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National Institute of Technology, Hamirpur (HP)

Name of the Examination: B.Tech. End-Semester Theory Examination, June, 2023

: 1st Year B.Tech Title of the Course : Engineering Chemistry Time: 3 Hours

: 2nd Semester : CY-101 **Course Code** Maximum Marks: 50

Note: All questions are compulsory.

- 1. What is lubrication ? Differentiate between thick and thin layer lubrication mechanisms.
- 2. What are additives ? Why antioxidants and detergents are added in the lubricating oils? Explain 3 their functioning.
- 3. Explain why flash point should be higher and cloud point should be lower than the operating 3 temperatures for a good lubricant? 3
- 4. What is stress corrosion? Explain caustic embrittlement in boilers.
- 5. Explain different types of corrosion inhibitors with example.
- 6. Discuss the formation of classical smog and photochemical smog.

7. Discuss the electrochemical corrosion with the help of the chemical reactions/mechanisms.

- 8. Define 2D nanomaterials. Write two important properties and applications of graphene.
- 9. Define the term nanotechnology. How the surface area to volume ratio is related to the size of a 3 nanostructure?
- 10. Calculate the amount of lime (92% pure) and soda (98% pure) required for the treatment of the hardness of 30,000 litres of water whose analysis is as follows: $Ca(HCO_3)_2 = 40.5 \text{ mg/L};$ $Mg(HCO_3)_2 = 36.5 mg/L; MgSO_4 = 30 mg/L; CaSO_4 = 34 mg/L, CaCl_2 = 27.75 mg/L; NaCl = 10$ mg/L.
- 11. (a) The value of force constant is same for ${}^{1}H^{35}Cl$ and ${}^{2}D^{35}Cl$. If the fundamental frequency of ${}^{1}\text{H}^{35}\text{Cl}$ is 2890 cm⁻¹, calculate the fundamental frequency of ${}^{2}\text{D}^{35}\text{Cl}$. (b) How will you distinguish between the following pairs on the basis of Infrared Spectroscopy? 3



12. (a) Discuss the working principle and limitations of TGA. How is it different from DTA?	2
(b) Write short notes on-	
(i) Softening of water (ii) Greenhouse gases (iii) Lambert Beers law	3
13 What is AFM ? Discuss its detailed working principle. How it is different from SEM ?	5
14 What is BOD ? How is it different from COD ? 50 ml of a water sample contains 840 p	pm of

dissolved oxygen. Five days later, the dissolved oxygen value becomes 230 ppm after the sample 5 has been diluted to 80 ml. Calculate the BOD of the water sample.