

5

B.Sc. Eng.CEE/2nd Sem.

Date: July 11, 2025

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF NATURAL SCIENCES

Semester Final Examination
Course Number: CHEM 4253
Course Title: Chemistry II

Summer Semester: 2023-2024
Full Marks: 120
Time: 2 Hours

Please answer according to the order of the questions. Answer all the 4 (FOUR) questions. The symbols have their usual meanings. Marks of each question and the corresponding CO and PO are written in the brackets.

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1. a) Define corrosion and discuss the economic aspects of corrosion referring to the direct loss and indirect loss due to corrosion. (10)
(CO1)
(PO1)
- b) Discuss the effects of soil and minerals on the quality of under-ground water and describe the methods by which volatile and suspended matters are usually removed from water. (10)
(CO2)
(PO1)
- c) Write the names of different methods of synthesizing polymer. Describe the mechanism of different classes of addition polymerization. (10)
(CO1)
(PO1)
2. a) Water is a unique substance. Illustrate this statement from both physical and chemical properties point of views using appropriate chemical equations where applicable. (10)
(CO2)
(PO1)
- b) Point out the detrimental effects of friction. Explain the necessity of using lubricants in different parts of the machineries. Describe the following properties of liquid lubricants: (10)
(CO2)
(PO1)
(i) Degree of API, (ii) Viscosity index, (iii) Cloud point, and (iv) Pour point
- c) With the help of diagrams discuss the effects of different factors on the rate of under-water corrosion. (10)
(CO1)
(PO1)
3. a) Define polymer and distinguish between the following: (10)
(CO1)
(PO1)
(i) high polymer and low polymer
(ii) thermo-plastic polymer and thermo-setting polymer
(iii) isotactic, syndiotactic and atactic polymer.
- b) Explain the causes of formation of sludge and scale in the boiler due to use of untreated water. Describe the methods of prevention of corrosion with suitable examples. (10)
(CO2)
(PO1)
- c) Define oxidation and reduction potential of an electrode. Using Nernst equation, explain that the oxidation and the reduction potential of an electrode in an electrolyte solution are numerically equal but their signs are opposite to each other. (10)
(CO1)
(PO1)

4. a) Using chemical formula of zeolite, explain the principle of softening hard water by ion exchange method. (10)
(CO2)
(PO1)
- The hardness of 15000 dm^3 water sample is completely removed by passing it through a zeolite bed. The zeolite bed requires 120 dm^3 of brine for its complete regeneration. Calculate the concentration of NaCl in brine. The sample water has a hardness of 220 ppm as CaCO_3 .
- b) Discuss the spontaneity of corrosion reaction with suitable examples. (10)
(CO1)
(PO1)
- An electro-chemical cell is made up of nickel / nickel salt solution and copper / copper salt solution. Show by calculation which of the two metals (copper or nickel) will be corroded.
[The standard reduction potential of copper and nickel electrodes are: + 0.337 and - 0.250 volt respectively].
- c) Classify lubricants into different classes. Describe the different steps involved in refining lubricating oil. Point out the major advantages and disadvantages of using mineral oil as lubricants. (10)
(CO2)
(PO1)