

### CELL STRUCTURE

**Cytoplasm:** Living material that makes up a cell

between solid-liquid (texture)

made of many structures, can be seen in an electron microscope

structures -> **organelles**

**Nucleus:** largest organelle

**Contains:** **chromosomes** (carry genes)

important group of proteins:**enzymes** (control the chemical reactions in the cytoplasm)

**Cell membrane:** thin layer

forms a boundary between cytoplasm-outside

chemicals can pass into and out -> membrane is **partially permeable**

can go further & *control* the movement-**selectively permeable**

**Mitochondrion:** need a lot of energy (muscle/nerve cells)

carry out reactions of **respiration**

- The DNA stays in the nucleus, proteins are carried to the cytoplasm, they are put together in **ribosomes**.

### PLANT CELLS

**Cell wall:** layer of non-living material outside the cell membrane

made of **cellulose** (carbohydrate) -> helps the cell to keep its shape

**Vacuole:** large central space surrounded by a membrane

permanent feature of the cell

filled w/ **cell sap** (store of dissolved sugars, mineral ions and other solutes)

**Chloroplast:** absorbs light energy to make food (photosynthesis)

contains **chlorophyll** (green pigment)

### ENZYMES: CONTROLLING REACTIONS IN THE CELL

- Chemical reactions are controlled by **enzymes**

- Enzymes are biological **catalysts**

- Catalysts: chemical which speeds up a reaction w/out being used up itself

- It takes part in the reaction, but then is unchanged and free to catalyse more

- Cells contain many different enzymes, each catalysing different reactions

genes -> proteins (enzymes) -> catalyse reactions

### KEY POINT

**Metabolic reactions:** chemical reactions in a cell

**Metabolism:** sum of all the metabolic reactions

**Enzymes' function:** catalyse these reactions

### KEY POINT 2

In the intestine enzymes are covered onto the food to break it down -> *extracellular enzymes* (outside cells)

However, most enzymes stay inside cells and do their function there -> *intracellular*

### KEY POINT 3

**Secretion** is the release of fluid/substances from a cell/tissue

### Why are enzymes important?

- The temperatures inside the organisms are low

e.g.-> human 37°C, w/out catalysts the reactions would be too slow to allow life to go on

- Reactions only take place quickly enough when enzymes are there to speed them up

### ENZYMES 2

**Substrate:** molecule that an enzyme acts on

**Active site:** small area on an enzyme's surface

**Lock and key** the substrate fits into the active site of the enzyme like a

**model:** key fitting into a lock



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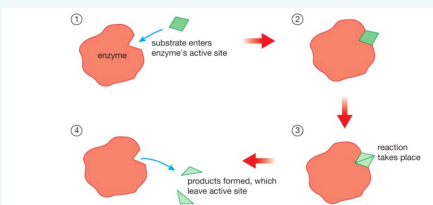
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### ENZYMES 2 (cont)

a substrate will only fit into the active site of a particular enzyme

- 1- the substrate attaches to the active site of the enzyme
- 2- the reaction takes place and products are formed
- 3- substrate joins up w/ the active site -> lowers the energy needed for the reaction to start, allowing the products to be formed easily

### enzyme catalysing



### TEMPERATURE

As the enzyme is heated up to the **optimum** temperature, the rise in temperature increases the rate of reaction.

↑ temperatures give the enzyme's molecules & substrate + kinetic energy -> they collide more often

+ collisions -> reaction will take place more frequently

### KEY POINT

"Optimum" temperature means the "best" temperature (temperature at which the reaction takes place most rapidly)

### TEMPERATURE 2

However, above the optimum, temperature has another effect

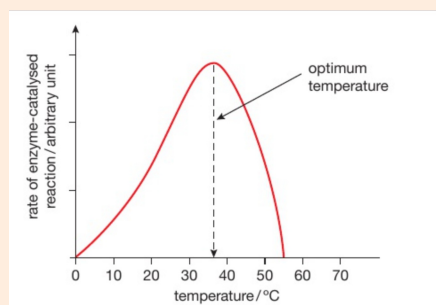
Enzymes are made of proteins -> proteins are broken down by heat

**Denatured:** ↑ 40°C, heat destroys the enzyme

Denaturing changes the shape of the active site so the substrate won't fit into it

Denaturing's permanent- enzyme molecules won't catalyse the reaction

### effect of t on the action of an enzyme



### pH

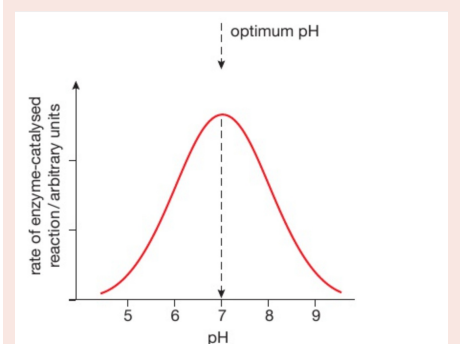
pH's inside cells is neutral (pH7) & most enzymes have evolved to work best at this pH.

at extremes of pH either side of neutral, the enzyme activity decreases (photo)

**optimum pH:** pH at which the enzyme works best

either side of the optimum, the pH affects the structure of the enzyme molecule & changes the shape of its active site -> substrate won't fit into it so well

### pH figure



### HOW THE CELL GETS ITS ENERGY

how does it get energy? ↓

**respiration:** break down food molecules to release the stored chemical energy that they contain

oxygen: oxidise food

carbon dioxide & water: are released as waste products

**glucose** (sugar): main food oxidised, contains stored chemical energy that can be converted into other forms of energy

respiration releases **ATP**, can be used in ↓

- contraction of muscle cells (movement)

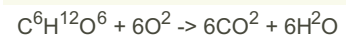
- active transport of molecules and ions

- building large molecules (proteins)

- cell division

reaction for respiration ↓ ↓

glucose + oxygen -> carbon dioxide + water (+energy)



↳ **aerobic respiration**



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