Summary

Cells are the basic building blocks of living organisms.
Microscope were required to understand their structure and function.
Cells come in two basic types Eukaryotic – with membrane bound organelles, and Prokaryotes – no membrane bound organelles.
Organism develop by the cell division starting with one cell.
Cells vary enormously in appearance and function.
Cells have very similar basic chemistry.
Present day cells have apparently evolved from the same ancestral cell.
Living organisms are studied by looking at specific examples of bacteria, animals, fungi and plants.

Cells can be organised into **tissues**, organs, organ systems and complex multicellular organism.
Viruses aren't therefore really living and cannot reproduce on their own.

Cells are small – so we use **microscopes** to look at them and **micrometers** and nanometers to measure them and their components.
Light microscopes: first developed in the 17th century. Have limited **resolution** due to the wavelength of light.
Electron microscopes; developed in the 1930s enabled structures within the cell to be seen in detail. Only dead cells could be observed.
Observations suggested that cells came into existence by the **division** of other cells. Followed by cells **enlargement** and **differentiation**.

Cells are unique in being able to **organise material** – the tendency of the universe is for things to become less organised and "breakdown" into chaos – a bit like a child's birthday party.
Living things are also able to transfer information from one cell to its daughter cells – inheritance. Because processes involved in reproduction can cause individuals to vary, some individuals survive to reproduce and others do not. This leads to change in a species over time called **evolution**.

Cells are typically 5 – 20 micrometers in diameter.
Staining makes it easier to identify cells and their components.
Fluorescent probes that bind to one component help specific studies.
Scanning **electron microscopes** look at specimens coated in metal and show up surface detail.

With the light microscope there appears to be a boundary, the cell membrane. Inside is the **cytoplasm** = cytosol + **organelles**.
The cell may have a large, membrane bound nucleus. Cells with a nucleus are called **eukaryotic** cells, those without are called **prokaryotic** cells – mostly bacteria.
The main organelles found in eukaryotic cells are **Mitochondrion** (plu. Mitochondria), **Chloroplasts** – only in **Algae** and **Plants, endoplasmic reticulum, golgi apparatus, lysosomes, peroxisomes,** and other **vesicles**.
The remainder of the interior is a water based gel where many chemical reactions take place.

Cytoskeleton is responsible for changes in shape cell movement and is composed of actin molecules, microtubules and intermediate filaments.
In plant cells the cytoskeleton forms tracks for the movement of e.g. mitchondria around the cell.

Cells vary enormously in appearance and function
Lactobacillus is a bacterium a few μm long and a frog egg is about 1mm. Cells vary in shape e.g. nerve cells and blood cells and in the their chemical requirements e.g. some require oxygen to others it is a deadly poison.
However in spite of this enormous variety of cells in different species all living cells have a similar basic chemistry due to evolution from the same ancestor.