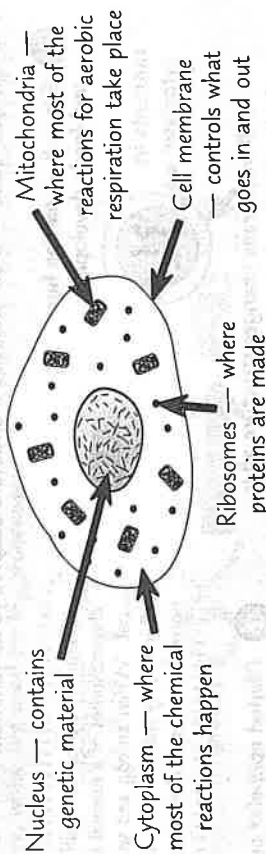


# Cells

## Eukaryotic Cells

### ANIMAL CELL

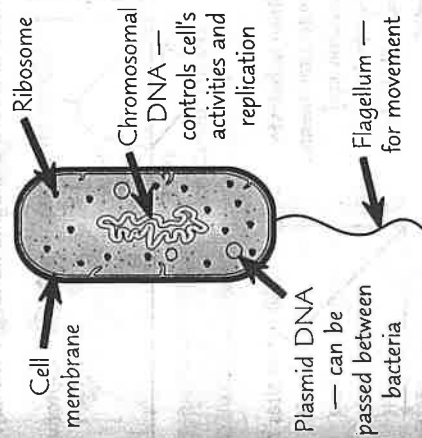


### PLANT CELL



## Prokaryotic Cells

### BACTERIAL CELL



## Microscopy

Electron microscopes were invented later than light microscopes.

They have a higher magnification and resolution than light microscopes.


This means they let us see smaller things in more detail, so we can understand subcellular structures better now.

# Specialised Cells and Enzymes

## Three Specialised Cells

**SPECIALISED CELL** — a cell that has a structure adapted to its function.

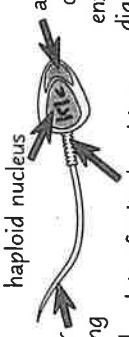
- 1 Egg cell** — carries female DNA and feeds developing embryo



nutrients in cytoplasm

haploid nucleus

cell membrane changes structure after fertilisation to prevent more sperm entering
- 2 Sperm cell** — transports male DNA to egg

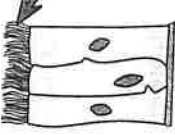


tail for swimming to egg

lots of mitochondria to provide energy for swimming

haploid nucleus

acrosome contains enzymes for digesting egg membrane
- 3 Ciliated epithelial cell** — moves substances along internal surfaces (e.g. mucus in airways)



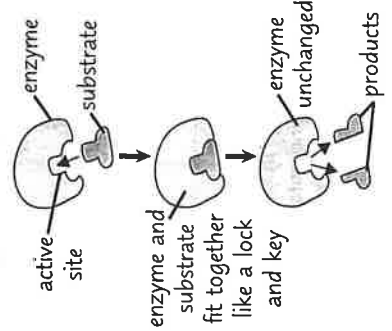
cilia 'beat' to move substances

Haploid nuclei contain half the chromosomes of a normal body cell. When an egg and sperm cell join, they make a cell with the normal number of chromosomes.

## Enzymes

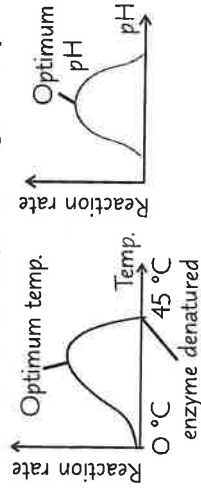
Enzymes catalyse (speed up) chemical reactions.

Each enzyme only catalyses one specific reaction because of the unique shape of its active site.

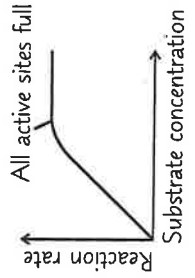


## Factors Affecting Enzyme Activity

High temperatures and high and low pHs denature enzymes (change the shape of the active site so the enzyme no longer works).



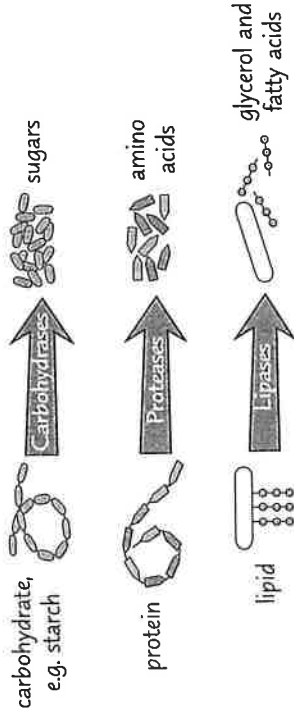
More substrate molecules means enzyme and substrate are more likely to meet.



## Enzymes in Organisms

Enzymes break big molecules into smaller ones, which are used for life processes.

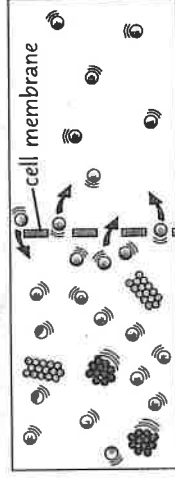
Enzymes also catalyse synthesis reactions — building big molecules from smaller ones.



## Diffusion

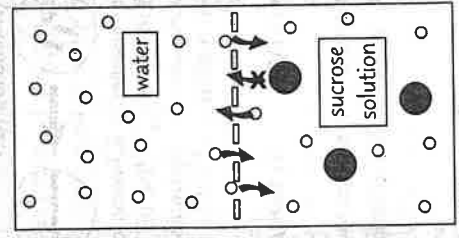
**DIFFUSION** — the net (overall) movement of particles from an area of higher concentration to an area of lower concentration.

Only very small molecules (e.g. glucose) can diffuse across cell membranes.



## Osmosis

**OSMOSIS** — the net movement of water molecules across a partially permeable membrane from a region of higher water concentration to a region of lower water concentration.



## Active Transport

**ACTIVE TRANSPORT** — the movement of particles against a concentration gradient. It requires energy from respiration.

Transport this info into your head, even if it's going against your concentration gradient.

# Enzymes and Transport in Cells

# The Cell Cycle

## Chromosomes and the Cell Cycle

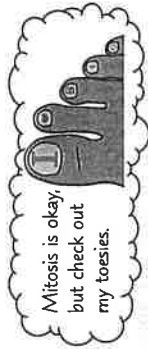
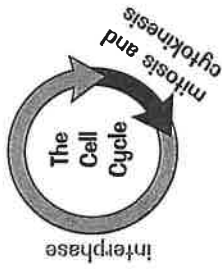
**CHROMOSOMES** — coiled up lengths of DNA molecules, which carry genes. They're found in the nucleus and they're normally in pairs in body cells.

**CELL CYCLE** — a series of stages in which cells divide to produce new cells.

When a cell is not dividing, it is in interphase. Before dividing, it does three things:

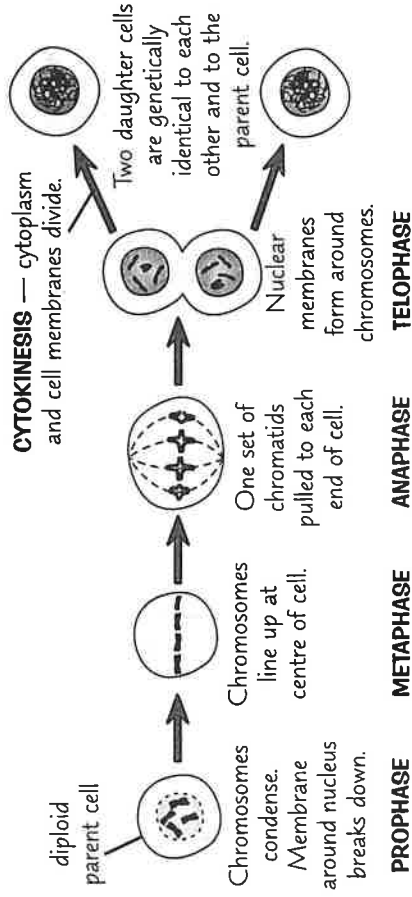
- 1 Grows in size.
- 2 Increases the amount of subcellular structures, e.g. mitochondria and ribosomes.
- 3 Duplicates its DNA.

Cells with two copies of each chromosome are 'diploid'.



## Mitosis

**MITOSIS** — the stage of the cell cycle when the cell divides.



Mitosis allows organisms to grow or replace cells that have been damaged. Some organisms use mitosis in asexual reproduction.

- If there's a change in one of the genes that controls cell division,
- the cell may start dividing uncontrollably. This can result in cancer.

# Growth and Stem Cells

## Three Methods of Growth

Plants and animals grow due to:

1 **CELL DIFFERENTIATION** — the process by which a cell changes to become specialised for its job.



2 **CELL DIVISION (mitosis)**



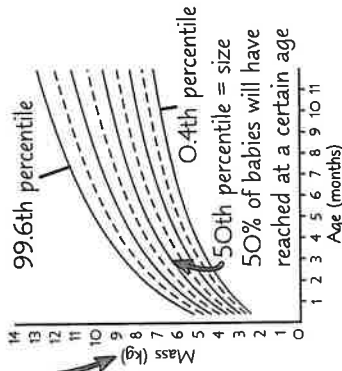
3 **CELL ELONGATION (plants only)**



## Percentile Charts

Percentile charts are used to monitor a child's growth.

Mass, length and head circumference are monitored over time.



Doctors may be concerned if, e.g. a baby's size was below the 0.4th percentile or changed by more than two percentile lines over time.

## Stem Cells

**STEM CELLS** — undifferentiated cells that can divide to produce lots more stem cells, and can differentiate into many other types of cell.

Stem cells can be grown in a lab and made to differentiate. The specialised cells can be transferred into people and so can be used in medicine:

Stem cells from...	Can become...
adult animal	many kinds of cell, e.g. blood cells
human embryo	any kind of human cell
plant meristem	any kind of plant cell

Potential Benefits	Potential Risks
<ul style="list-style-type: none"> <li>• Could replace cells that have been damaged by disease or injury, e.g. new cardiac muscle cells could treat heart disease.</li> </ul>	<ul style="list-style-type: none"> <li>• Tumour development.</li> <li>• Disease transmission (if donor stem cells are infected with a virus).</li> <li>• Rejection by patient's immune system.</li> </ul>