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Question Paper Code : 37010

B.E./B.Tech. DEGREE EXAMINATION, JANUARY 2014.

First Semester

Marine Engineering

CY 6152 — CHEMISTRY FOR MARINE ENGINEERING

(Regulation 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Mention the different types of impurities present in ground water and their sources?
2. What are the effects of dissolved gases present in boiler feed water on the boiler metal?
3. How does the purity of a metal and the relative volume of the corrosion product affect its rate of corrosion?
4. List out the various design rules to minimize corrosion troubles.
5. 0.675 g of CaCO_3 was dissolved in dil. HCl and diluted to 750ml. 50ml of this solution required 50ml of EDTA solution for titration. 40ml of a sample of hard water required 10.4ml of the same EDTA solution. Calculate the hardness of the water sample.
6. Compare the desalination of water by reverse osmosis and electro dialysis processes
7. Give the advantages and Limitations of zeolite process of softening of water.
8. Write the principle of estimation of dissolved oxygen present in water.
9. Mention the role of capping agents in the synthesis of gold nano particles.
10. How do solar cells work? What are their advantages?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Write the various reactions by which ground water acquires dissolved solids. (8)
- (ii) What are the problems associated with the formation of scales in boilers? (8)

Or

- (b) (i) What are the sources of fresh water? What percentage of water present in the earth which is available for human utilization? (6)
- (ii) Write a note on various troubles that arise due to the use of hard waters in boiler. (10)
12. (a) (i) Write the auto catalytic mechanism of pitting corrosion. Write down the various factors that affect pitting corrosion in steels. (8)
- (ii) Compare the mechanisms of stress corrosion cracking and corrosion fatigue. Suggest means to control these forms of corrosion. (8)

Or

- (b) (i) Explain the various forms of corrosion occurring in boilers due to the presence of dissolved oxygen in boiler feed water? How is dissolved oxygen removed from boiler feed water? (10)
- (ii) Explain the corrosion protection by sacrificial anode and impressed current methods. (6)
13. (a) (i) Calculate the quantity of lime and soda ash required to soften 10,000 litres of water containing $\text{Ca}(\text{HCO}_3)_2$, $\text{Mg}(\text{HCO}_3)_2$, MgCl_2 , CaSO_4 , free acids and NaCl respectively 162ppm, 146ppm, 95ppm, 136ppm, 1.5ppm and 29ppm. (8)
- (ii) How will you estimate the alkalinity of a water sample and what will you infer from the results? (8)

Or

- (b) (i) Write the principle of electrodialysis and explain how does it help in the desalination of brackish water? (8)
- (ii) How is chloride content of a water sample estimated? (8)

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14. (a) (i) Explain the EDTA method of determination of hardness of water. Calculate the total, permanent and calcium hardness in ppm of CaCO_3 equivalence of a water sample containing $\text{Mg}(\text{HCO}_3)_2 = 68\text{mg/L}$, $\text{Ca}(\text{HCO}_3)_2 = 148\text{mg/L}$, $\text{MgCl}_2 = 198\text{mg/L}$, $\text{CaSO}_4 = 142\text{mg/L}$. (Given that the molecular weight of $\text{Mg}(\text{HCO}_3)_2$, $\text{Ca}(\text{HCO}_3)_2$, MgCl_2 and CaSO_4 are 146, 162, 95 and 136 respectively). (8)
- (ii) Explain the demineralization of water by ion-exchange process. How are exhausted cation and anion exchange resins regenerated? (8)

Or

- (b) (i) Write the principle of determination of total dissolved solids by conductance measurements. (4)
- (ii) In the Winkler's method of determination of DO. 200 ml of a water sample consumed 8 ml of 0.025N sodium thiosulphate solution. Calculate the amount of dissolved oxygen present in ppm. (4)
- (iii) How are zeolites useful in the removal of hardness causing ions from water? (8)
15. (a) (i) Explain the construction of Lithium ion battery with the reactions occurring during charging and discharging. What are the advantages of lithium ion battery over other batteries? (8)
- (ii) Write any two methods of synthesis of carbon nanotubes. (8)

Or

- (b) (i) Explain the working of direct methanol fuel cells. (6)
- (ii) Differentiate between primary and secondary cells. Explain the working of lead acid battery giving the relevant electrode reactions involved during charging and discharging. How does the wrong polarity connections and type of coating affect the performance of battery? (10)

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Question Paper Code : 57266

B.E/B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

First Semester

Marine Engineering

CY 6152 – CHEMISTRY FOR MARINE ENGINEERING

(Regulations 2013)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. Give the approximate composition of sea water.
2. What is the mechanism by which $\text{Ca}(\text{HCO}_3)_2$ enters ground waters ?
3. What is meant by dealloying ? Give examples. What are its consequences ?
4. When steel and brass are coupled in a corrosive medium, what are the points to be considered to minimize galvanic effect ?
5. 16.2 mg of $\text{Ca}(\text{HCO}_3)_2$ and 12.0 mg of MgSO_4 are present in a litre of water. Calculate the quantity of lime and soda required for their removal.
6. Compare reverse osmosis and electrodialysis processes of desalination of water.
7. Define hardness of water. How is hardness of water expressed ?
8. List out the various tests carried out in boiler feed water and their purposes.
9. What are the various types of carbon nanomaterials ?
10. Compare batteries and fuel cells.

PART – B (5 × 16 = 80 Marks)

11. (a) Discuss the physical, chemical and biological impurities of water and the characteristics imparted by them. (16)

OR

- (b) How are scales formed in boilers ? Discuss the mechanism of CaSO_4 scale formation. List out the various ways by which scale formation can be prevented and mention their importance. (16)

12. (a) (i) Explain the electro chemical mechanism of corrosion. How do the cathodic reactions change with pH during corrosion of iron in water ? (10)

- (ii) Write the mechanism of pitting corrosion. (6)

OR

- (b) (i) Write the causes, mechanism and prevention of stress corrosion cracking. (8)

- (ii) How is deaeration of water carried out ? Explain in detail. (8)

13. (a) (i) How are the various alkalinities of a water sample estimated ? How do you interpret the results ? (8)

- (ii) Describe any one method of desalination of water. (8)

OR

- (b) Describe the principle and the methods of lime – soda treatment of boiler feed water. How are ion exchange methods superior to this method ? (16)

14. (a) Explain the various ways by which dissolved oxygen and total dissolved solids are estimated in boiler feed water. (16)

OR

- (b) (i) Describe how would you quantify the amount of hardness and chlorides in boiler feed water. (10)

- (ii) Give the specification for water to be used in tubular boilers. (6)

15. (a) (i) How are carbon nano tubes produced ? Mention their applications. (8)

- (ii) What are the ways in which gold nano particles are prepared and stabilized ? What are their applications ? (8)

OR

- (b) (i) Give the construction and working of lead-acid batteries. (10)

- (ii) Write the principle of working of a direct methanol fuel cell. (6)

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Question Paper Code : 71697

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

First Semester

Marine Engineering

CY 6152 – CHEMISTRY FOR MARINE ENGINEERING

(Regulations 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the sources of organic and inorganic impurities in fresh waters?
2. List the required characteristics of boiler feedwater.
3. What are the steps to be followed during the blow down operation in marine boilers?
4. How do purity of metals and relative volume of corrosion product affect the rate of corrosion?
5. List out the various design rules to minimize corrosion troubles.
6. Write the principle of estimation of salinity using salinometer.
7. What are the causes of priming, foaming and carryover in boilers?
8. Write the principle of estimation of dissolved oxygen present in a water sample.
9. Mention the role of capping agents in the synthesis of gold nanoparticles.
10. What is the role of carbon nanotubes in fuel cells?

PART B — (5 × 16 = 80 marks)

11. (a) Give an analysis of the dissolved solids in an average sample of: (i) Sea water (ii) Fresh water. Which of these solids can form scale and which can cause corrosion? Explain.

Or

- (b) How are scales formed in boilers? Discuss the mechanism of CaSO_4 scale formation. List out the various ways by which scale formation can be prevented and mention their importance.

12. (a) What are the causes of corrosion in boilers? What precautions would you take to prevent corrosion (i) when boiler is steaming? (ii) when boiler is idle? How would you test the boiler water for acidity and alkalinity?

Or

- (b) Explain the various forms of corrosion occurring in boilers due to the presence of dissolved oxygen in boiler feed water. How is dissolved oxygen removed from boiler feed water?

13. (a) Explain the chemical methods adopted to estimate the amount of chloride, sulphite and phosphate content in a given water sample.

Or

- (b) (i) Describe the Principle involved and the methods of lime-soda treatment of boiler feed water. (10)
- (ii) 0.5g of CaCO_3 was dissolved in HCl and the solution made upto 500 ml with distilled water. 50ml of the solution required 48ml of EDTA solution for titrations. 50ml of hard water sample required 15ml of EDTA and after boiling and filtering required 10ml of EDTA solution Calculate the hardness. (6)

14. (a) Explain the working principle involved in the zeolite and ion-exchange resin methods of water softening. How are the exhausted columns regenerated in these processes? Give a comparative account of these methods.

Or

- (b) What is the concentration of dissolved oxygen (DO) in water at normal temperature and pressure? What is the effect of pressure and temperature on the DO concentration in water? Mention the physicochemical principles. In the Winkler's method of determination of DO, 200 ml of a water sample consumed 8 ml of 0.025N sodium thiosulphate solution. Calculate the amount of dissolved oxygen in ppm.

15. (a) (i) Explain the working principle advantages, limitations and precautions to be taken care during the usage of Lead acid battery. (10)
- (ii) Write any two methods of synthesis of carbon nanotubes. (6)

Or

- (b) (i) Explain the working of direct methanol fuel cells with appropriate equations. (8)
- (ii) Discuss the working principle of a solar cells and mention their applications. (8)

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Question Paper Code : 77105

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

First Semester

Marine Engineering

CY 6152 — CHEMISTRY FOR MARINE ENGINEERING

(Regulation 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List out the various impurities present in ground water.
2. Enumerate the ways in which water can be freed from its contaminants.
3. How is chemical deaeration of boiler feed water carried out?
4. How does hydroxyl ion influence corrosion of boiler metal?
5. What is the purpose of alkali treatment of boiler feed water?
6. Compare reverse osmosis and electro dialysis processes.
7. A water sample contains 14 mg of $\text{Ca}(\text{HCO}_3)_2$, per litre and 12 mg of MgSO_4 per litre. Calculate the total and temporary hardness in terms of CaCO_3 equivalent.
8. What are coagulants? How are they useful in water treatment?
9. Give the advantages of Ni – Cd batteries over lead acid batteries.
10. How do fuel cells differ from ordinary batteries?

PART B — (5 × 16 = 80 marks)

11. (a) (i) What are the sources of fresh water? What percentage of natural water is fresh? Briefly explain the purpose of water treatment in boilers. (6)
- (ii) What are scales? Explain the mechanism of formation of CaSO_4 scale in boilers. (10)

Or

- (b) (i) What are the water parameters to be checked before water enters a boiler? (6)
- (ii) Explain the various problems caused by boiler scales. How can scale formation be prevented? (10)
12. (a) (i) Briefly explain the mechanism of stress corrosion, cracking and corrosion fatigue. (6)
- (ii) With neat sketches explain the cathodic corrosion protection methods. (10)

Or

- (b) (i) Explain the mechanism of pitting corrosion? (8)
- (ii) Explain the physiochemical principles involved in mechanical deaeration of boiler feed water. (8)
13. (a) (i) With a neat diagram explain the reverse osmosis process. (8)
- (ii) What are the causes of priming and foaming and how do you control them? (8)

Or

- (b) (i) Define alkalinity of water. Explain the procedure employed for determining alkalinity in water. (10)
- (ii) Write the principle of lime – soda process? Why should we use coagulants also during lime soda treatment? (6)
14. (a) (i) How is hardness of water determined by complexometric titration method? (10)
- (ii) 20 ml of a water sample consumed 12 ml of EDTA solution containing 1.855 g per liter. Calculate the hardness of the water sample. (Assume that EDTA is completely soluble in water). (6)

Or

- (b) (i) What are zeolites? Write their types. How are they useful in the process of softening of hard water? Write the advantages and disadvantages of permutit process. (10)
- (ii) How is dissolved oxygen in water estimated? (6)

15. (a) Give the properties and applications of carbon nanotubes and gold nano particles. (16)

Or

- (b) (i) What are secondary batteries? Describe the fabrication and working of any one secondary battery giving relevant chemical reactions. (10)
- (ii) Write the cathodic and anodic half cell reactions of hydrogen and direct methanol fuel cells. How do they differ from each other? (6)

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Question Paper Code : 80309

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

First Semester

Marine Engineering

CY 6152 — CHEMISTRY FOR MARINE ENGINEERING

(Regulations 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. How ground water acquires calcium hardness. Explain.
2. How does solubility of CaSO_4 vary with temperature?
3. Mention any four metals which form passive oxide films.
4. When iron and bronze are galvanically coupled in sea water, which one would corrode?
5. Compare the features of reverse osmosis process with those of electrodialysis.
6. Define priming and foaming in boilers.
7. Write the units by which hardness of water is expressed.
8. What is meant by coagulation? Mention two polyelectrolytes used for coagulation.
9. Mention the different forms of carbon nano structures.
10. What are dye sensitized solar cells?

PART B — (5 × 16 = 80 marks)

11. (a) Discuss the mechanisms of scale and sludge formation in boilers. Mention the means to prevent these problems.

Or

- (b) (i) Tabulate the major impurities in natural waters, their compositions and the means to remove them. (8)
(ii) What is the mechanism by which CaSO_4 scale is formed in boilers? (8)
12. (a) What are the problems caused by the presence of dissolved oxygen in boiler feed water? Write the mechanical and chemical method of removing DO.

Or

- (b) (i) Discuss the mechanism of electrochemical corrosion. (8)
(ii) How will you control corrosion by cathodic protection? (8)
13. (a) Write the principle and methods of treatments in lime soda process of water suffering.

Or

- (b) (i) How are the different alkalities of water determined? (8)
(ii) Write a method of estimation of chlorides in water. (8)
14. (a) (i) How are the different hardness parameters of water estimated using complexometric titrations? (10)
(ii) Write the principle of working of conductivity based TDS meter. (6)

Or

- (b) (i) How will you estimate calcium and magnesium hardness of water separately? (8)
(ii) Write the principle of deionization of water using ion exchange resins. (8)
15. (a) (i) Explain the unique properties of nano materials. (8)
(ii) Explain the principle of working of hydrogen oxygen fuel cells. (8)

Or

- (b) (i) How are gold nano particles synthesized? (8)
(ii) Write the construction and working of Ni — Cd batteries. (8)