CHEMISTRY ASSIGNMENT - 1

Q.1 While calculating the hardness of water, 78 mL of EDTA is used to titrate the complete hardness of 80 mL of hard water sample. The EDTA used here was first standardised by using 10 mL of standard $CaCl_2$ solution which contain 7 g/L $CaCO_3$ equivalent hardness. The volume of EDTA used in standardisation was 20 mL. Calculate $CaCO_3$ equivalent hardness in ppm and degree Clarke in hard water sample.

Q.2 Mention the pH range of indicator phenolphthalein and methyl orange and write the respective hydrogen ion concentration range too.

Q.3 What is the significance of using indicator in the titration ?

Q.4 A given 10 mL of alkaline hard water sample is titrated against 0.1 N HCl solution, the total and phenolphthalein alkalinity in the hard water sample is 40 and 30 ppm respectively. Calculate the volume of HCl used to calculate phenolphthalein alkalinity and total alkalinity. What are the basic ions present in the solution?

Q.5 If volume of HCl used to determine phenolphthalein alkalinity is 6 mL and for methyl orange alkalinity is 3 mL. What are the basic ions present in the solution?

Q.6 Complete the following reactions:

A): $CO3^{2-} + H^+$ ———-> X

B): Mg^{2+} + Eriochrome Black -T ———> X + EDTA ——-> Y + Z

C): H_2SO_4 + $Ca(OH)_2$ ———->. X + Y

Write the products X, Y, Z in all three reactions and mention colour of each product in reaction B.

Q.7 A 18 cm^3 of hard water sample required 2 cm^3 of 0.02 M EDTA solution for the titration using EBT indicator. Another 18 cm^3 of hard water sample from the same source was boiled and filtered. The obtained filtrate required 1 cm^3 of 0.02 M EDTA solution for titration. Calculate temporary, permanent and total hardness of water sample.

Q.8 Draw the structure of EDTA and disodium salt of EDTA .

Q.9 Do the following UNIT CONVERSIONS:

7.57 gram (g) into centigram (cg)
6.12 kilogram (kg) into gram (g)
5.167 millilitre (mL) into Litre (L)
2.13 milligram (mg) into kilogram (kg)
7.265 milligram (mg) into gram (g)
400 Litre (L) into millilitre (mL)
100 decigram (dg) into gram (g)

Q.10 6 g of HCl is dissolved in 200 g of water,

a) Calculate moles of HCl and water in solution.
b) What is the molarity and normality of solution if volume of solution is 2 mL ?

Q.11) if pH + pOH = 14

And $[H^+] = 2 \times 10^{-2}$ M, Calculate $[OH^-]$?

Q.12) Arrange them in increasing $[H^+]$ and $[OH^-]$ concentration :

A) 0.005 M HCl. B) 0.0001 M H_2SO_4. C) 0.5 M HNO_3 D) 0.002 M $HClO_3$

Write down their acidic strength also.

Q.13) Arrange them in order of increasing basicity:

A) 0.006 M NaOH B) 0.006 M $Mg(OH)_2$ C) 0.012 N $Mg(OH)_2$ D) 0.006 N NaOH

Q.14) Explain why buffer does not change the pH of solution when small amount of acid or base added into it with the help of NH_4OH + NH_4Cl buffer solution. Write the required chemical reaction and explain it.

Q.15). If mass of solute is 26 g and mass of solvent is 50 g, then calculate the concentration of solute in parts per million?

Q.16) Do the following unit conversions:

A) 50 ppm into mg/L
B) 0.07 ppm into degree Clarke.
C) 46 ppm to degree French.

Q.17) Define suspended and dissolved solid. Which type of solids is responsible for turbidity, colour and odour to water sample?

Q.18) Consider a 20 mL sample of hard water, after filtration, the residue heated (over >100 ^oC) and mass of residue obtained is 2 g. When the filtrate is heated similarly , the mass of solid obtained is 0.2 g less than the previous one. Calculate TS, TDS and TSS in mg/L or ppm in water sample.

Q.19) What factor affect the pH range 0-14, explain in detail.

Q.20) A sample of water contains 18 mg/L of, 17 mg/L of $CaSO_4$, 12 mg/L of $CaCl_2$, 14 mg/L of $Mg(HCO_3)_2$, and 14 mg/L of $MgCl_2$. Calculate temporary, permanent and total hardness in terms of $CaCO_3$ equivalent.

Given molecular weight $Ca(HCO_3)_2$= 162, $CaSO_4$= 136, $Mg(HCO_3)_2$= 146, $MgCl_2$= 95.

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