Transmission electron microscopes have a magnification of x500 000 and a resolution of 0.2nm (electrons have a shorter wavelength than light).

Scanning electron microscopes have a magnification of x100 000 and a resolution of 10nm.

The ultrastructure of eukaryotic cells and the functions of the different cellular components

To include the following cellular components and an outline of their functions: nucleus, nucleolus, nuclear envelope, rough and smooth endoplasmic reticulum (ER), Golgi apparatus, ribosomes, mitochondria, lysosomes, chloroplasts, plasma membrane, centrioles, cell wall, flagella and cilia.

Cellular component	Structure	Function	Relative size
Nucleus	Contains DNA which associates with proteins	Contains genetic material in the	5-10µm
	called histones to form chromatin which coils	form of chromosomes	-
	and condenses to form chromosomes.		
Nucleolus	Within the nucleus and composed of proteins	Produces RNA and ribosomes	1µm
	and RNA.		
Nuclear envelope	Double membrane containing nuclear pores.	Contains nuclear pores, which	0.02-0.04µm
		allow the transport of proteins	
		into the nucleus	
Rough endoplasmic	Consists of a series of flattened, membrane-	Transports proteins synthesised	0.1µm
reticulum (RER)	bound sacs called cisternae and studded with	in the attached ribosomes	
	ribosomes.		
Smooth endoplasmic	Consists of cisternae and no ribosomes.	Produces lipids	0.1µm
reticulum (SER)			
Golgi apparatus	Formed of cisternae and no ribosomes	Modifies, processes and	2.5µm
	(structurally similar to SER)	packages proteins and produces	
		lysosomes	
Ribosomes	Free floating in cytoplasm or attached to	Site of protein synthesis	0.025µm
	RER. Each consists of two subunits.		
Mitochondria	Have a double membrane: inner is highly	Releases energy through	3µm
	folded forming cristae and fluid interior is	aerobic respiration	
	called the matrix. Membrane forming cristae		
	contains enzyme used in aerobic respiration.		
	Contains mitochondrial (mt)DNA.		
Lysosomes	Specialised forms of vesicles (membranous	Special's c vesicles that contain	0.5-1.5µm
	sac consisting of a single membrane with	 Jarolytic enzymes necessary 	
	fluid inside) containing hydrolytic en yn es.	for intercellular digestion. They	
	frolling	The ponsible for breaking	
		down waste material in cells.	
Chloroplasts	Two menoranes separated by fure-filler	Contains chlorophyll for	6µm
	Pace. Inner membrane is point ous with	photosynthesis	
	thylakoids (network of nattened membrane)		
	sacs). A stack of thylakoids is called a		
	granum (plural: grana). Grana contain		
	chiorophyli. Also contain DNA and		
Discussion	ribosomes.	Description the stress end of	0.000
Plasma membrane	Has a prospholipid bilayer (prospholipids	Regulates the movement of	0.006µm
Contriales	With protein channels, glycoproteins etc)	substances in and out of the cell	0.5
Centholes	Composed of microtubules (small tubes of	Helps make spindle libres for	0.5 µm
	the controcome		
Collwell	Made of colluloso	Made of collulate fibras which	1.2 um
		provide strength and supports	ι-z μιιι
Flagella	Made up of a cylinder that contains pinc	Lised for cell movement	2000
	microtubules arranged in a circle Also two		Ζυμπ
	microtubules in a central hundle		
Cilia	Similar structure to flagella but smaller and in	Lised to move fluids	less than 10um
Unid	larger numbers		

Flagella have a tail which is used to move the cell and sometimes as a sensory organelle in detecting chemical changes of the cell's environment.

The sweeping movements of mobile cilia move substances such as mucus across the surface of the cells. Stationary cilia are present in the surface of many cells and are used in sensory organs e.g. nose.

Undulipodia and cilia can move because the microtubules can use energy from ATP.