

Monday Aug 31st

TODAY'S CLASS

- Recap of **KEY POINTS** from last week
- **Clicker / Response Session Debut!**
- **Topic #2 (cont.) :**
MATTER & ENERGY - APPLIED
- **TYING IT ALL TOGETHER**



Syllabus



Course
FAQ



POP QUIZ ON THE SYLLABUS & FAQ COURSE LOGISTICS

Q1: When is it OK to talk to my classmates during classtime?

[FAQ # 34](#)

Q2: When should you **begin taking RQ-1 (next one due a week from **WEDNESDAY**) so you are sure to finish it **before the** **“CUTOFF” DEADLINE?****

[FAQ # 23](#)

Q3: What should you do if you **need Dr H to sign a grade report for your program, coach, tutor, sorority, fraternity, etc.?**

[FAQ #29](#)

Q4 When and where are the office hours for Dr. H and the rest of the Teaching Team?

[FAQ #5](#)

Q5 -If I worked together on an individual assignment with another student, can we turn in similar papers?

[FAQ #16](#)

Q6 May I take the Final Exam early?

[FAQ #26](#)

CLASS “recap” TIME

RECAP CLASS #1

Classroom & Course Logistics

Science & Quotes

Global Change

Hands-on Group Work:

GLOBAL MAP!

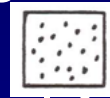
GROUP ACTIVITY

2) Then sketch in as best you can – use symbols to label:

-- The major mountain ranges



-- The major desert areas



-- The major areas of boreal forests



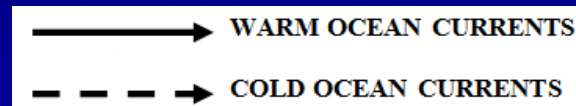
-- The major areas of tropical rainforest

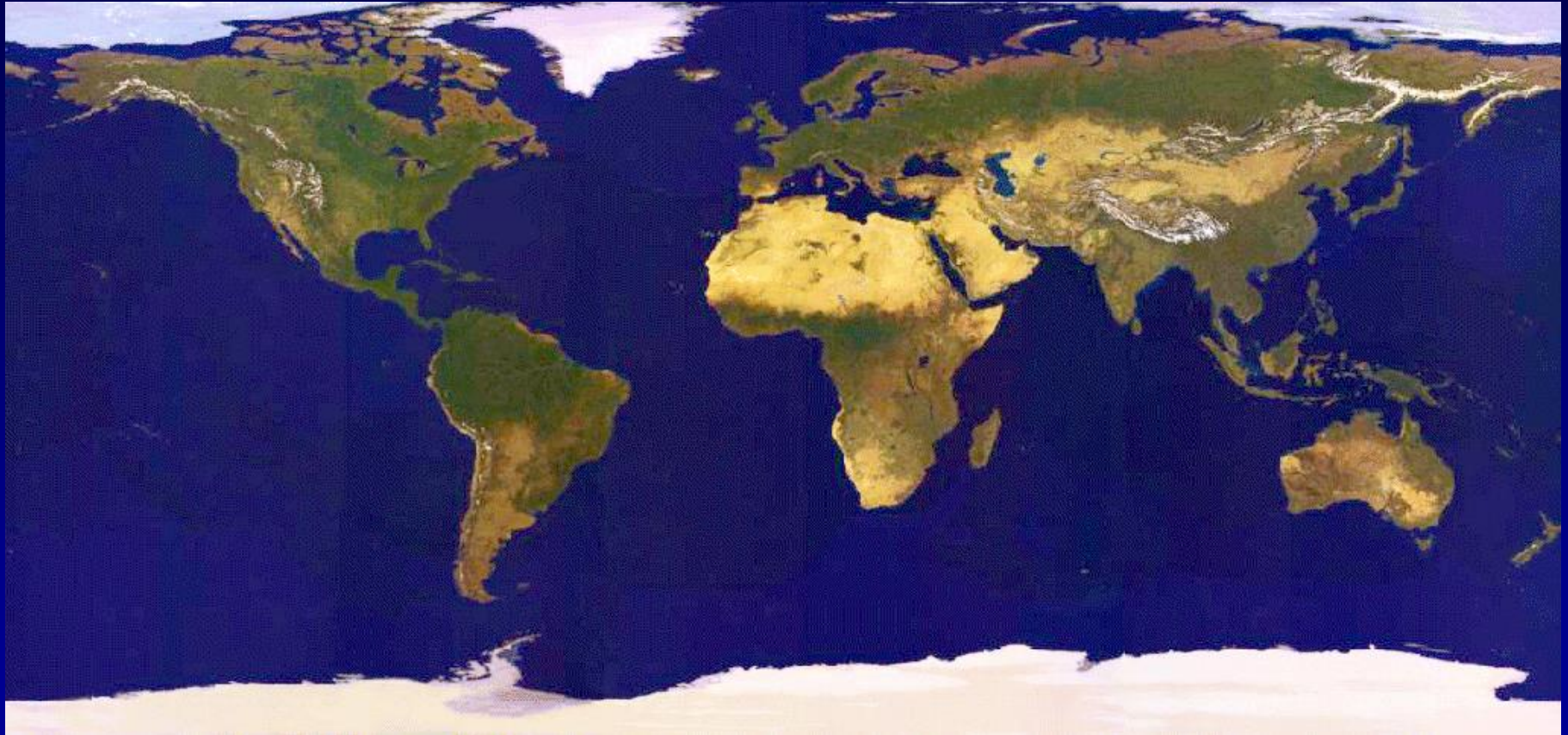


--The major areas of tundra



--The major warm and cold ocean currents

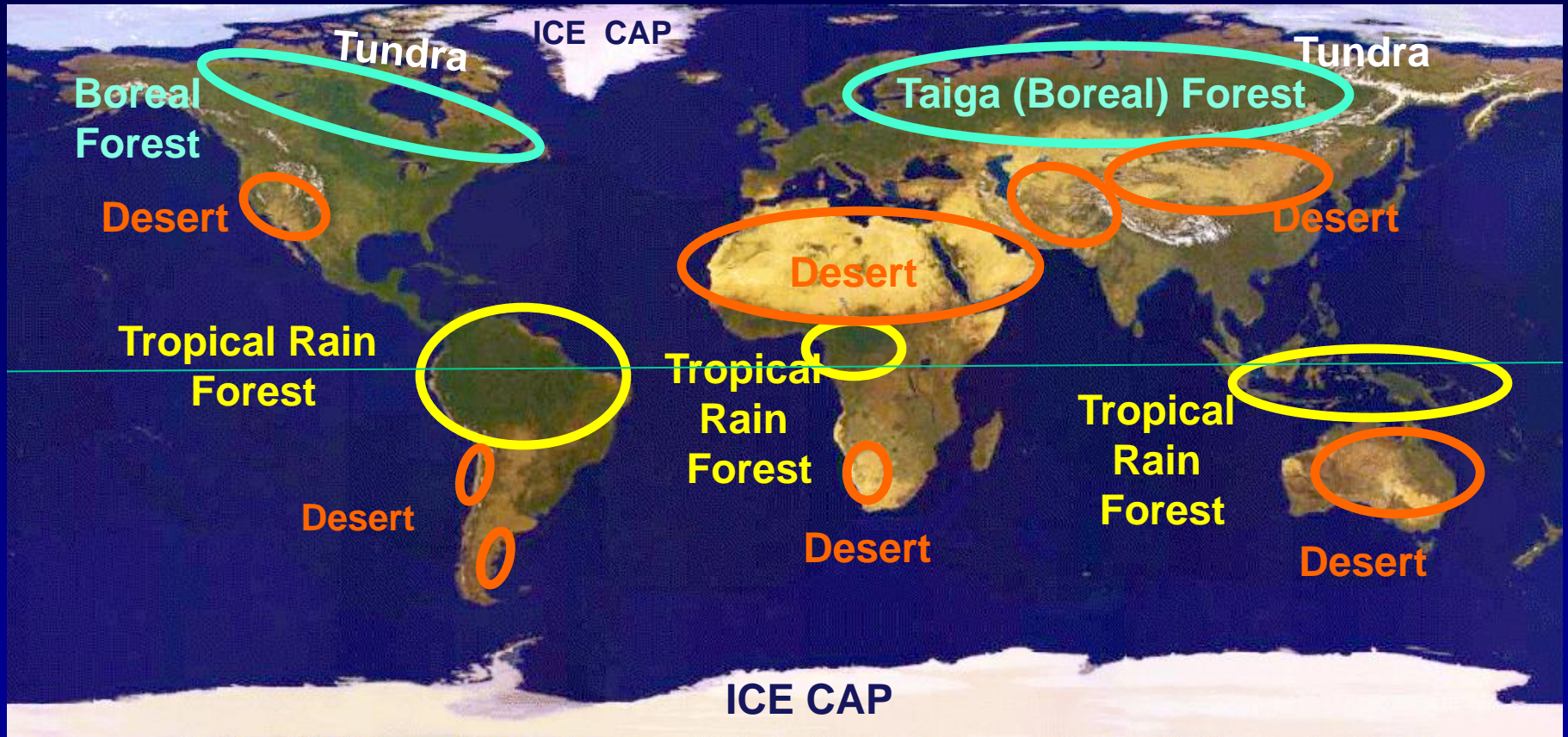




World Vegetation Map - USGS WWW Server

<http://capita.wustl.edu/CAPITA/Datasets/GlobalAerosol/GlobVegetation/earthveg.gif>

Greatly generalized



World Vegetation Map - USGS WWW Server

RECAP CLASS #2

More Course Logistics

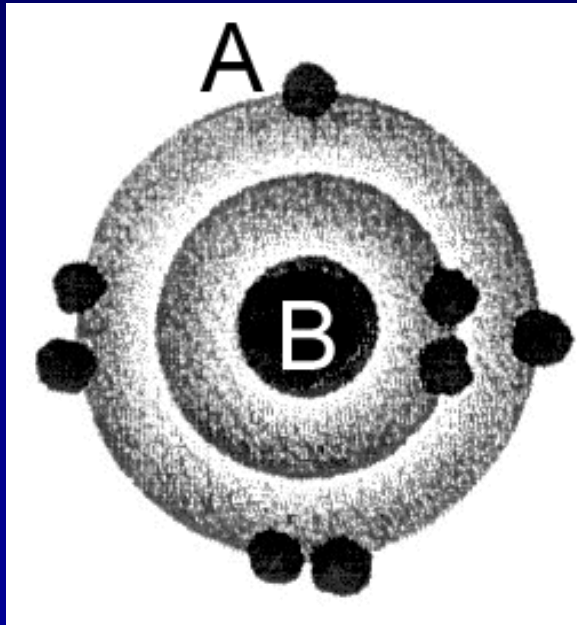
Matter Basics: atoms

Hands-on Group Work:
Periodic Table Review

GC –related Atoms & Molecules

Intro to Solar Energy (video)

Schematic “dot” diagram of an oxygen atom



protons = 8

neutrons = 8

atomic # = 8

mass # = 16

TRIAL RESPONSE TIME!

Practice Day: CLICKER POINTS WILL NOT BE COUNTED TODAY

Clicker



*Older clicker
is OK*

ResponseWare
Device



Open up your “APP”
or

login to: rwpoll.com

ENTER CHANNEL = 28

ENTER SESSION ID = see above

Q1. I am a . . .

A. FRESHMAN

B. SOPHOMORE

C. JUNIOR

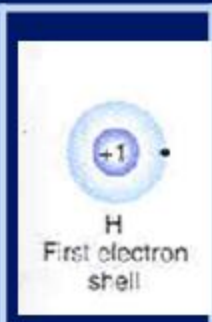
D. SENIOR

E. HUMAN BEING

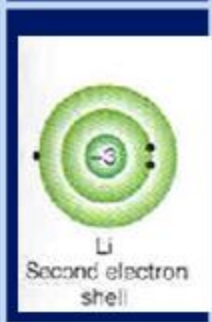
F. OTHER

Q2. Where does Boron fit in the Table?

(Answer with a number from 1 – 7)

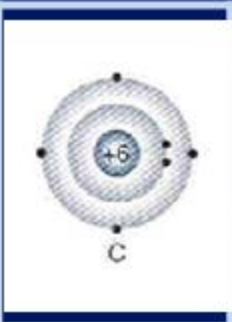


1

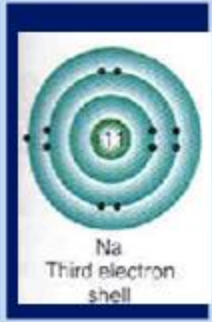
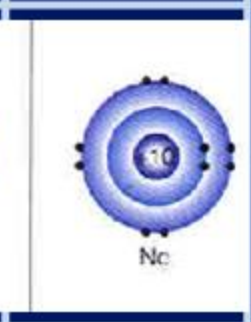
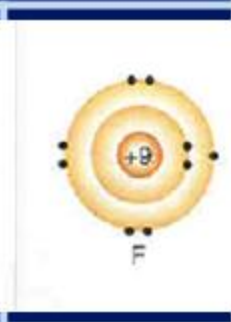
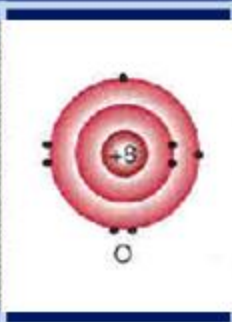


2

3

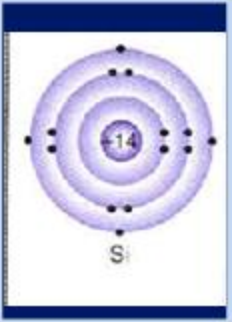


4

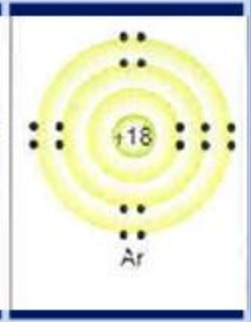
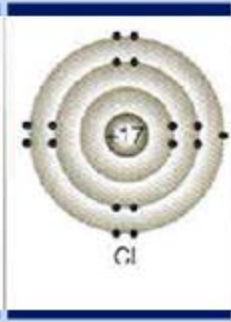
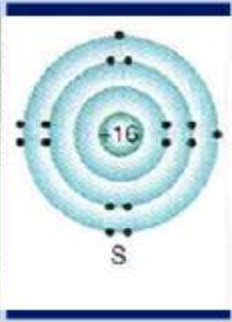


5

6



7



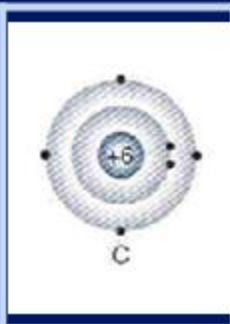
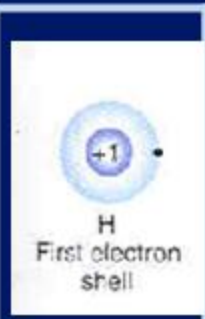
Q2. Where does Boron fit in the Table?



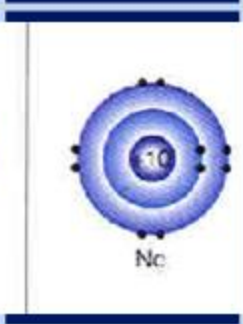
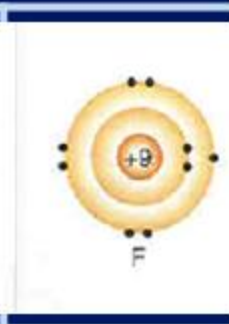
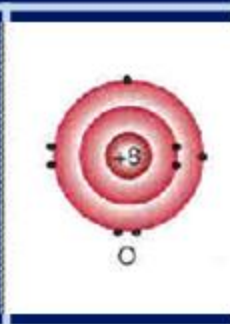
3 or "c" is correct!

(2 shells & 3 electrons in the outer shell)

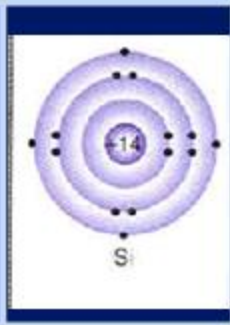
1



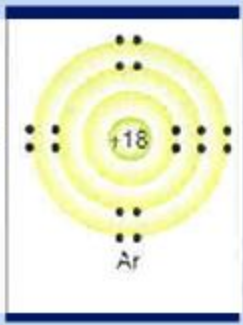
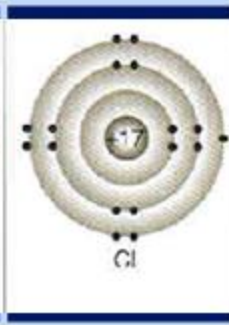
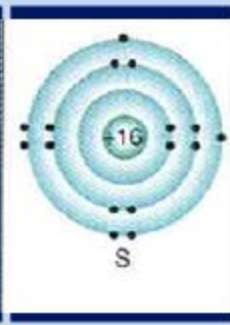
4



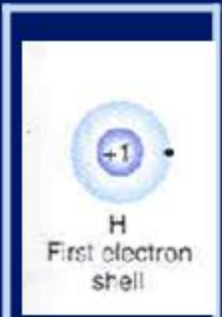
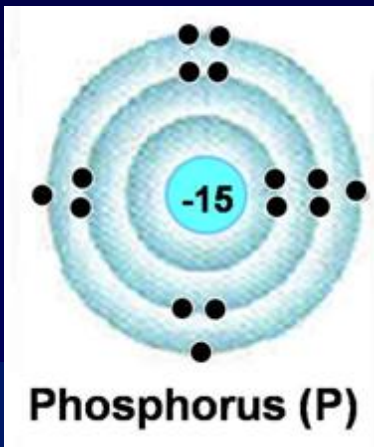
6



7



Q3. Where does Phosphorus fit in the Table?

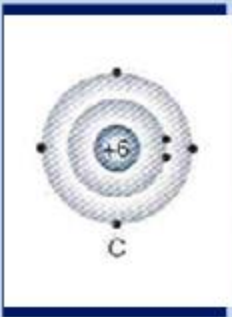


1

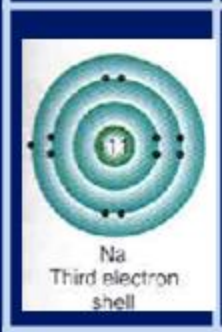
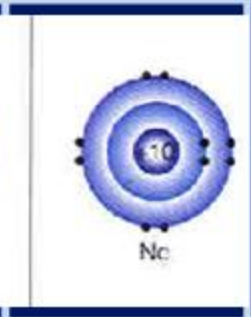
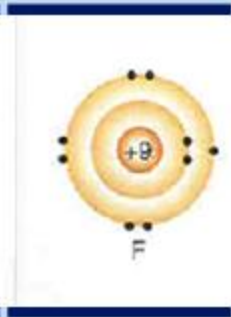
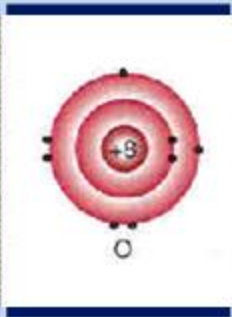


2

3

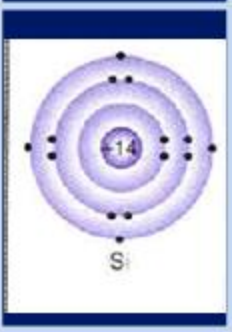


4

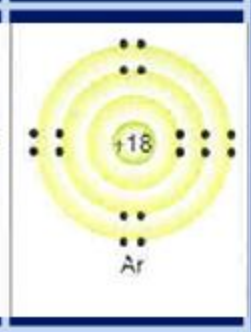
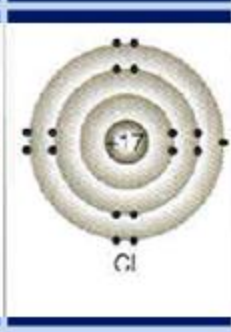
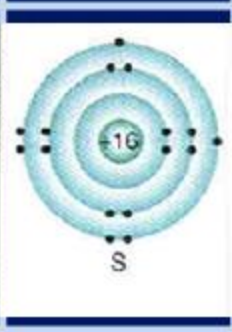


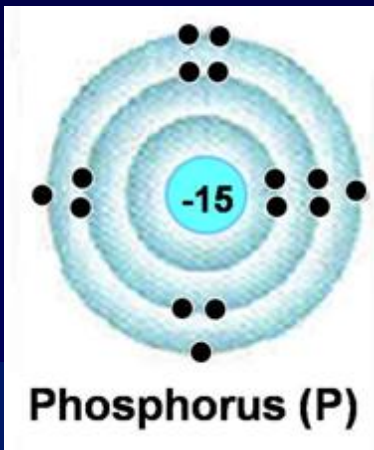
5

6



7



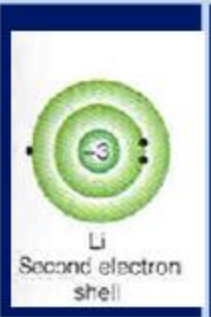


Q3. Where does Phosphorus fit in the Table?

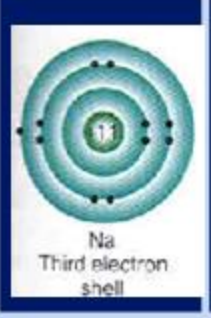
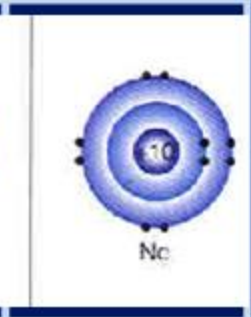
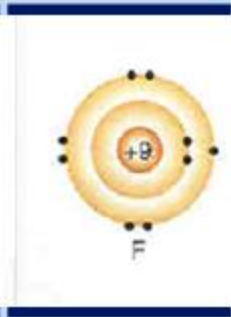
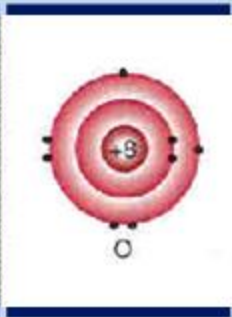
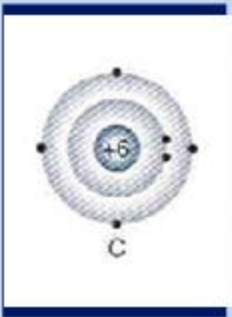
7 or “g” **is correct!**

(3 shells & 5 electrons in the outer shell)

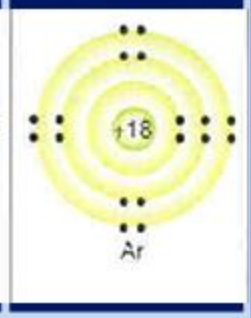
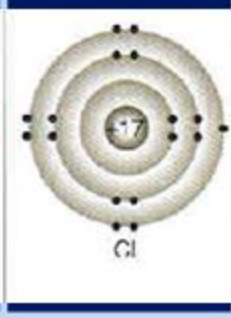
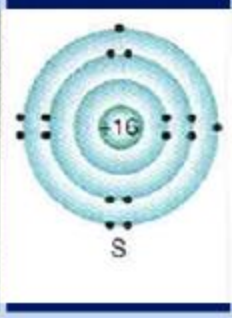
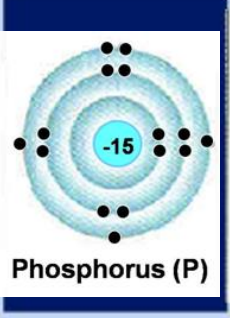
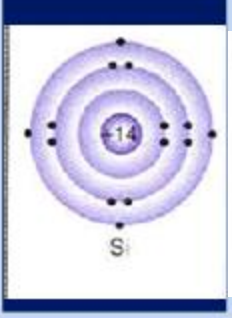
1



2



5



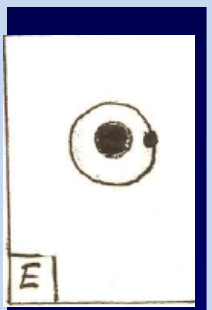
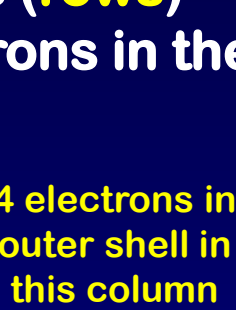
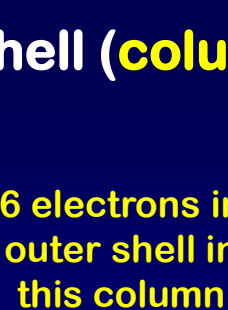
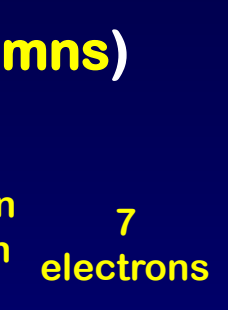
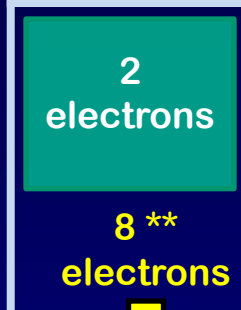

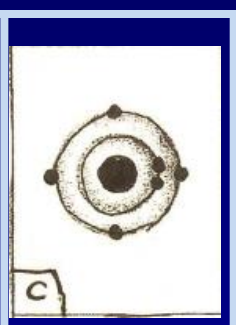








How is the PERIODIC TABLE organized?

1 electron in
outer shell in
this column

The Periodic Table is organized by:

of shells (**rows**)

of electrons in the outer shell (**columns**)

 <p>E</p>	<p>Row 1: 1 shell</p>		<p>4 electrons in outer shell in this column</p>  <p>C</p>		<p>6 electrons in outer shell in this column</p>  <p>G</p>	<p>7 electrons</p>  <p>D</p>	<p>2 electrons</p> <p>8 ** electrons</p>  <p>B</p>
 <p>I</p>	<p>Row 2: 2 shells</p>		 <p>C</p>		 <p>G</p>	 <p>D</p>	 <p>B</p>
 <p>J</p>	<p>Row 3: 3 shells</p>		 <p>K</p>		 <p>H</p>	 <p>F</p>	 <p>A</p>

In Row 1 the outer shell is “full” with only 2 electrons in last column **

In Row 2 the outer shell is “full” with 8 electrons in last column

In Row 3 the outer shell is “full” with 8 electrons . . . and so forth

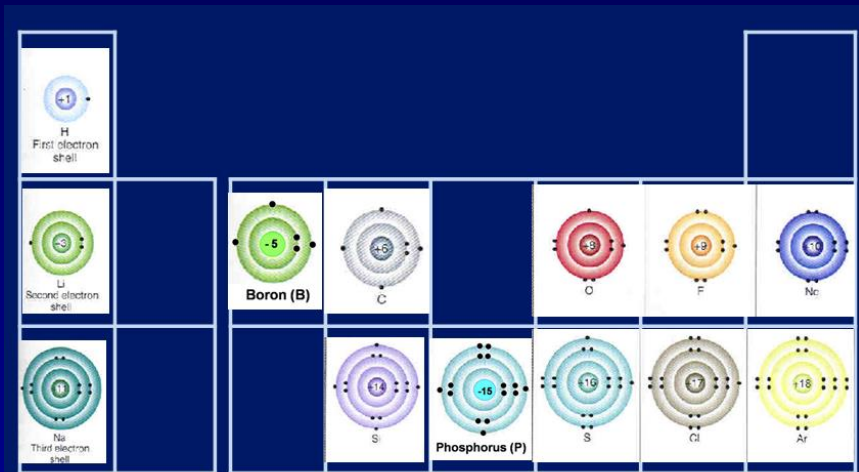
HOW ARE MATTER & ENERGY RELATED?

The Periodic Table is organized by:

of shells (rows)

of electrons in the outer shell (columns)

**Because each element
of matter has a
unique set of electron
arrangements
within its
ENERGY**



LEVELS . . .

**. . . each element is “attuned” to
a unique, discrete set of**

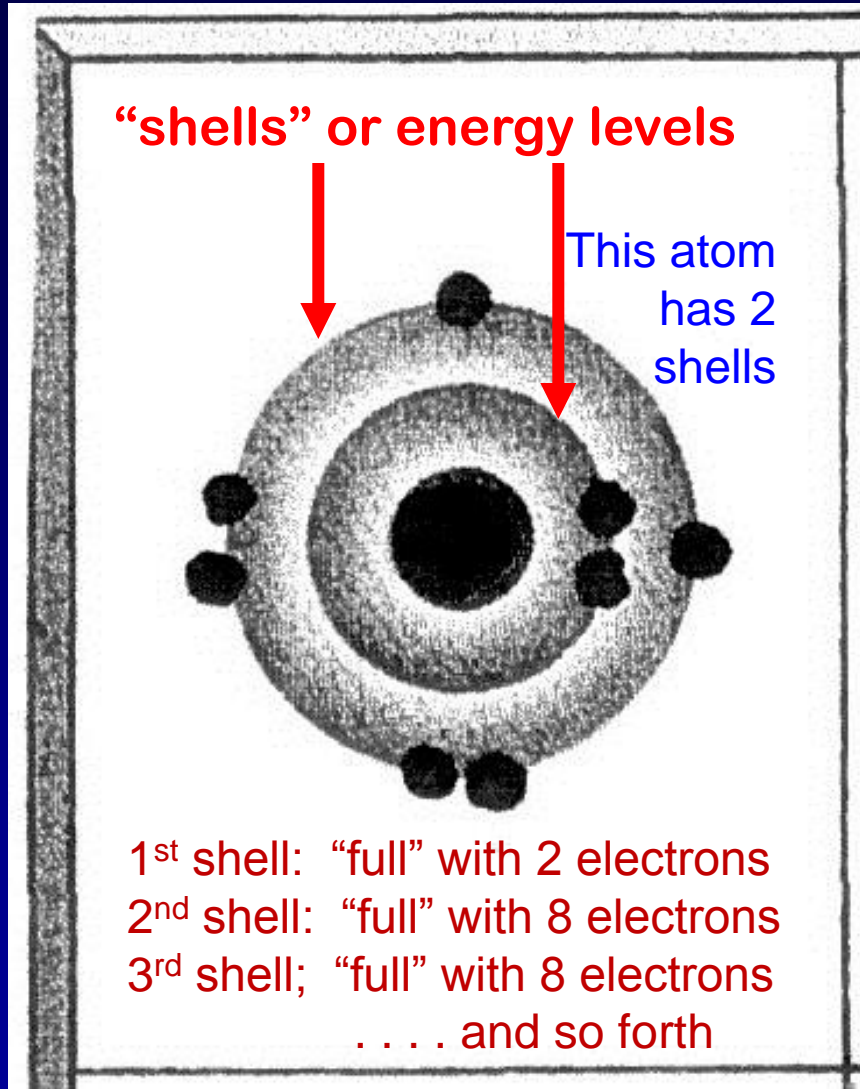
ENERGY “PULSES”

Topic #2 (cont.) ENERGY & MATTER APPLIED

OBJECTIVES:

To review basic physical concepts of energy and matter and some key ways in which they interact.

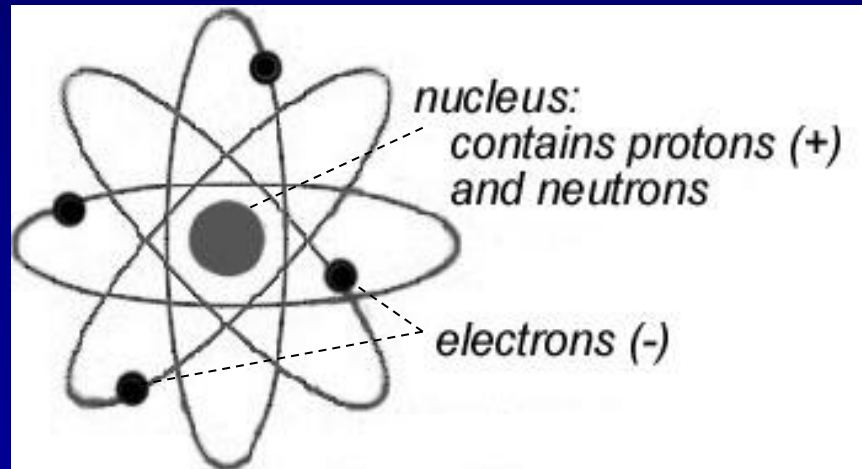
Electron Configuration in Shells (for Elements 1 to 18)



Atomic #	Element & Symbol	Number of Electrons in Each Shell			Total # of Electrons
		1st	2nd	3rd	
1	Hydrogen, H	1			1
2	Helium, He	2 (Full)			2
3	Lithium, Li	2	1		3
4	Beryllium, Be	2	2		4
5	Boron, B	2	3		5
6	Carbon, C	2	4		6
7	Nitrogen, N	2	5		7
8	Oxygen, O	2	6		8
9	Fluorine, F	2	7		9
10	Neon, Ne	2	8 (Full)		10
11	Sodium, Na	2	8	1	11
12	Magnesium, Mg	2	8	2	12
13	Aluminum, Al	2	8	3	13
14	Silicon, Si	2	8	4	14
15	Phosphorus, P	2	8	5	15
16	Sulfur, S	2	8	6	16
17	Chlorine, Cl	2	8	7	17
18	Argon, Ar	2	8	8 (Full)	18

THE EARLY PLANETARY MODEL OF THE ATOM

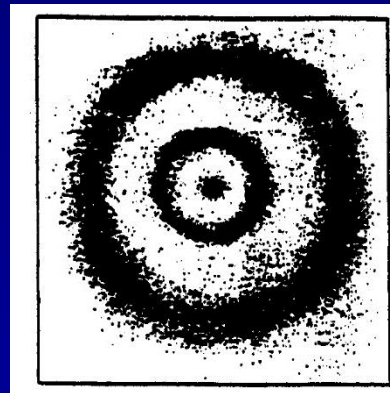
Electrons
“orbiting”
the
nucleus



VS.

The BOHR MODEL OF THE ATOM:

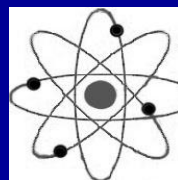
According to Neils Bohr's model of the atom:



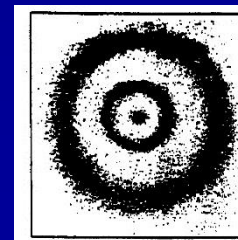
. . . .there are only certain
"allowed orbits"

- in which an electron can exist
for long periods of time without
giving off radiation (energy).

- As long as the electron
remains at one of these
distances, its energy is fixed.

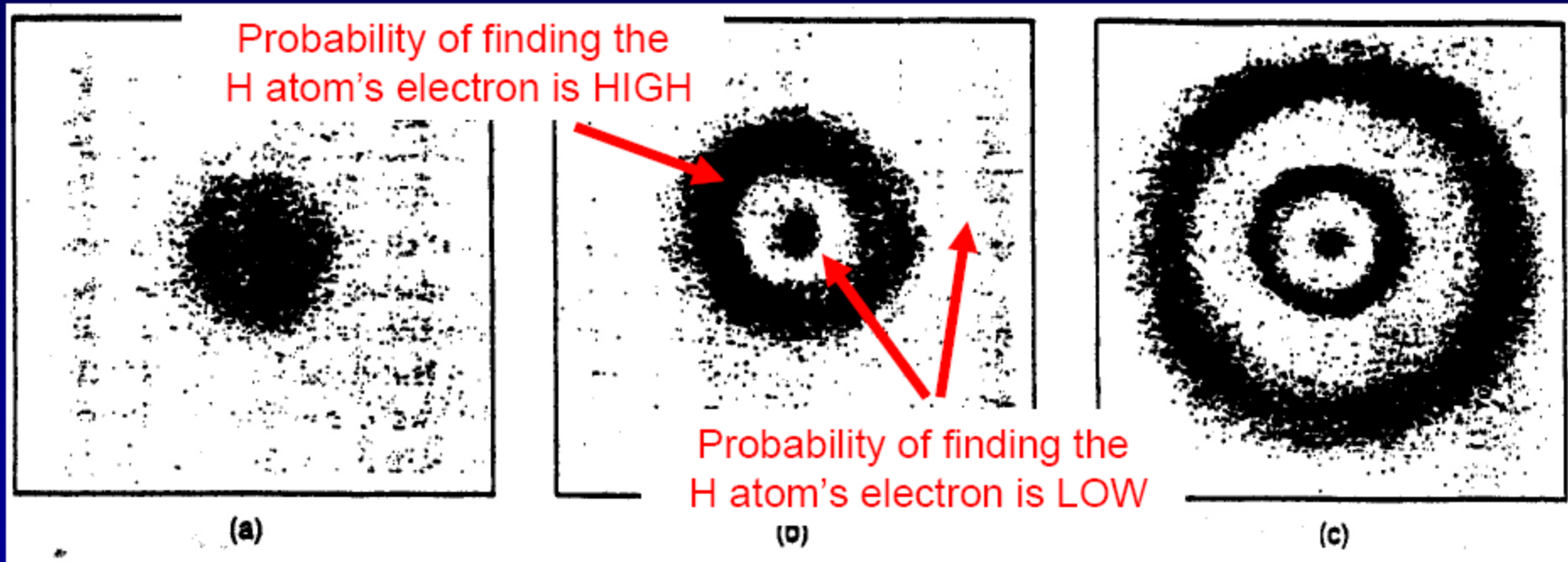


vs.



Schematic Diagrams representing **ELECTRON ENERGY STATES (Shells)** for Hydrogen H in the Bohr model :

REMEMBER: HYDROGEN has only **ONE electron!**



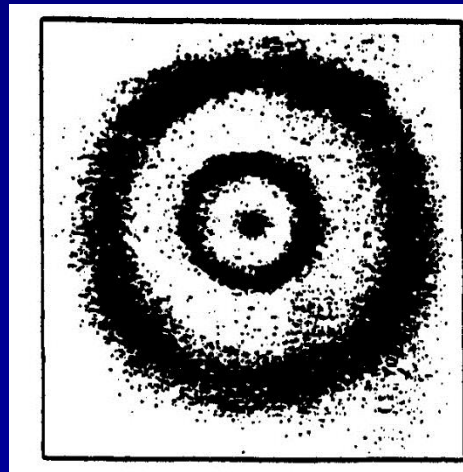
GROUND State

Excited State 1

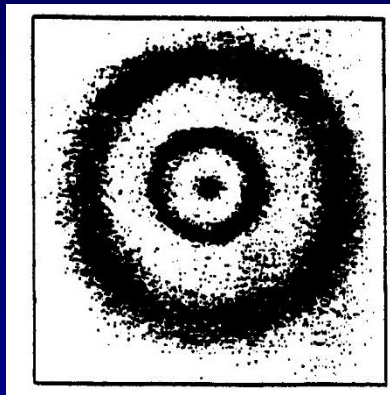
Excited State 2

The **quantum model** of the atom states that:

electrons can exist only in
discrete allowed places within shells
(or energy levels)
and not in between.



-- The “empty” spaces represent areas with *little likelihood* of finding an electron



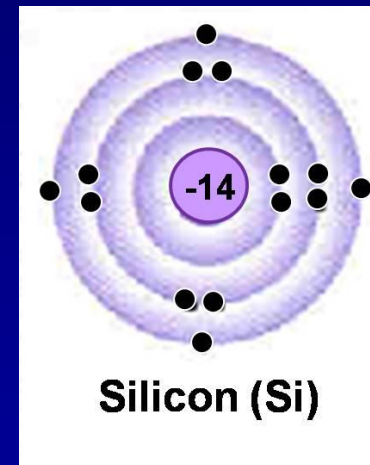
-- Dark areas represent places (or energy levels) where electrons are “allowed” to be

**... BUT HOW DO THEY GET
FROM ONE ENERGY LEVEL
TO ANOTHER???**

MORE OF



Staring: The **SUN** &



<http://www.pbs.org/wgbh/nova/solar/>

STATES OF MATTER

Solid:

-- a substance that resists changes of shape and volume

-- characterized by structure in the particular order and bonding of atoms that make up the material

Example = a crystal in which the molecules are locked into a strict geometrical order.

Liquid:

-- a substance that flows freely in response to unbalanced forces

- molecules more or less move freely past one another as individuals or small groups
- are not confined to fixed positions (as in solids)

-- **LIQUIDS CAN EXHIBIT PRESSURE**

(pressure = a force per unit area)

... and will take the shape of the container they are in.

Gas:

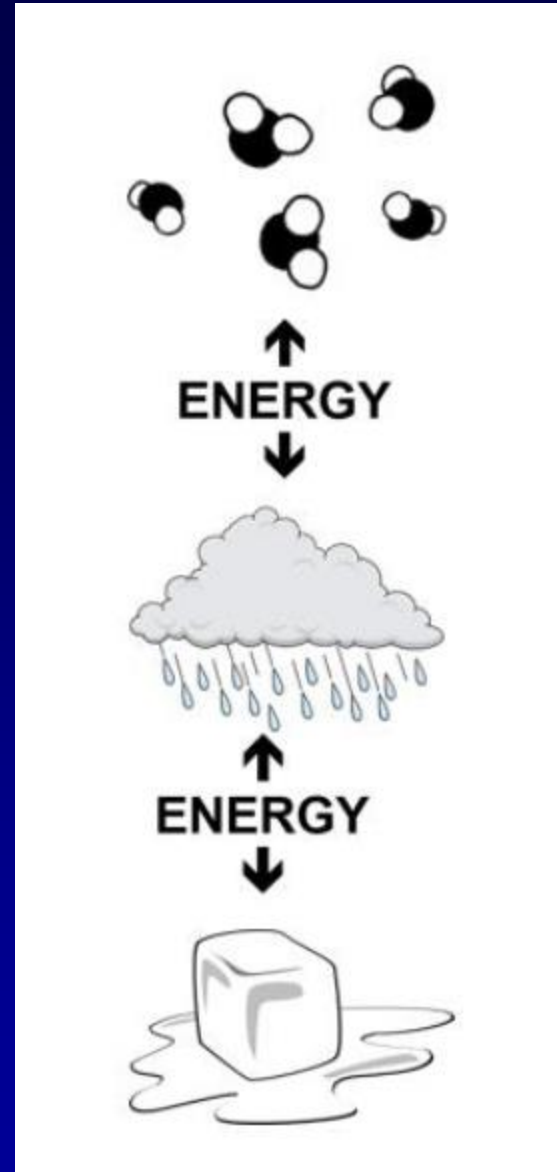
- a substance that expands (and contracts) easily, rapidly, and indefinitely
- fills all space available to it
- takes the shape of its container
 - the distance between molecules is such that no cohesive forces exist
 - atoms or molecules are in high speed motion
 - many collisions and rebounds occur
- **GASES ALSO EXHIBIT PRESSURE**

**ENERGY &
MATTER
INTERACT
IN PHASE
CHANGES
BUT HOW??**

WATER
VAPOR

LIQUID
WATER

ICE



WATER
VAPOR

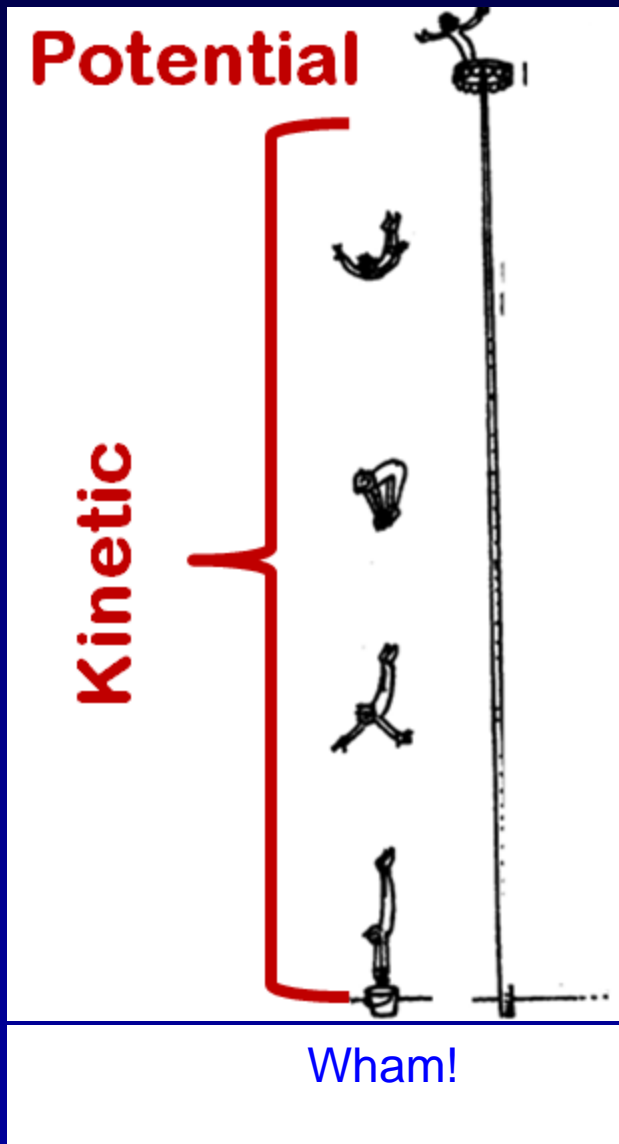
LIQUID
WATER

ICE



QUICK ENERGY REVIEW

Two Main Kinds of Energy



- **Potential** = energy a system possess if it is capable of doing work, but is *not* doing work now
- **Kinetic** = energy of *motion*; the ability of a mass to do **WORK !**

DIFFERENT FORMS OF
POTENTIAL ENERGY:

HOW MANY CAN YOU
DEMONSTRATE?

Energy Transformations & Conservation of Energy:

“Everything that happens can be described as energy transformation.”



ENERGY IS CONSERVED!

ENERGY IN OUR EVERYDAY LIVES . . .

ENERGY: think of it as "stuff" that can't be created or destroyed, but can be converted in form. The form might be:

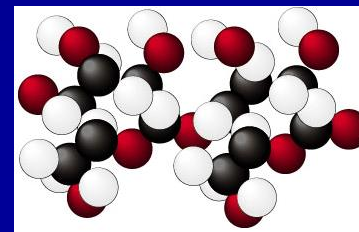
- **A MOVING MASS (KE)**
(a large truck going 80 mph)



- **AN ELEVATED MASS (PE)**
(a boulder poised on a hill)



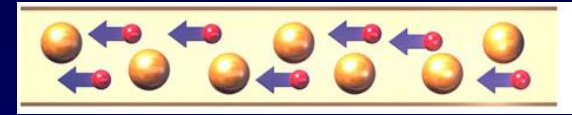
- **A PARTICULAR CHEMICAL COMBINATION (PE)**



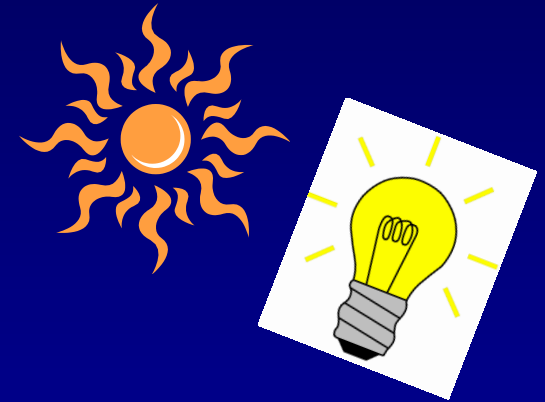
a Glucose molecule

ENERGY IN OUR EVERYDAY LIVES . . .

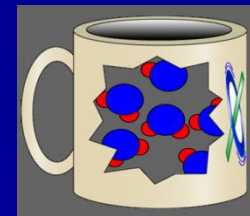
- **ELECTRICITY** (PE)
(electrons flowing through a wire)



- **LIGHT / ELECTROMAGNETIC ENERGY** (PE)
(solar radiation or light from a bulb)



- **HEAT / THERMAL ENERGY** (PE)
(energetic jiggling molecules in a hot substance)



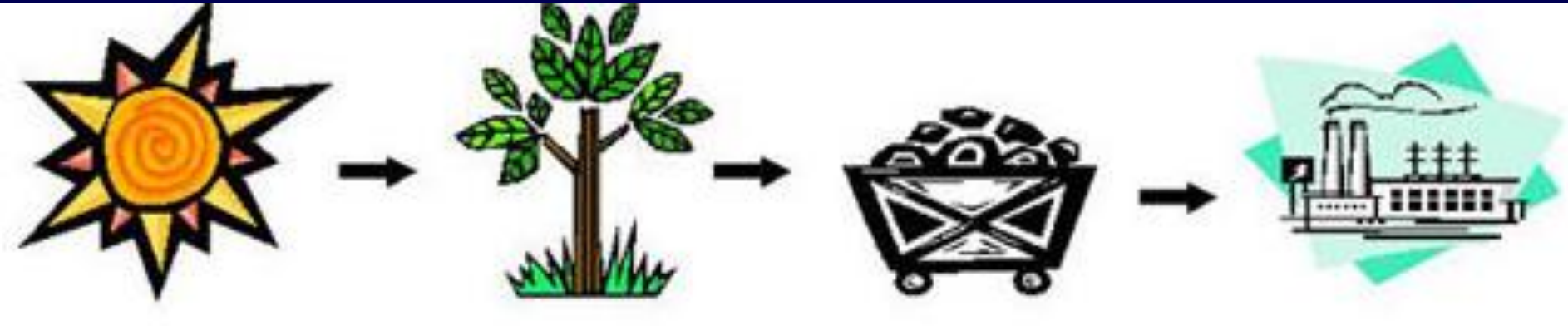
The Law of Conservation of Energy:

Energy cannot be created or destroyed.

*It can be transformed (converted)
from one form to another but*

**THE TOTAL AMOUNT OF ENERGY
NEVER CHANGES.**

KEY POINT FOR GLOBAL CLIMATE CHANGE: ENERGY IS CONVERTED FROM ONE FORM TO ANOTHER



The Sun produces Electromagnetic Energy

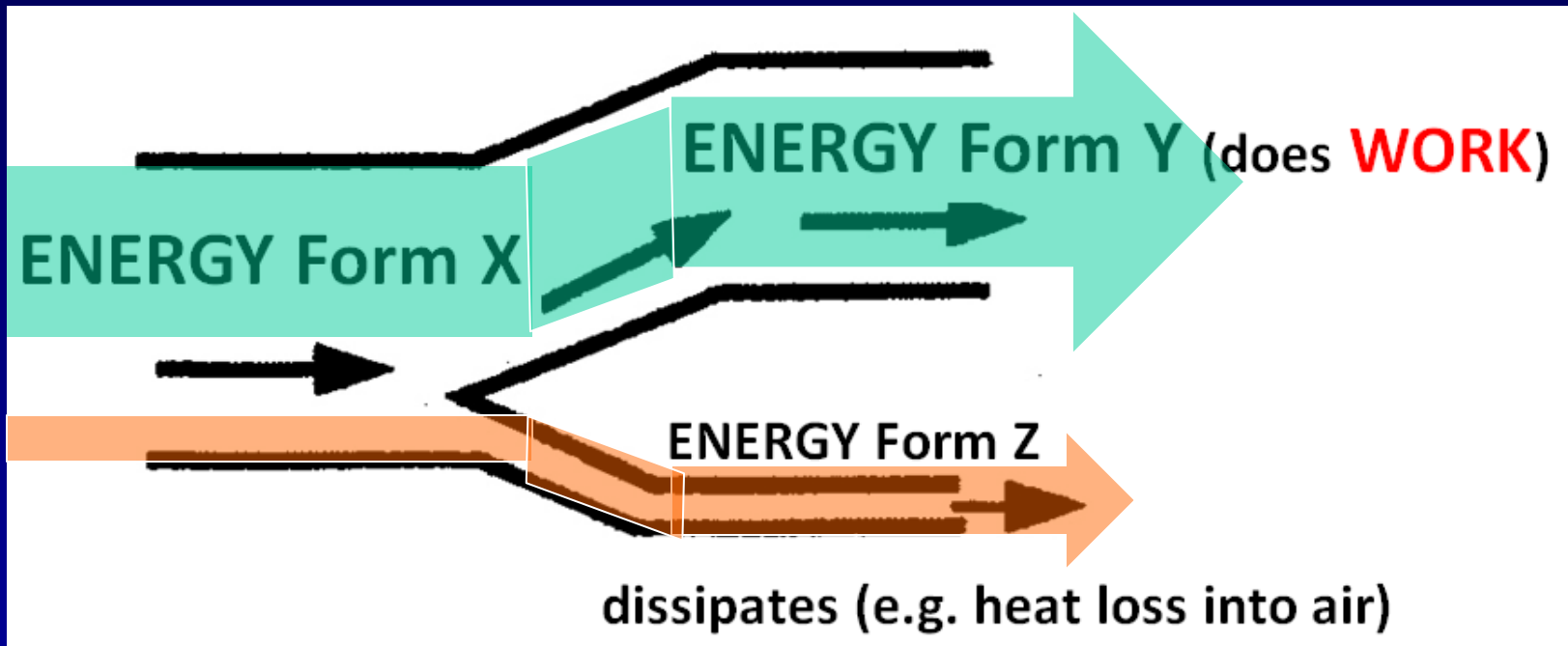
Plants turn the solar energy into Chemical Energy through photosynthesis

Plants are fossilized & compressed (over millions of years) and become Fossil Fuels such as coal and oil

Fossil fuels are burned in power plants to produce Electricity for our homes, businesses & industry

A KEY POINT:
IN EVERY ENERGY CONVERSION . . .

- Some of it goes where you want it:



- Some goes elsewhere:
(usually as heat loss or “exhaust”)

Although energy may not be destroyed,
it can become **INEFFICIENT**

i.e., is not easily used or available to do work!

Efficiency = work done / energy used



*This concept is critically important for designing successful
GREEN TECHNOLOGIES & for mapping out
SOLUTIONS for addressing climate change*

**SEE YOU ON
WEDNESDAY!**

**BRING CLICKERS &
CLASS NOTES!**