

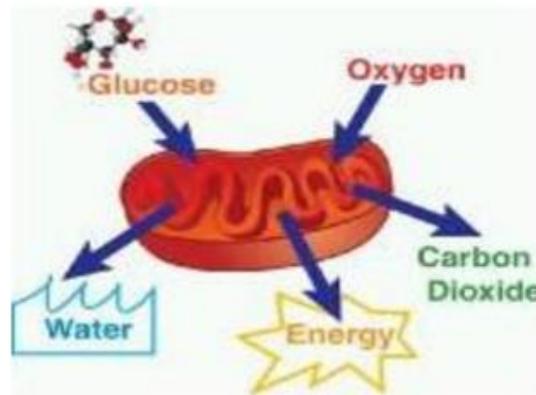
Worksheet: 3

Class: 9 Year: IGCSE II  
Chapter 12

Subject: Biology

### Respiration

**Respiration releases energy from food**



Respiration is the **chemical reactions** that **break down nutrient molecules** in living cells to **release energy**.

In humans, our cells need energy (ATP) for:

## Respiration

- **Respiration:** Chemical reactions that break down nutrient molecules in living cells to release energy.
- Uses of energy in the body of humans:
  - Muscle contraction
  - Protein synthesis
  - Cell division
  - Active transport
  - Growth
  - Passage of nerve impulses
  - Maintenance of a constant body temperature.

# Types of Respiration

## Aerobic Respiration

Release of a relatively large amount of energy in cells by the breakdown of food substances in the presence of oxygen.

Glucose + Oxygen → Carbon Dioxide + Water + Energy



## Anaerobic Respiration

Release of a relatively small amount of energy by the breakdown of food substances in the absence of oxygen.

- In Muscles: Glucose → Lactic Acid
  - $C_6H_{12}O_6 \rightarrow 2C_3H_6O_3 + 2 \text{ ATP}$
- In Yeast (Single-Cell Fungi): Glucose → Ethanol + Carbon Dioxide
  - $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2 + 2 \text{ ATP}$

## Uses of Anaerobic Respiration

### Brewing

When provided a sugar source, enzymes such as yeast respire anaerobically to produce alcohol, which can later be distilled and sold.

### Bread Making

- Grapes (sugar source) are pressed to allow enzymes to begin fermentation
- Yeast converts sugar into alcohol.
- At 8-9% the alcohol (which is toxic) kills the yeast
- Higher concentrations are achieved by distillation
- Flour, sugar, water and salt are mixed with yeast to make the dough.
- The dough is kept in a warm, moist environment (28°C). Yeast ferments sugar-making carbon dioxide, which creates bubbles, so the bread rises
- Cooking (at 180°C) – kills yeast, evaporates alcohol and hardens the outer surface.

#### Disadvantages of Anaerobic Respiration:

- Only produces 1/20 of the energy per glucose molecule that aerobic respiration would
- Produces poisonous lactic acid

### Lactic Acid:

- Transported in blood to heart, liver and kidneys, which oxidize it
- The heart, liver and kidneys need extra oxygen to do this which causes you to continue breathing heavily after exercise.
- The extra oxygen is called the oxygen debt.

The End