

WEEK SIX (19TH-23RD APRIL 2020)

CHEMISTRY

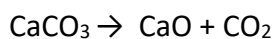
CHAPTER 13: CARBONATES



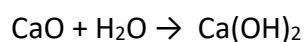
Manufacture of Calcium Oxide (lime)

Manufacture of lime

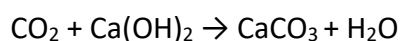
- Limestone consists mainly of calcium carbonate, CaCO_3 .
- Lime which is calcium oxide, is manufactured from calcium carbonate by **thermal decomposition**:



- **Slaked** lime, calcium hydroxide, is made by adding a small amount of water slowly to calcium oxide:



- Limewater is a solution of calcium hydroxide in water, hence it is **alkaline**.
- The addition of carbon dioxide to calcium hydroxide produces the initial starting material, calcium carbonate:

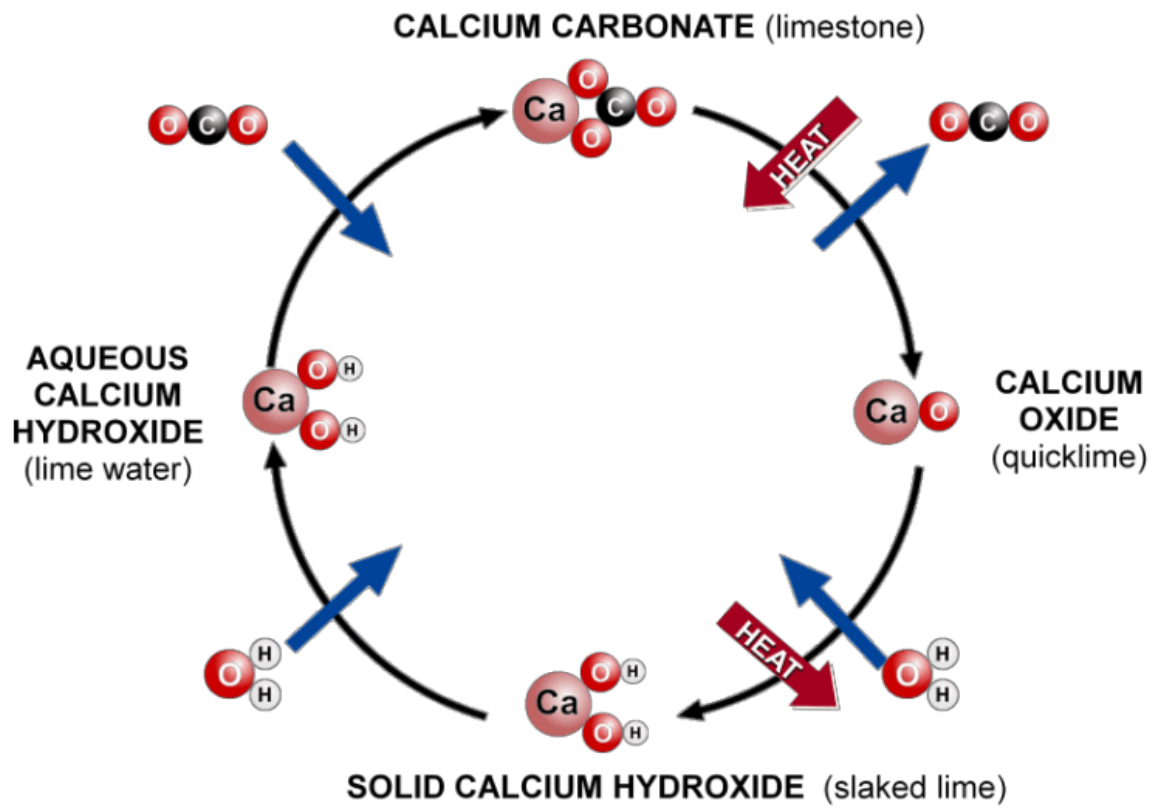


- This reaction is the basis of the standard chemical test for CO_2

Test for Carbon Dioxide

Carbon Dioxide turns limewater cloudy
carbon dioxide + calcium hydroxide (limewater)
→ calcium carbonate + water

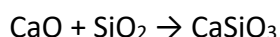




the above shows the three reactions in the limestone cycle

Uses of limestone

- Limestone (calcium carbonate) is used in the manufacture of **iron** and **cement**.
- In the production of iron, limestone is added to the blast furnace where it decomposes to form lime (CaO) and carbon dioxide.
- The lime reacts with silica impurities to form calcium silicate, which floats to the top of the molten iron and is removed:



- Cement is manufactured by heating a mixture of powdered limestone and clay in a rotary kiln.
- Once heated, calcium sulfate and water are added which produce cement.
- Cement is a hardened, interlocked structure of calcium aluminate ($\text{Ca}(\text{AlO}_2)_2$) and calcium silicate (CaSiO_3).
- CaCO_3 is also used in treating excess **acidity** in soils and lakes where it is often preferred to lime because it does not make the water in the soil alkaline.

Uses of lime

- Lime (calcium oxide) is used in **lime** mortar and in **flue-gas** desulfurization.
- Flue-gas desulfurization involves spraying acidic sulfur dioxide emissions with jets of slaked lime to reduce pollution by neutralising these gases before they leave the factory chimneys.
- Lime is also used in treating excess acidity in soils and lakes. If excess lime is used, however, the water in the soil may become too alkaline.

Uses of slaked lime

- Slaked lime (calcium hydroxide) is used in treating acidic soils and neutralising acidic industrial wasted products.