How microscopes work

- Magnification is how much bigger the image is than the specimen
- Magnification = Image size / actual size
- Resolution is how detailed an image is. More specifically, how well a microscope distinguishes two points that are close together.

The three types of microscope

- Light microscope
- Laser scanning confocal microscope
- Electron microscopes

Light microscope

- Light microscopes use light
- They have a resolution of 0.2 micrometres – so they are usually used to look at whole cells or tissues
- The maximum magnification of a light microscope is about x1500

Laser scanning confocal microscopes

- They use laser beams to scan a specimen, which is usually tagged with fluorescent dye.
- The laser causes this dye to fluoresce. This light is then focused through a pinhole onto a detector. The detector will print a 3d image on a computer
- The pinhole means out of focus light is blocked, so they produce a much clearer image than a light microscope
- They can be used to look at different depths in thick specimens

Electron microscopes

- These use electrons instead of light to from an image. They have a higher resolution than light microscopes so produce a much clearer image.
- **Transmission electron microscope –** use electromagnets to focus a beam of electrons, which is transmitted through the specimen. Denser parts absorb more electrons so appear darker. TEM's produce high resolution images.
- **Scanning electron microscope -** scan a beam of electrons across the specimen. This knocks off electrons on the specimen, which gather in a cathode ray tube to from an image. The images can be 3D but are lower resolution than TEM's

Light microscope	**TEM**	**SEM**	
0.2 micrometres	0.0002 micrometres	0.002 micrometres	**Resolution**
X1500	>x1 000 000	<x500 000	**Magnification**