

## Important Classes of Biological Reactions

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Chemical reactions are processes in which the atoms making up molecules are rearranged. This can occur in 4 different ways.

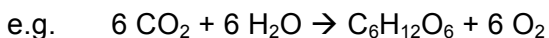
### 1. Oxidation/Reduction (Redox) Reactions

- i) Oxidation involves the loss of electrons by one reactant.  
LEO – loss of electrons is oxidation
- ii) Reduction involves the gain of electrons by another reactant.  
GER – gain of electrons is reduction



“LEO the Lion  
says GER”

In biological systems redox reactions involve the removal of H atoms from one molecule and the addition of H atoms to another molecule (recall  $p^+ + e^- = H$  atom)

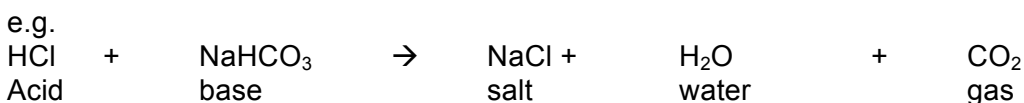


In photosynthesis H atoms are transferred from water to carbon dioxide, reducing carbon dioxide to form glucose

### 2. Neutralization (Acid-Base) Reactions:

Involves an acid combining with a base to produce a salt and water. Recall:

- i) Acids release  $H^+$  ions/are proton donors
- ii) Bases release  $OH^-$  ions/are proton acceptors



In humans, stomach acid is neutralized by sodium bicarbonate in pancreatic juice.

### 3. Condensation reactions

Small molecules (monomers) are joined together to form a larger molecule (macro-molecule).

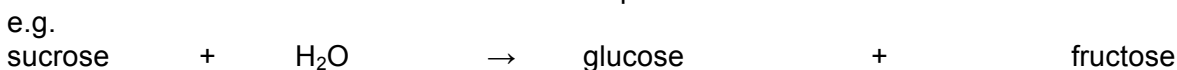
Condensation reactions are polymerization reactions in which many small molecules (monomers) are linked together to form a long chain or larger molecule called a polymer.



- A water molecule **is released** during each condensation reaction.
- Energy is required for the reaction to occur and is stored within chemical bonds

### 4. Hydrolysis reactions:

Reactions where macromolecules are broken apart into smaller molecules.



- A water molecule **is added** during each hydrolysis reaction.
- Energy is released