

DIFFERENT BIO-CHEM REACTIONS

DR



BIO-CHEM RXT



BIO-CHEM RXT

DIFFERENT BIO-CHEM REACTIONS

DIFFERENT REACTANTS

D



REACTANT(S)



REACTANT(S)

DIFFERENT ACTIVATION ENERGY

?



REACTANT(S)

PRODUCT(S)



REACTANT(S)

PRODUCT(S)

QUESTION

WHAT DO SCIENTISTS
CALL A CHEMICAL
AGENT THAT
ACCELERATES A
CHEMICAL REACTION?

QUESTION



ANSWER

CATALYST

ANSWER

CATALYST

CATALYST

CATALYST



**ACCELERATES
CHEMICAL REACTION**

CATALYST



CATALYST

ACCELERATES

CHEMICAL REACTION

DECREASES

ACTIVATION ENERGY

CATALYST

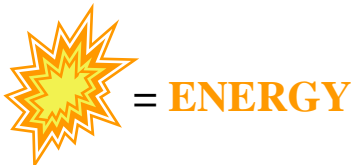
CHEMICAL REACTION



REACTANT(S)

PRODUCT(S)

ACTIVATION ENERGY





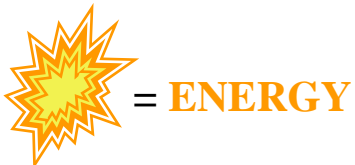
CHEMICAL REACTION



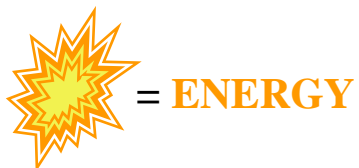
REACTANT(S)

PRODUCT(S)

ACTIVATION ENERGY



CHEMICAL REACTION



**ACTIVATION ENERGY
DECREASES**

QUESTION

WHAT DO SCIENTISTS
CALL A BIOCHEMICAL
CATALYST?

QUESTION



ANSWER

ENZYMIE

ANSWER

ENZYMIE

ENZYMIE



ENZYME

PROTEIN

BIOCHEMICAL CATALYST

ENZYME



ENZYME

PROTEIN

BIOCHEMICAL CATALYST

DECREASES

ACTIVATION ENERGY

ENZYME

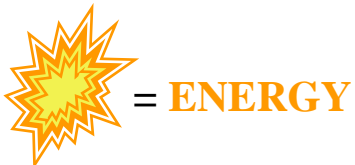
BIOCHEMICAL REACTION



REACTANT(S)

PRODUCT(S)

ACTIVATION ENERGY



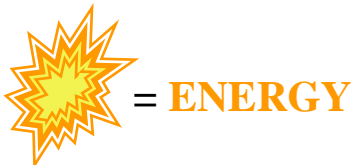
BIOCHEMICAL REACTION



REACTANT(S)

PRODUCT(S)

ACTIVATION ENERGY



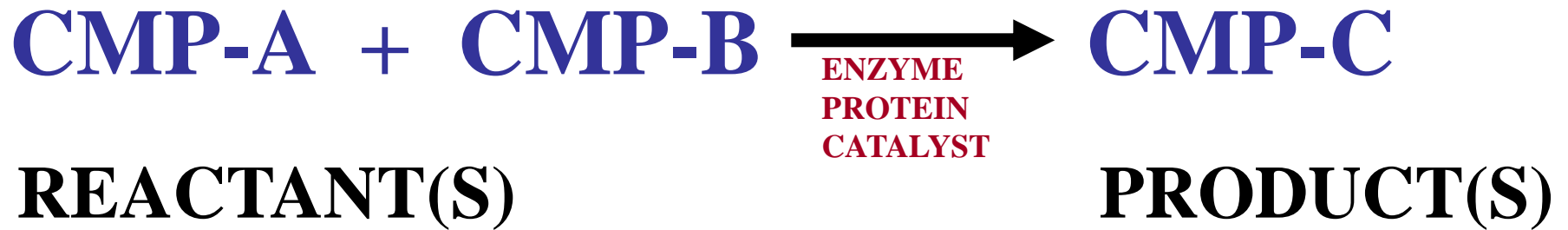
BIOCHEMICAL REACTION



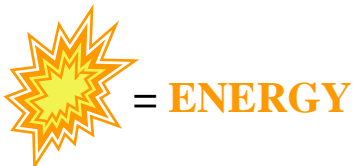
ACTIVATION ENERGY



BIOCHEMICAL REACTION

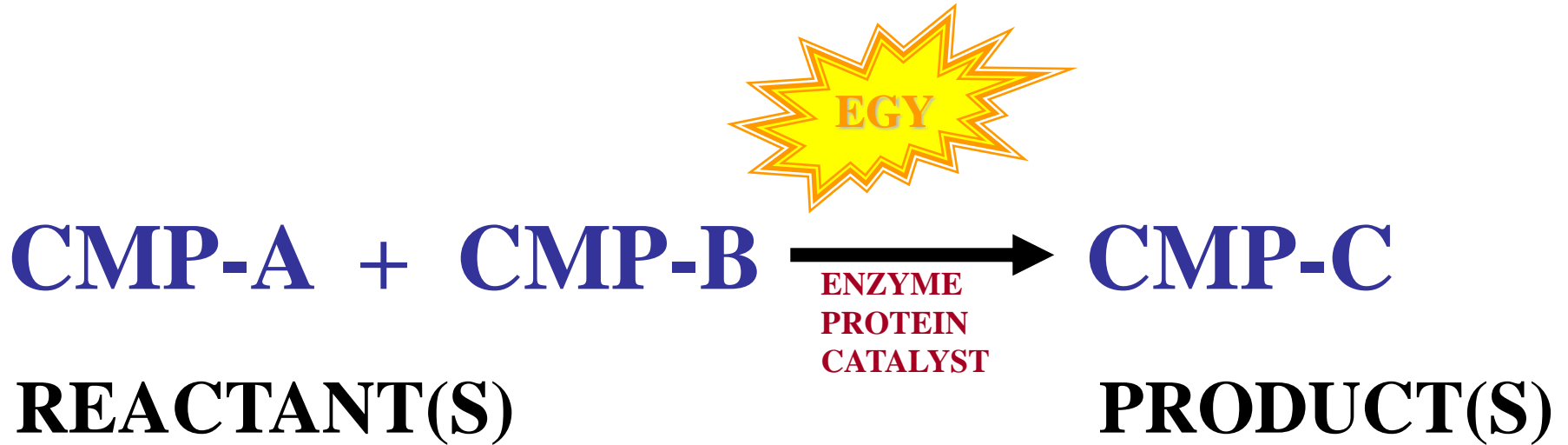
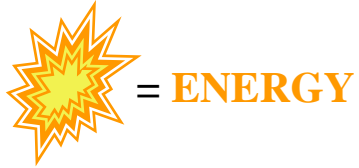


ACTIVATION ENERGY



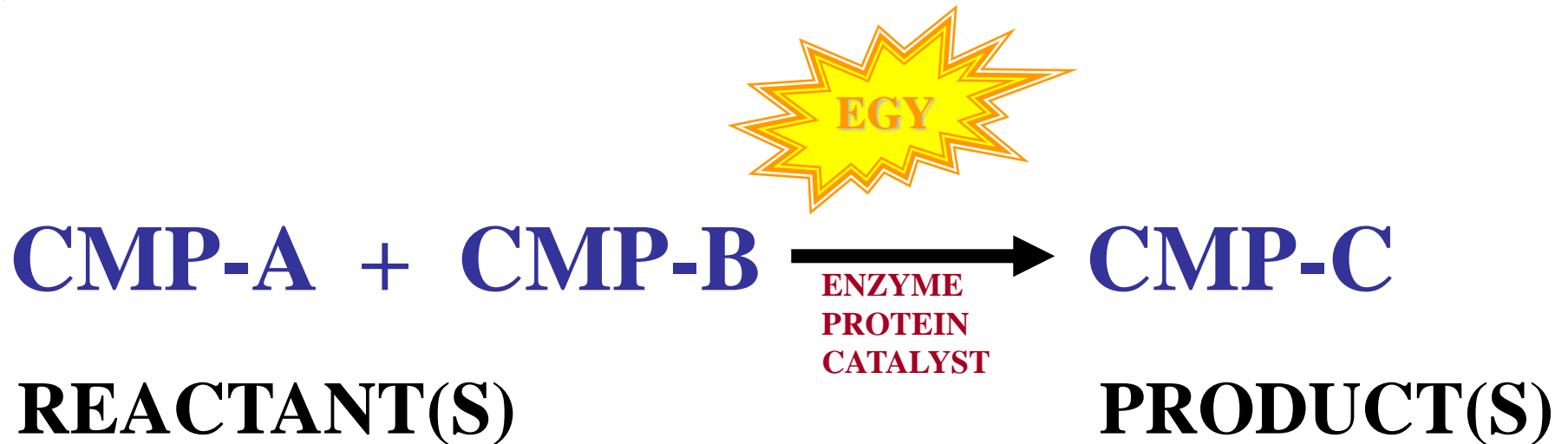
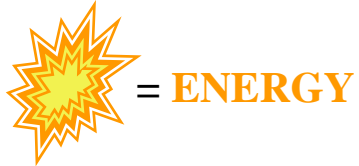


BIOCHEMICAL REACTION



**ACTIVATION ENERGY
DECREASES**

BIOCHEMICAL REACTION



**ALL
BIOCHEMICAL REACTIONS
REQUIRE ENZYMES**



**BIOCHEMICAL
PATHWAY
EXAMPLE
GLYCOLYSIS**

GLYCOLYSIS

GLUCOSE

GLYCOLYSIS

HEXOKINASE

+

ATP

EGY

ADP

GLUCOSE-6-PHOSPHATE

ENZYMES

PHOSPHOGLUCOISOMERASE

ENZYMES

RED = ENZYME

RED = ENZYME

FRUCTOSE-6-PHOSPHATE

PHOSPHOFRUCTOKINASE

ATP

EGY

ADP

FRUCTOSE-1-6-PHOSPHATE

 = ENERGY

ENZYMES

FRUCTOSE-1-6-PHOSPHATE

ENZYMES

RED = ENZYME

ALDOLASE
ISOMERASE

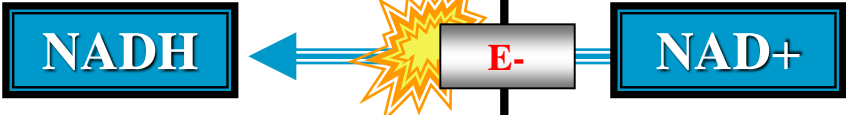
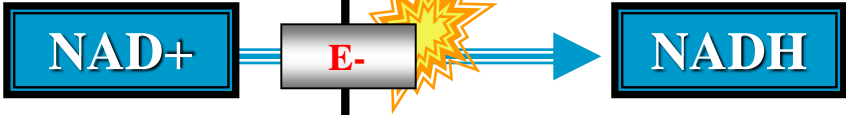
RED = ENZYME +

PHOSPHOGLYCERALDEHYDE - PGAL

PHOSPHOGLYCERALDEHYDE - PGAL

TRI-PHOSPHATE DEHYDROGENASE

TRI-PHOSPHATE DEHYDROGENASE



1-3-BISPHOSPHOGLYCERATE

1-3-BISPHOSPHOGLYCERATE

PHOSPHOGLYCEROKINASE

PHOSPHOGLYCEROKINASE



3-PHOSPHOGLYCERATE - PGA

3-PHOSPHOGLYCERATE - PGA

3-PHOSPHOGLYCERATE - PGA

ENOLASE

3-PHOSPHOENOLPYRUVATE

PYRUVATE KINASE



PYRUVATE

ENZYMES

RED = ENZYME

3-PHOSPHOGLYCERATE - PGA

>

ENOLASE

3-PHOSPHOENOLPYRUVATE

PYRUVATE KINASE



PYRUVATE

ENZYMES

RED = ENZYME

**BIOCHEMICAL REACTIONS
REQUIRE ENZYMES**

***ENZYMES
VITAL
CELL
METABOLISM***

***ENZYMES
ENSURE
EFFICIENT
METABOLISM***



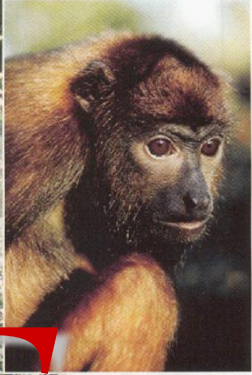
HOMEOSTASIS



ENZYMES



VITAL



TO

LIFE

EARTH

CHAPTER 03

WATER'S BIO-IMPORTANT PROPERTIES



PLANET EARTH & WATER



**PLANET EARTH
AND
WATER**

EARTH



**WATER MOST
ABUNDANT
EARTH
COMPOUND**

EARTH



**EARTH SURFACE
70% WATER**

EARTH

**WATER
DOMINATE
CLIMATIC
REGULATOR**

EARTH



**WATER
ENSURES LIFE
CONDUCTIVE
ENVIRONMENT**

EARTH



LIVING ORGANISMS

LIVING ORGANISMS

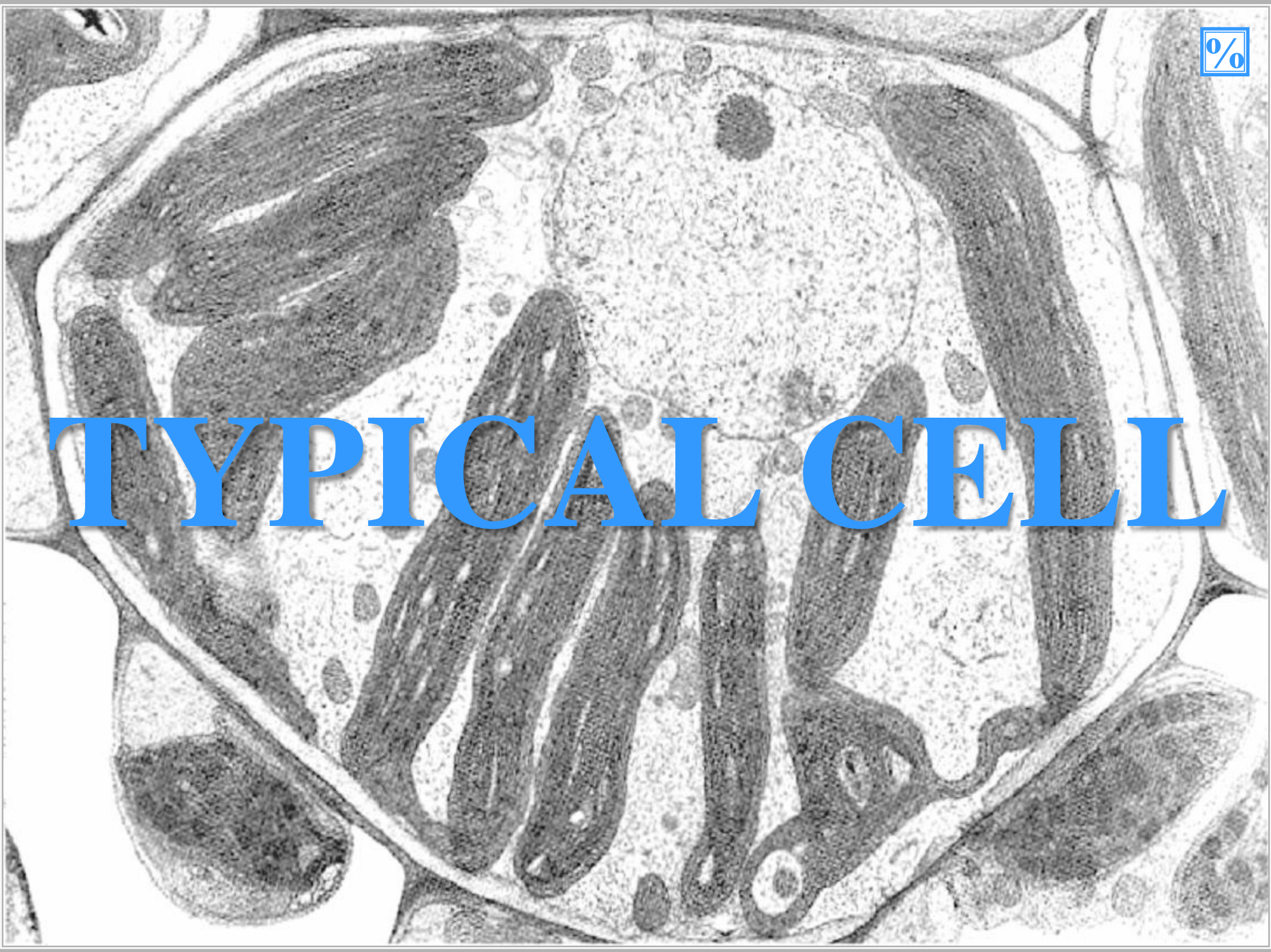
LIVING ORGANISMS

EARTH





TYPICAL CELL

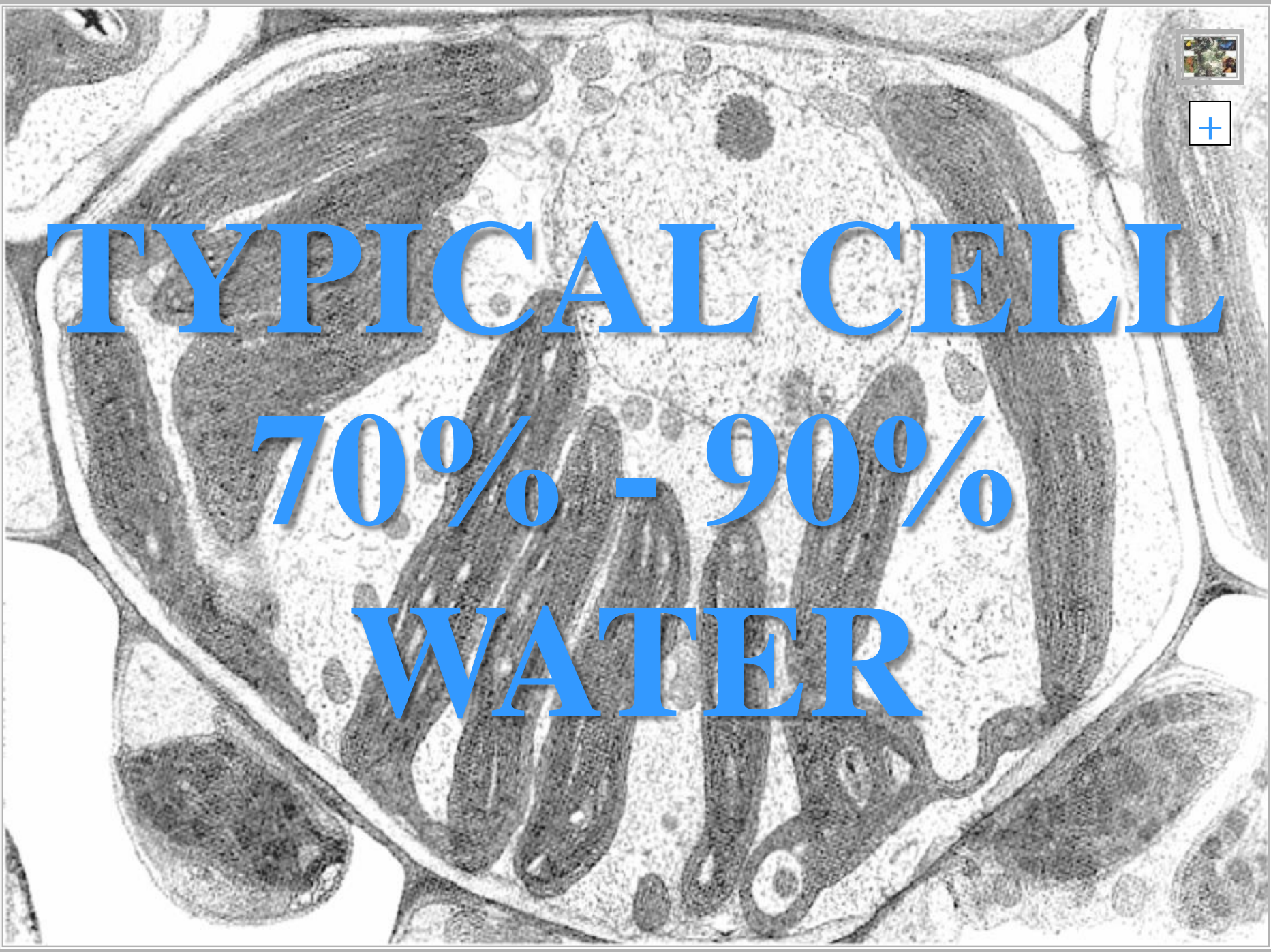


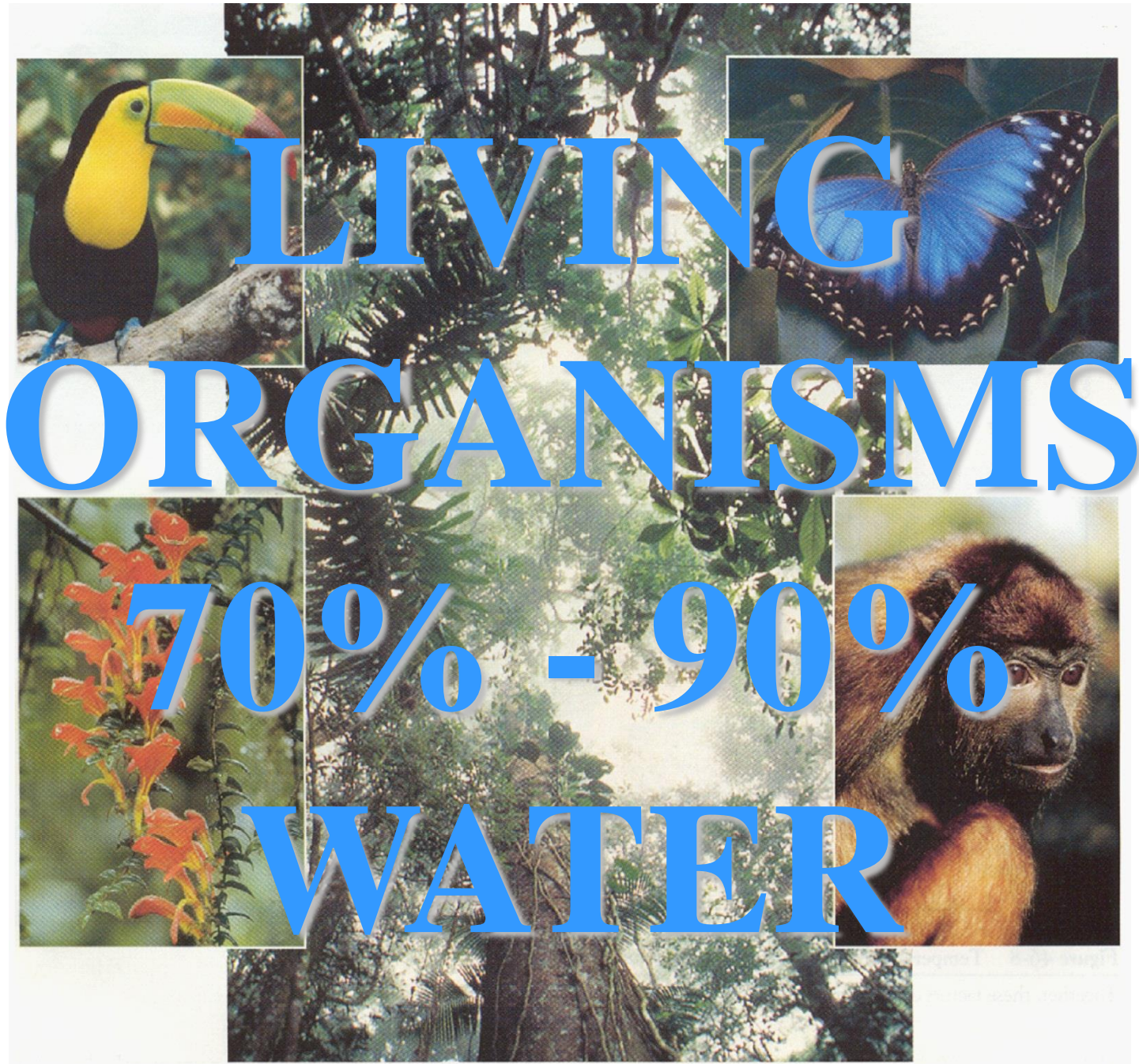


TYPICAL CELL

70% - 90%

WATER





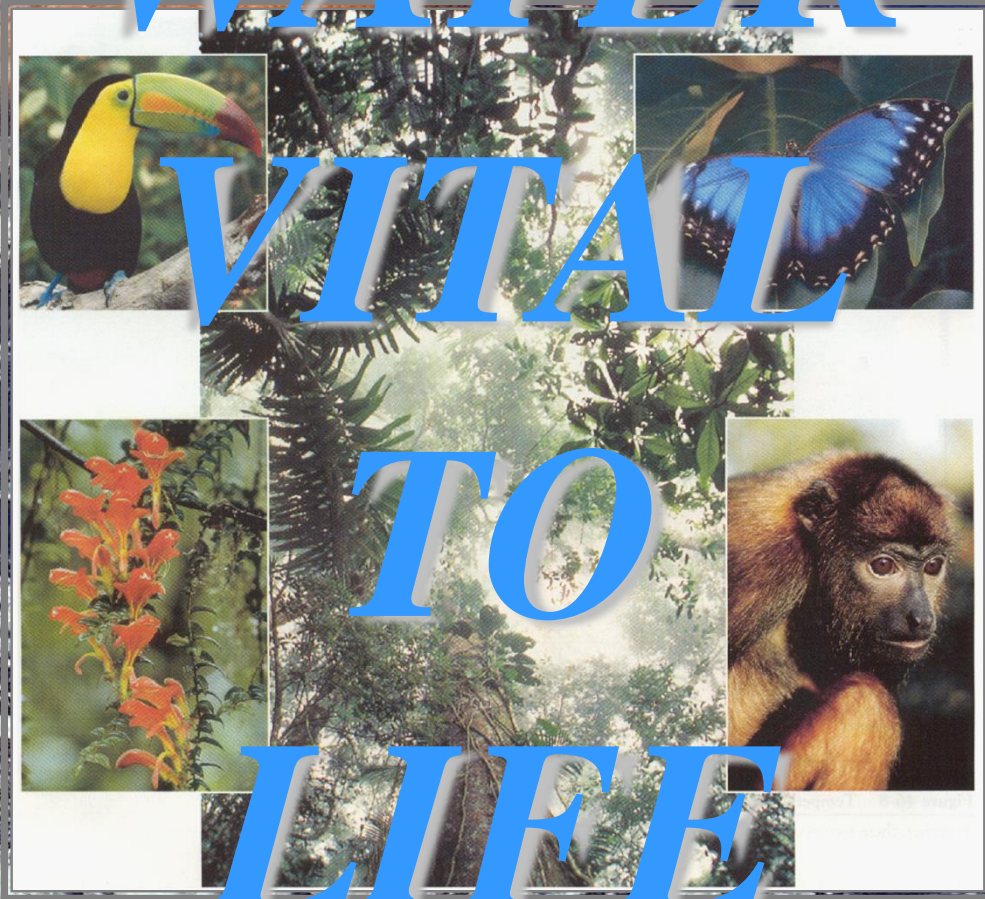
LIVING ORGANISMS

70% - 90%

WATER



WATER

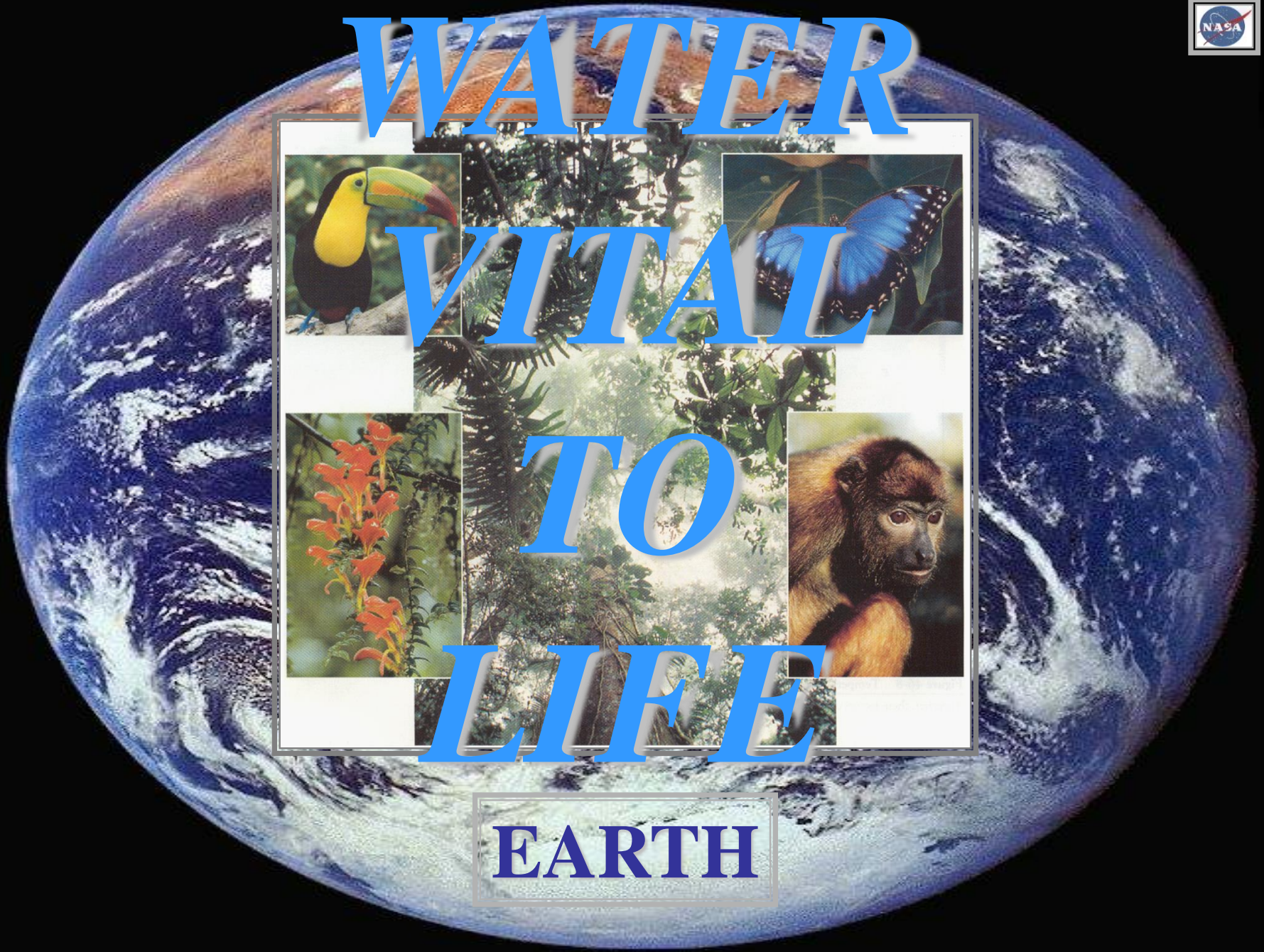


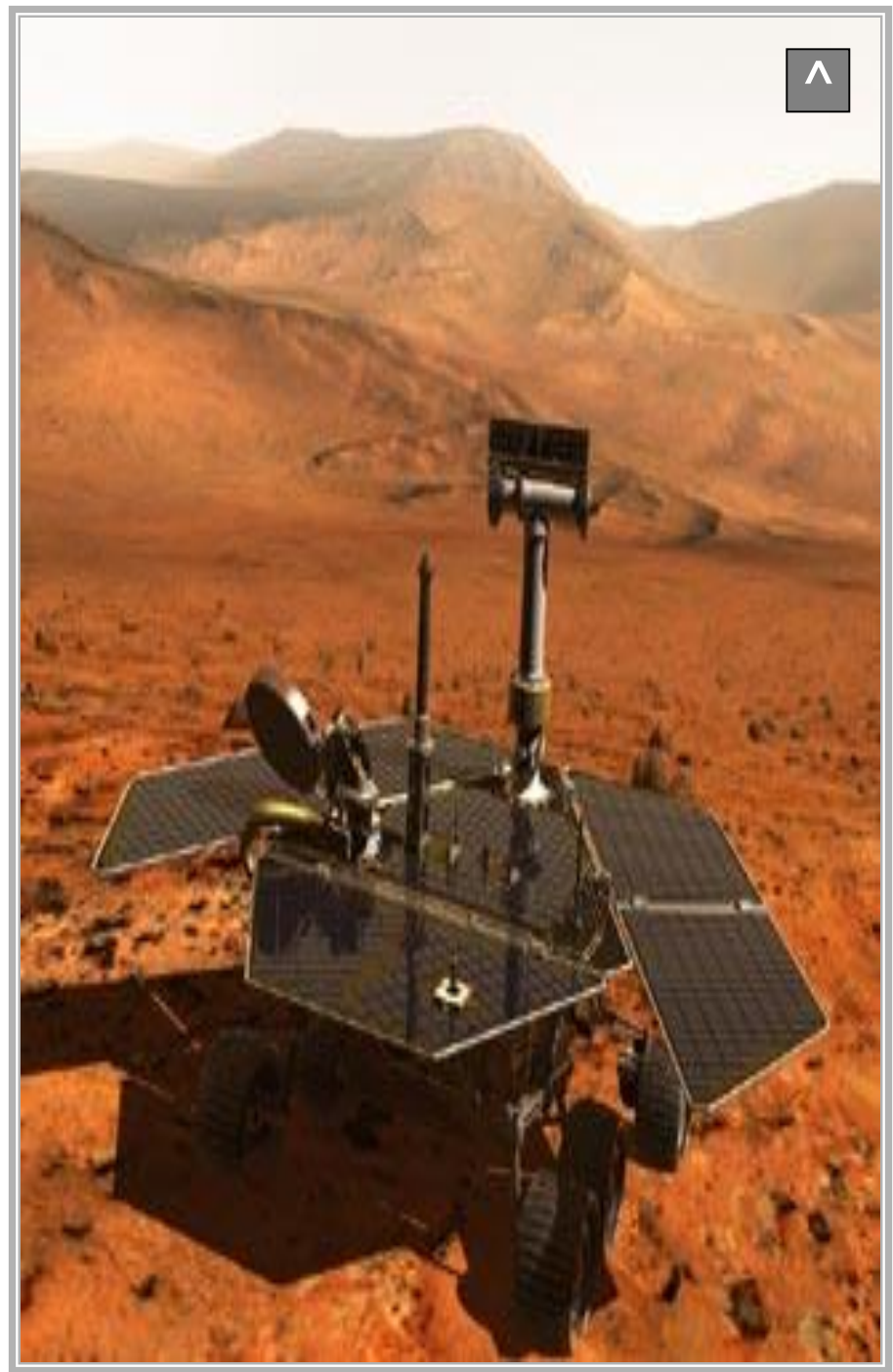
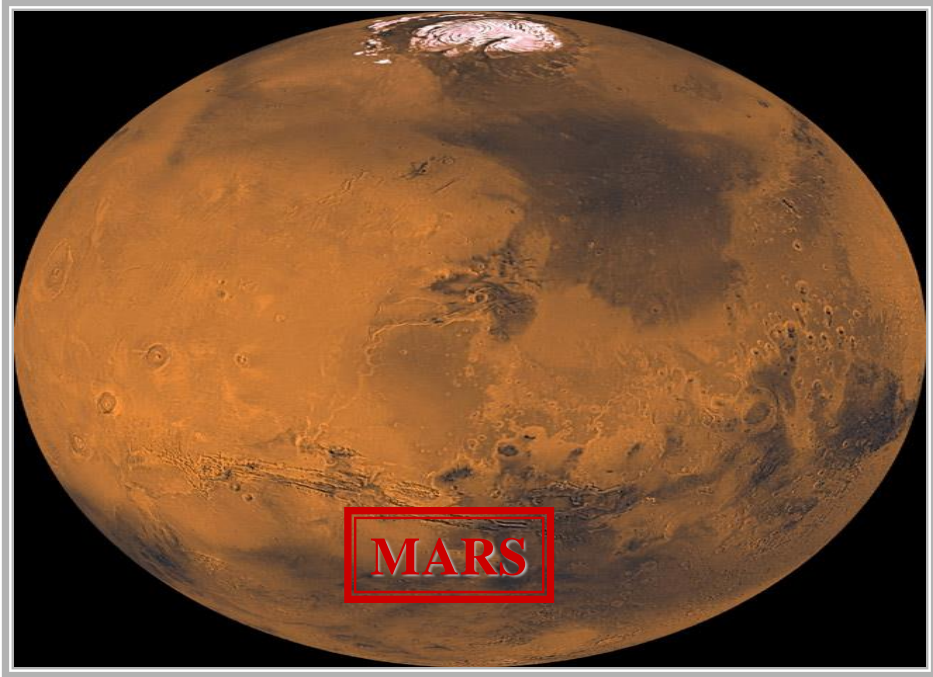
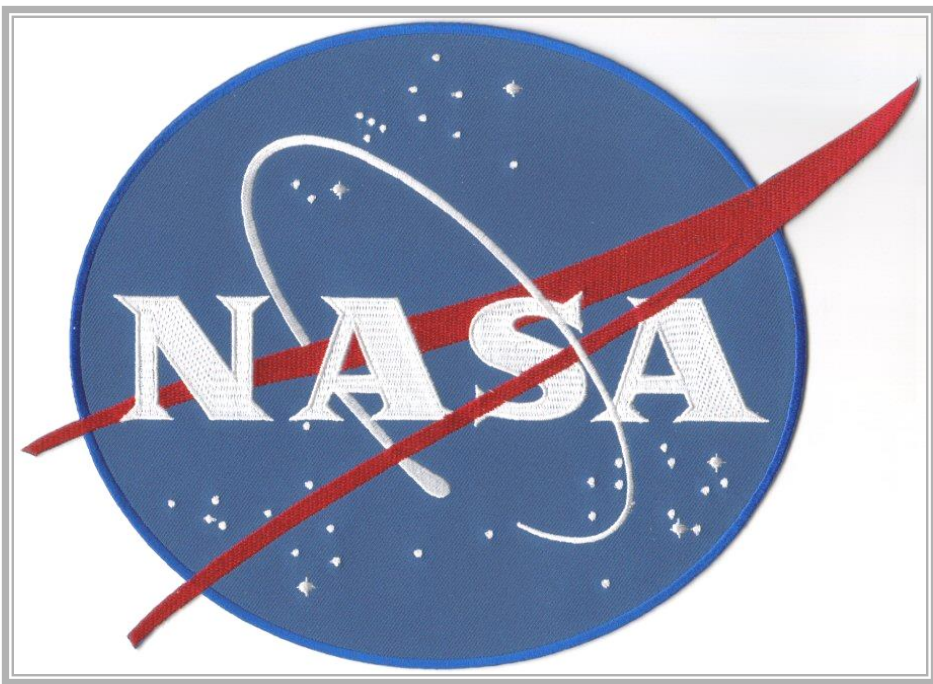
VITAL

TO

LIFE

EARTH





BIO-IMPORTANT WATER PROPERTIES

BIO-IMPORTANT WATER PROPERTIES

COHESION

BIO-IMPORTANT WATER PROPERTIES

BIO-IMPORTANT WATER PROPERTIES

**COHESION
ADHESION**

BIO-IMPORTANT WATER PROPERTIES

BIO-IMPORTANT WATER PROPERTIES

COHESION

ADHESION

HIGH SPECIFIC HEAT

BIO-IMPORTANT WATER PROPERTIES



BIO-IMPORTANT WATER PROPERTIES

COHESION

ADHESION

HIGH SPECIFIC HEAT

HIGH HEAT EVAPORATION

BIO-IMPORTANT WATER PROPERTIES

SOLUTION TERMS

SOLUTION

SOLUTION TERMS

S

SOLUTION

SOLVENT-SOLUTE

MIXTURE

SOLUTION TERMS

SOLUTION

SOLVENT

SOLUTION TERMS

SOLVENT

LIQUID

SOLUTION

COMPONENT

SOLUTION TERMS

SOLVENT

SOLUTE

SOLUTION TERMS

SOLUTE

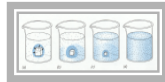
DISSOLVED

SOLUTION

COMPONENT

SOLUTION TERMS

SOLUTE



SUGAR SOLUTION EXAMPLE

SOLUTION TERMINOLOGY

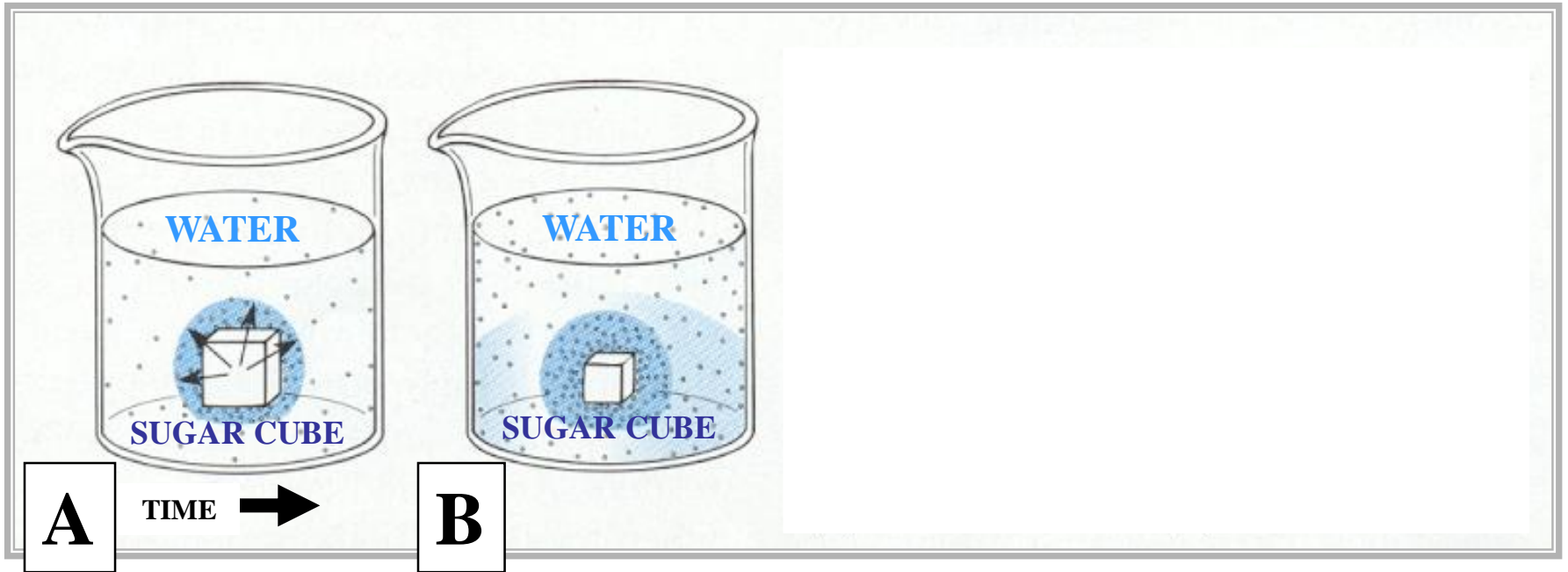


WATER = SOLVENT

SUGAR = SOLUTE

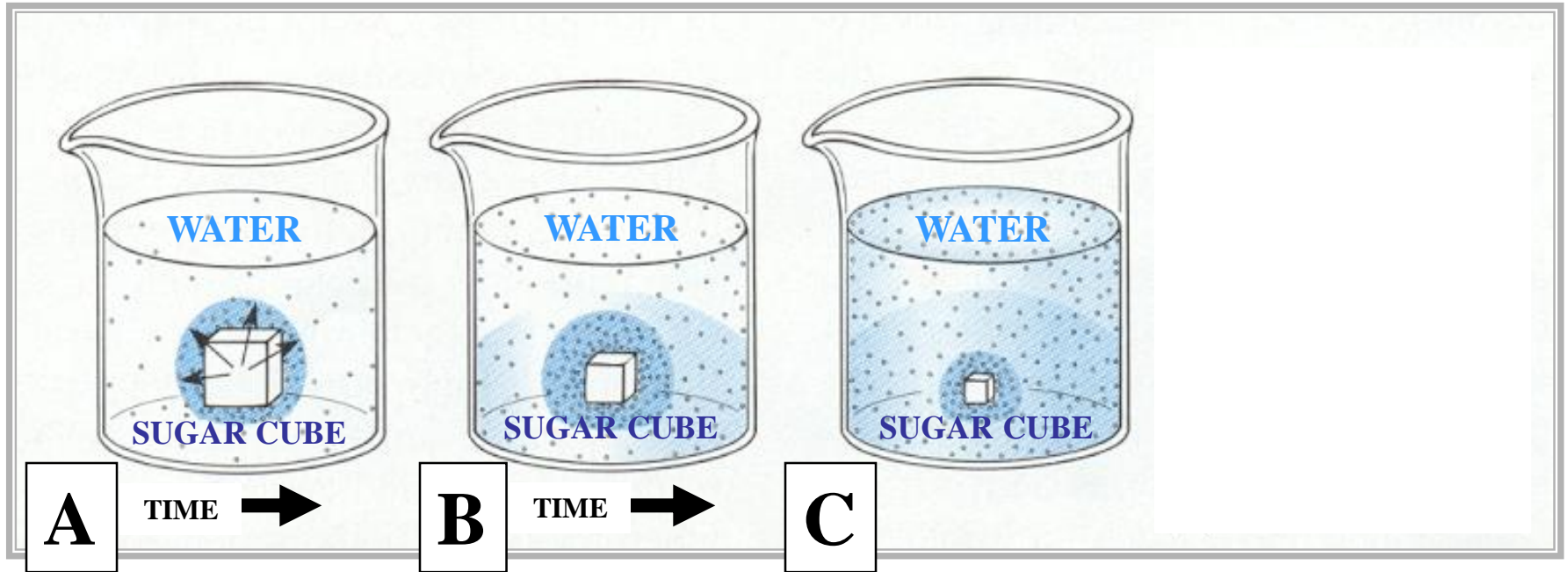
**SUGAR
SOLUTION**

SOLUTION TERMINOLOGY



WATER = SOLVENT
SUGAR = SOLUTE } **SUGAR SOLUTION**

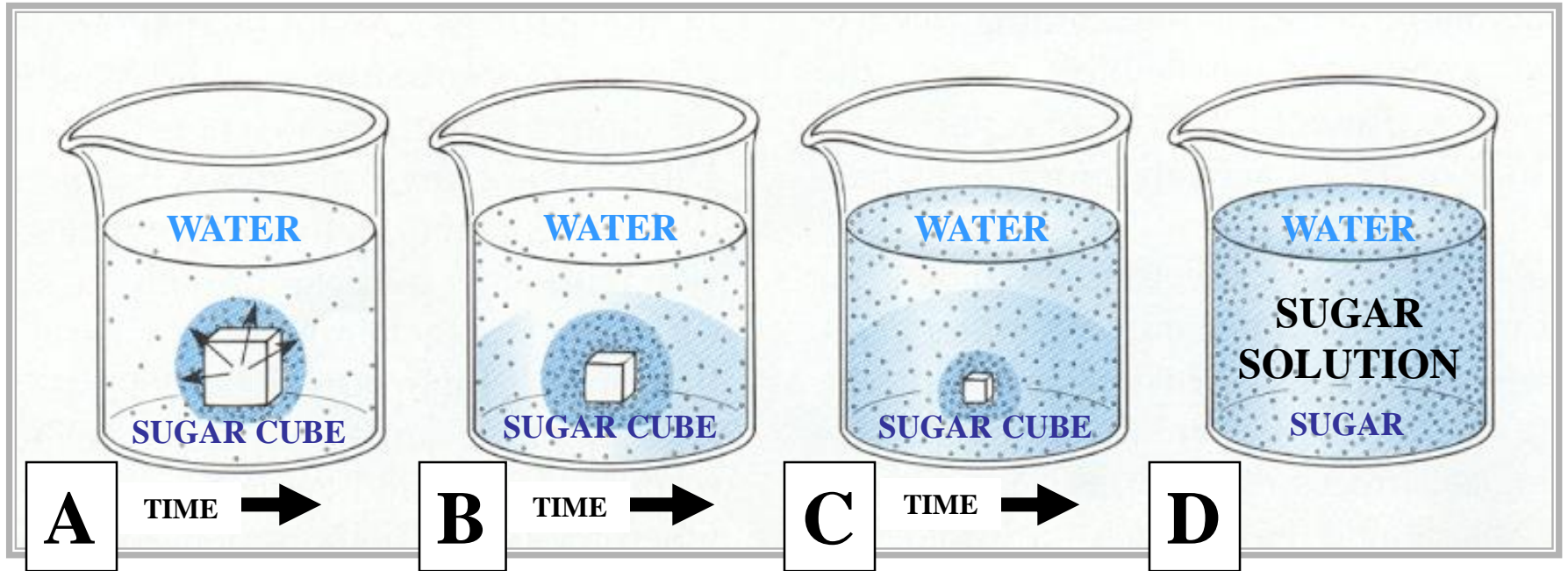
SOLUTION TERMINOLOGY



WATER = SOLVENT
SUGAR = SOLUTE } **SUGAR SOLUTION**



SOLUTION TERMINOLOGY



WATER = SOLVENT
SUGAR = SOLUTE } **SUGAR SOLUTION**

COHESION

COHESION

COHESION

**ATTRACTION
LIKE
MOLECULES**

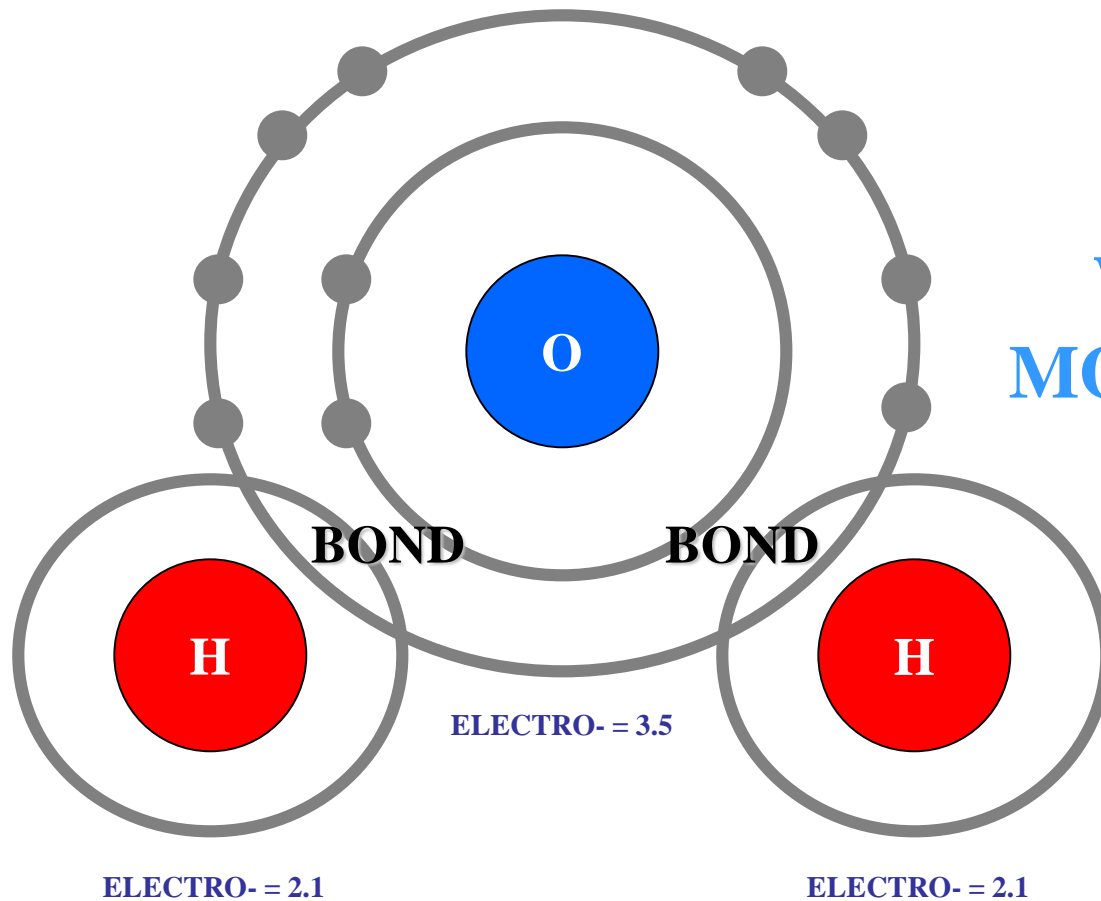
COHESION

WATER MOLECULE

OXYGEN
HIGHER
ELECTRO-

HYDROGEN
LOWER
ELECTRO-

WATER
MOLECULE



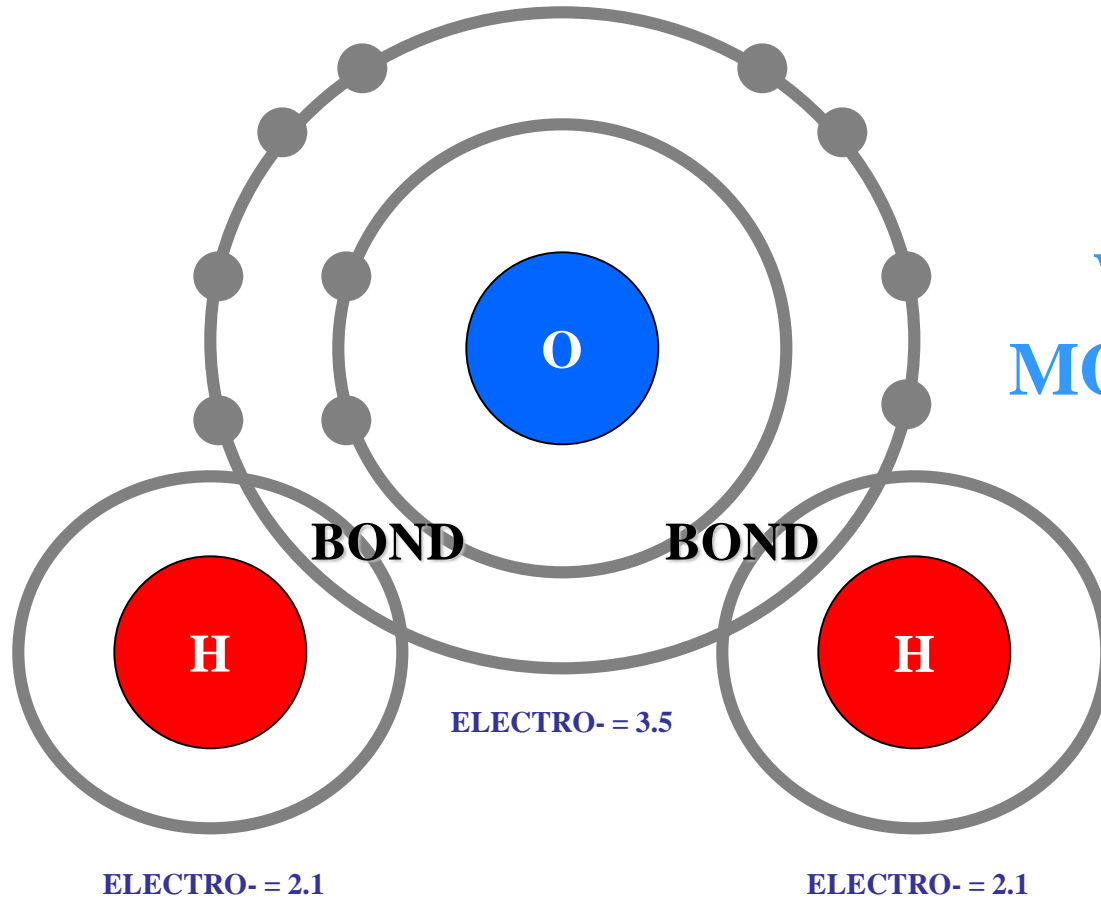
● = **E-**

COVALENT BOND

OXYGEN
HIGHER
ELECTRO-

HYDROGEN
LOWER
ELECTRO-

WATER
MOLECULE



● = E-

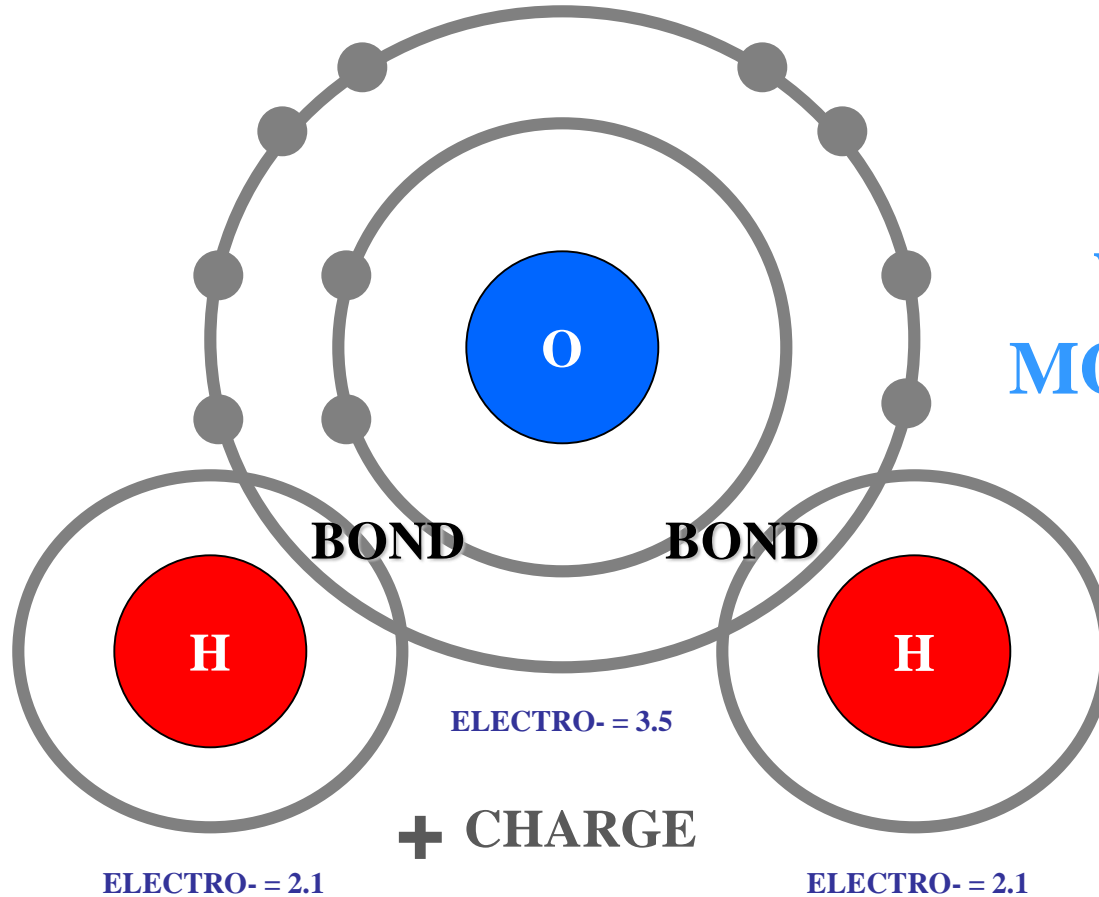
POLAR COVALENT BOND

- CHARGE

OXYGEN
HIGHER
ELECTRO-

WATER
MOLECULE

HYDROGEN
LOWER
ELECTRO-



● = e-

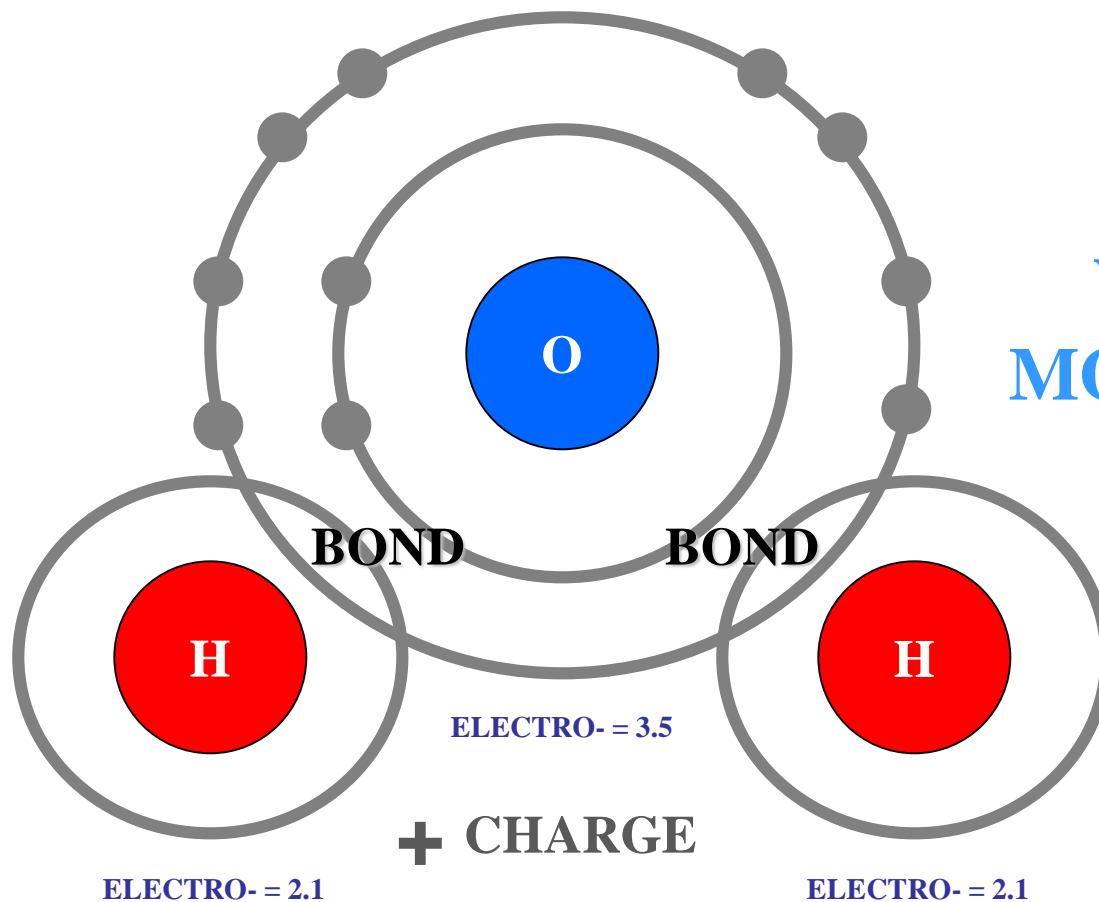
POLAR COVALENT BOND

- CHARGE

OXYGEN
HIGHER
ELECTRO-

HYDROGEN
LOWER
ELECTRO-

**WATER
MOLECULE**



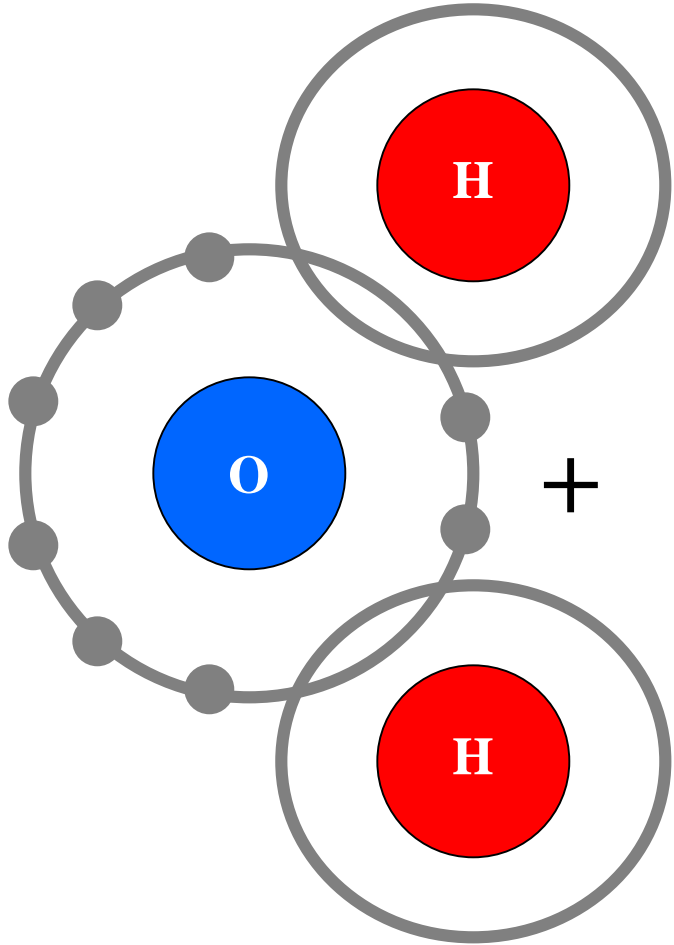
● = E-

HIGHLY POLAR

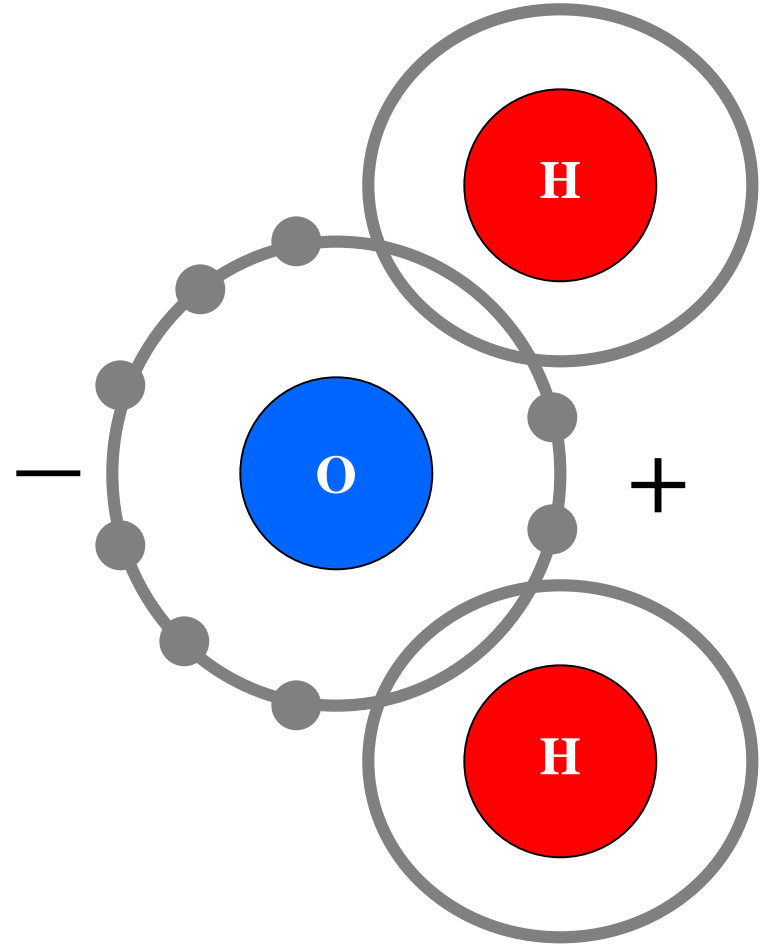
WATER MOLECULES



HP



WATER

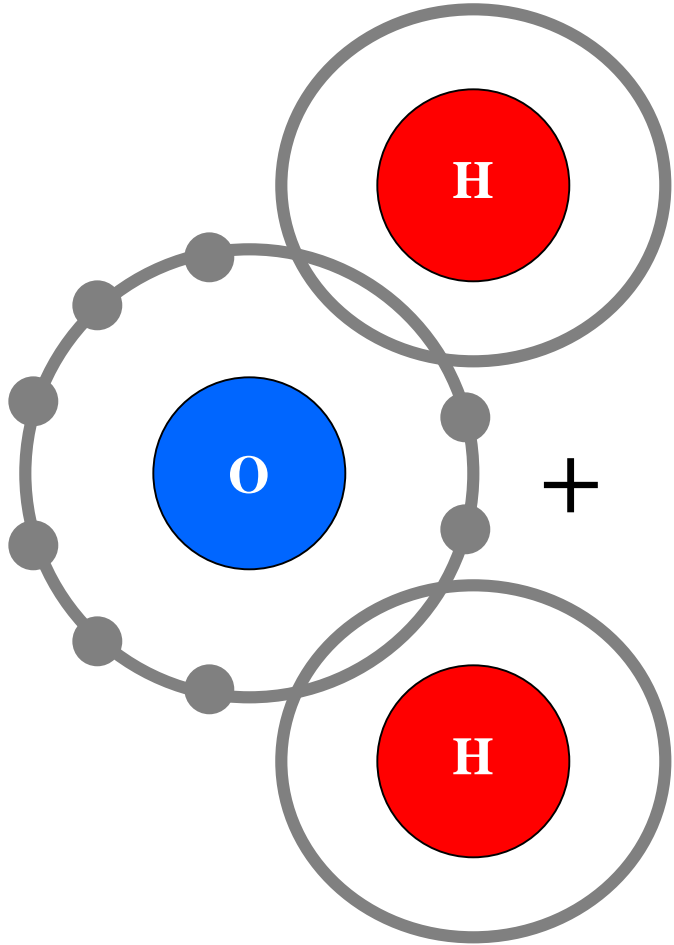


WATER

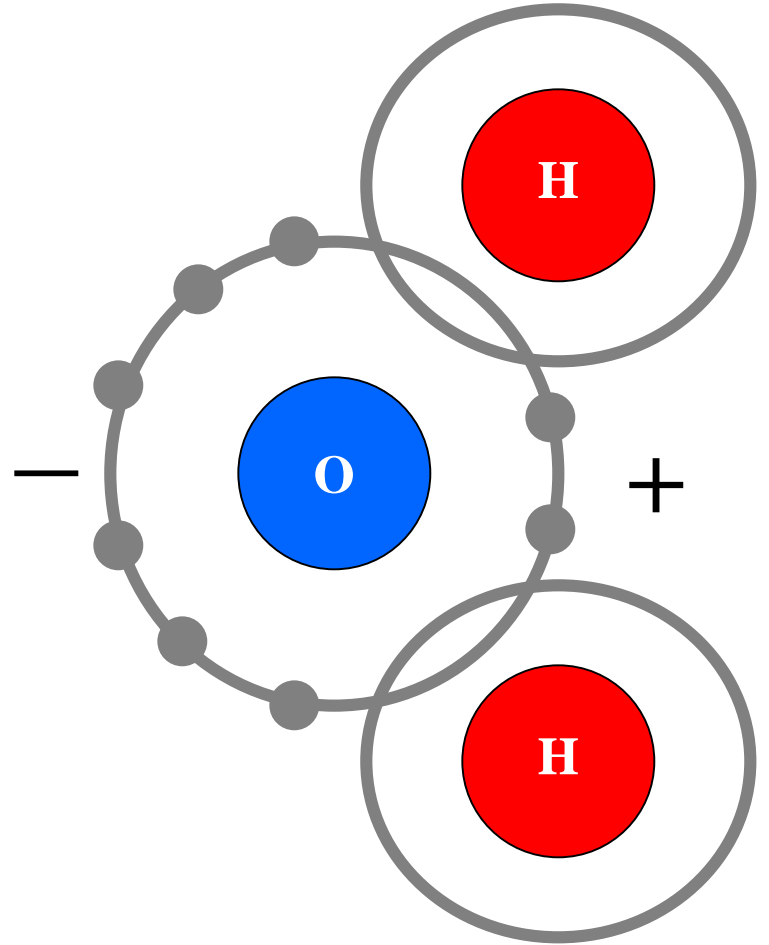
WATER MOLECULES

H

+



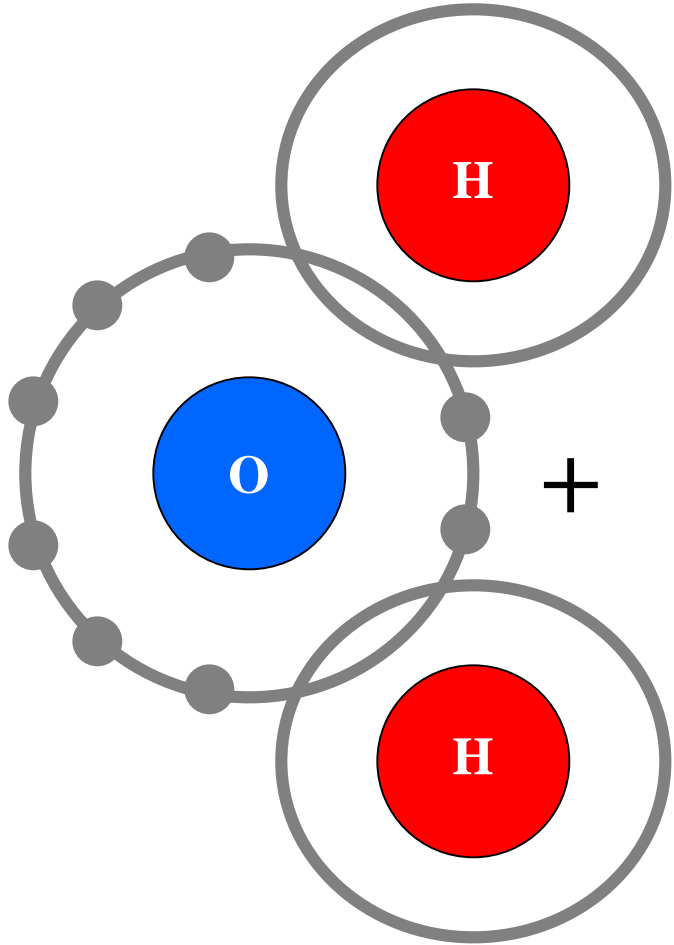
HIGHLY POLAR



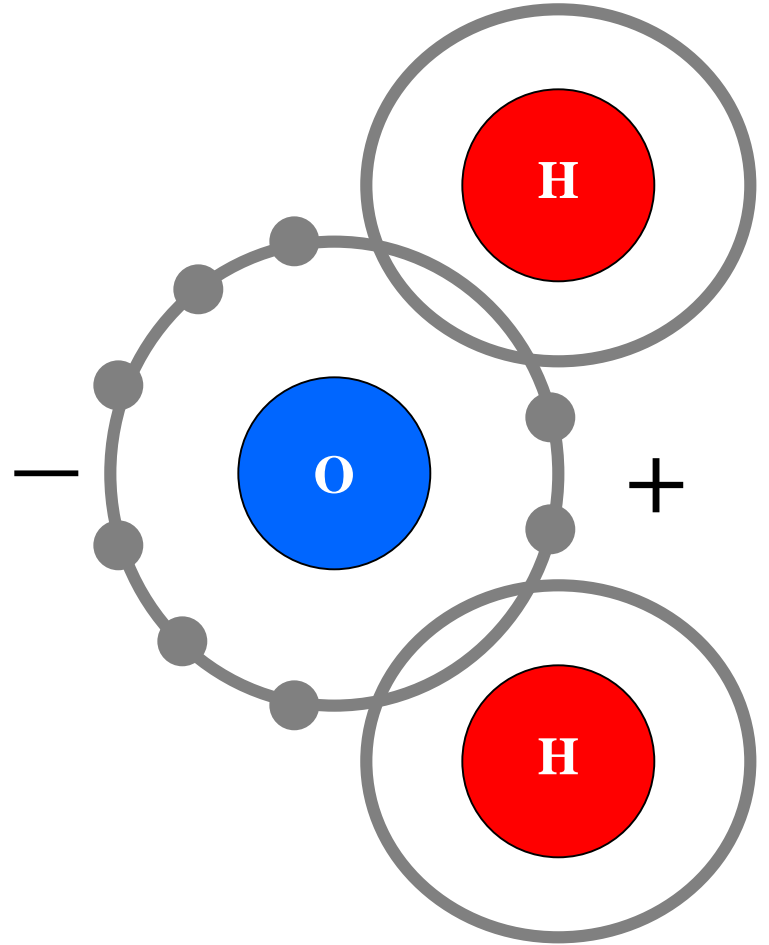
HIGHLY POLAR

WATER MOLECULES

O

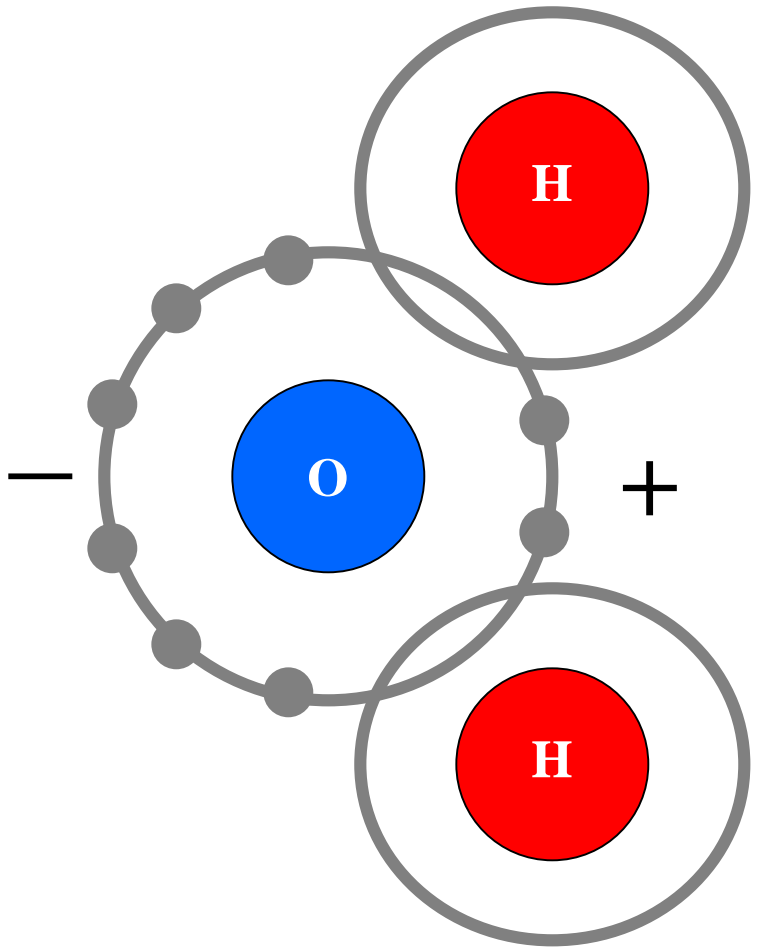


HYDROGEN POLE +

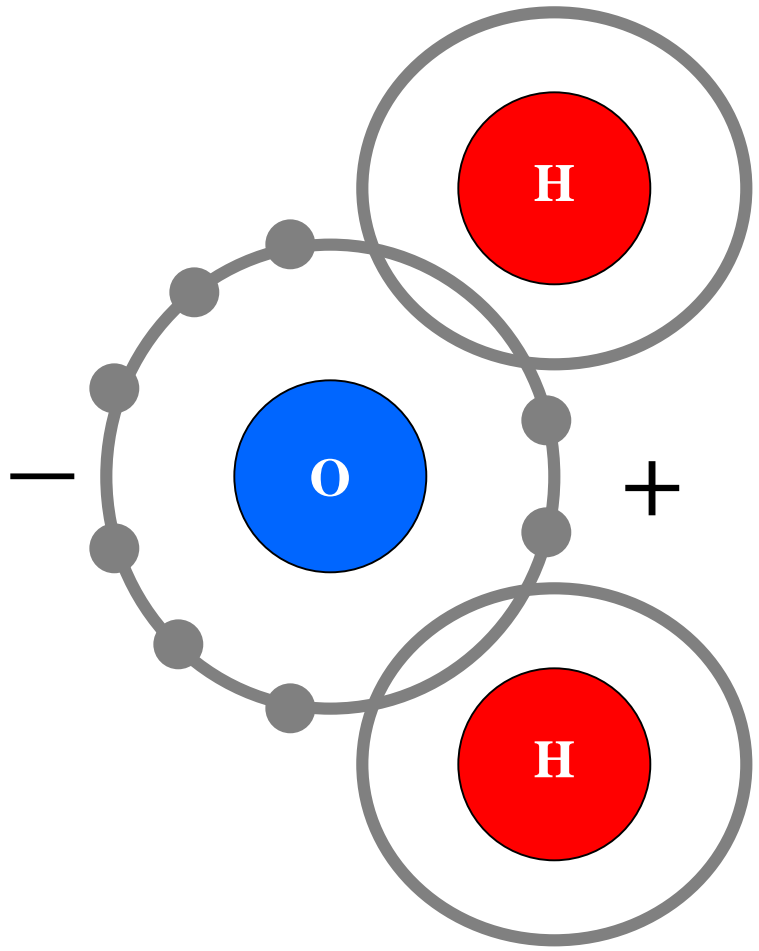


WATER

WATER MOLECULES

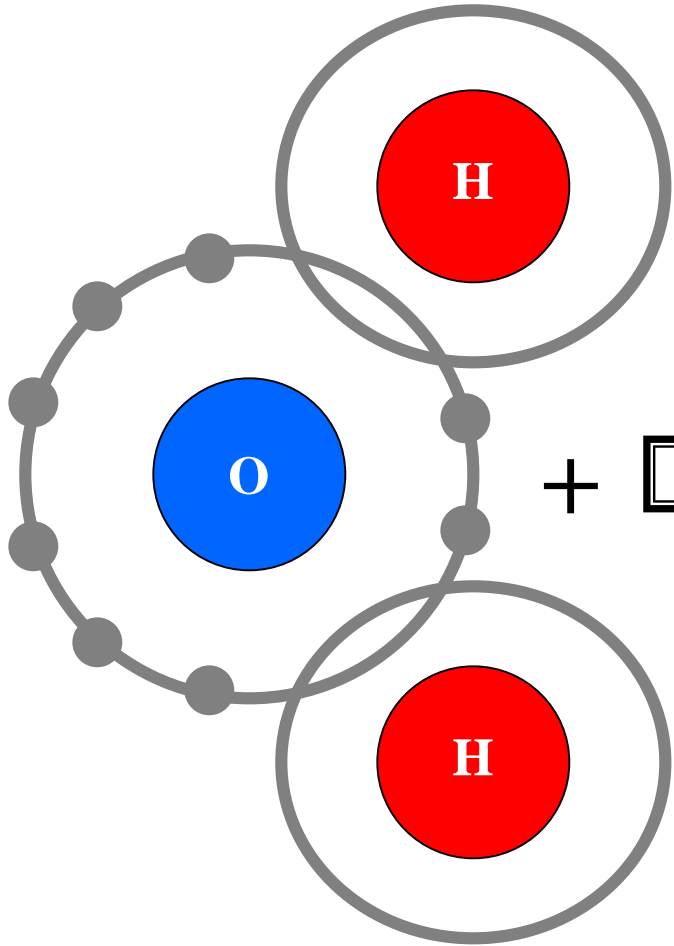
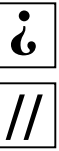


HYDROGEN POLE +



- OXYGEN POLE

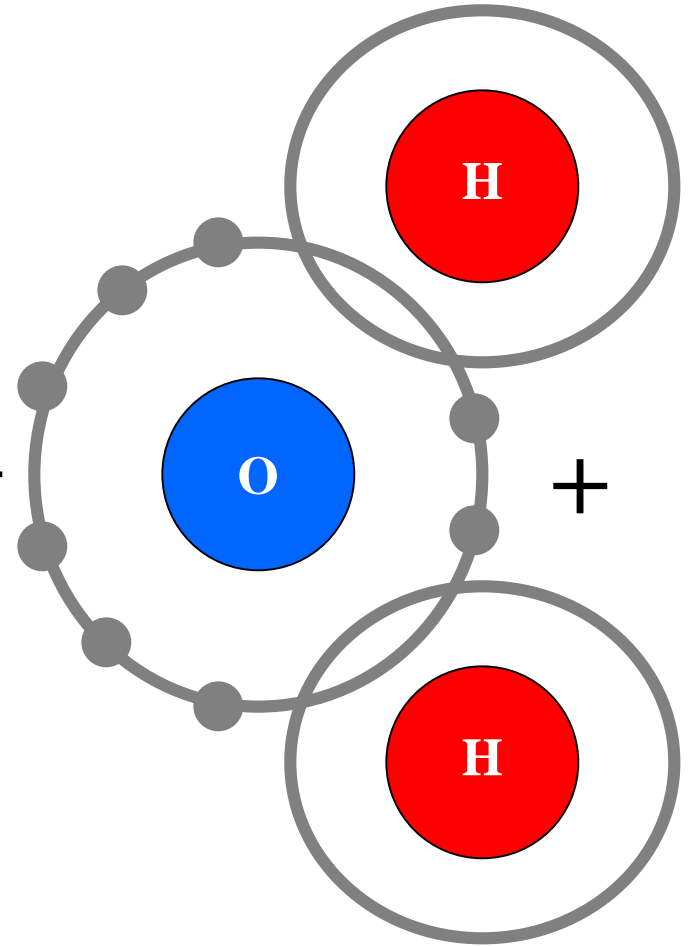
WATER MOLECULES



+

ATTRACT

-

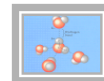


+

HYDROGEN POLE +

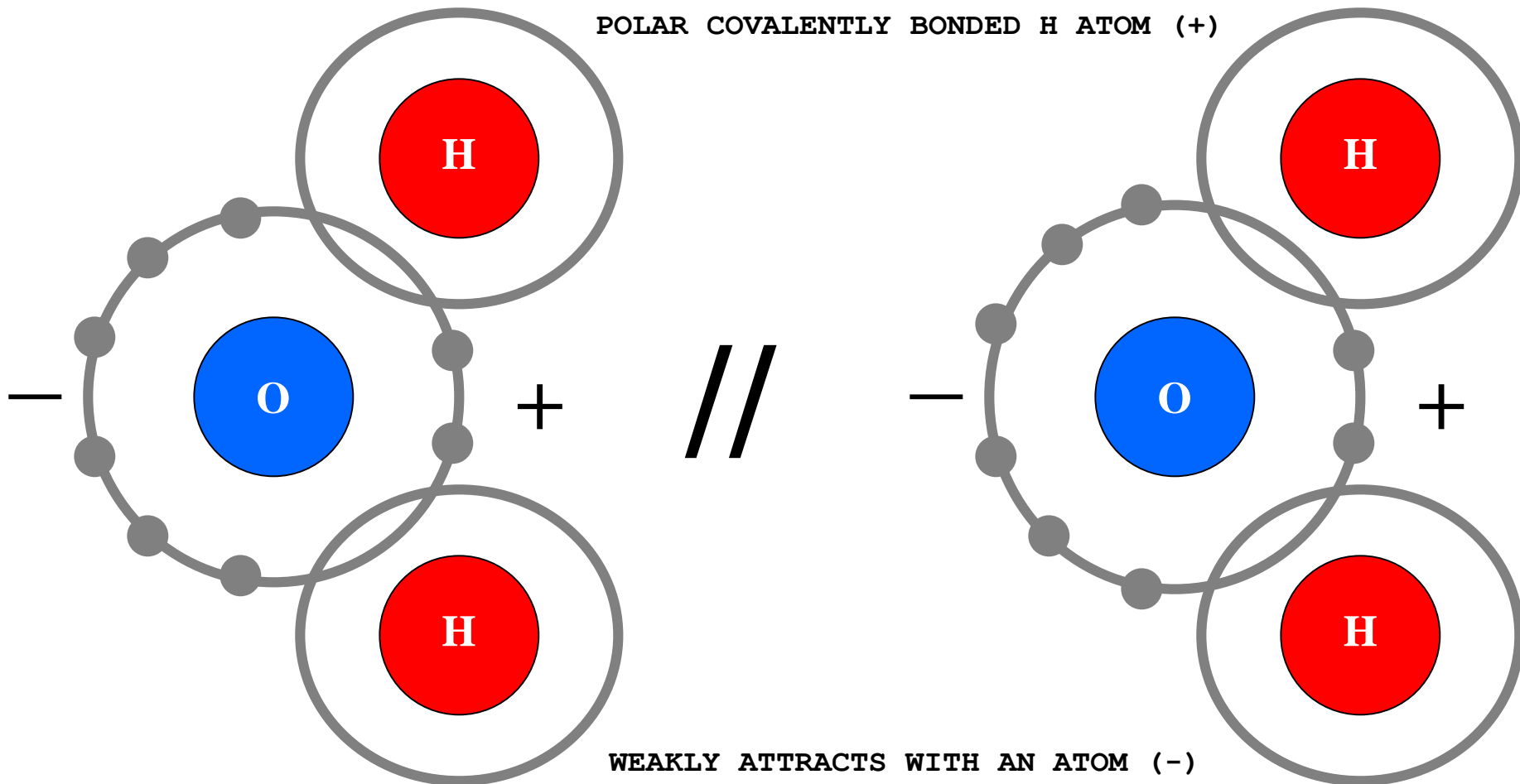
- **OXYGEN POLE**

WATER MOLECULES



2

POLAR COVALENTLY BONDED H ATOM (+)



// = **HYDROGEN BOND**

WATER MOLECULES

**WATER
COHESION**

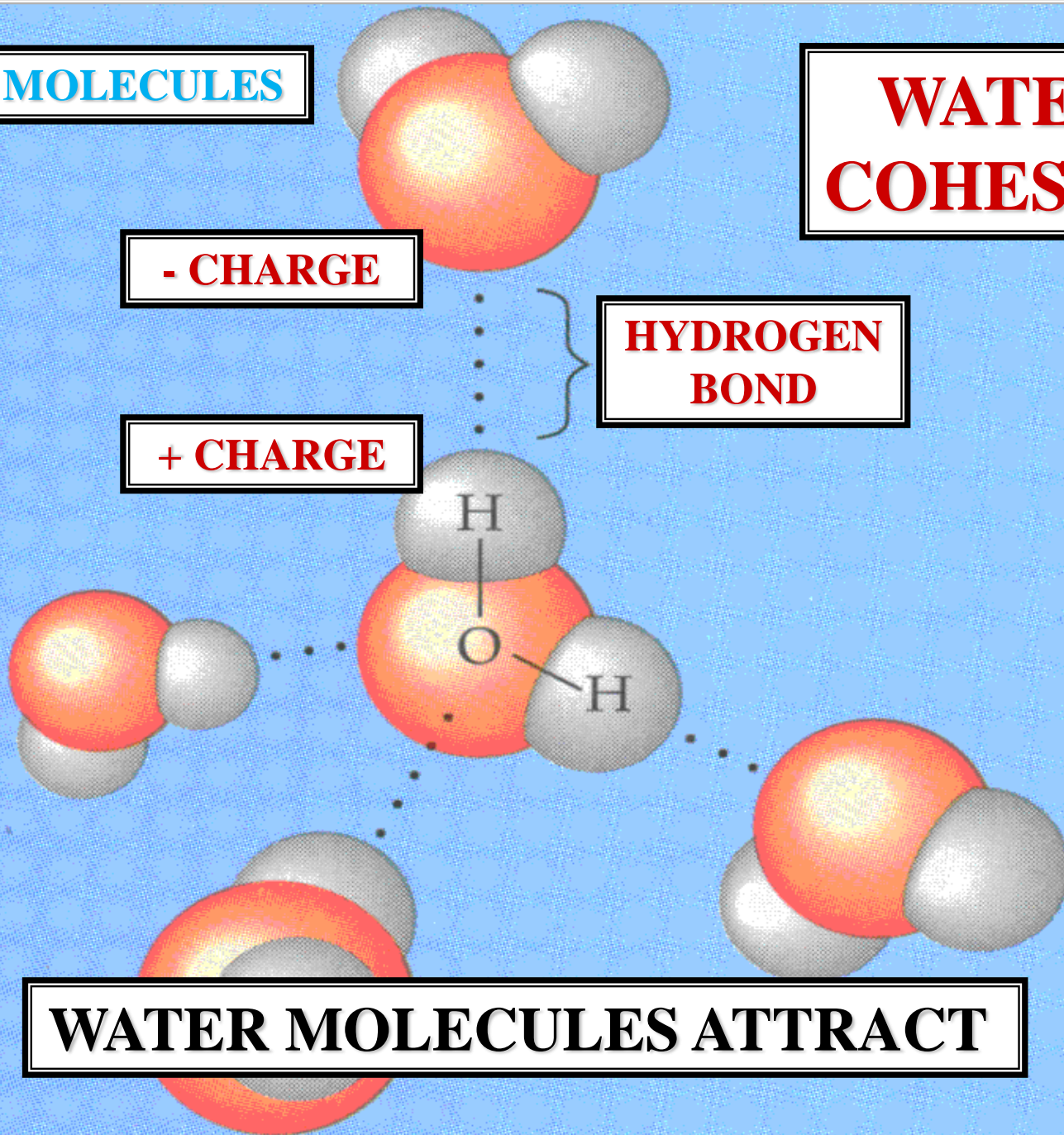
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- CHARGE

+ CHARGE

**HYDROGEN
BOND**



WATER MOLECULES ATTRACT



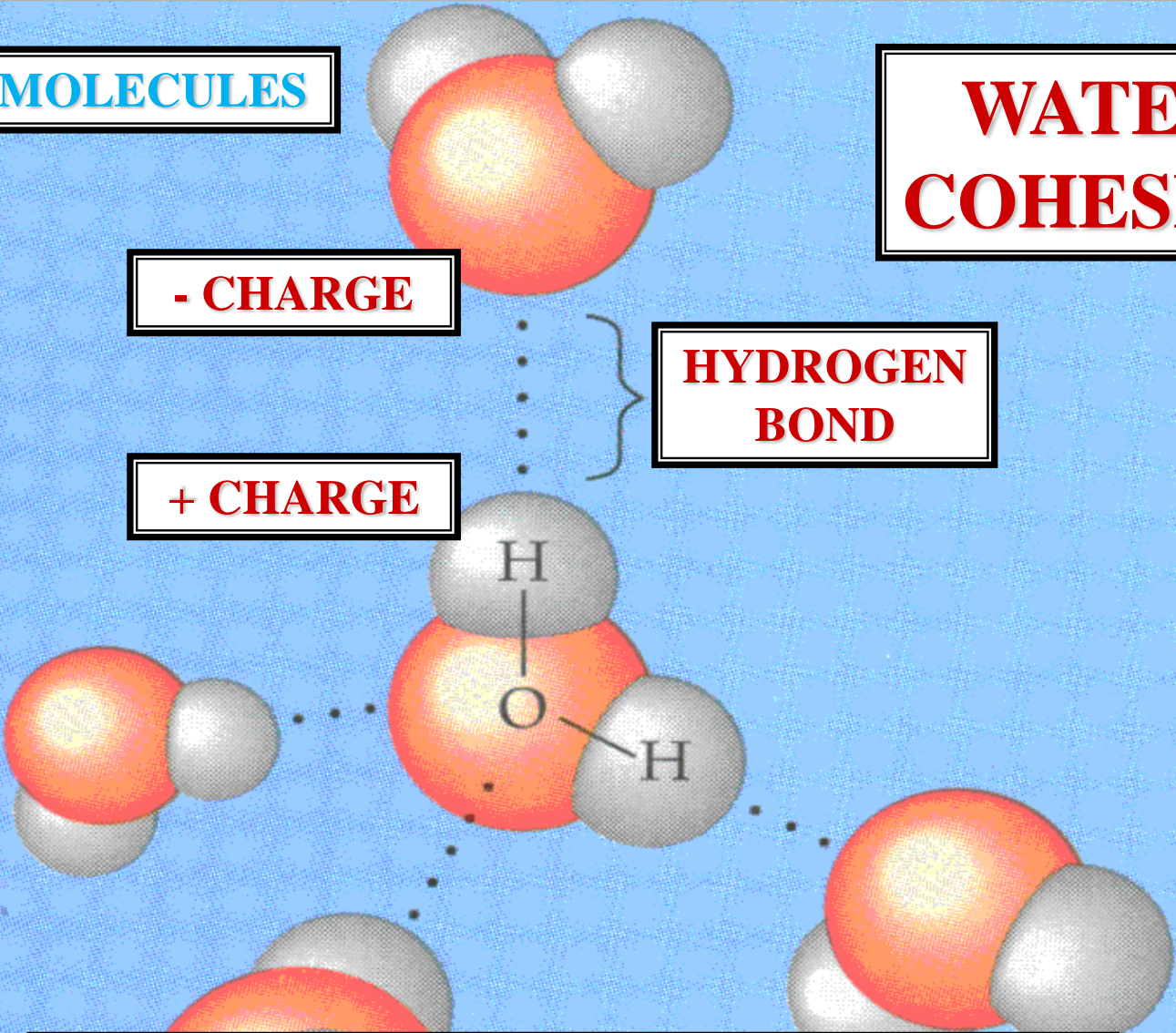
WATER MOLECULES

**WATER
COHESION**

- CHARGE

+ CHARGE

**HYDROGEN
BOND**



**WATER MOLECULES ATTRACT
VIA HYDROGEN BONDS**



WATER COHESION

WATER BIO-IMPORTANT PROPERTIES



**WATER
UNDERGOES
COHESION**

WATER BIO-IMPORTANT PROPERTIES

ADHESION

ADHESION



ADHESION

ATTRACTION
UNLIKE
MOLECULES

ADHESION



WATER

ADHESION

NON-POLAR SOLUTE

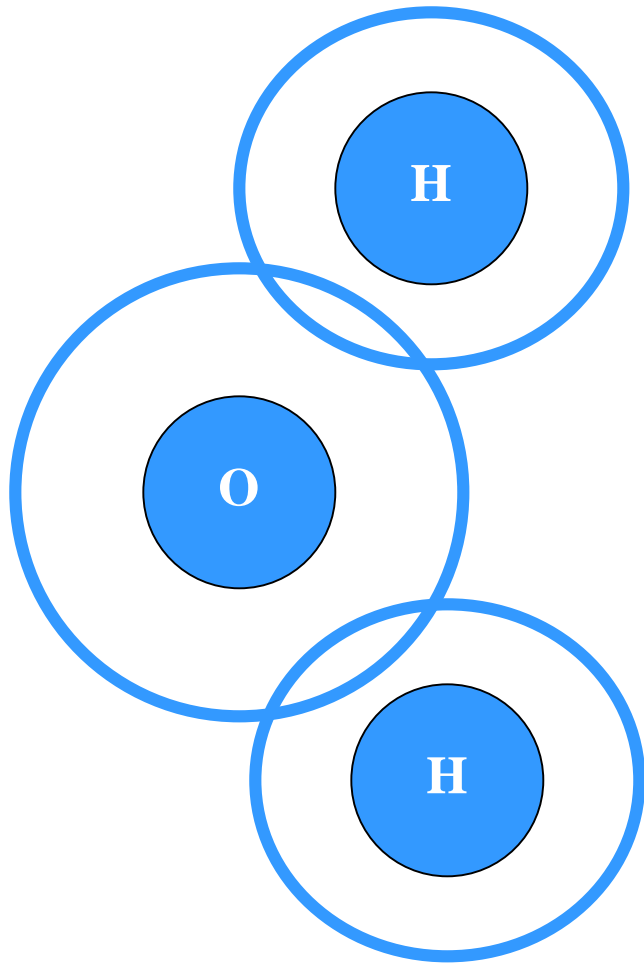
VS

POLAR SOLUTE

WATER ADHESION

NON-POLAR SOLUTE

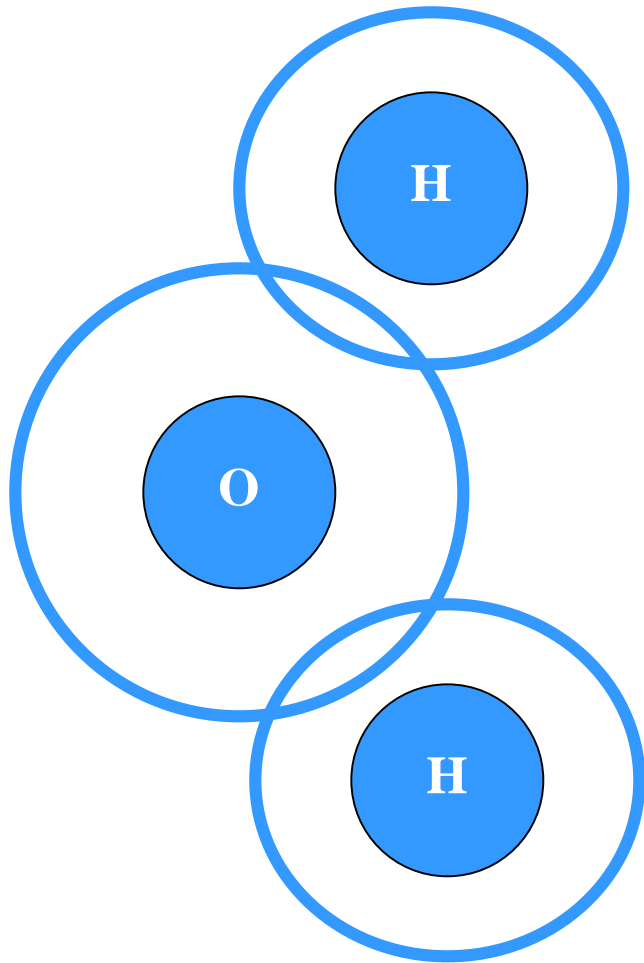
NON-POLAR SOLUTE



WATER MOLECULE

NON-POLAR SOLUTE

+

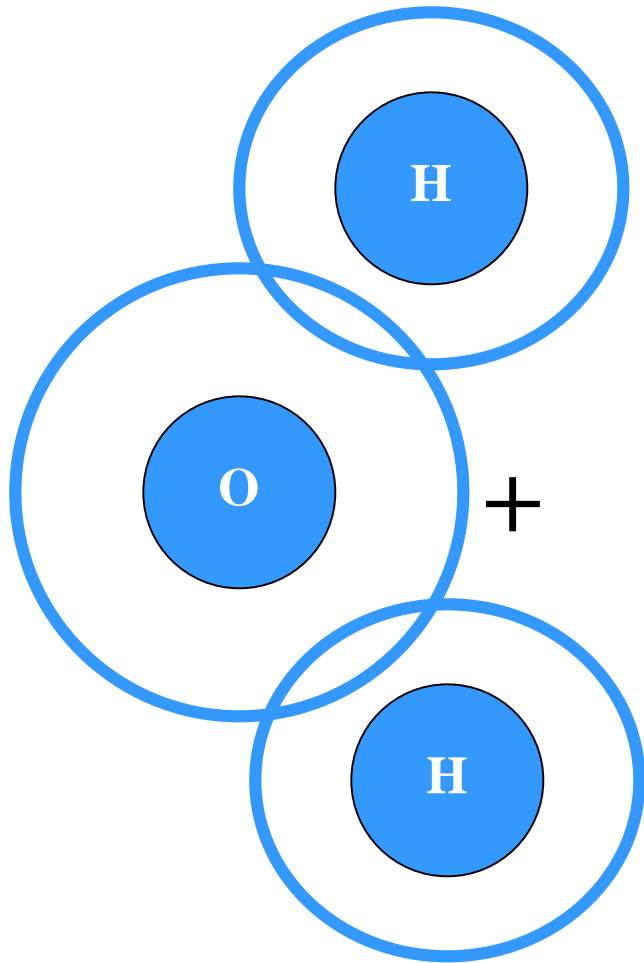


WATER MOLECULE

HIGHLY POLAR

NON-POLAR SOLUTE

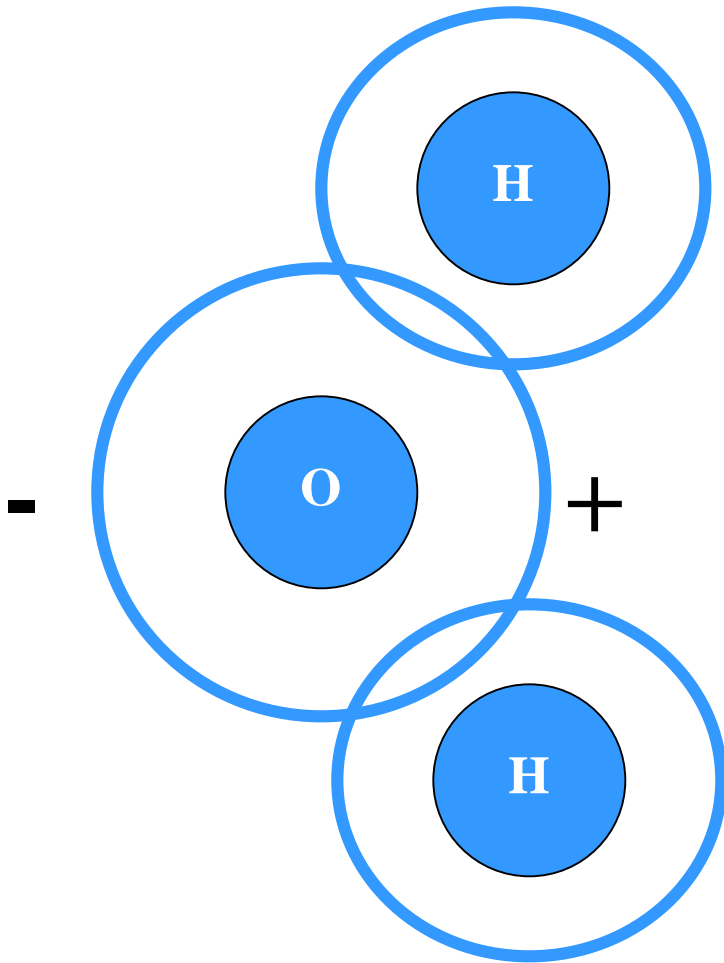
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+ POSITIVE CHARGE

POLAR WATER MOLECULE

NON-POLAR SOLUTE

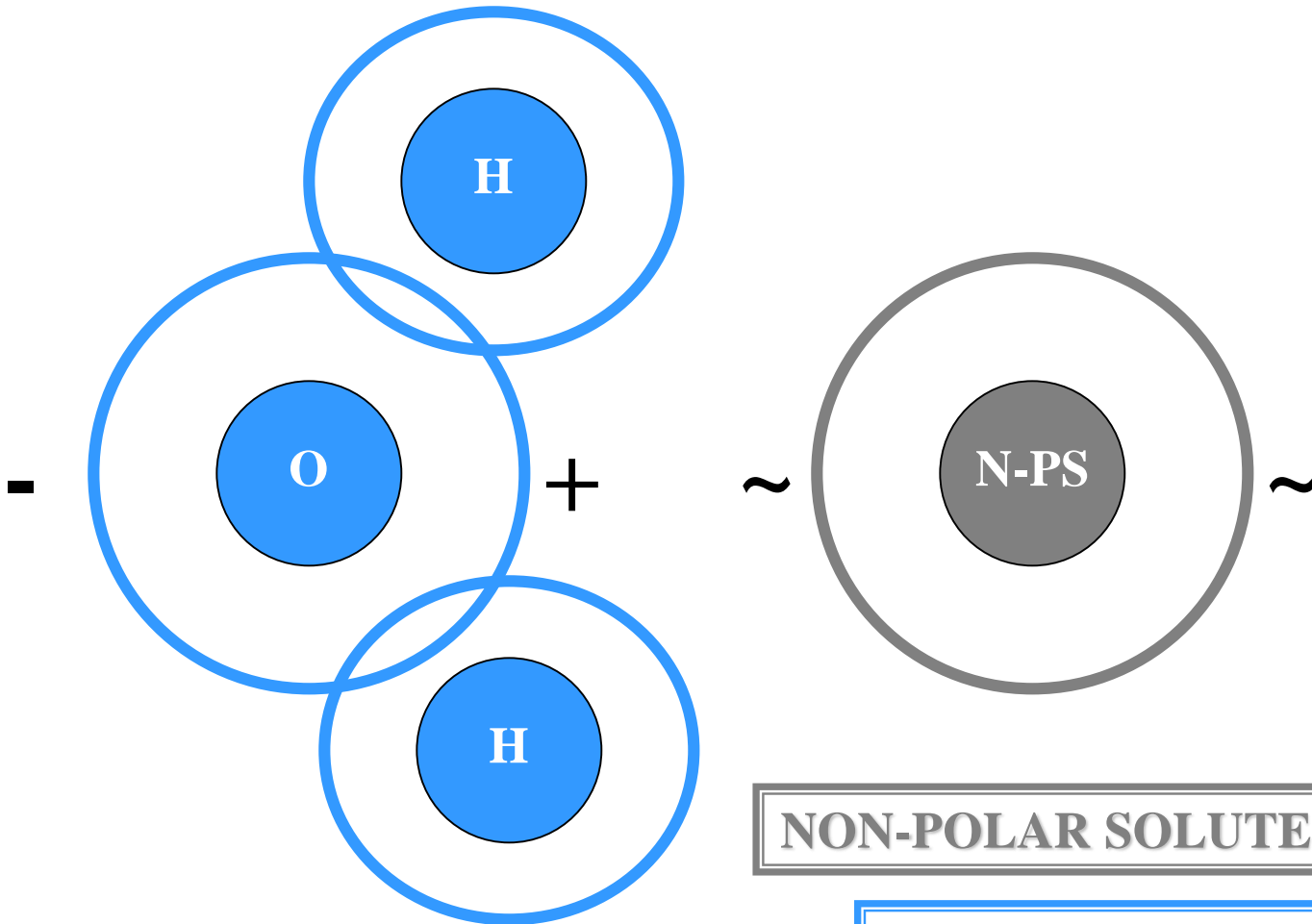
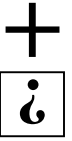


POLAR WATER MOLECULE

+ POSITIVE CHARGE

- NEGATIVE CHARGE

NON-POLAR SOLUTE



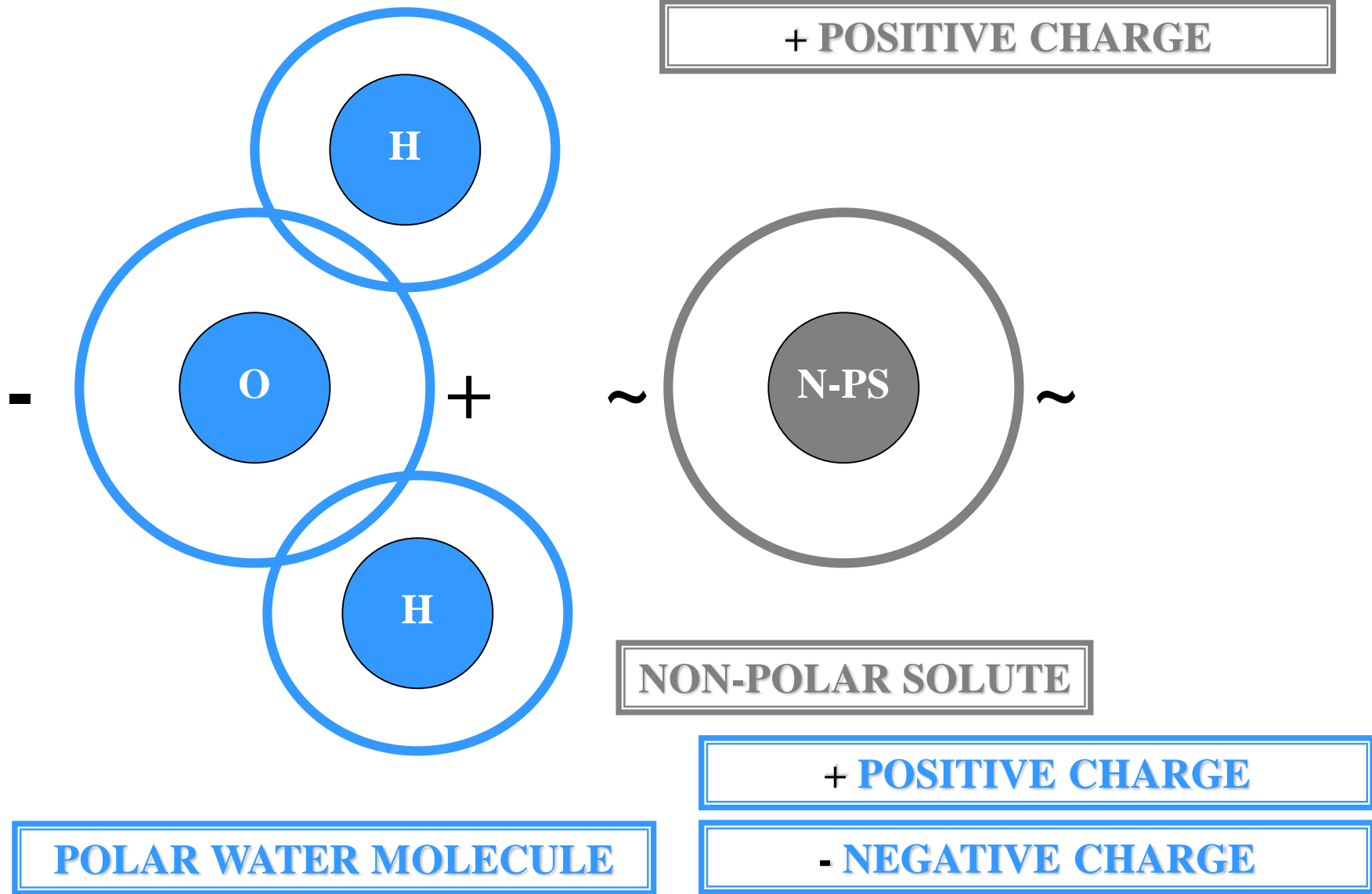
POLAR WATER MOLECULE

NON-POLAR SOLUTE

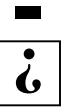
+ POSITIVE CHARGE

- NEGATIVE CHARGE

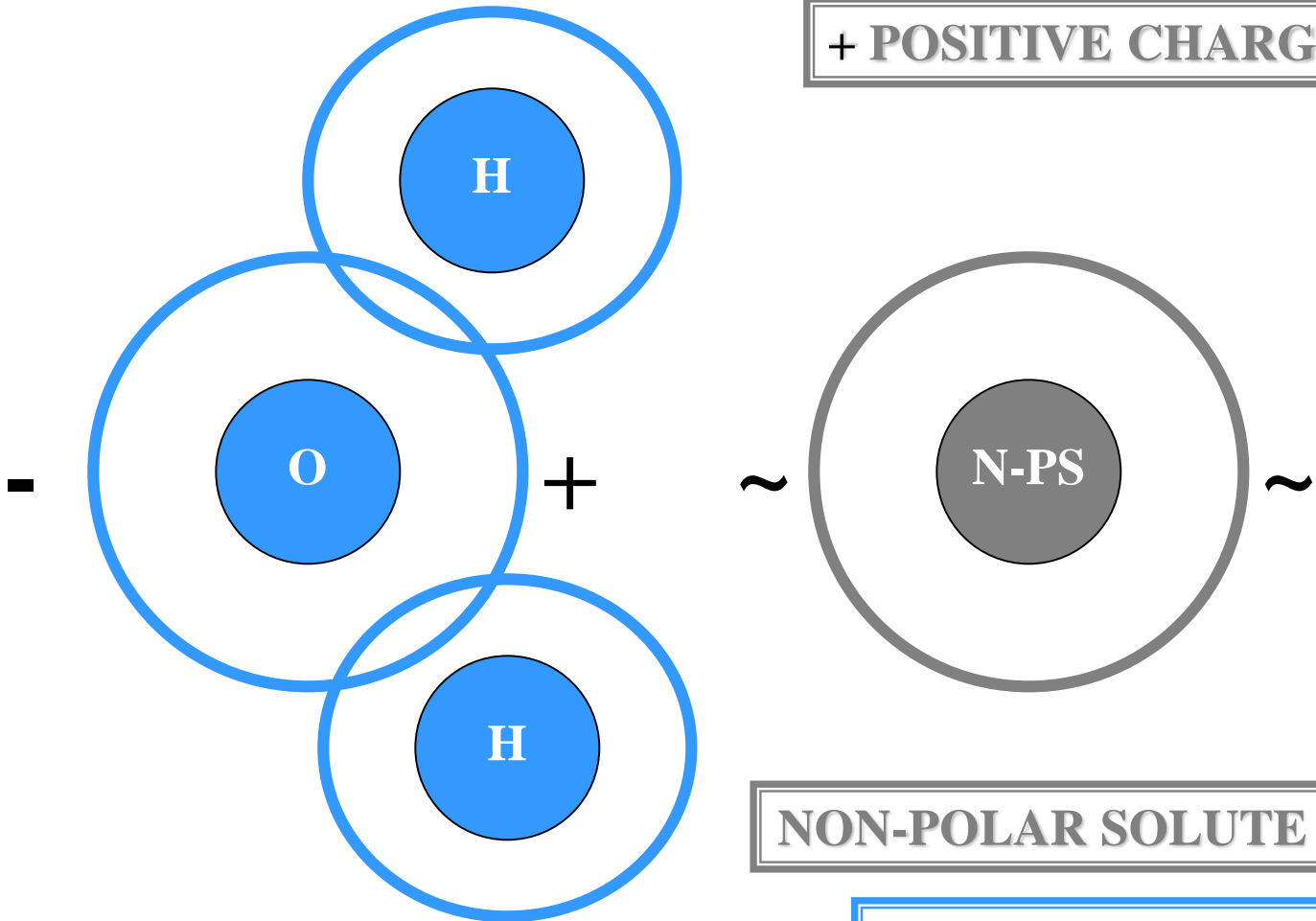
NON-POLAR SOLUTE



NON-POLAR SOLUTE



+ POSITIVE CHARGE: **ABSENT**



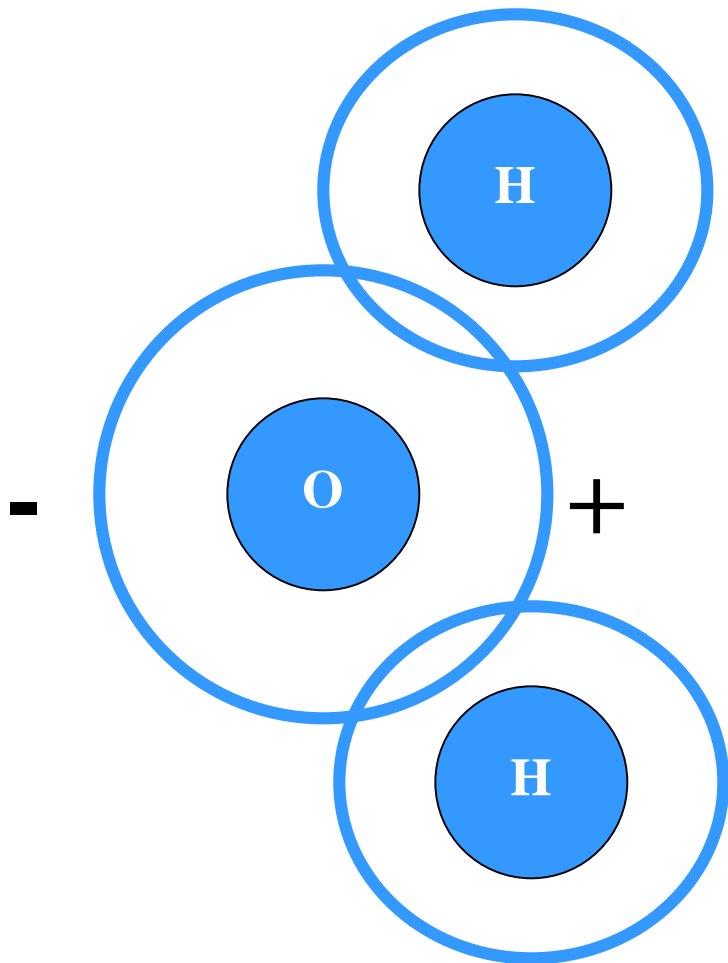
POLAR WATER MOLECULE

NON-POLAR SOLUTE

+ **POSITIVE CHARGE**

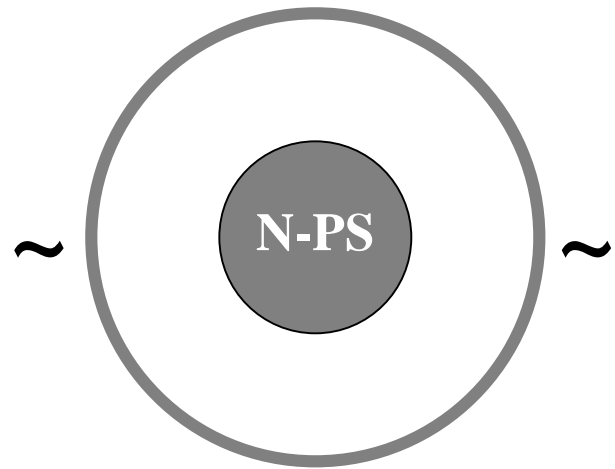
- **NEGATIVE CHARGE**

NON-POLAR SOLUTE



+ POSITIVE CHARGE: **ABSENT**

- NEGATIVE CHARGE



NON-POLAR SOLUTE

+ POSITIVE CHARGE

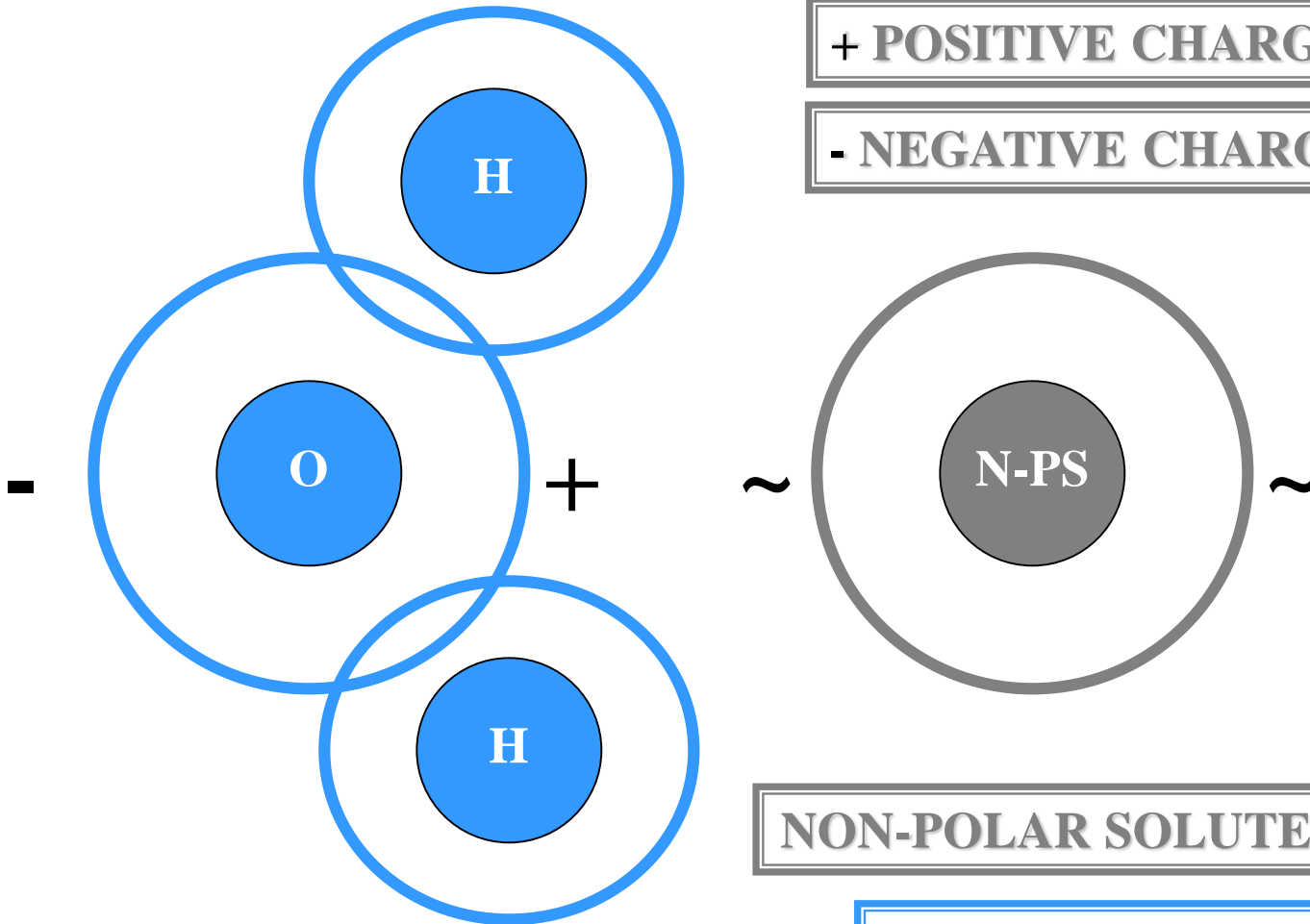
- NEGATIVE CHARGE

POLAR WATER MOLECULE

NON-POLAR SOLUTE

+ POSITIVE CHARGE: **ABSENT**

- NEGATIVE CHARGE: **ABSENT**



POLAR WATER MOLECULE

NON-POLAR SOLUTE

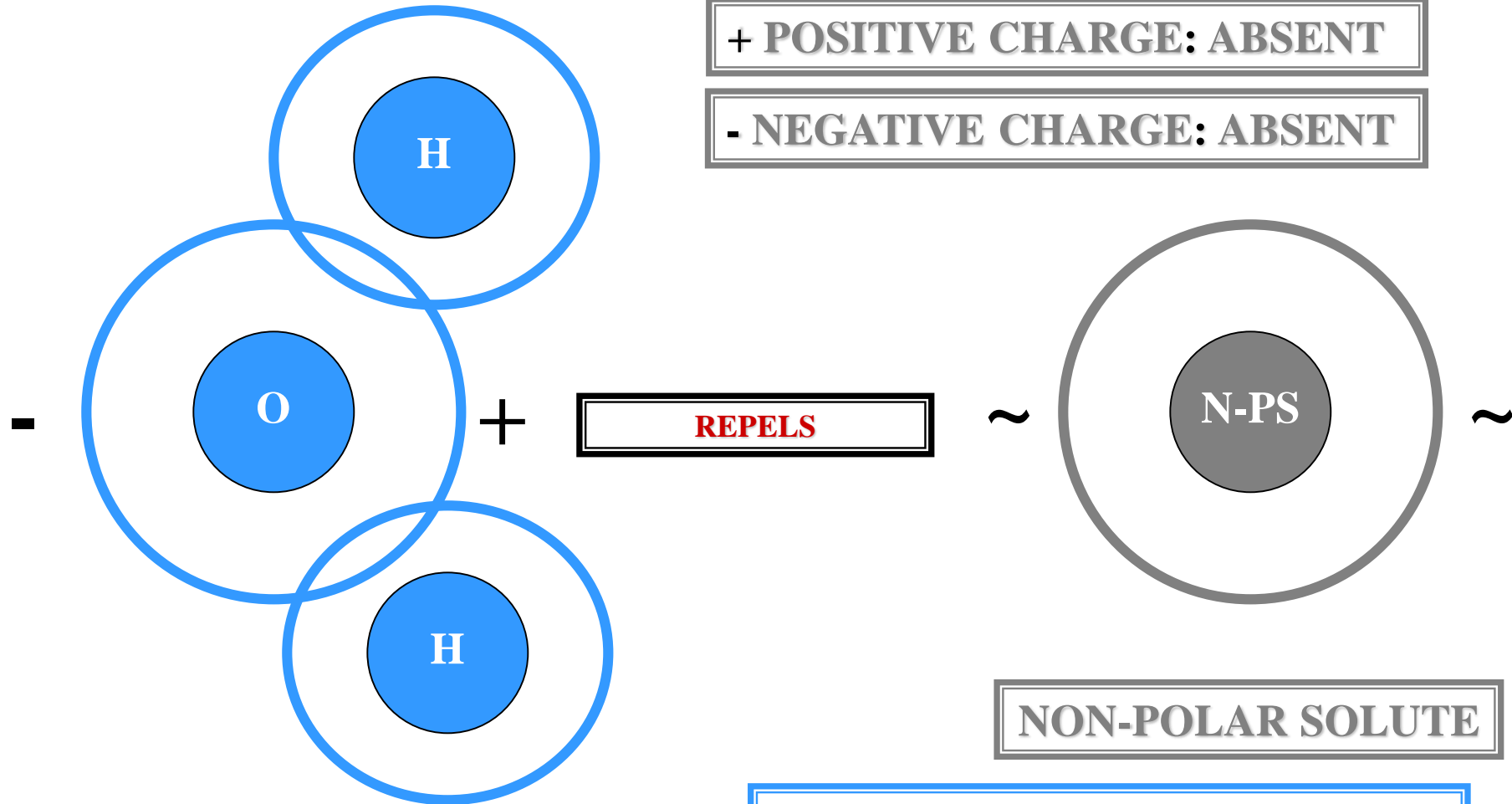
+ **POSITIVE CHARGE**

- **NEGATIVE CHARGE**

NON-POLAR SOLUTE

+ POSITIVE CHARGE: ABSENT

- NEGATIVE CHARGE: ABSENT



REPELS

N-PS

NON-POLAR SOLUTE

+ POSITIVE CHARGE

- NEGATIVE CHARGE

POLAR WATER MOLECULE

WATER BIO-IMPORTANT PROPERTIES

**NON-POLAR
SOLUTE**

REPELS WATER

WATER BIO-IMPORTANT PROPERTIES

WATER MOLECULES

**WATER
ADHESION**

H

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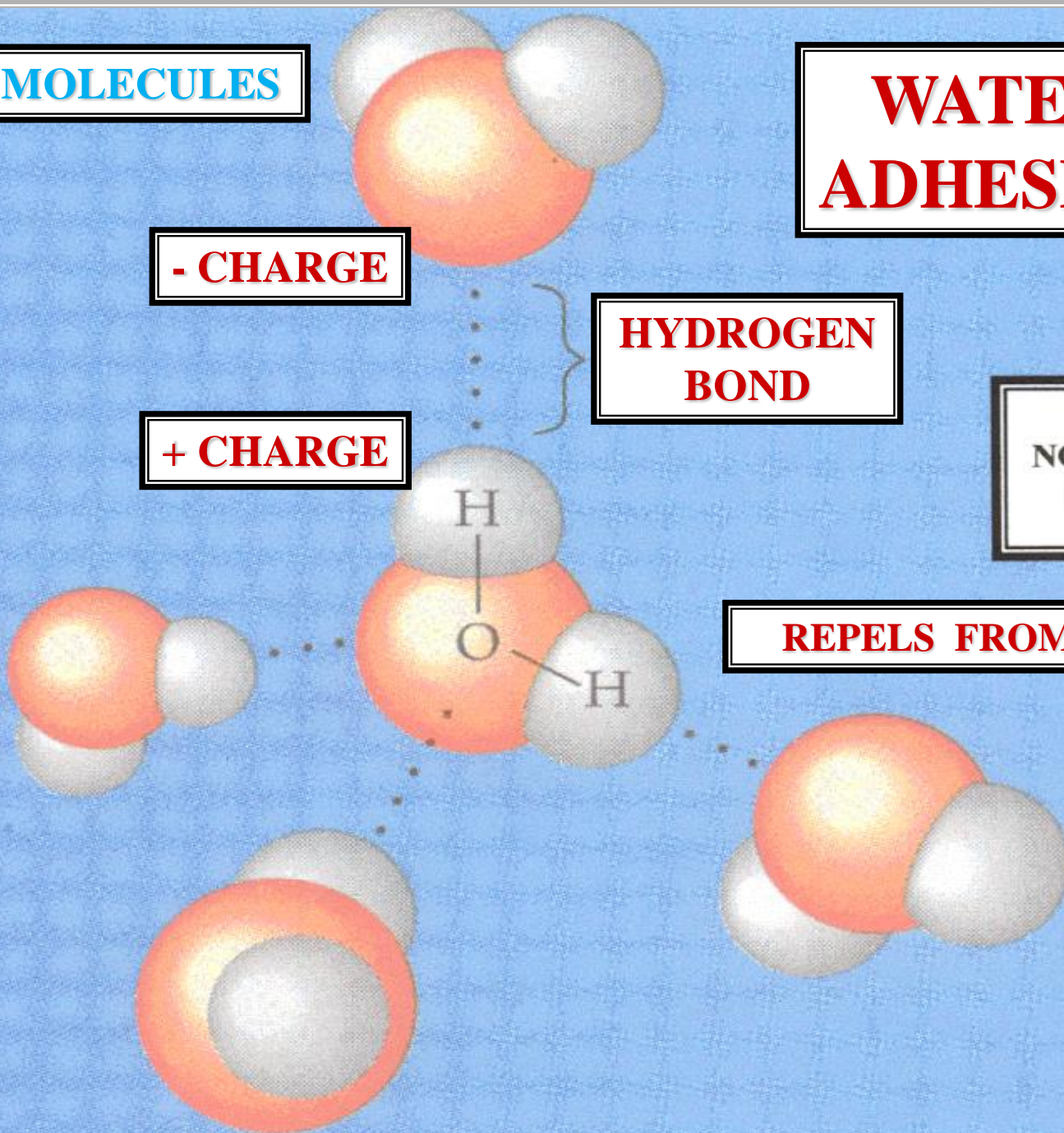
- CHARGE

+ CHARGE

**HYDROGEN
BOND**

~
**NON-POLAR
SOLUTE**
~

REPELS FROM WATER



WATER MOLECULES

**WATER
ADHESION**

H
i

- CHARGE

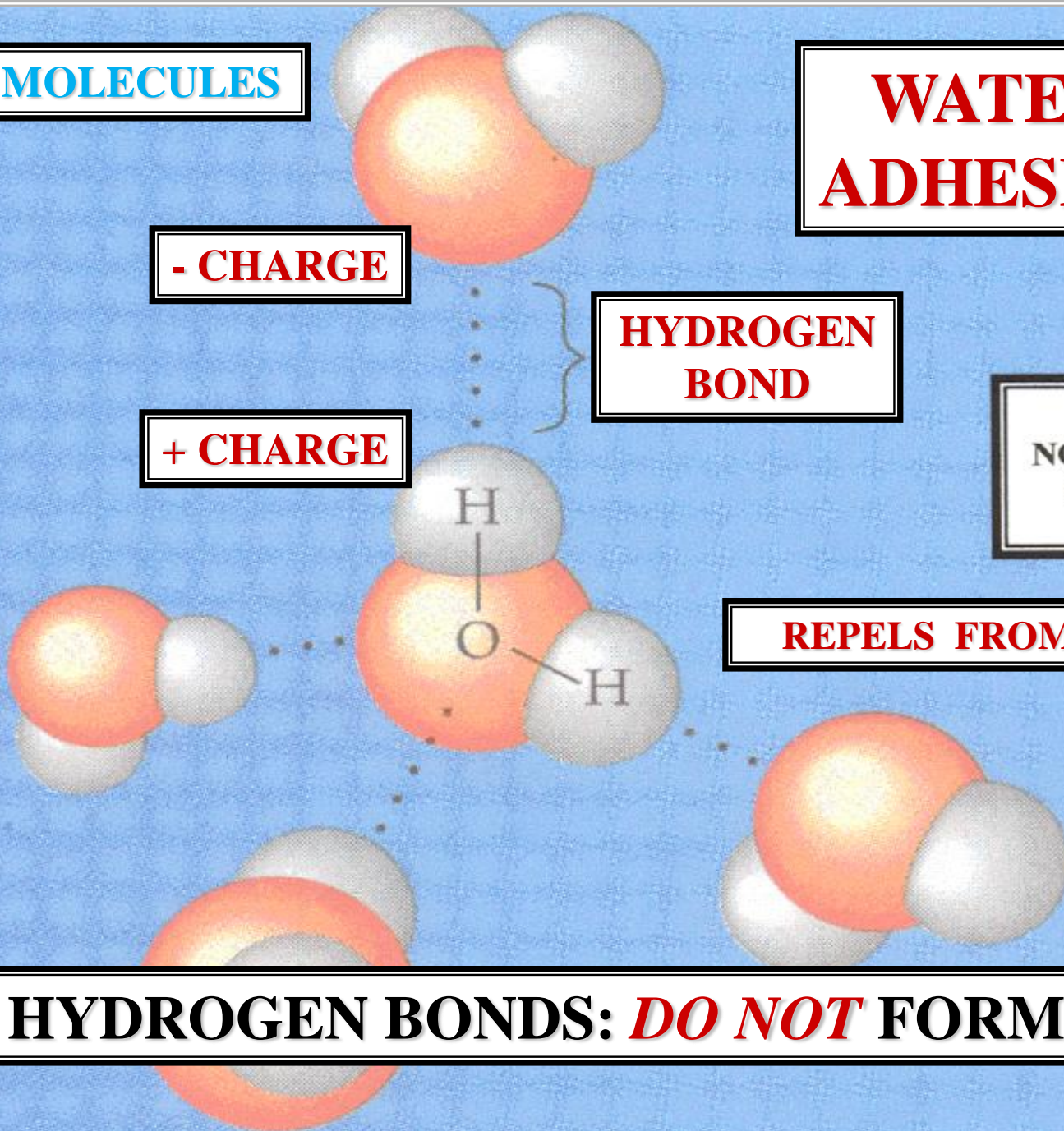
+ CHARGE

**HYDROGEN
BOND**

~
**NON-POLAR
SOLUTE**
~

REPELS FROM WATER

HYDROGEN BONDS: *DO NOT* FORM



WATER MOLECULES

**WATER
ADHESION**

- CHARGE

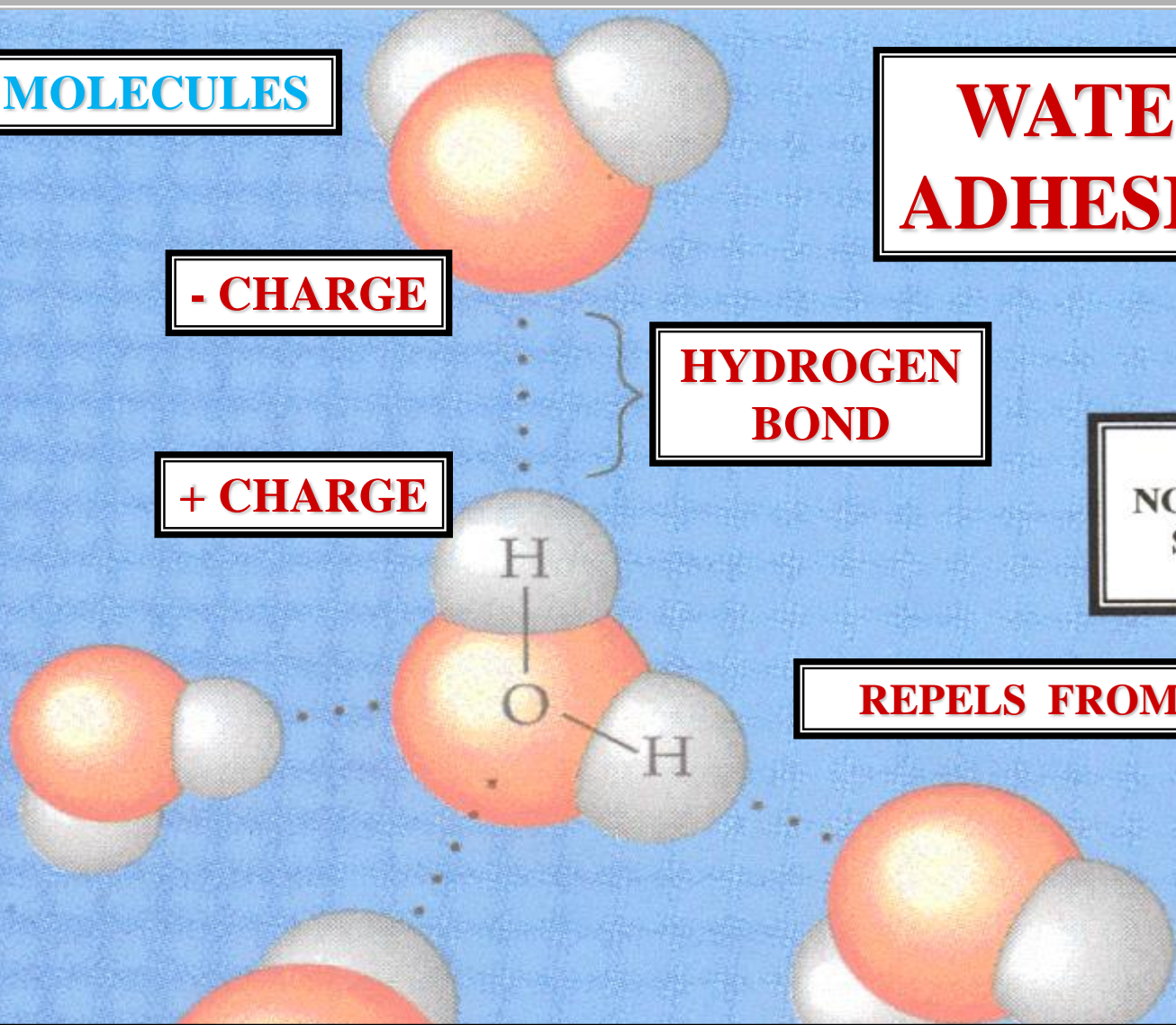
+ CHARGE

**HYDROGEN
BOND**

~
**NON-POLAR
SOLUTE**
~

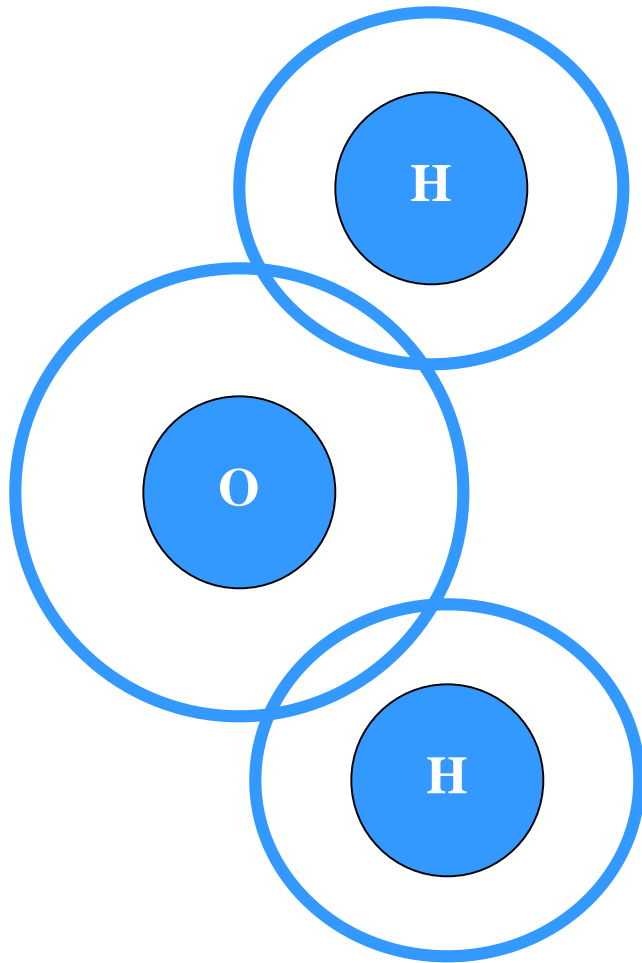
REPELS FROM WATER

**HYDROGEN BONDS: *DO NOT* FORM
NON-POLAR SOLUTE: **HYDROPHOBIC****



WATER
ADHESION
POLAR SOLUTE

POLAR SOLUTE



WATER MOLECULE