

Magnification Calculations

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

1m=1000mm
1mm=1000µm
1µm = 1000nm

Eyeiece Graticules & Stage Micrometers

Number of Micrometers ÷ Division = 1 Graticule
Number of Graticule ÷ Division = Measurement (µm)
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

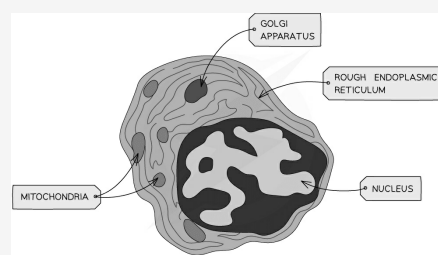
Photomicrographs

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

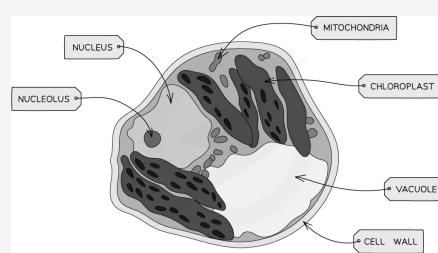
Electron micrographs

Images obtained from electron microscopes, 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 not 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 Round sacs transport
endopl- substances.
asmic

reticulum
(RER):

Processes proteins.

Smooth Involved in the production/p-
endopl- rocessing/storage of
asmic lipids/carbohydrates/ste-
reticulum roids.
(ER):

Site where substances
needed by the cell are
made.

Has no ribosomes.

Golgi body (Golgi apparatus/complex)

Synthesises specific Hormones &
functions: 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 Hydrolytic
mixtures of digestive enzymes
enzymes:

Attached to the vacuole of cells.

Discharged/removed from cell.

Centriole

Involved in making the cilia.

Not found in flowering plants & fungi.

Microtubules

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

Plasmodesmata

Important for transport/communication/sig-
nalling between cells.

Controls movement & created paths
between cells.

The vital role of ATP

Adenosine Triphosphate Provides
is a nucleotide. energy to cells.

It is produced in mitochondria & chloro-
plasts.

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

ATP from respiration = used to transfer
energy in all energy-requiring processes 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	0.5–5µm DIAMETER	UP TO 40µm 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 A protein coat called a 'capsid'
have:

A nucleic acid core (their genomes
are either DNA or RNA, can be
single or double-stranded)