

VIVEKANANDA COLLEGE
THAKURPUKUR
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NAAC ACCREDITED 'A' GRADE



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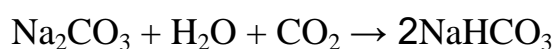
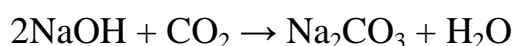
Name of the Teacher: ISHITA ROY along with Prof. MEENAKSHI MUKHERJEE

Name of the Department: DEPARTMENT OF BOTANY

ESTIMATION OF DISSOLVED FREE CARBON DIOXIDE (CO₂) IN TWO DIFFERENT WATER SAMPLES

➤ **PRINCIPLE:**

Free Carbon dioxide (CO₂) reacts with NaOH or Na₂CO₃ to form NaHCO₃. Free CO₂ can be determined by titrating the two samples using a strong alkali (NaOH) at pH 8.3. At this pH all the free CO₂ is converted into bicarbonate. Completion of the reaction is indicated by the development of a pink color of Phenolphthalein indicator at the equivalence pH of 8.3.



Amount of alkali needed to produce the pink color indicates the amount of free CO₂ present in the two samples.

➤ **REQUIREMENTS:**

- i. Burette and burette stand
- ii. Pipette
- iii. Measuring cylinder
- iv. Beaker
- v. Conical flask (100ml)
- vi. Funnel
- vii. Bottle with stopper (250ml)
- viii. Dropper

REAGENTS:

- i. 0.05(N) NaOH solution
- ii. Phenolphthalein indicator

➤ PREPARATION OF REAGENTS:

Preparation of reagents:

- i. **0.05(N) NaOH solution-** 40gm of NaOH was dissolved in CO₂ free distilled water and volume made upto 1000ml. 50ml of 1(N) NaOH was taken and diluted with distilled water to make 1000ml of 0.05(N) NaOH solution. This solution was standardized with pH 8.3 with HCl or H₂SO₄ or oxalic acid.
- ii. **Phenolphthalein indicator-** 0.5gm of phenolphthalein indicator was dissolved in 50ml of 90% ethanol and 50ml of distilled water was added to it. This solution was neutralized by adding 0.05(N) NaOH solution until a faint pink color appeared.

➤ PROCEDURE:

(1) Preparation of reaction mixture:

- i. Two different water samples were collected from two different water bodies. First water sample (**Sample- 1**) was collected from one pond in a narrow mouthed bottle with minimum exposure to air and precautions were taken so that the sample was not agitated. Bubbling or mixing with air or other gases was avoided.
- ii. 50ml of water sample was taken in a 100ml conical flask. 3 such sets were prepared for Sample- 1.
- iii. A few drops of phenolphthalein indicator (3-4drops) were added to the sample sets.
- iv. Each conical flask was placed against a white background.
- v. If the color turns pink then free CO₂ is absent. If the sample remains colorless then it is titrated against 0.05(N) NaOH. At the end point a faint pink color appears.
- vi. The end point reading was recorded.
- vii. Second water sample (**Sample- 2**) was collected from another pond and tested in same procedure as Sample- 1.

➤ RESULTS:

Water samples	No. of observations	Volume of sample taken	Initial burette reading (ml)	Final burette reading (ml)	Difference (ml)	Mean (ml)
Sample-1	1.					
	2.					
	3.					
Sample-2	1.					
	2.					
	3.					

➤ CALCULATION:

For Sample- 1:-

Total free CO₂ (mg/L) → [ml × (N) of NaOH × 44 × 1000] ÷ ml of sample

For Sample- 2:-

Total free CO₂ (mg/L) → [ml × (N) of NaOH × 44 × 1000] ÷ ml of sample

➤ COMMENT:

Free CO₂ is a measure of one of the important environmental factor affecting aquatic life. The value of free CO₂ in Sample- 1 is _____ mg/L and the value of free CO₂ in Sample- 2 is _____ mg/L. We can see that the amount of free CO₂ in Sample- 1 is more than that of Sample- 2. Higher concentrations of CO₂ have inhibitory effects on plants and animals. Free CO₂ value is not that much high in Sample- 1 so, no inhibitory effect on plants and animals is seen.

➤ PRECAUTIONS:

Since atmospheric CO₂ is readily soluble in water, method of determining the amount of free CO₂ is always subjected to more or less 50% error. The following precautions should be taken for increasing the degree of accuracy.

- I. While collecting the sample in both cases, care should be taken to avoid contact of sample from air. This can be achieved by collecting the sample from subsurface water by opening the lid of empty sample bottle under water.
- II. The sample should be analyzed immediately after collection because CO₂ is liable to escape easily from the sample.
- III. The sample should not be agitated.
- IV. The surface of water sample exposed to air during the titration should be kept as small as possible.
- V. The sample should not be agitated during the titration.

