

Indian Maritime University
(A Central University, Govt of India)
End Semester Examinations – December 2023
Programme Name: B. Tech (Marine Engineering)
Semester: I
Subject Code: UG11T4104
Subject Name: INDUSTRIAL CHEMISTRY

Date: 22.12.2023

Max Marks: 70

Duration: 03 Hrs

Pass Marks: 35

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.

1. When a non-volatile solute is added to a solvent what is the difference in vapour pressure expressed as a fraction of original vapour pressure equal to
 - (a) Mole fraction of solute in vapour phase
 - (b) Mole fraction of solvent in vapour phase
 - (c) Mole fraction of solute in liquid phase
 - (d) Mole fraction of solvent in liquid phase
2. During treatment of water sedimentation is done
 - (a) Before filtration
 - (b) After filtration
 - (c) along with Chlorination
 - (d) Simultaneously with filtration
3. Corrosion involves _____ reactions.
 - (a) Oxidation
 - (b) Reduction

- (c) Both Oxidation and Reduction
 - (d) Displacement
4. Which portable water treatment method is most effective at removing microbiological contaminants like bacteria and viruses from untreated water sources?
- (a) Activated carbon filtration
 - (b) UV (Ultraviolet) disinfection
 - (c) Chemical flocculation
 - (d) Reverse osmosis filtration
5. Which of the following mechanisms is NOT a typical way that paints provide protection to surfaces?
- (a) Barrier protection
 - (b) Cathodic protection
 - (c) Inhibitive protection
 - (d) Sacrificial protection
6. Indicator used in the calcium hardness is
- (a) EBT
 - (b) SBT
 - (c) Murexide
 - (d) Methyl Orange
7. Which type of dry corrosion results in the formation of a fine, powdery oxide on the metal surface?
- (a) Crevice corrosion
 - (b) Intergranular corrosion
 - (c) Fretting corrosion
 - (d) Erosion corrosion
8. Which of the following gases is the primary component of natural gas?
- (a) Oxygen (O_2)
 - (b) Methane (CH_4)
 - (c) Carbon dioxide (CO_2)

- (d) Hydrogen (H_2)
9. Which of the following is Raoult's law applicable to, in order to determine molar masses correctly?
- (a) Ionic solute in liquid
 - (b) Non - ionic solute in dilute solution
 - (c) Non - ionic solute in concentrated solution
 - (d) Ionic solid in insoluble form in solvent
10. Select the incorrect statement from the following option
- (a) Lubricant reduces the frictional heat
 - (b) Lubricant acts as a seal and keeps out dirt
 - (c) Lubricant transmits fluid power
 - (d) Lubricant enhances corrosion

Section B

Five Questions of 02 Marks each

11. Write a short note on reverse osmosis and list an application
12. Explain the principle of cathodic protection
13. Explain relationship between molecular weight and depression at the freezing point
14. Define lower heating value and higher heating value of fuel
15. Explain about Colligative Properties

Section C

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

16. a) Formulate the corrosion rate expression and rate measurements with graph. (5 Marks)
- b) Explain electrochemical corrosion and its mechanism with suitable sketch. (5 Marks)
17. a) Describe the mechanical and chemical method of removal of DO , CO_2 and acids from the boiler water. (5 Marks)

- b) Appraise causes and effect of priming and foaming in the boiler and evaluate that proper boiler water chemistry control is essential to minimize it. (5 Marks)
18. a) Devise the ultimate analysis of hydrocarbon fuel for carbon and hydrogen (5 Marks)
- b) Define lubrication and outline mechanism of lubrication (5 Marks)
19. a) Define Henry's law. What are the factors effecting the solubility of solid in liquid. [5 Marks]
- b) What is abnormal colligative properties and how is it related to Vant Hoff's factor? [5 Marks]
20. a) Explain the mechanism of Dry and Wet corrosion [5 Marks]
- b) Write a short notes on (i) Pitting corrosion (ii) Crevice corrosion [5 Marks]
21. a) Write a short note on desalination and discuss Electro dialysis method in detail [5 Marks]
- b) Explain the ion exchange process for the purification of water with a neat diagram [5 Marks]
22. a) Discuss the various methods of corrosion control. [5 Marks]
- b) Write briefly on corrosion inhibitors and explain its functions. [5 Marks]