

Science

Draw and label a typical plant cell.

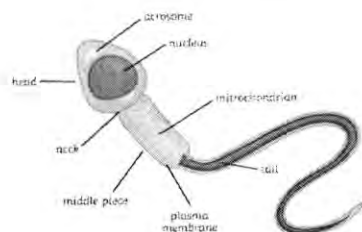
Which organelle is...

- the site of aerobic respiration?

- the site of protein synthesis?

- the site of photosynthesis?

Sperm cells are specialised cells. Explain how the acrosome helps the sperm cell to carry out its function.



Draw and label the parts of a typical bacterial cell.

Why do cells undergo mitosis?

What has to happen before the cell divides?

What happens to the cell during mitosis?

1. _____
2. _____
3. _____

What are 'embryonic' stem cells?

Name two medical conditions that could be treated with embryonic stem cells in the future.

1. _____
2. _____

Diffusion is: (Tick the correct box.)

a. The movement of water particles from a high water concentration to a lower water concentration across a partially permeable membrane. ☐

b. The spreading out of the particles of any gas or liquid from an area of high concentration to an area of lower concentration. ☐

c. The movement of particles from a low concentration to a higher concentration. ☐

Light microscopes have objective lenses.

What is the purpose of the objective lens?

What is osmosis?

Name three substances that are transported into, or out of, animal cells by diffusion.

1. _____
2. _____
3. _____

Name the tubes that transport the food around the plant.

How many chromosomes does...

- a human skin cell contain?

- a human gamete contain?

Name the tubes that transport water up the stem of a plant.

Draw and label a typical animal cell.

Which organelle is...

- the site of aerobic respiration?

- controls the movement of substances in and out of the cell?

- contains the genetic information?

Root hair cells are specialised cells. Describe how the root hair cell is adapted to carry out its function.

Describe how active transport is used by the following:

1. plants

2. animals

Describe three ways that exchange surfaces are adapted to their function.

1. _____
2. _____
3. _____

Where in the body are adult stem cells found and how do they differ from embryonic stem cells?

Why do some people object to embryonic stem cell research?

How do prokaryotic cells differ from eukaryotic cells?

Write each of the following numbers in standard form.

2500 _____

0.003 _____

4 200 000 _____

0.00000006 _____

Which has a bigger surface area to volume ratio, an elephant or a mouse?

Plants can be cloned from meristem cells. Give two advantages of cloning plants.

1. _____
2. _____

The unit centimetres is written as cm. What do each of the following units represent?

mm: _____

µm: _____

nm: _____

pm: _____

The width of a cell is 0.025mm; under the microscope it is 10mm.

What was the magnification?

Describe two ways in which active transport is different to diffusion.

1. _____
2. _____

What is the equation for calculating the magnification of an image?

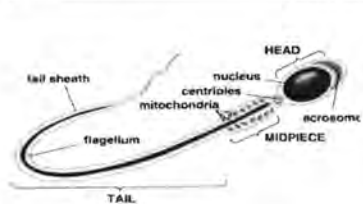
Biology 1: Cell Biology

Section 1: Cell Structure

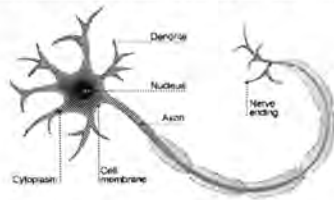
Cell Structure	Function	Eukaryotic		Prokaryotic Bacterial Cells
		Animal Cells	Plant Cells	
1 Nucleus	Contains genetic information that controls the functions of the cell.	Y	Y	
2 Cell membrane	Controls what enters and leaves the cell.	Y	Y	Y
3 Cytoplasm	Where many cell activities and chemical reactions within the cell occur.	Y	Y	Y
4 Mitochondria	Provides 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

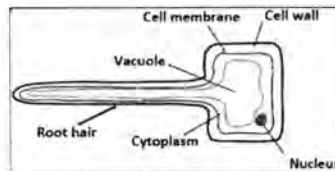
Specialised Cell	How structure relates to function
13 Sperm cell	Acrosome contains enzyme to break into egg; tail to swim; many mitochondria to provide energy to swim.
14 Nerve cell	Long to transmit electrical impulses over a distance.
15 Muscle cell	Contain protein fibres that can contract when energy is available, making the cells shorter.
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.



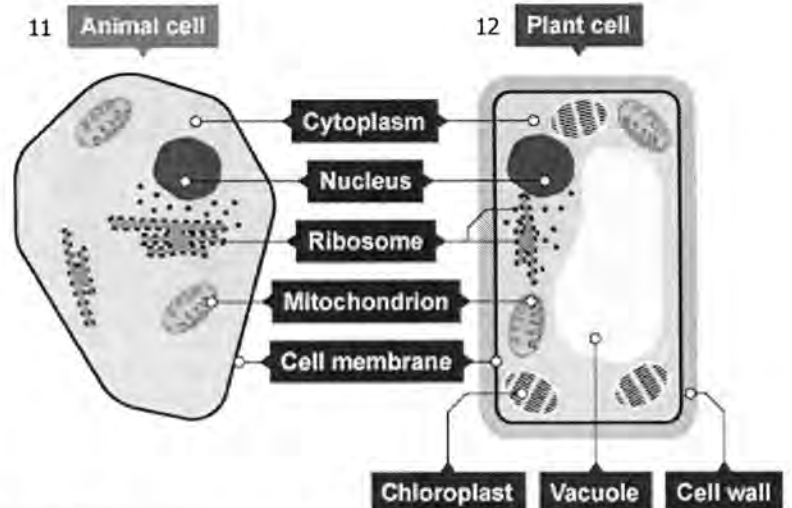
19 – Sperm cell



20 – Nerve cell



21 – Root hair cell



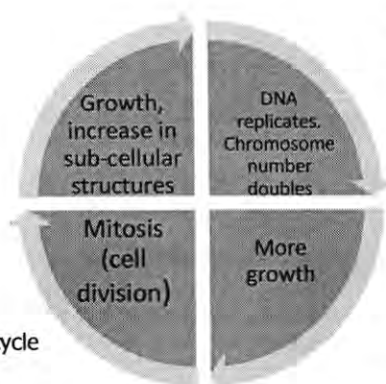
Section 3: Microscopy

22 Magnification	The degree by which an object is enlarged . Magnification = $\frac{\text{size of image}}{\text{size of real object}}$
23 Resolution	The ability of a microscope to distinguish detail .
24 Light microscope	Basic microscope with a maximum magnification of 1500x. Low resolution .
25 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
26 Centimetre (cm)	0.01m	10^{-2}m
27 Millimetre (mm)	0.001m	10^{-3}m
28 Micrometre (μm)	0.000001m	10^{-6}m
29 Nanometre (nm)	0.000000001m	10^{-9}m

30 – Cell cycle



Section 5: Mitosis and the Cell Cycle	
31	Number of sub-cellular structures (e.g. ribosomes and mitochondria) increase .
32	Number of chromosomes double .
33	One set of chromosomes is pulled to each end of the cell.
34	The nucleus divides .
35	Cytoplasm and cell membranes divide to form two identical cells

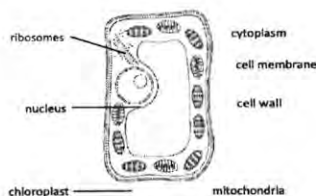
Section 6: Stem Cells		
Stem Cell	Properties	Uses
36 Embryonic stem cell	Can divide into most types of cell.	Therapeutic cloning – embryonic stem cells produced with same genes as patient. No rejection .
37 Adult stem cell	Can divide into a limited number of cells e.g. bone marrow stem cells can form various blood cells.	
38 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 clones
Pros and Cons of Using Stem Cells		
39 Pros	Treatment of diseases such as diabetes, dementia and paralysis.	
40 Cons	Ethical and religious objections. Can transfer viruses held within cells.	

Section 7: Transport Across Membranes		
Cell Structure	Definition	Uses
41 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.
42 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.
43 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 8: Factors Affecting Diffusion	
Factor	Explanation
44 Difference in concentrations (concentration gradient)	The greater the difference in concentrations, the faster the rate of diffusion.
45 Temperature	Particles move more quickly at higher temperatures, so rate of diffusion increases.
46 Surface area of membrane	The greater the surface area the quicker the rate of diffusion.

Section 9: Adaptations of Exchange Surfaces	
47	Large surface area
48	Thin membrane to provide a short diffusion path
49	Ventilation (in animals for gas exchange – maintains a concentration gradient)
50	Efficient blood supply (in animals – maintains a concentration gradient)

Draw and label a typical plant cell.

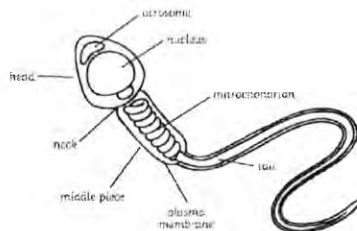


Which organelle is...

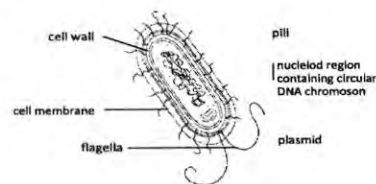
- the site of aerobic respiration?
mitochondria
- the site of protein synthesis?
ribosomes
- the site of photosynthesis?
chloroplasts

Sperm cells are specialised cells. Explain how the acrosome helps the sperm cell to carry out its function.

The acrosome contains enzymes that digest through the egg cell membrane.



Draw and label the parts of a typical bacterial cell.



Why do cells undergo mitosis?

To produce new cells for growth and repair.

What has to happen before the cell divides?

The cell grows and increases the amount of organelles, and it replicates its DNA.

What happens to the cell during mitosis?

- Chromosomes line up in the centre of the cell and copies are pulled apart by spindle fibres to opposite ends of the cell.
- Nuclear membranes form around the chromosomes to make two nuclei.
- Finally, the cell splits into two identical 'daughter' cells.

What are 'embryonic' stem cells?

Undifferentiated cells found in the early embryo.

Name two medical conditions that could be treated with embryonic stem cells in the future.

- diabetes
- spinal injuries/paralysis

Diffusion is: (Tick the correct box.)

- a. The movement of water particles from a high water concentration to a lower water concentration across a partially permeable membrane. ☐
- b. The spreading out of the particles of any gas or liquid from an area of high concentration to an area of lower concentration. ☒
- c. The movement of particles from a low concentration to a higher concentration. ☐

Light microscopes have objective lenses.

What is the purpose of the objective lens?

To form and magnify an image of the specimen.

What is osmosis?

The movement of water molecules from an area of high water concentration to an area of lower water concentration across a partially permeable membrane.

Name three substances that are transported into, or out of, animal cells by diffusion.

- oxygen
- carbon dioxide
- amino acids

Name the tubes that transport the food around the plant.

phloem

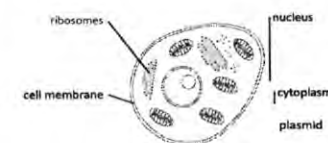
How many chromosomes does...

- a human skin cell contain?
46/23 pairs (diploid)
- a human gamete contain?
23 single (haploid)

Name the tubes that transport water up the stem of a plant.

xylem

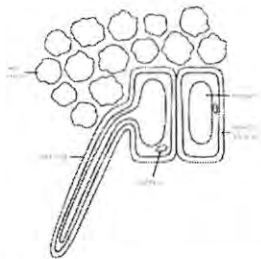
Draw and label a typical animal cell.



Which organelle is...

- the site of aerobic respiration?
mitochondria
- controls the movement of substances in and out of the cell?
cell membrane
- contains the genetic information?
nucleus

Root hair cells are specialised cells. Describe how the root hair cell is adapted to carry out its function.
It has a large surface area for the rapid absorption of water and mineral ions from the soil.



Describe how active transport is used by the following:

1. plants
To obtain mineral ions from the soil.
2. animals
To absorb nutrients (e.g. glucose) from the small intestine when they are at low concentrations.

Describe three ways that exchange surfaces are adapted to their function.

1. large surface area
2. thin walls
3. moist/good blood supply (animals)

Where in the body are adult stem cells found and how do they differ from embryonic stem cells?

Found in the bone marrow.

They can only turn into certain cell types, such as blood cells.

Why do some people object to embryonic stem cell research?

They believe that all embryos have the potential to become a human being, so should not be used for experimentation.

How do prokaryotic cells differ from eukaryotic cells?

Bacterial cells are much smaller. They don't have a nucleus, mitochondria or chloroplasts. They do have plasmids with extra DNA.

Write each of the following numbers in standard form.

2500 2.5×10^3

0.003 3×10^{-3}

4 200 000 4.2×10^6

0.00000006 6×10^{-8}

Which has a bigger surface area to volume ratio, an elephant or a mouse?

mouse

Plants can be cloned from meristem cells. Give two advantages of cloning plants.

1. Farmers can produce clones of a desired plant quickly and cheaply.
2. Saves rare species from extinction.

Describe two ways in which active transport is different to diffusion.

1. Moves against a concentration gradient (low to high).
2. requires energy

The unit centimetres is written as cm. What do each of the following units represent?

mm: millimetres

μ m:
micrometres

nm: nanometres

pm: picometres

What is the equation for calculating the magnification of an image?

$$\text{magnification} = \frac{\text{image size}}{\text{real size}}$$

The width of a cell is 0.025mm; under the microscope it is 10mm

What was the magnification?

$$\text{magnification} = 10 \div 0.025 = 400$$