

**Indian Maritime University**  
**(A Central University, Govt of India)**  
**End Semester Examinations – June 2023**  
**Programme Name: B Tech (ME)**  
**Semester:   I**  
**Subject Code: UG11T4104**  
**Subject Name: Industrial Chemistry**

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Date: 16.06.2023

Max Marks: 70

Duration: 03 Hrs

Pass Marks: 35

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General Instructions

- (i) All Sections (A, B & C) are to be attempted.
- (ii) Options, if any, are specified in respective section.

Section A

Ten MCQs/Fill in the Blanks of 01 Mark each – Choose the correct answer as applicable.

Q1. Which among the following is the heaviest

- (a) One mole of Oxygen
- (b) One molecule of sulphur trioxide
- (c) Ten mole of hydrogen
- (d) 44 g of carbon dioxide

Q2. Which of the following is a Colligative Property?

- (a) Relative lowering of fluid pressure
- (b) Decrease in Boiling Point
- (c) Decrease in Freezing Point
- (d) Change in Volume after Mixing

Q3. Waterline corrosion in steel tank is an example of

- (a) Stress corrosion
- (b) Differential aeration corrosion
- (c) Pitting corrosion
- (d) Differential metal corrosion

Q4. Alkalinity of water cannot be due to the presence of:

- (a)  $\text{OH}^-$  only
- (b)  $\text{CO}_3^{2-}$  and  $\text{HCO}_3^-$
- (c)  $\text{OH}^-$  and  $\text{CO}_3^{2-}$
- (d)  $\text{OH}^-$  and  $\text{HCO}_3^-$

Q5. Which of the following is not a hazardous chemical present in water?

- (a) Cadmium
- (b) Calcium
- (c) Chromium
- (d) Arsenic

Q6. Which of the following is not a method for disinfection of water?

- (a) Chlorination
- (b) Ozonisation
- (c) Electrodialysis
- (d) UV treatment

Q7. Define rusting of iron:

- (a) Corrosion occur at cathode
- (b) Corrosion product is deposited at anode
- (c) Corrosion occur at anode
- (d) Corrosion product is deposited at cathode

Q8. Percentage of Nitrogen can be determined by the process

- (a) Orsat's apparatus
- (b) Eschka
- (c) Fractional Distillation

(d) Kjeldahl Method

Q9. Evaporation of water is:

- (a) An exothermic process
- (b) An endothermic process
- (c) A process where no heat change occurs
- (d) A process accompanied by chemical reaction

Q10. That some organic compounds which defy oxidation at lower chlorine concentration get oxidized when the ----- chlorine concentration is reached.

- (a) Cloud point
- (b) Break point
- (c) Flash point
- (d) Fire point

### **Section B**

Five Questions of 02 Marks each

Q11. Define precipitation reaction with an example?

Q12. What is meant by desalination and list the methods employed for desalination?

Q13. What is caustic embrittlement and how can it be avoided?

Q14. Define gross calorific value and net calorific value.

Q15. Explain the phenomena of a galvanic cell in the case of differential aeration.

### Section C

Seven Questions of 10 Marks each of which any 05 questions to be answered.

Q16.(a) Write a short note on Hardness, carbonate and Phosphate conditioning. (6 marks) (b). Define the colligative properties of solutions and write the various colligative properties of solutions. (4 marks)

Q17.(a). 45 g of ethylene glycol is mixed with 600g of water. Calculate the freezing point depression and freezing point of the solution. ( $K_f = 1.86 \text{ kg mol}^{-1}$ ) ( 7 marks) (b). Osmotic Pressure of a KCl solution at 300 K is 50 atm. What is the molal concentration of a KCl solution? ( 3 Marks)

Q18(a) Explain phenomenon of Reverse Osmosis and its applications. (4 marks) (b) Explain elevation of boiling point and depression of freezing point and how van't hoff factor affects the boiling point of a strong electrolyte solution. (6 marks)

Q19 (a).What is Calorific value of a fuel. How can we calculate it? (4 marks) (b). Explain the process of softening water using ion exchange method. (6 Marks)

Q20 (a) What are the classification of fuel. Give brief description of each.(4 marks) (b) Draw and explain the cathodic protection techniques in the case of impressed current and sacrificial anode with help of galvanic cell (6 marks)

Q21 (a) Define corrosion and factors influencing it. (4 marks) (b). Define what is natural gas, LPG, Producer gas and water gas composed of. (6 marks)

Q22 (a). What is flammability, upper flammable limit, and lower flammable limit. (3 marks) (b). Explain various water testing such as chloride and alkalinity. (7 Marks)