

# Fermentation

## 7.3 Fermentation

1. Fermentation is an alternative pathway of cellular respiration in breaking down glucose without the presence of oxygen
2. The breaking down of glucose through fermentation is incomplete and only taken place in the cytoplasm
3. Fermentation can occur in human muscle cells, yeasts, plants, and certain bacteria such as *Lactobacillus*
4. Fermentation can be divided into two: lactic acid and alcohol fermentation

### Lactic acid fermentation

- Glucose is broken down into pyruvic acid through glycolysis and then broken down into lactic acid
- There are only two ATP molecules formed during glycolysis
- Example:
  - *Lactobacillus* such as yogurt
  - Human muscle cells

### Alcohol fermentation

- Glucose is broken down into pyruvic acid through glycolysis and then broken down into ethanol and carbon dioxide
- There are only two ATP molecules formed during glycolysis
  - Yeast
  - Plant such as paddy plant

### Comparison between aerobic respiration and fermentation:

#### Similarities between aerobic respiration and fermentation

- The breakdown process of glucose and its conversion to chemical energy.
- Produces chemical energy in the form of ATP.
- The process begins in the cytoplasm.
- The process begins with glycolysis where glucose is converted to pyruvate.
- Occurs in yeast, bacteria, animals, and plants.

#### Differences between aerobic respiration and fermentation

Aerobic respiration	Fermentation
The breakdown process of glucose is completed in the presence of oxygen.	The breakdown process of glucose is incomplete without oxygen or in limited oxygen conditions.
Occurs in the cytoplasm and mitochondrion.	Occurs in the cytoplasm.
Produces water	Does not produce water
Glucose is oxidized completely into carbon dioxide and water	Glucose is not oxidized completely into ethanol and carbon dioxide or lactic acid.
One molecule of glucose generates 2898 kJ of energy.	One molecule of glucose generates 210 kJ (alcohol fermentation) or 150 kJ (lactic acid fermentation) of energy.