**ENGINEERING CHEMISTRY-I (BE ¼) 2018-19**

**QUESTION BANK**

**UNIT-II-WATER CHEMISTRY AND CORROSION**

**WATER CHEMISTRY**

1.Define hardness of water? Why do we express hardness in terms of CaCO3 equivalents.

2. Name the salts responsible for the temporary and permanent hardness of water .

3. What is EDTA? Write its structure and uses.

4. Explain the principle behind the color change from wine red to blue of the indicator in the EDTA titration of hardness estimation of water.

5. Give the principle of determination of hardness of water by EDTA method.

6. Give the chemical reactions involved in determination of hardness of water by EDTA titration.

7. Distinguish between temporary and permanent hardness?

8. What are the units of hardness of water? Give the relationship between various units.

9. What is the method to remove temporary hardness? Write the chemical reaction involved.

10. What are the disadvantages of hard water when used for domestic purposes and industrial purposes?

11. Specifications of domestic and industrial water are different. Explain.

12. Distinguish between i) softening and demineralization ii) desalination and deionization of water.

13.what are the chief sources of water?

14. Which is the purest form of water? why?

**PART-B**

15. Describe ion exchange process of softening of water. What are its advantages over other methods?

16. Give the chemical reactions involved during i)softening of water by ion exchange resins and

ii)regeneration of exhausted ion exchange resin.

17. What is reverse osmosis process of desalination of brackish water? What are its advantages?

18. What is meant by alkalinity in water? What are the different types?

19. How the carbonate and bicarbonate alkalinity is determined experimentally in a water sample?

20. What are the specifications of potable water?

21. What is disinfection of water? Mention the methods of disinfection of water by

Chlorination

22. What is ‘breakpoint chlorination’? what are its advantages?

23. Explain the determination of hardness of water by EDTA method.

**Numerical problems**

1. A 100 ml sample of water contains 12 mg of MgSO4 (Mol. Wt. = 120) and 22.2 mg of CaCl2 (Mol.Wt. = 111). Calculate the hardness in ppm units.(Ans=30ppm)
2. A sample of water contains 21.9 mg of Magnesium bicarbonate, 19.0 mg of MgCl2 33mg CaCl2 and 18 mg of MgS04 per liter. Calculate the temporary and permanent hardness of this sample (At. Wt Mg = 24, Ca = 40, S = 32, Cl = 35.5) (Ans=150ppm and 65ppm)
3. A sample of water contains the following impurities :Mg(HCO3)2=29.2 mg/l, Ca(HCO3)2 =32.4,CaCl2=22.2 mg/l, MgSO4=120 mg/l and NaCl =40 mg/L. Calculate temporary hardness and permanent hardness in ppm. (Ans=40ppm and 120ppm)
4. 60 ml of standard hardness containing 1 mg of pure CaCO3 per ml consumed 22 ml of EDTA. 40 ml of water sample consumed 20 ml of EDTA solution using EBT indicator. 40 ml of water sample after boiling, filtering consumed 15 ml of EDTA. Calculate the temporary and permanent hardness of water sample. (Ans=338ppm and 1022ppm)
5. 100 ml of a sample of hard water required 15 ml of 0.01 M EDTA for titration using EBT indicator. 100 ml of sample was boiled and filtered. The filtrate is made up to 100 ml with distilled water. This made up solution required 8 ml of 0.01 M EDTA solution for titration. Calculate the total, permanent and temporary hardness of the sample of hard water in terms of ppm units. (Ans=150ppm,80ppm and 70ppm)
6. 50 ml of a sample of water consumed 20 ml of 0.01 M EDTA. The same water after boiling consumed 12 ml of same EDTA. Calculate the total, temporary and permanent hardness of water.

( Ans= 400ppm,160ppm and 240ppm)

1. A 100 ml of sample hard water neutralizes exactly 12 ml of 0.12N HCl using

Methyl orange as indicator. Determine the type of alkalinity. (Ans= HCO3- =720ppm)

1. 100 ml of water sample on titration with N/50 HCl requires 8 ml of acid upto (P) end point and 9 ml of acid upto (M) end point. Calculate the type of alkalinity present.

(Ans=CO3-2=160ppm,HCO3-=10ppm)

1. 100 ml of water sample required 30 ml of N/50 H2SO4 for neutralization upto (P) end point. After this methyl orange was added to this and further acid required was again 30 ml calculate alkalinity of water.(Ans= CO3-2 =60ppm)
2. 100ml of sample required 4 ml of N/50 H2SO4 for neutralization upto (P) end point. Another 16 ml of same acid was needed for further titration upto (M) end point. Determine the type of alkalinity.(Ans= CO3-2 =80ppm, HCO3- =80ppm)

**CORROSION**

**PART-A**

1. Define the term ‘corrosion’ of a metal.
2. Though aluminum is above iron in the galvanic series. Yet aluminum corrodes to a small extent. Explain why?
3. A pure metal rod immersed vertically in water starts corroding at bottom. Give reasons.
4. Why should Nickel plated steel articles be free from pores and pin holes?
5. What happens when cathodic coatings breaks?

6.Why does corrosion occur in steel pipe connected to copper tank?

7.Account for the following:

* A nail hammered in a block of wood gets its stem rusted but not head.
* In Cathodic coating parent metal gets severely corroded when crack appears compared to anodic coating.
* A plumber fixes a copper bolt in Iron structure. Which part gets corroded? Explain..

1. Which type of oxide flm is most protective against corrosion.
2. Most of the metals undergo severe corrosion in acidic environment than in alkaline/neutral environment. Why?

**PART-B**

1. Write a note on galvanic series.
2. Explain the rusting of iron metal with the help of electrochemical theory of corrosion.
3. Corrosion of water filled steel tanks occurs below the waterline. Explain.
4. **Discuss the factors that affect the rate of corrosion of a metal.**
5. Explain how rate of corrosion of a metal is affected by the following factors a) Position of metal in galvanic series b) Ratio of anodic &cathodic areas .c) influence of PH.
6. Write a note on a) water-line, b) pitting corrosions.
7. **Write a brief note on cathodic protection.**
8. **What is sacrificial anode? Discuss its role in the control of corrosion of a metal**.
9. What are anodic and cathodic metallic coatings? Explain with suitable examples.
10. **What is a metallic coating? How are metallic coatings classified? Give examples**.
11. Explain hot dipping methods for galvanizing .

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