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Experiment No-2

Alkalinity of given water sample.

* Aim - To determine alkalinity of given water sample.

* objective - To determine the alkalinity i.e. ability of water to maintain constant pH due to carbonate, bicarbonates and hydroxide ions present in water. The alkalinity of water is determined by titrating sample against standard solution of acid in an acid-base titration.

* Apparatus - Burette, Conical flask (250ml), volumetric Flask, Burette stand, etc.

* chemicals - 0.02N HCl, Phenolphthalein indicator, Methyl orange indicator, water sample etc.

* observations:

Burette — 0.02N HCl solution

Pipette — water sample

Indicators — 1. Phenolphthalein
2. Methyl orange to the same solution after getting first end point.

End point — 1. Pink to colourless
2. Yellow to red.

* observation Table:

Sample No.	Readings in ml							
	V_1				V_2			
	I	II	III	constant	I	II	III	constant
1.	0	0	0	0	7.9	7.9	7.7	7.9
2.	9.8	10	9.8	9.8	16.5	16.8	16.5	16.5
3.	4.5	4.5	4.2	4.5	17.2	17.2	17.1	17.2

* Calculations -

① Sample (1)

$V_1 = 0ml$

$V_2 = 7.9ml$

$\therefore V_1 = 0; \therefore M = 10$ & $M_2 = 7.9 ppm$

$\therefore$ Alkanlinity due to $HCO_3 = M = 7.9 ppm.$

② Sample (2),

$V_1 = 9.8ml.$

$V_2 = 6.5ml.$

So, $V_1 > \frac{1}{2} V_2$

$\therefore M = 10; V_2 = 165 ppm.$

& $P = 10; V_1 = 9.8 ppm$

$\therefore$ Alkalinity due to $OH = (2P - M) = 190 - 165 = 31 ppm$

$\therefore$ Alkalinity due to $CO_3^{2-} = 2(M - P) = 67 \times 2 = 134 ppm$

③ Sample (3)

$V_1 = 4.5 \quad V_2 = 17.2$

$\because V_1 < 1/2 V_2;$

$\therefore P = 4.5 ppm$

$M = 17.2 ppm$

$\therefore$ Alkalinity due to $HCO_3^- = (M - 2P) = 172 - 90 = 82 ppm$

$\therefore$ Alkalinity due to $CO_3^{2-} = 2P = 90 ppm.$

* Result-

water sample	OH^-, alkalinity in ppm	CO_3^{2-} alkalinity in ppm	HCO_3^-, alkalinity in ppm
1	–	–	79
2	31	134	–
3	–	82	90

* Questions -

Q 1) what are the adverse effects of acidic and alkaline water?

Ans → ① Adverse effects of Acidic water.

The corrosive nature of acidic water causes metal ions such as iron, manganese, copper, lead and zinc to leach into water, causing elevated levels of toxic metals in your water. Signs of acid water are corrosion of fixtures, blue staining or rust staining. Acidic water can also cause pinhole leaks and pipe failure overtime.

② Adverse effects of Alkaline water.

It includes the lowering of natural stomach acidity, which helps kill bacteria and expel other undesirable pathogens from entering your bloodstream. Aditionally an overall excess of alkanity in the body may cause gastrointestial issues and skin irritations. Too much alkalinity may also agitate the body's normal pH.

Q 2) Explain the significance of alkalinity determination.

Ans → Alkalinity is a measure of the capacity of water to neutralize acids. This is known as the buffering capacity of water or the ability of water to resist a change in pH when acid is added. Alkalinity in water is due primarily to the presence of bicarbonate, carbonate and hydroxide ions.

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

Ans → At a higher temperature it is for example 6.5 rather than 7.0. The pH of buffers also changes with temperature since a buffer is an equilibrium reaction, the dissociation of a weak acid or base In practice, one looks up the temperature dependence of each buffer.

Q 4) Name various ions which are responsible for alkalinity of water.

Ans → The alkalinity of water is due to primarily the presence of bicarbonate, carbonate and hydroxide ions. Salts of weak acids, such as borates, silicates and phosphates may also contribute.

Q. 5) Alkalinity of water cannot be due to the simultaneous presence of OH, CO_3 and HCO_3. Give reason.

Ans → The possibility of OH, & HCO_3 ions together is ruled out because they combine instantaneously to form CO_3^{2-} ions. Thus OH^- & HCO_3^- ions cannot exist together in water and hence can be concluded that all the three OH^-, HCO_3^-, CO_3^{2-} ions cannot exist together.