

# **THE NEED FOR ENERGY**

**[HTTP://WWW.YOUTUBE.COM/WATCH?V=BBTQF9Q\\_PFW](http://www.youtube.com/watch?v=BBTQF9Q_PFW)**

## **CHARACTERISTICS OF LIFE →**

- 1. Life is based on organic chemistry**
- 2. Composed of cells- smallest living unit**
- 3. Use energy**
- 4. Form and size range**
- 5. Growth (and development)**
- 6. Life span**
- 7. Response to environment**
- 8. Reproduction**
- 9. Adapt/evolve over time**

# ENERGY

- Energy is the ability to do work
- Many types of energy:
  - Physical
  - Mechanical
  - Electrical
  - Chemical
- Potential=stored
- Kinetic= being used
- \*can be transformed from one type to another – battery: chemical to electrical, roll downhill: potential to kinetic

The  
chemical  
energy cells  
use → ATP

**For our bodies to do work  
(life processes), can't use energy  
in form of heat/light ...  
living things need energy  
in form of **ATP****

# CELL PROCESSES THAT REQUIRE ENERGY

1. Cell movement → cilia, flagella
2. Active transport → [low] to [high]
  - endocytosis, exocytosis,
3. Mitosis → cells divide

# ALL ORGANISMS NEED ENERGY FOR LIFE...

How is energy obtained?

1. producer =

2. consumer =

Organisms need energy because cells **need energy to function!**

Ex: working out



**WHAT ORGANELLE STORES/RELEASES ENERGY?**

*MITOCHONDRIA!*

- Power house of the cell

# HOW MUCH ATP DO HUMAN CELLS USE?

- Each cell in the human body is estimated to use between one billion and two billion ATP's per minute
- With 100 trillion cells in the human body, how much ATP do we need?
- In the span of 24 hours, 100 trillion cells produce @ 441 lbs of ATP!

# ENERGY

ENERGY MOLECULE = ATP

*Adenosine triphosphate*

Adenosine molecule + 3 phosphate groups

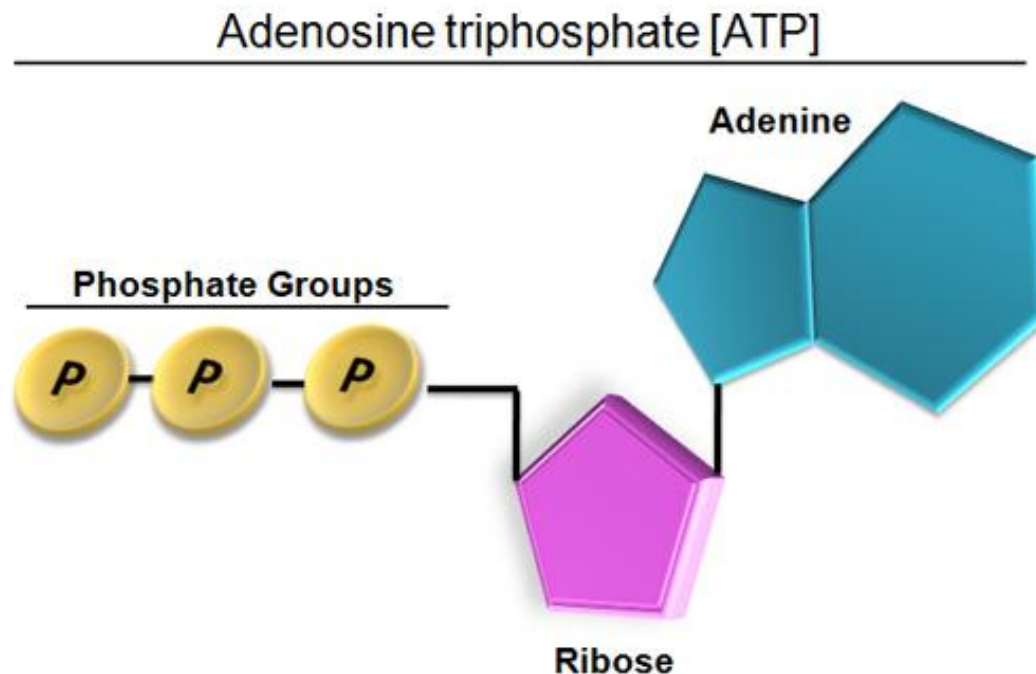




## MAKE UP OF ATP:

*ATP = Adenosine triphosphate*

- Adenosine molecule → adenine + ribose sugar
- 3 phosphate groups



# ENERGY

- Energy is stored in chemical bonds of the molecule
- Can be used quickly and easily by the cell
- When molecule is broken down, energy is released

- Energy of ATP is stored in chemical bonds **between phosphate groups**

- When one bond breaks → one P-group is released; energy is given off

ATP → **ADP** (Adenosine diphosphate)

- When two bonds break → two P-groups are released energy is given off

ADP → **AMP** (Adenosine monophosphate)

## WHY IS ENERGY STORED IN THE BONDS?

- Phosphate groups are negatively charged
- Like charges repel (and opposites attract)
- Energy is therefore needed to keep ATP together

AMP

ADP

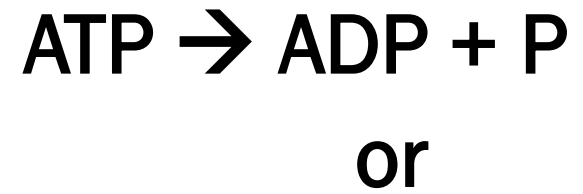
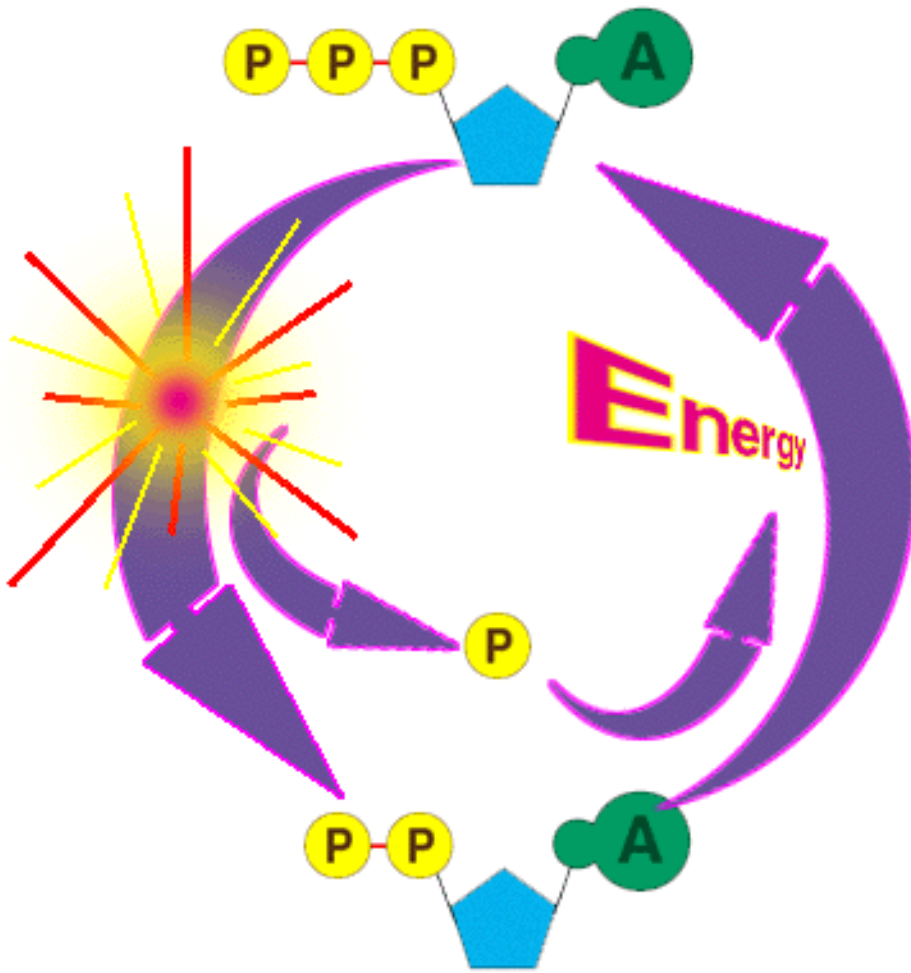
ATP

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little energy

most potential energy

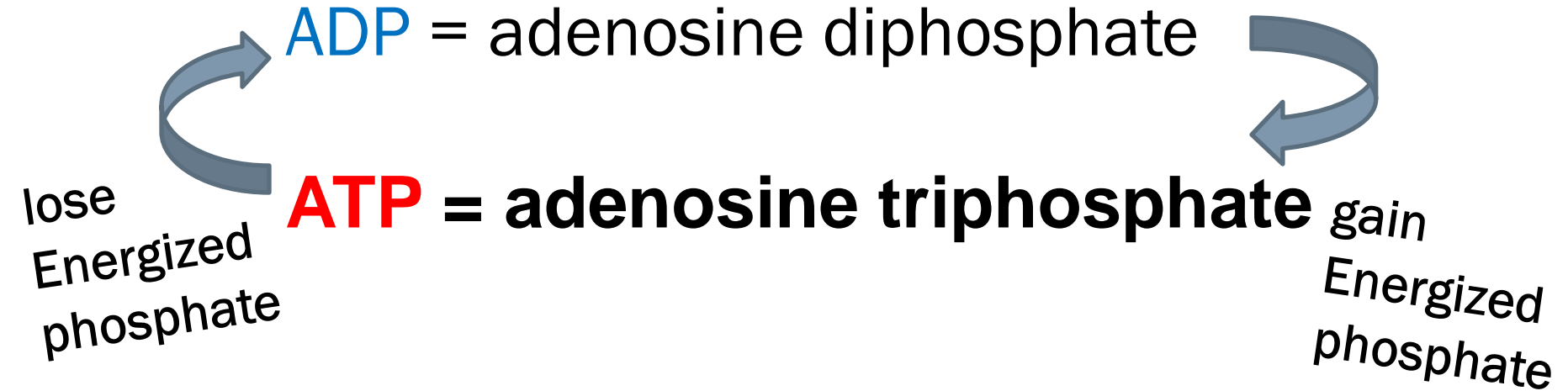
to keep ATP stored together **AND** to break bond(s)



\* Continuous cycle \*

# MODEL

**ATP is the ultimate form of energy for living things!**



## WHY IS ADP-ATP CYCLE IMPORTANT?

- Cell **doesn't** have to store all the ATP it needs
- As long as P-groups available, cycle can continue to make more energy
- Cell can use ADP for energy if it has to (not typically done, though)

# ADP-ATP CYCLE AND A BATTERY

How does the ADP-ATP Cycle compare to a cell phone battery?

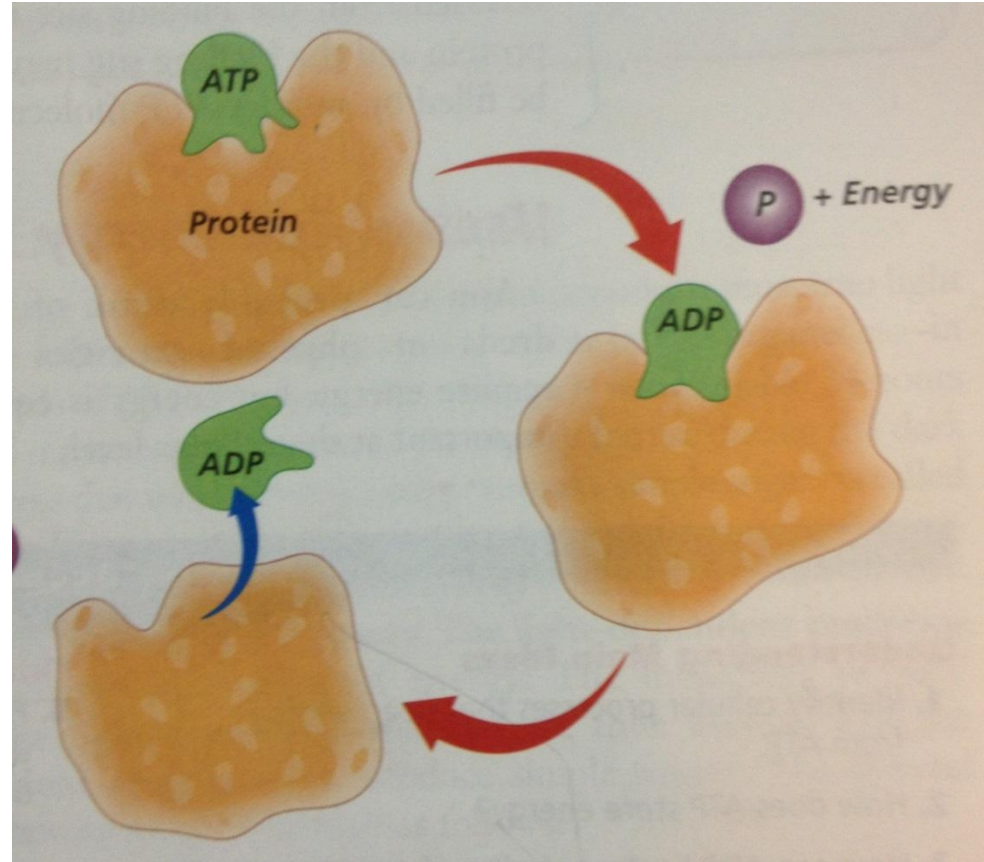
## Rechargeable/renewable cycle

- Use energy to text, tweet, etc.
- When all used up, phone dies
- “Charge” it back up and add “energy” by plugging phone into electrical outlet
- Battery is re-charged and more energy is made
- Cycle continues, just as the ADP-ATP cycle does!



# HOW DO THE CELLS GET THE ENERGY?

- Many proteins have a specific binding site for ATP to bind to
- When bound, a P-group is released, forming ADP
- Protein then releases ADP so that another ATP can bind to the binding site




# ATP-ADP CYCLE IN THE BODY

- When a muscle contracts, ATP gives off its energy (ATP bond is broken to release the energy, leaving ADP) (The ADP is “recharged” into ATP when we eat)
- Glucose from the food you consumed is broken down, creating more ATP
- ATP can then be used again to cause another muscle contraction

Making atp → [http://www.youtube.com/watch?v=V\\_xZuCPiHvk](http://www.youtube.com/watch?v=V_xZuCPiHvk)

## REVIEW:

1. What does ATP stand for? ADP? AMP?
  2. What three molecules are in ATP?
  3. How does ATP store energy?
  4. How can ADP be recycled to form ATP again?
  5. How do proteins access energy?
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# WORKSHEET



# OXIDATION-REDUCTION REACTIONS

Transfer of one or more electrons and/or energy from one compound to another

– Two Parts:

\* Oxidation

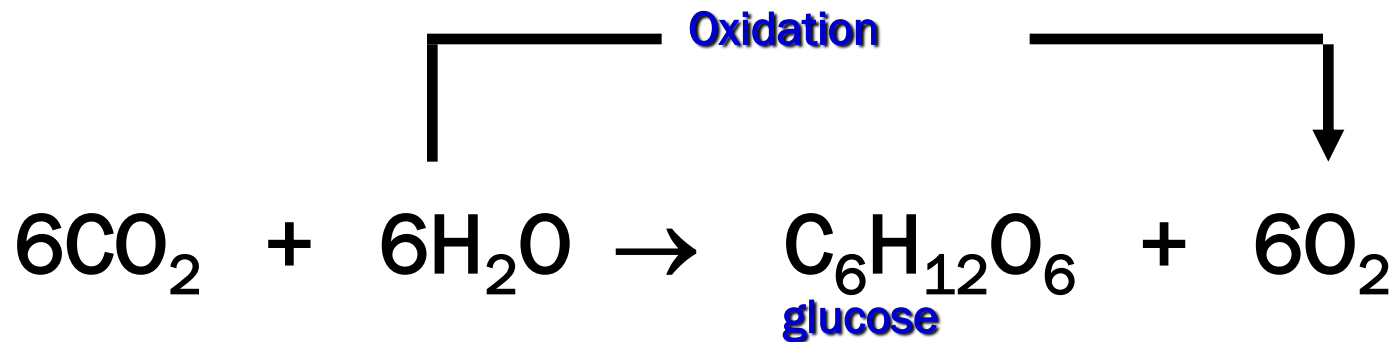
\* Reduction

OIL RIG — LEO (says) GIR

# OXIDATION REACTION

The loss of **electrons, hydrogen atoms, or energy** from a substance.

Or the **gain** of **oxygen**.

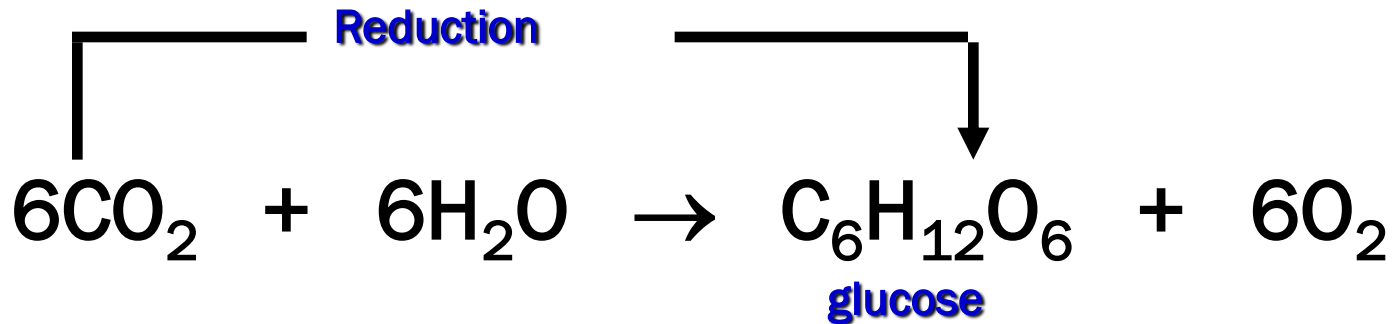


THIS IS  
PHOTOSYNTHESIS!

# REDUCTION REACTION

The gain of **electrons, hydrogen atoms, or energy** to a substance.

Or the **loss** of **oxygen**.



THIS IS  
PHOTOSYNTHESIS!



# REDUCTION REACTION

	ELECTRONS	HYDROGEN ATOMS	ENERGY
OXIDATION			
REDUCTION			

OIL RIG ----- LEO (says) GIR