

CHAPTER 2 : Basic components of living systems

More microscopy

Electron microscopy

- Beam of electrons with wavelength of less than 1mm used to illuminate specimen
- More detail of cell ultrastructure can be seen because electrons have a smaller wavelength than light waves
- Clear resolution of images of up to x500 000 magnification

- Very expensive
- Only used in controlled environment, dedicated space
- Specimens can be damaged by electron beam because of complex preparation process, problem with artefacts

Two types of electron microscope:

Transmission electron microscope (TEM) - beam of electrons transmitted through specimens and focused to produce an image. Similar to light microscopy, best resolution and resolving power of 0.5nm

Scanning electron microscope (SEM) - beam of electrons sent across the surface of specimen and reflected electrons are collected. resolving power is 3-10nm, three dimensional images of surfaces produced.

A comparison of light and electron microscopy

Light microscope	Electron microscope
Inexpensive to buy and operate	Expensive to buy and operate
Small and portable	Large and needs to be installed
Simple sample preparation	Complex sample preparation
Sample preparation doesn't usually lead to distortion	Sample preparation often distorts material
Vacuum isn't required	Vacuum is required
Natural colour of sample is seen (or stains are used)	Black and white images produced (can be coloured digitally)
Up to x2000 magnification	Over x500 000 magnification
Resolving power is 200nm	Resolving power of TEM is 0.5nm as a SEM is 3-10nm
Specimens can be living or dead	Specimens are dead