SL IB Biology

Your notes

Tool 2: Technology

Contents

Applying Technology to Collect Data in Biology


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Applying Technology to Collect Data in Biology

- Improvements in technology and data sharing have made it easier to **collect data** during biological investigations
  - **Electronic sensors** can be used to collect experimental data, e.g.
    - Taking measurements of the abiotic environment
    - Using monitoring equipment to assess physiological factors such as lung volume and heart rate
  - Data relating to DNA sequences and chromosomes can be extracted from online **databases**
    - A database is a **structured collection of data** so it can be searched**, sorted, filtered** and **analysed** quickly
  - **Models** and **simulations** can be used to generate data to **inform predictions** about real life scenarios, e.g.
    - Predictions about population growth can be made using population growth curve models
    - Model ecosystems such as mesocosms can be used to investigate the effects of changing environmental variables

E.g. collecting data using electric data loggers and sensors

Data loggers

- Data loggers are electronic devices that allow for the **quick and efficient gathering of data**
  - The information contained within a data logger can be inputted into a computer and formatted into a **table**
  - After this is done the computer is able to calculate the **average** and **plot graphs** using the data and calculate gradients quicker and more accurately than humans
- Data loggers are attached to sensors that monitor and record environmental parameters over time, e.g. temperature, pressure, or pH sensors

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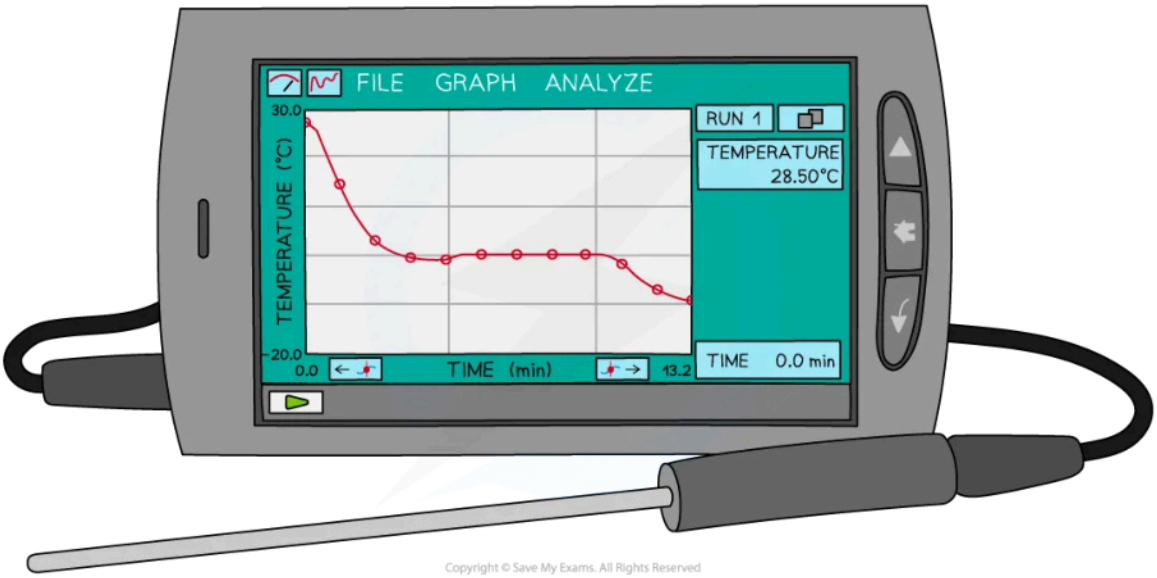
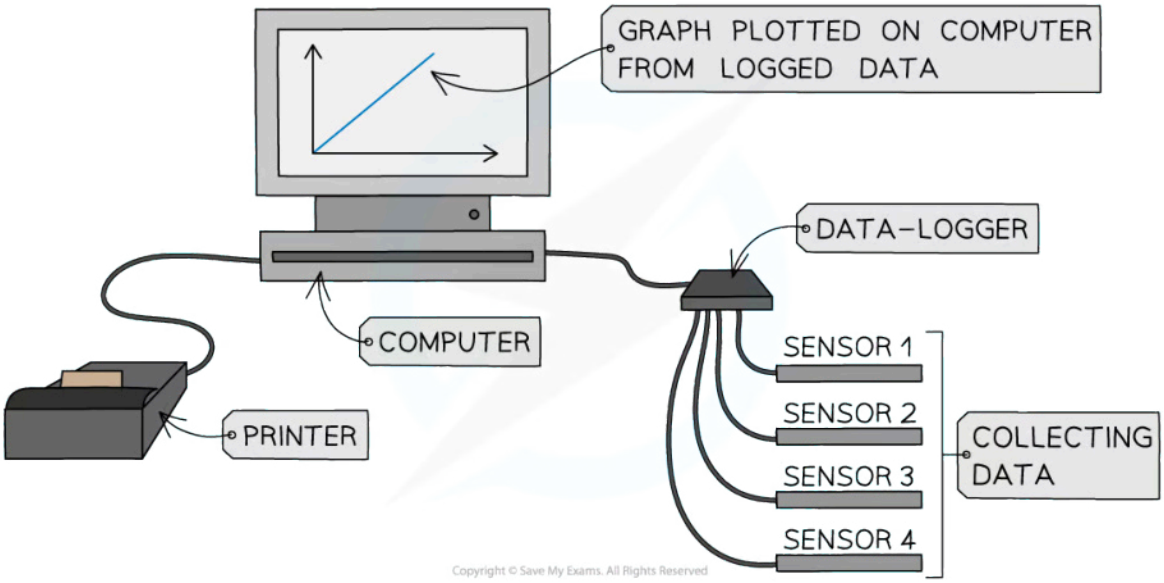


Data loggers with sensors can measure factors such as temperature

Sensors

- Sensors are **input** devices that detect and respond to specific changes in their surroundings, converting the detected information into electrical signals stored within a data logger
- Examples of sensors include
  - pH meters
    - pH meters measure the acidity or alkalinity of a solution expressed as a **pH value**
      - A pH value is a measure of the concentration of **hydrogen ions** (H^+) in the solution
    - It might be necessary to measure the pH of a solution while, e.g. investigating the effect of pH on enzyme activity
  - Temperature probes
    - Temperature sensors are used to measure the temperature of a system or a reaction
    - They are crucial for carrying out experiments that require specific temperature conditions
    - Temperature sensors can be used instead of thermometers in practical investigations



Electronic data loggers and sensors can be used to easily gather information and relay it to a computer for processing

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Applying Technology to Process Data in Biology

Applying Technology to Process Data in Biology

- With the volume and complexity of data from some types of investigation, the integration of **technology** has become essential for efficiently processing, analysing and interpreting experimental data
- Using technology to process data can be demonstrated when conducting internal assessment as well as during practical investigations, e.g.
  - **Spreadsheets** can be used to record and manipulate data
    - It is easy to input raw data, categorise it, and organise it into columns and rows
    - Spreadsheets can perform calculations, statistical analyses and mathematical operations on datasets
  - Computers can **draw graphs** from raw data
    - Spreadsheets employ built-in functions to automatically generate graphs and charts, making it possible to visualise trends, patterns, and correlations in the data
    - E.g. population data may yield data with large ranges that are easier to manipulate using a computer
  - Computers can use data to **produce models** to inform ongoing predictions
  - **Images can be analysed** using computer programmes
    - E.g. images of joints in motion can be analysed using a computer


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