The cycle begins when the acetyl group from acetyl CoA is attached to oxaloacetate to form citrate.

In a two-step reaction, citrate is rearranged to an isomer called isocitrate.

Isocitrate is oxidized to α-ketoglutarate. CO₂ is released and NADH is formed.

α-Ketoglutarate is oxidized as it combines with CoA to form succinyl CoA. Once again, CO₂ is released and NADH is formed.

Succinyl-CoA is broken down to CoA and succinate. This exergonic reaction drives the synthesis of GTP from GDP and Pᵢ. GTP can transfer its phosphate to ADP, thereby forming ATP.

Malate is oxidized to oxaloacetate. NADH is made. The cycle can begin again.

Fumarate combines with water to make malate.

Fumarate combines with water to make malate.

Succinate is oxidized to fumarate, FADH₂ is made.
OVERALL REACTION OF KREB’S CYCLE

• OAA is regenerated during this cycle.

• 2. Each pyruvic acid molecule gives three molecules of CO2, 4 NADH, 2 FADH and one ATP.

• Two Kreb’s cycles operate per glucose molecule, as 2 PA are formed per glucose during glycolysis.
SUMMARY - AEROBIC RESPIRATION

Glucose (C6 H12 O6 ) + 6O2→6CO2 + 6H2 O +38ATP

1. Glucose is completely oxidized.
2. Takes place in the cells of higher plants and animals.
3. Takes place in the cytoplasm and mitochondria of the cell, in three steps.
4. Products are 6CO2 + 6H2 O +38ATP.
a) Type of substrate - Respiratory substrate may be carbohydrate, protein or fats.

The kind of substrate being oxidized is obtained by measuring the respiratory quotient. What is respiratory quotient or R.Q?

\[
RQ = \frac{\text{volume of carbon dioxide given off}}{\text{volume of oxygen taken in}}
\]

For carbohydrates, \( \frac{\text{CO}_2}{\text{O}_2} = 1 \) as in stem and roots.

For protein, \( \frac{\text{CO}_2}{\text{O}_2} < 1 \) as in protein rich seeds like pulses.

For fat and oils \( \frac{\text{CO}_2}{\text{O}_2} > 1 \) as in oil containing seeds e.g. mustard.

As for fats RQ > 1 more energy is released per mol of fat than per mol of glucose.