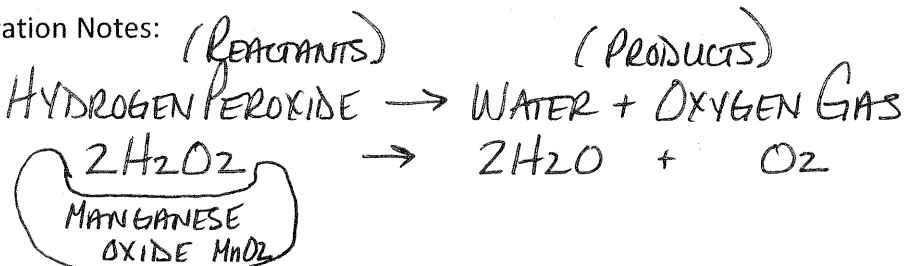


Chemical Reaction: Enzymes and the Reactions of Life Photosynthesis and Cellular Respiration

Demonstration Notes:



*ALL H & O THAT GOES IN MUST COME OUT.

↑ ACTS AS AN ENZYME TO SPEED UP REACTION

Notes p. 64-67

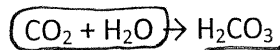
Changing Matter

1. The ability to move or change matter is called ENERGY.
2. Energy can exist in what form (list 5)?
 - LIGHT
 - HEAT
 - CHEMICAL ENERGY
 - MECHANICAL ENERGY
 - ELECTRICAL ENERGY
3. A physical change occurs when only the FORM or SHAPE of matter changes.
4. Give an example of a physical change. POURING SUGAR TO ICE TEA; SMASHING A GRAPE
5. A chemical change occurs when a substance changes into a DIFFERENT substance; the IDENTITY of the matter changes.
6. Give an example of a chemical change. WOOD + O₂ + HEAT → CO₂ + H₂O
7. Describe the Law of Conservation of Mass. MATTER IS NOT CREATED OR DESTROYED.
TOTAL MASS BEFORE = TOTAL MASS AFTER
8. Describe the Law of Conservation of Energy. ENERGY MAY CHANGE FORM BUT
TOTAL ENERGY BEFORE = TOTAL ENERGY AFTER
9. Living things use different chemical reactions to GET THE ENERGY THEY NEED FOR
LIFE PROCESSES.

Chemical Reactions

1. During a chemical reaction, bonds between ATOMS are broken, and new ones are formed.
2. A REACTANT is the substance that is changed in a chemical reaction.
3. A PRODUCT is the new substance formed.
4. The arrow means CHANGE TO OR FORMS (YIELDS).

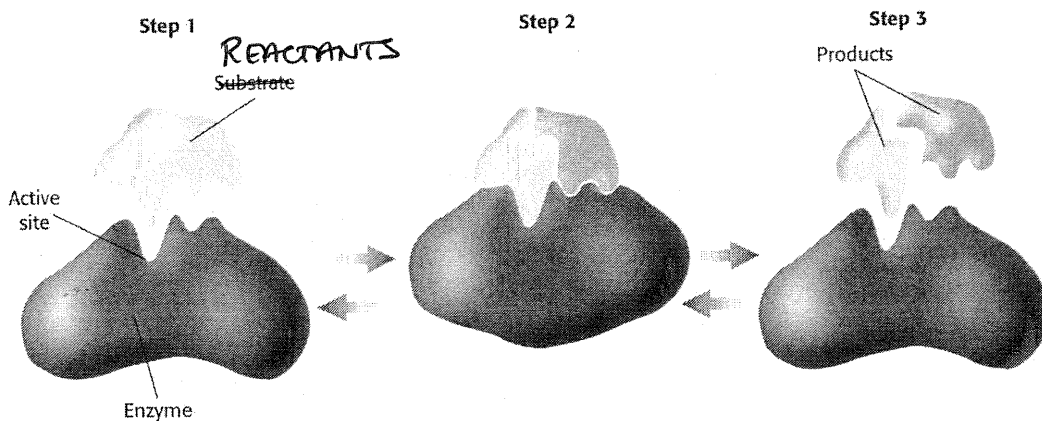
5. In the chemical reaction below, circle the reactants, and underline the products.



6. The minimum kinetic energy needed by colliding particles to start a chemical reaction is called ACTIVATION ENERGY.
7. Chemical reactions can occur only when the ACTIVATION ENERGY is available and the correct atoms are ALIGNED.

Biological Reactions

1. Use the glossary in the book to define Homeostasis. THE MAINTENANCE OF A CONSTANT INTERNAL STATE IN A CHANGING ENVIRONMENT
2. An ENZYME is a molecule that increases the speed of BIOCHEMICAL reactions.
3. Enzymes help organisms maintain HOMEOSTASIS.
4. Use the figure below to describe what happens in each step of enzyme action.



5. Many enzymes are PROTEINS. Changes in TEMPERATURE and pH can change the shape of the protein's shape.

Counting Atoms

The formula for a compound indicates the elements that make up the compound and the number of atoms of each element present in the compound. These numbers of atoms are indicated by the use of small numbers called subscripts. Sometimes groups of atoms act as a single atom. Such a group of atoms is called a radical. If a radical is used in a formula more than once, the radical is put in parentheses and the subscript appears outside the parentheses. When a subscript appears outside the parentheses, it indicates that all the elements inside the parentheses should be multiplied by that subscript. For example, the formula $\text{Fe}(\text{OH})_3$ indicates the combination of one atom of iron, Fe, three atoms of oxygen, O, and three atoms of hydrogen, H.

In the following examples, list each element in the compound and the number of atoms of each element present. The first example has been done for you. You may already be familiar with some of the compounds.

Name	Use	Formula	Atoms in Formula
Calcium carbonate	Limestone	CaCO_3	Ca = calcium 1 C = carbon 1 O = oxygen 3
Aspirin	Pain reliever	$\text{C}_9\text{H}_8\text{O}_4$	9 CARBON 8 HYDROGEN 4 OXYGEN
Magnesium hydroxide	Found in milk of magnesia	$\text{Mg}(\text{OH})_2$	1 MAGNESIUM 2 OXYGEN 2 HYDROGEN
Paradichlorobenzene	Moth crystals	$\text{C}_6\text{H}_4\text{Cl}_2$	6 CARBON 4 HYDROGEN 2 CHLORINE
Acetic acid	Found in vinegar	$\text{C}_2\text{H}_4\text{O}_2$	2 CARBON 4 HYDROGEN 2 OXYGEN
Trinitrotoluene (TNT)	Explosive	$\text{C}_7\text{H}_5(\text{NO}_2)_3$	7 CARBON 5 HYDROGEN 3 NITROGEN 6 OXYGEN

Name	Use	Formula	Atoms in Formula
Calcium dihydrogen phosphate	Fertilizer	$\text{Ca}(\text{H}_2\text{PO}_4)_2$	1 CALCIUM 4 HYDROGEN 2 PHOSPHOROUS 8 OXYGEN
Pyrite	Fool's gold	FeS_2	1 IRON 2 SULFUR
Sucrose	Sugar	$\text{C}_{12}\text{H}_{22}\text{O}_{11}$	12 CARBON 22 HYDROGEN 11 OXYGEN
Heptane	One of several components in gasoline	C_7H_{14}	7 CARBON 14 HYDROGEN
Sulfuric acid	Used in car batteries	H_2SO_4	2 HYDROGEN 1 SULFUR 4 OXYGEN
Cellulose	Found in wood products such as your pencil and paper	$\text{C}_6\text{H}_7\text{O}_2(\text{OH})_3$	6 CARBON 10 HYDROGEN 5 OXYGEN
Asbestos	Insulator	$\text{H}_4\text{Mg}_3\text{Si}_2\text{O}_9$	4 HYDROGEN 3 MAGNESIUM 2 SILICON 9 OXYGEN
Dichlorodiphenyl-trichloroethane (DDT)	Banned pesticide	$\text{C}_{14}\text{H}_9\text{Cl}_5$	14 CARBON 9 HYDROGEN 5 CHLORINE
Silicon dioxide	Sand	SiO_2	1 SILICON 2 OXYGEN
Iron oxide	Rust	Fe_2O_3	2 IRON 3 OXYGEN
Butane	Lighter fluid	C_4H_{10}	4 CARBON 10 HYDROGEN

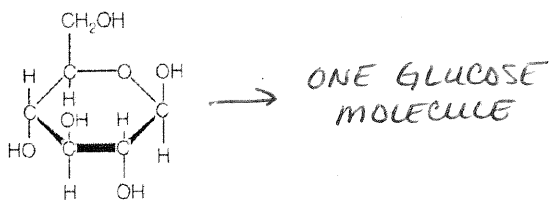
Photosynthesis & Cellular Respiration

Making food for an organism and using that food for energy!

Glossary of Terms:

Photosynthesis: THE PROCESS BY WHICH PLANTS USE SUNLIGHT, CARBON DIOXIDE, AND WATER TO PRODUCE CARBOHYDRATES (FOOD) AND OXYGEN.

Glucose: THE TYPE OF CARBOHYDRATE (FOOD) THAT PLANTS MAKE DURING PHOTOSYNTHESIS



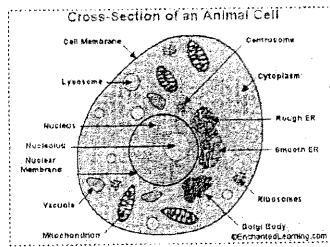
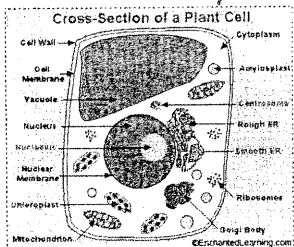
Chloroplast: THE ORGANELLE FOUND IN EUKARYOTIC PLANT CELLS WHERE PHOTOSYNTHESIS TAKES PLACE.

Chlorophyll: THE GREEN PIGMENT INSIDE OF THE CHLOROPLAST WHERE SUNLIGHT IS TRAPPED.

Cellular Respiration: THE PROCESS BY WHICH EUKARYOTIC CELLS PRODUCE ENERGY (ATP) FROM CARBOHYDRATES (GLUCOSE).

ATP (adenosine triphosphate): THE TYPE OF ENERGY THAT RUNS THE CELL; CELL BATTERIES

Mitochondria: THE ORGANELLE FOUND IN ALL EUKARYOTIC CELLS WHERE GLUCOSE IS TURNED INTO ENERGY (ATP).



Chemical Reaction: A BREAKING AND REFORMING OF COVALENT BONDS
TO FORM A NEW CHEMICAL COMPOUND.

Reactants: CHEMICAL COMPOUNDS THAT GO INTO A CHEMICAL REACTION

Products: CHEMICAL COMPOUNDS THAT COME OUT OF A CHEMICAL REACTION

Photosynthesis

Word Equation

WATER + CARBON DIOXIDE + SUNLIGHT \rightarrow ^(FOOD) GLUCOSE + OXYGEN

Chemical Equation

$6\text{H}_2\text{O} + 6\text{CO}_2 + \text{SUNLIGHT} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$

Goal of Process: MAKE FOOD FOR PLANT CELLS

Where in the cell does this process take place? CHLOROPLAST

What attracts the sunlight to the chloroplast? CHLOROPHYLL

Cellular Respiration

Word Equation

^(FOOD) GLUCOSE + OXYGEN \rightarrow CARBON DIOXIDE + WATER + ^(ENERGY) ATP

Chemical Equation

$\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{ATP}$

Goal of Process: ^(GLUCOSE) TURN FOOD INTO ENERGY FOR THE CELL (ATP)

Where in the cell does this process take place? MITOCHONDRIA

Fermentation: THE PROCESS IN WHICH CELLULAR ENERGY (ATP) IS MADE WITHOUT OXYGEN.

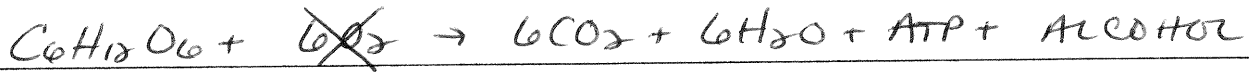
Another word for fermentation is ANAEROBIC which means without OXYGEN. If your cells needed to make energy in the absence of oxygen...it would still make that energy (ATP), but you would pay a price. Some form of waste would be produced.

Examples of Fermentation

Chemical Equation for Fermentation in Muscle Cells

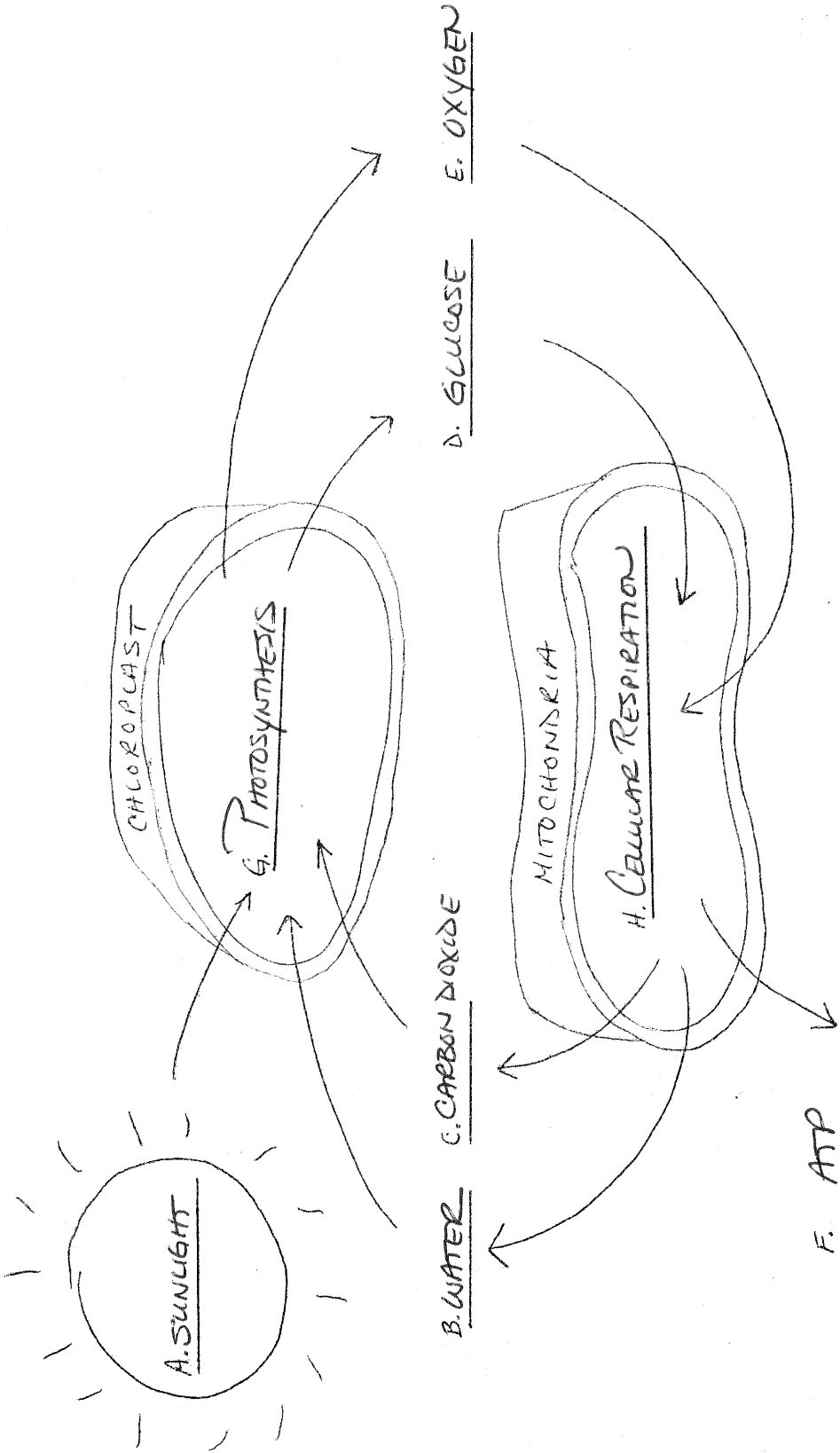


Chemical Equation for Fermentation in Yeast Cells



Photosynthesis & Cellular Respiration Practice

Process	What goes in?	What comes out?	Where does this happen?
Photosynthesis	Words: WATER CARBON DIOXIDE SUNLIGHT Chemical Formulas: $6H_2O + 6CO_2 + \text{LIGHT}$	Words: OXYGEN GLUCOSE Chemical Formulas: $6O_2 + C_6H_{12}O_6$	CHLOROPLAST
Cellular Respiration	Words: OXYGEN GLUCOSE Chemical Formulas: $6O_2 + C_6H_{12}O_6$	Words: WATER CARBON DIOXIDE ATP Chemical Formulas: $6H_2O + C_6H_{12}O_6 + ATP$	MITOCHONDRIA
Fermentation	Words: OXYGEN GLUCOSE Chemical Formulas: $6O_2 +$ $C_6H_{12}O_6$	Words: WATER CARBON DIOXIDE + ATP + ACID Chemical Formulas: $6H_2O + 6CO_2 + ATP + \text{ACID}$	MITOCHONDRIA



- A. Where plants get their energy for their "food" making process.
- B. Taken in by plant through its roots. Molecule looks like Mickey Mouse.
- C. Taken in by plant through leaves. Gas that animals release.
- D. "Food" that is made by plants.
- E. Released by plants. Gas that animals and plants need.
- F. Energy for the cell. Batteries that run the cell.
- G. Process in which plants make their own "food".
- H. Process in which plants and animals use "food" and turn it into cellular energy.