Magnification Calculations

I = Image size
A = Actual size of image
M = Magnification

1m=1000mm
1mm=1000µm
1µm = 1000nm

Eyepiece Graticules & Stage Micrometers

Number of Micrometers ÷ Number of Graticule Division	= 1 Graticule Division
Graticule Divisions x Magnification Factor	= Measurement (µm)

Magnification

How many times bigger the image of a specimen observed is in compared to the actual size of the specimen.

A light microscope has two types of lens:	An eyepiece lens. A series of objective lenses.
Total Magnification:	Eyepiece Lens Magnification x Objective Lens Magnification = Total Magnification

Resolution

The ability to distinguish between two separate points.

Resolution of a light microscope is limited by the wavelength of light.

Electron microscopes have a higher resolution and magnification as electrons have a much smaller wavelength than visible light.

Electron Microscope VS Light Microscope

Electron Microscope	Light Microscope
Large and installations = Can't move.	Small and easy to carry.
Vacuum Needed.	No Vacuum Needed.
Complicated sample preparation.	Easy sample preparation.
Over X 500 000 Magnification.	Up to X 2000 Magnification.
Resolution = 0.5nm	Resolution = 200nm
Specimens = Dead	Specimens = Dead/Living

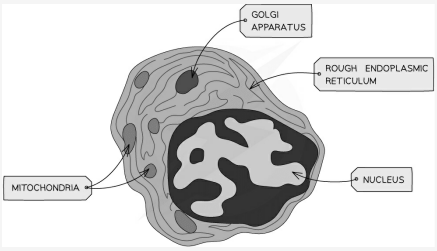
Photomicrographs

Images obtained from a light microscope, these are used for specimens above 200 nm.

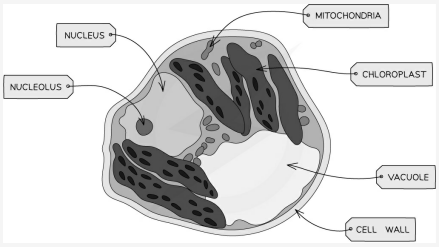
Electron micrographs

Images obtained from electron micros-copes, both scanning and transmission, these are used for specimens above 0.5 nm

Electron Micrographs: Animal Cells



Electron Micrographs: Plant Cells



Cell Surface Membrane

Controls exchange of material between the internal and external cell environment.

Cell Wall (Plant Only)

Used to enclose/protect/support.

Fully permeable = Lets anything through.

Nucleus

Gives instruction.

Contains the cells DNA

Contains nuclear envelope = separates nucleus from cytoplasm.

Nucleolus

Site where ribosomes are made.

Mitochondrion

Powerhouse of the cell.

Site of aerobic respiration.

Produces ATP.

Has 70s Ribosomes & Circular DNA.

Chloroplast (Plant Only)

Contain DNA.

Can't live on their own.

Where photosynthesis happens.

Ribosome

Built of 2 subunits.

Do ont have a membrane.

Ones found in cytosol = always attached to ER

Ones found freely in cytoplasm or as part of the Rough endoplasmic reticulum in Eukaryotic cells.

Is a complex of ribosomal RNA & Proteins.

Site of translation.

80s Ribosomes

60s & 40s subunits.

Found in Eukaryotic Cells

In cytoplasm

70s Ribosomes

50s & 30s subunits.

Ribosomes in Prokaryotes.

In Mitochondria & Chloroplast.

Endoplasmic Reticulum

Has 2 Types

Rough endoplasmic reticulum (RER):	Round sacs transport substances.
	Processes proteins.
Smooth endoplasmic reticulum (ER):	Involved in the production/processing/storage of lipids/carbohydrates/steroids.
	Site where substances needed by the cell are made.
	Has no ribosomes.

Golgi body (Golgi apparatus/complex)

Synthesises specific functions:	Hormones & enzymes.

Modifies proteins and packages them into vesicles or lysosomes.

Tonoplast (Plant Only)

Controls exchange.

Around vacuole in plants.

Large Permanent Vacuole (Plant Only)

Regulates osmotic properties.

Used to keep plants stiff.

Where pigment (petal colour) is found.

Lysosomes

Cleaners of the cell.

Single membrane.

Contains concentrated mixtures of digestive enzymes:	Hydrolytic enzymes

Attached to the vacuole of cells.

Discharged/removed from cell.

Centrolie

Involved in making the cilia.

Not found in flowering plants & fungi.

Microtubules

Involved in movement of components within the cell.	Guid & direct organelles.

Plasmodesmata

Important for transport/communication/signalling between cells.

Controls movement & created paths between cells.

The vital role of ATP

Adenosine Triphosphate is a nucleotide.	Provides energy to cells.

It is produces in mitochondria & chloroplasts.

This energy is required:	In anabolic reactions. Active Transport. In animals.

ATP from respiration = used to transfer energy in all energy-requiring prosesses in the cells.

Structural features of Typical Prokaryotic Cells

Bacteria are a type of prokaryote.

Unicellular

100s/1000s of times smaller than eukaryotic cells.

Genetic material is not packaged within a membrane-bound nucleus and is usually circular.

Prokaryotic vs Eukaryotic Cell Structures

FEATURE	PROKARYOTES	EUKARYOTES
SIZE	0.5–5 μm DIAMETER	UP TO 40 μm DIAMETER
GENOME	DNA CIRCULAR WITH NO PROTEINS, IN THE CYTOPLASM	DNA IS ASSOCIATED WITH HISTONES (PROTEINS) FORMED INTO CHROMOSOMES
CELL DIVISION	OCCURS BY BINARY FISSION, NO SPINDLE INVOLVED	OCCURS BY MITOSIS OR MEIOSIS AND INVOLVES A SPINDLE TO SEPARATE CHROMOSOMES
RIBOSOMES	70S RIBOSOMES	80S RIBOSOMES
ORGANELLES	VERY FEW NO MEMBRANE-BOUND ORGANELLES.	NUMEROUS TYPES OF ORGANELLES MEMBRANE-BOUND SINGLE MEMBRANES: LYSOSOMES, GOLGI COMPLEX, VACUOLES DOUBLE MEMBRANES: NUCLEUS, MITOCHONDRIA, CHLOROPLAST NO MEMBRANE: RIBOSOMES, CENTRIOLES, MICROTUBULES
CELL WALL	MADE OF PEPTIDOGLYCAN (POLYSACCHARIDE AND AMINO ACIDS) AND MUREIN	PRESENT IN PLANTS (MADE OF CELLULOSE OR LIGNIN) AND FUNGI (MADE OF CHITIN, SIMILAR TO CELLULOSE BUT CONTAINS NITROGEN)

Viruses

Non-cellular structures.

They have:	A protein coat called a 'capsid'
	A nucleic acid core (their genomes are either DNA or RNA, can be single or double-stranded)