

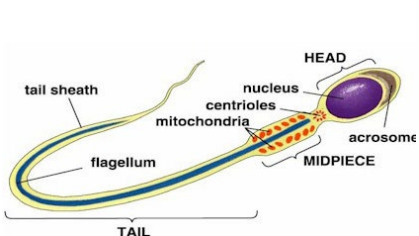
Biology 1: Cell Biology

Section 1: Cell Structure

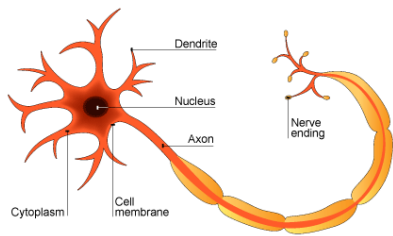
Cell Structure	Function	Eukaryotic		Prokaryotic
		Animal Cells	Plant Cells	Bacterial Cells
1 Nucleus	Contains genetic information (DNA) that controls the functions of the cell.	Y	Y	
2 Cell membrane	Controls what enters and leaves the cell.	Y	Y	Y
3 Cytoplasm	Where many cell activities and chemical reactions within the cell occur.	Y	Y	Y
4 Mitochondria	Releases energy from aerobic respiration .	Y	Y	
5 Ribosome	Synthesises (makes) proteins .	Y	Y	Y
6 Chloroplast	Where photosynthesis occurs.		Y	
7 Permanent vacuole	Used to store water and other chemicals as cell sap .		Y	
8 Cell wall	Strengthens and supports the cell. (Made of cellulose in plants.)		Y	Y
9 DNA loop	A loop of DNA , not enclosed within a nucleus.			Y
10 Plasmid	A small circle of DNA , may contain genes associated with antibiotic resistance.			Y

Section 2: Specialised Cells

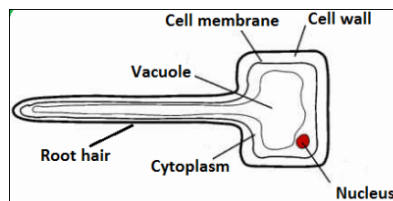
Specialised Cell	How structure relates to function
13 Sperm cell	Acrosome contains enzyme to break into egg; tail to swim; many mitochondria to release energy to swim.
14 Nerve cell	Long to transmit electrical impulses over a distance. Insulated cells
15 Muscle cell	Contain protein fibres that can contract when energy is available, making the cells shorter. Many mitochondria to release energy for this contraction
16 Root hair cell	Long extension to increase surface area for water and mineral uptake; thin cell wall .
17 Xylem cell	Waterproofed cell wall; cells are hollow to allow water to move through.
18 Phloem cell	Some cells have lots of mitochondria for active transport ; some cells have very little cytoplasm for sugars to move through easily. Sieve plates



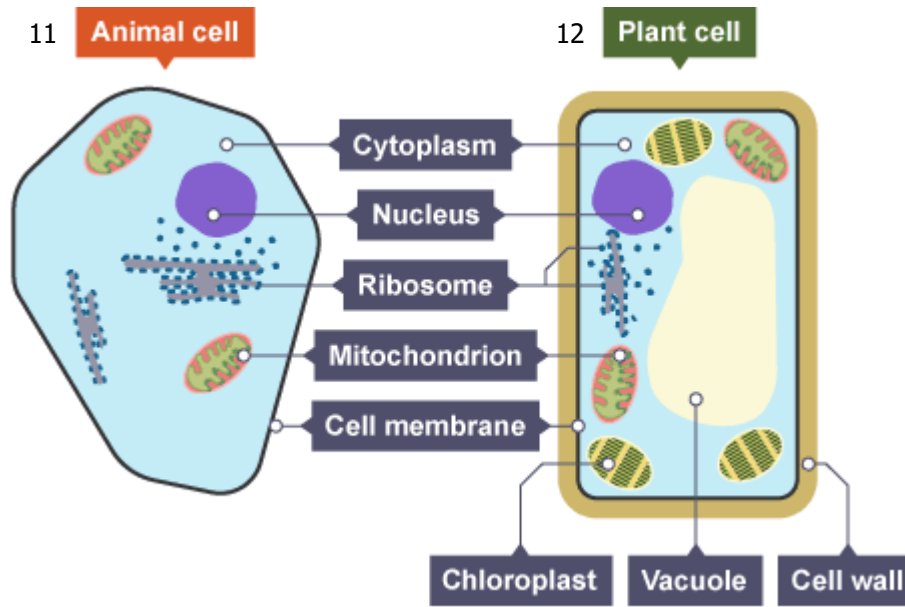
19 – Sperm cell



20 – Nerve cell



21 – Root hair cell



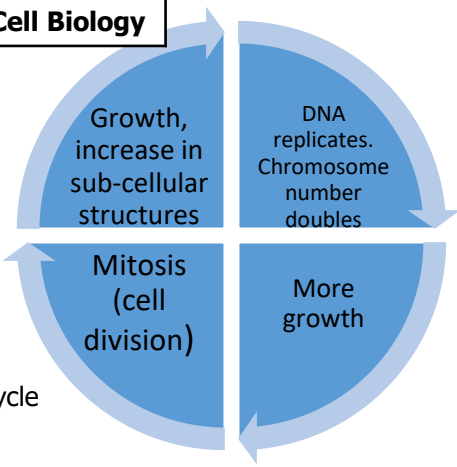
Section 3: Microscopy

22 Real cell size	Real size = Image size / Magnification
23 Magnification	The degree by which an object is enlarged . Magnification = size of image / size of real object
24 Resolution	The ability of a microscope to distinguish detail .
25 Light microscope	Basic microscope with a maximum magnification of 1500x. Low resolution .
26 Electron microscope	Microscope with a much higher magnification (up to 500 000x) and resolving power than a light microscope. This means that it can be used to study cells in much finer detail.

Section 4: Orders of Magnitude

Unit Prefix	Size in metres	Standard Form
27 Centimetre (cm)	0.01m	10^{-2} m
28 Millimetre (mm)	0.001m	10^{-3} m
29 Micrometre (μ m)	0.000001m	10^{-6} m
30 Nanometre (nm)	0.000000001m	10^{-9} m

Biology 1: Cell Biology



31 – Cell cycle

Section 5: Mitosis and the Cell Cycle

32	Number of sub-cellular structures (e.g. ribosomes and mitochondria) increase .
33	Number of chromosomes double .
34	One set of chromosomes is pulled to each end of the cell.
35	The nucleus divides .
36	Cytoplasm and cell membranes divide to form two identical daughter cells

Section 7: Transport Across Membranes

Cell Structure	Definition	Uses
42 Diffusion	Spreading out of the particles (gas/solution) resulting in a net movement from an area of higher concentration to an area of lower concentration .	Oxygen and carbon dioxide in gas exchange (leaves and alveoli). Urea from cells into the blood plasma for excretion in the kidney.
43 Osmosis	The diffusion of water from a dilute solution to a concentrated solution through a partially permeable membrane.	Movement of water into and out of cells.
44 Active Transport	The movement of substances from a more dilute solution to a more concentrated solution (against a concentration gradient). Requires energy from respiration.	Absorption of mineral ions (low concentration) from soil into plant roots . Absorption of sugar molecules from lower concentrations in the gut into the blood which has a higher sugar concentration.

Section 6: Stem Cells

Stem Cell	Properties	Uses
37 Embryonic stem cell	Can divide into most types of cell.	Therapeutic cloning – embryonic stem cells produced with same genes as patient. No rejection .
38 Adult stem cell	Can divide into a limited number of cells e.g. bone marrow stem cells can form various blood cells.	
39 Meristem	Found in plants. Can differentiate (divide) into any type of plant cell.	Clone rare species to prevent extinction . Crops with special features can be cloned

Pros and Cons of Using Stem Cells

40 Pros	Treatment of diseases such as diabetes, dementia and paralysis.
41 Cons	Ethical and religious objections. Can transfer viruses held within cells.

Section 10: Culturing microorganisms

52 Binary fission	How bacteria multiply by simple cell division every 20 mins or so
53 MEAN DIVISION TIME	Used to calculate bacterial populations e.g. If a bacterial cell has a mean division time of 30 mins how many cells will it have produced in 2.5 hours? 2.5 hours x 60 = 150 mins 150 mins ÷ 30 mins = 5 divisions $2^5 = 2 \times 2 \times 2 \times 2 \times 2 = 32$ cells
54 Culture	A growth of microbes either in nutrient broth or on agar jelly
55 Uncontaminated culture	Required for investigating the action of antibiotics/antiseptics
56 Aseptic technique	A method followed by microbiologists to grow uncontaminated cultures: - Sterilise culture medium/petri dishes before use - Pass inoculating loops through a flame to sterile - Petri dish lid secured with tape, store upside down - In schools grow at 25 degrees to prevent growth of pathogens

Section 8: Factors Affecting Diffusion

Factor	Explanation
45 Difference in concentrations (concentration gradient)	The greater the difference in concentrations, the faster the rate of diffusion.
46 Temperature	Particles move more quickly at higher temperatures, so rate of diffusion increases.
47 Surface area of membrane	The greater the surface area the quicker the rate of diffusion.

Section 9: Adaptations of Exchange Surfaces

48	Large surface area
49	Thin membrane to provide a short diffusion path
50	Ventilation (in animals for gas exchange – maintains a concentration gradient)
51	Efficient blood supply (in animals – maintains a concentration gradient)

Section 11: Zones of inhibition

57 Inhibition zone	A clear area/zone where no bacteria grow
58 Use:	Area = πr^2 to calculate in inhibition zone of antiseptic A $\pi \times 10^2$ $= 3.14 \times 100$ $= 314\text{mm}^2$

