

Nucleus: controls synthesis of proteins, divides in cell division and ensures all daughter cells exact copies, copies instructions in DNA into smaller fragments of RNA. Nucleolus assembles ribosomes for DNA production

RER: transport system, production and packaging of proteins and glycoproteins.

SER: synthesis, storage and transport of lipids and some carbohydrates.

Ribosomes: make enzymes for respiration and responsible for protein synthesis.

Golgi: modify proteins (add carbohydrate), produce large volumes of enzymes, store modify and transport lipids and make lysosomes.

Lysosomes: endocytosis, autolysis and exocytosis.

Mitochondria: aerobic respiration, production of ATP as energy source for cell.

Chloroplasts: trap and absorb light, site of photosynthesis

Vacuole: storage of sugars and amino acids, helps support plant when turgid, contain vegetable and petal pigment.

Cell Wall: support plant, semipermeable - control what enters and leaves, plasmodesmata connect neighbouring cells and allow transport of materials, prevent cells bursting and allow water transport throughout plant.

Transmission Electron Microscope

- need a near vacuum - electrons absorbed or deflected by molecules in the air
- specimen very thin - electron beam pass through
- high energy electron beam needed - may destroy specimen
- whole system in a vacuum - living specimens can't be absorbed
- complex staining process but image not in colour
- image may contain artefacts - not part of natural specimens and a result from preparation
- flat 2D image

Scanning Electron Microscope

- need a near vacuum - electrons absorbed or deflected by molecules in the air
- high energy electron beam needed - may destroy specimen
- whole system in a vacuum - living specimens can't be absorbed
- complex staining process but image not in colour
- image may contain artefacts - not part of natural specimens and a result from preparation
- produces 3D image by computer analysis

Interphase

- Growth 1 - protein synthesis organelles produced and cytoplasm volume increases. Cell carries out usual functions
- Synthesis 1 - DNA replicates, cell only enters if division to follow
- Growth 2 - shorter phase, proteins needed for cell division synthesised (spindle fibres)

Mitosis

- **end of interphase:** DNA replicated not coiled, nuclear membrane and nucleolus present.
- **Prophase:** DNA coils and condenses, chromosomes attached at centromere, nucleolus disappears and centrioles move to opposite ends of cell, microtubules assemble.
- **Metaphase:** nuclear membrane breaks down, microtubules form nuclear spindle, chromosomes move to equator of cell and attach to spindle fibre by centromere.
- **Anaphase:** centromeres divide, spindle fibres contract and pull sister chromatids to opposite ends of cell
- **Telophase:** chromatids separate structures. Nuclear membrane forms around each group of chromosomes, unwind into chromatin, nucleoli form, spindle fibres disappear and centrioles may divide.
- growth and cell replacement
- formation of multicellular organisms from a single cell - must have all genes in each cell
- same proteins produced by all cells - genes that code for them must be present in all
- differentiation of cells into specialised cells - produce many of same proteins, switch on different genes to make specialised proteins

