DETERMINATION OF FREE CO_2 IN WATER

Background Information

Carbon dioxide (CO_2) is present naturally as a result of animal respiration, the decay of organic of matter, and the decomposition certain minerals. It is the major source of acidity in polluted water samples.

Surface waters typically contain less than **10 ppm** (mg/L) dissolved (CO_2), while **ground waters** may contain **several hundred ppm** (mg/L). All aquatic organisms release (CO_2) into the water. Some of it bubbles to the surface, some of it dissolves (mixes in) with the water, but most of the carbon dioxide found in the water is **produced by** organisms (bacteria mostly) that carry on decomposition of dead material. During daylight all plants use carbon dioxide and give off oxygen By photosynthesis process. At night, the opposite is Plants use oxygen and give off carbon dioxide. By true respiration process high level of carbon dioxide usually **indicates** that there is a lot of dead material undergoing decomposition. This may occur naturally, but could be the result of different types of water pollution. (CO_2) and water united to form carbonic acid (H_2CO_3), which analyses to bicarbonate ion and positive hydrogen ion as in the formula:

$$CO_2 + H_2O \longrightarrow H_2CO_3$$

$$H_2CO_3 \longrightarrow HCO_3 + H^+$$

$$HCO_3 \longrightarrow CO_3 + H^+$$

The relationship between pH of the aquatic medium and co2 forms can be explained as following:

Medium	PH	CO_2 Forms
Acidic	Low	Dissolved free form carbonic acid (H_2CO_3)
Neutral	Moderate	Bicarbonate forms (HCO_3)
Alkaline	High	Carbonate from (CO_3)

Test Procedure:

1. Collect your water sample carefully to prevent gas volatilization.
2. Take 100 ml from water sample either supplement or irrigated water by cylinder and put it in a flask.
3. Add 10 drops from **phenolphthalein** as indicator solution.
4. Titrate with **0.025N sodium hydroxide** solution (NaOH).
5. Stir the water sample gently during the titration.
6. The point of titration is the start of **pink color** appearance in the solution end
7. Calculate Volume of sample (ml)

$$\text{CO2(PPM)} = \frac{ml\ tirtrant\ (NaOH) * (0{,}025) N * 1000\ mg/L}{\text{Volume of sample (ml)}}$$