical reactions involved during the softening of water by the lime-soda process. **(5)**

(c) Differentiate between priming and foaming. **(2)**

UNIT-IV

Q8 (a) Explain the following factors influencing the rate of corrosion. **(6)**

i. Temperature
ii. Nature of metal
iii. pH

(b) Explain surface characterization technique BET and its applications **(6)**

Q9 (a) Discuss the theory and mechanism of dry corrosion in detail. **(6)**

(b) Write a short note on the following: **(6)**

i. Use of alternative feed stocks
ii. Use of Innocuous reagents

****