

WJEC Wales Biology GCSE

Topic 2.7: Micro-organisms

Notes



Growing micro-organisms

Micro-organisms can be cultured to **increase** their **population numbers**, enabling scientists to study them more easily e.g. bacteria are too small to be seen individually but once cultured, form **colonies** which can be seen with the naked eye.

Each bacterial **colony** arises from a **single cell**, enabling the **estimation** of the **number of cells** in the **initial culture** e.g. if 5 bacterial colonies are present, it is likely that these have arisen from 5 individual cells. However, **clumping** of cells can lead to misleading estimates.

Culturing may be done using **solid agar** or a **nutrient broth**. The culture medium contains the essential **nutrients** required by the micro-organisms.

Aseptic techniques

Aseptic techniques reduce **contamination** from other micro-organisms.

To avoid contamination of samples:

- **Sterilise** all equipment and surfaces before and after the experiment.
- **Inoculating loop** held in the **Bunsen burner flame** to kill any bacteria already present.
- **Flame** the **rim** of the culture bottle (before and after a sample of culture is removed) to create an updraft of air moving out of the bottle (prevents contamination of the culture).
- **Lid** of agar plate lifted only **slightly**, keeping it **low** over the agar.
- Inoculating loop sterilised again (after transfer of the culture) in the **Bunsen burner flame**.

Effect of temperature on the growth of bacteria

Bacteria grow most rapidly at **warm** temperatures (**optimum**). If the temperature rises too high above this optimum the bacteria are killed. If temperatures fall too low, the rate of growth decreases.

Food is refrigerated to **slow** the **growth** of **micro-organisms**, allowing it to last longer before becoming spoilt. Freezing completely stops growth.

Production of penicillin

Penicillin is an **antibiotic** produced by the *Penicillium* fungus. It can be prepared industrially using a **fermenter**.



The following conditions must be controlled in a fermenter:

Condition	Why?	How?
Temperature	Optimum temperature for <i>Penicillium</i> is between 23 to 28°C.	Aerobic respiration in the <i>Penicillium</i> produces heat. The cooling jacket cools the culture.
Oxygen levels	<i>Penicillium</i> respire aerobically so requires oxygen.	Sterile air enters via the air intake.
pH	Optimum pH for <i>Penicillium</i> is around 6.5.	pH probe used to monitor pH levels. Acid/alkali intake enables the adjustment of pH levels.
Nutrient levels	Must remain low (penicillin produced at low nutrient levels only).	Once growth has started, no further nutrients are added.

The liquid medium is **drained** from the fermenter and **filtered** after approximately 200 hours. **Chemicals** are added to **extract** the penicillin.

