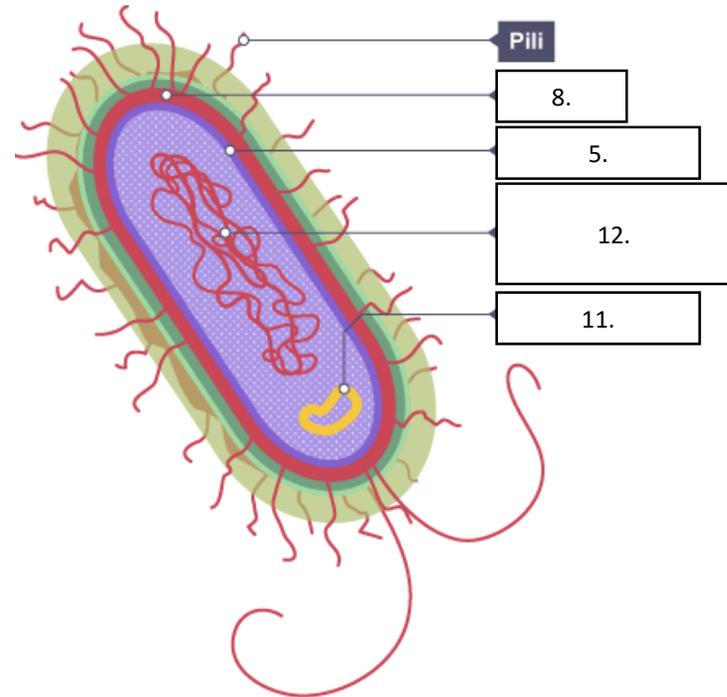
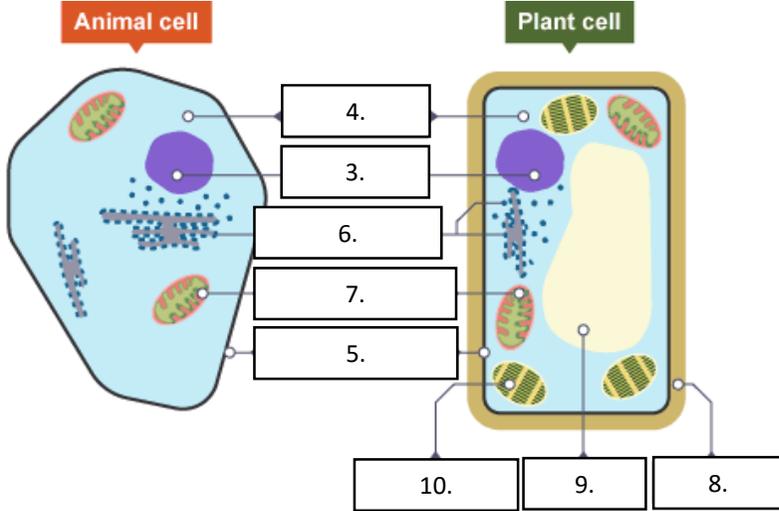


Biology Topic 1: Cell Biology

1. Cell structure



Keywords

1. Eukaryotic	A complex cell with a nucleus (e.g. animal or plant cells).
2. Prokaryotic	A smaller cell without a nucleus (e.g. bacterial cell).
3. Nucleus	Contains genetic material.
4. Cytoplasm	Where a cells chemical reactions happen.
5. Cell membrane	Controls what goes into and out of a cell.
6. Ribosome	Part of a cell where proteins are made.
7. Mitochondria	Where aerobic respiration takes place.
8. Cell wall	Only found in plant cells. Made of cellulose and supports the cell.
9. Vacuole	Only found in plant cells. Contains cell sap.
10. Chloroplasts	Only found in plant cells. Where photosynthesis takes place.
11. Plasmid	Only found in bacterial cells. A small loop of DNA.
12. Genetic material	Long strands of genes not tightly pack in a nucleus.

2. Specialised cells

Keywords

Differentiation	A stem cell turning into a specialised cell
Stem cell	A special type of cell which can turn into other specialised cells
Adult stem cells	Can only produce certain types of cell -found in bone marrow
Embryonic stem cells	Can produce all types of cells - controversial
Meristems	Where plant stem cells are found
Sperm cells	Take male DNA to the egg <ul style="list-style-type: none"> • Tail to help it swim • Lots of mitochondria for energy
Nerve cells	Carry electrical signals around the body <ul style="list-style-type: none"> • Long to cover long distances • Branches to connect to other cells
Muscle Cells	Muscle cells contract <ul style="list-style-type: none"> • Long so have space to contract • Lots of mitochondria for energy
Root hair cells	Root hair cells absorb water and minerals <ul style="list-style-type: none"> • Long hairs • Big surface area for absorption
Phloem Cells	Phloem cells transport sugars (plants) <ul style="list-style-type: none"> • Long tube joined end to end
Xylem cells	Xylem cells transport water (plants) <ul style="list-style-type: none"> • Long tubes joined end to end • Hollow so water can flow through

3. Comparing types of microscope

Type of microscope	Advantages	Disadvantages
Light microscope	<ol style="list-style-type: none"> Cheaper Can see colours Can see live specimen 	<ol style="list-style-type: none"> Lower magnification
Electron microscope	<ol style="list-style-type: none"> Expensive Higher magnification (x1000 more) 	<ol style="list-style-type: none"> Can only see dead specimen No colour

4. Calculating magnification

$$\text{magnification} = \frac{\text{size of image}}{\text{actual size of object}}$$

$$\text{actual size of object} = \frac{\text{size of image}}{\text{magnification}}$$

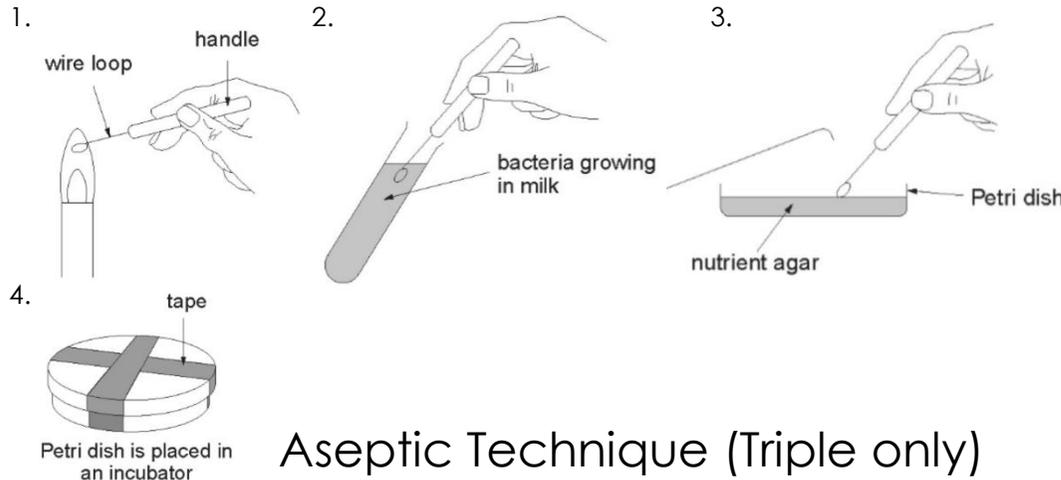


	(mm)	(μm)	(nm)
2mm	2	2000 (2×10^3)	2000000 (2×10^6)
130 μm	0.13	130	130000 (1.3×10^5)
0.032m	32	32000 (3.2×10^4)	32000000 (3.2×10^7)
7.25 μm	0.00725	7.25	7250 (7.25×10^3)

Conversion factors: mm to μm is $\times 1000$; μm to nm is $\times 1000$. Reverse conversions are $\div 1000$.

5. Culturing micro-organisms TRIPLE ONLY

Keywords	
Binary fission	"Splitting in two" how bacteria divide every 20 mins
Agar gel	A gel of nutrients bacteria can grow on
Nutrient broth	A liquid bacteria grow well in
Colony	A group of bacteria making a small circular shape
Inoculating loop	A metal loop use to transfer microorganisms
Petri dish	A small plastic dish used for growing microorganisms
Aseptic	Free from bacteria and viruses
Incubator	Device kept at constant temperature to help the microorganisms grow



Aseptic Technique (Triple only)

Aseptic technique

prep	All agar plates and broth must be sterilised before use
1.	The inoculating loop must be sterilised by passing through a flame
2.	Sample to be cultured is taken using the loop
3.	Sample spread on agar in petri dish
4.	Dish sealed shut with tape and incubated at 25° C

6. Cell division	
Keywords	
Chromosomes	Long strands of DNA containing genes. Found in 23 pairs in a human
Cell cycle	The process the cell goes through to divide
Mitosis	A type of cell division that creates 2 identical daughter cells
Therapeutic cloning	Using an embryo create to have the same genes as the patient. Controversial

8. Transport in cells		
Keywords	Definition	Examples
Diffusion	The passive movement of a substance from an areas of high concentration to an area of low concentration	<ul style="list-style-type: none"> Oxygen and carbon dioxide in the lungs Perfume in a room
Osmosis	The movement of water molecules across a partially permeable membrane from a less concentrated solution to a more concentrated solution.	<ul style="list-style-type: none"> Water uptake in plants Water absorption in the intestine
Active transport	Movement of a substance from a lower concentration to a higher concentration, against the concentration gradient. Uses energy.	<ul style="list-style-type: none"> Mineral absorption by roots Glucose absorption by the intestine
Surface area to volume ratio	The surface area divided by the volume expressed as a ratio	All high <ul style="list-style-type: none"> Unicellular organisms Alveoli in the lungs Villi in the intestines

7. Stages of mitosis	
1.	The cell grows and copies all its DNA, mitochondria and ribosomes
2.	The nucleus dissolves and the copied chromosomes pair up
3.	The chromosomes are pulled to opposite sides of the cell
4.	The cytoplasm and cell membrane divides making two identical cells

The diagram illustrates the four stages of mitosis in a vertical sequence. Stage 1 shows a single cell with a nucleus and chromosomes. Stage 2 shows the nucleus breaking down and chromosomes condensing. Stage 3 shows sister chromatids separating and moving to opposite poles. Stage 4 shows two new daughter cells forming as the cell membrane and cytoplasm divide.

9. Factors that effect the rate of diffusion/osmosis	
Speed up	Slow down
High concentration gradient	Low concentration gradient
High temperature	Low temperature
High surface area of membrane	Low surface area of membrane