

16/11/22

EXPERIMENT - 1.

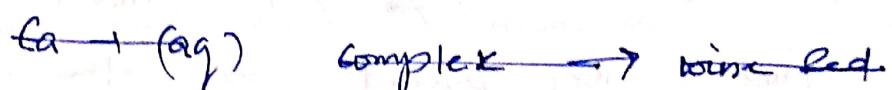
**Q.1.** Explain significance of determination of hardness of water.

- ⚫ Hardness in water is due to dissolved salts of Ca and Mg.
- ⚫ Unfit for drinking, Bathing, washing and can scale the walls of Boilers.
- ⚫ It can pose a threat to aquatic life if it is present in excess.

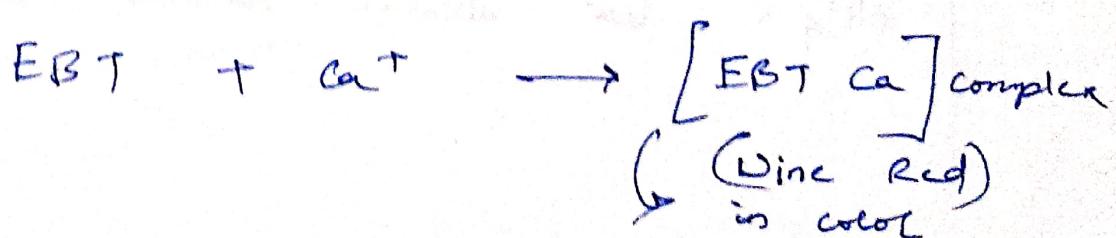
Due to these factors, we need to make sure that water hardness does not exceed its harmless limits. Hence the significance of measuring it.

**Q.2.** Why is the end point of titration wine Red to Blue?

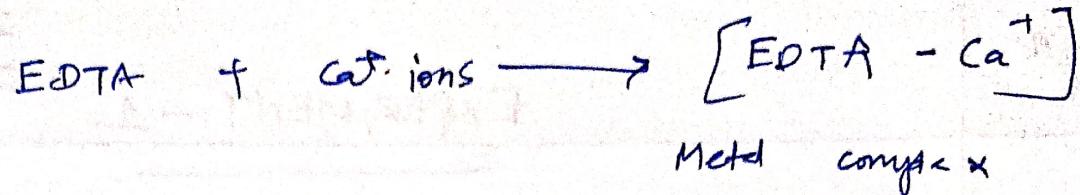
→



EBT is added to solution prior to titration. Eriochrome Black + calcium ions forms Metal EBT complex.



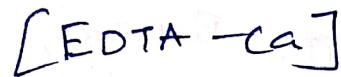
upon titration with EDTA,



Properties of metal complex

colorless in nature

Wine Red



so EBT is Free



Free

Blue

EBT is Blue in color and so

~~the~~ now solution appears Blue.

Q.3. Why and how is the pH value adjusted to about 10?

→ pH 10 buffer is used in EDTA titration because ~~is~~ EDTA  $\text{Y}_4^-$  need to react with metal ions present in the titration solution.

→ pH can be set using  $\text{NH}_4\text{OH}$  and ~~as~~  $\text{NH}_4\text{Cl}$  ~~as~~ alkaline solutions used as buffer.

Q.4. As per WHO norms what is the standard value for hardness of drinking water?

→ ~~Water~~ water sample containing  $\text{CaCO}_3$  concentration  $< 60 \text{ mg/L} \rightarrow \text{soft}$

$60 - 120 \text{ mg/L} \rightarrow \text{Moderately hard.}$

$120 - 180 \text{ mg/L} \rightarrow \text{Hard}$

$> 180 \text{ mg/L} \rightarrow \text{Very Hard.}$

Q.5.

What is portable water, deionised water, saline water, Brackish water, mineral water?

→ Portable water:

water which originates from surface and ground sources and is labelled as "drinking water". It is treated as for micro-organisms, bacteria, virus etc. to meet federal and state standards.

→ Deionised water:

Water with all mineral salts removed by boiling, and condensing to leave impurities behind.

(\*)

## Saline Water:

→ Water with very high concentrations of salts (mainly NaCl) is commonly called salt water.

→

## Brackish Water:

Salt water and fresh water mixed together

→

## Mineral Water:

Water containing large amounts of dissolved minerals sourced from natural springs.

( $\text{CaCO}_3$ , K,  $\text{MgSO}_4$ ,  $\text{Na}_2\text{SO}_4$  etc)

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## EXPERIMENT-2

Q.1

What are the adverse effects of acidic and alkaline water?

→

Acidic - Diarrhea, nausea and vomiting, abdominal pain, chills, weakness, shortness of breadth etc.

Alkaline - Nausea, vomiting, confusion, hand tremors etc

Q.2

Explain 5 significant points behind the alkalinity determination experiment

→

① It is important to measure a stream's ability to neutralize acidic pollution in water from Rainfall, waste water etc.

② These measurements are used by waste water treating plants to measure how much waste water a stream can neutralize.

→

It is the acid neutralizing ability of water.

Q.3. What is the effect of temperature on determination of alkalinity?

- If temperature  $T$ , equation shifts to right increasing carbonate to bicarbonate ratio. pH also drops because of this.
- pH and temperature are directly related.
- pH value without temperature is incoherent.

Q.4. Name various ions responsible for alkalinity of water.

- A. Carbonate ( $\text{CO}_3^{2-}$ )
- B. Bicarbonate ( $\text{HCO}_3^-$ )
- C. Hydroxide ions ( $\text{OH}^-$ )
- D. Borates, phosphates and silicates

Q.5. Alkalinity - Alkalinity of water cannot be due to simultaneous presence of  $\text{OH}^-$ ,  $\text{CO}_3^{2-}$ ,  $\text{HCO}_3^-$  ions. Give reason.

- $\text{OH}^- + \text{HCO}_3^- \rightarrow \text{H}_2\text{O} + \text{CO}_3^{2-}$  ions. So they cannot occur simultaneously for accounting of alkalinity.  $\therefore$  we can conclude that all 3  $\text{OH}^-$ ,  $\text{HCO}_3^-$  and  $\text{CO}_3^{2-}$  can't exist together.

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Experiment - 3

Q. 1 Explain the significance of moisture content determination in coal.

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- ① It is an important factor in coal analysis
  - ② It is needed to determine calorific value and handling properties of coal.
  - ③ Moisture absorbs heat, so high moisture content reduces relative efficiency while heating the coal.

Q. 2 What is the chemical composition of ash?

→ 25% - 45% -  $\text{CaCO}_3$

< 10% - potash

< 1% - phosphate

traces of  $\text{Fe}$ ,  $\text{Mn}$ ,  $\text{Zn}$ ,  $\text{Cu}$ , etc.

Q. 3 What is the difference between free ash and fixed ash?

→ Free ash : incombustible, inorganic remaining after fuel burning or mixed mining.

**Q(4)** Fixed Ash : Part of ash content of a coal that is structurally part of the coal itself. It can't be separated from it by any mechanical means.

(about 1 %)

**Q(5)** What is Inherent moisture of coal?

→ It is water (moisture) that occurs in microscopic structures of the coal generally filling ~~porous~~ pores and not visible in large fractures.

**Q(6)** At what temperature moisture and ash present in coal are removed?

→ Coal sample is heated at  $105^{\circ}$  to  $110^{\circ} \text{ C}$  for removal of moisture and ash.