

UNIT 1

General Chemistry

You will need your notebook today.

WHAT IS CHEMISTRY?

- What comes to mind when you think about 'chemistry'?

- Did you say 'chemicals, fire, energy, explosions, math, experiments'?
- If so, you are right, but there is much more!

WHAT IS CHEMISTRY?

- Chemistry is the study of the PROPERTIES, COMPOSITION, STRUCTURE of matter; the CHANGES that matter goes through; and the ENERGY changes associated with the changes in matter.

PROPERTIES – characteristics of substances

COMPOSITION – the identity of the substance's make-up

STRUCTURE – how the components are physically arranged.

CHANGES – when substances change from one to another – chemical reactions

ENERGY CHANGES - Energy gained or lost in reactions; exothermic or endothermic

- 
- Which of these characteristics (Properties, Composition, Structure, Changes, Energy Changes) do you most often associate with chemistry?

- 
- I bet 'changes' or 'energy changes', because often people think of chemical reactions. But the others (properties, composition, and structure) are super important because they let us know what everything is made up of.

BRANCHES OF CHEMISTRY

- There are certain areas, or branches, of chemistry that focus on specific types of matter:
 - Organic Chemistry – The study of carbon-containing compounds
 - Inorganic Chemistry – the study of compounds that do not contain carbon
 - Biochemistry – the study of chemical processes in living organisms
 - Analytical Chemistry – Deals with the identification and quantification of matter
 - Physical Chemistry – The study of the relationship between matter and energy, usually the energy involved in chemical changes.
 - Theoretical Chemistry – The use of computers and math to predict the properties of new substances.

BRANCHES OF CHEMISTRY

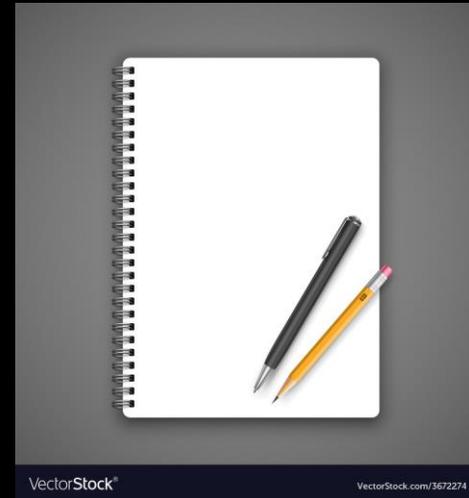
- Between the main branches of chemistry (organic, inorganic, biochemistry, analytical chemistry, physical chemistry, and theoretical chemistry), which sounds most interesting to you and why? Share with your shoulder partner.

PASS OUT TEXTBOOKS

- Mrs. Williams and Mrs. Gervase will pass out textbooks.
- Please sign and turn in Textbook Check-out Forms (located on inside cover).
- Distance Learners – Reminder that Wednesday and Thursday from 4:00pm to 6:00pm is materials pick-up, including your Chemistry Textbook.

CHEMISTRY BASICS: SUMMER HOMEWORK #1 REVIEW

TODAY YOU WILL NEED:



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CHEMISTRY BASICS

- Mass – Amount of matter in an object
- Atom – Smallest unit of an element that retains all the properties of that element
- Element – a pure substance that is made up of only one type of atom
- Compound – a substance that is made from the atoms of two or more different elements that are chemically bonded together. The elements' individual properties are completely different from the compound's properties.
- Mixtures – two or more pure substances that are physically combined. Each component of the mixture maintains its own identity and many of its properties. They may be separated by physical methods.

PROPERTIES

Physical

- Can be observed without changing the identity of the substance
- Mass
- Temperature
- Boiling Point
- Color
- Volume
- Melting Point
- Density
- Conductivity

Chemical

- The identity of the substance must be changed in order to observe a chemical property
- Acidity
- Flammability
- Oxidation
- Reactivity

PROPERTIES

Extensive

- Depend on the amount of matter
- Mass
- Volume
- Amount of energy in substance

Intensive

- Do not depend on amount of matter
- Melting Point
- Boiling Point
- Density
- Conductivity

CHANGES

Physical

- Solid to Liquid – Melting
- Liquid to Gas – Vaporization
- Gas to Liquid – Condensation
- Liquid to Solid – Freezing
- Solid to Gas – Sublimation
- Gas to Solid - Deposition

Chemical

- Burning
- Oxidizing
- Neutralization
- Reacting

MIXTURES

Homogenous

- Has the same composition throughout the mixture
- Alloys
- Solutions
- Tomato Soup
- Kool-Aid

Heterogenous

- Different samples of the same mixture have different compositions
- Trail Mix
- Concrete
- Blood
- Wood

STATES OF MATTER

Solid

Definite volume,
definite shape

Tightly packed
molecules

Molecules
vibrate in place

Low Energy

Liquid

Definite volume,
no definite
shape

Molecules flow
around each
other

Medium energy

Gas

No definite
volume or
shape

Molecules far
apart and fast
moving

High Energy

Plasma

Ionized Gas

Extremely high
energy

Electrons have
been ripped off
of gas particles

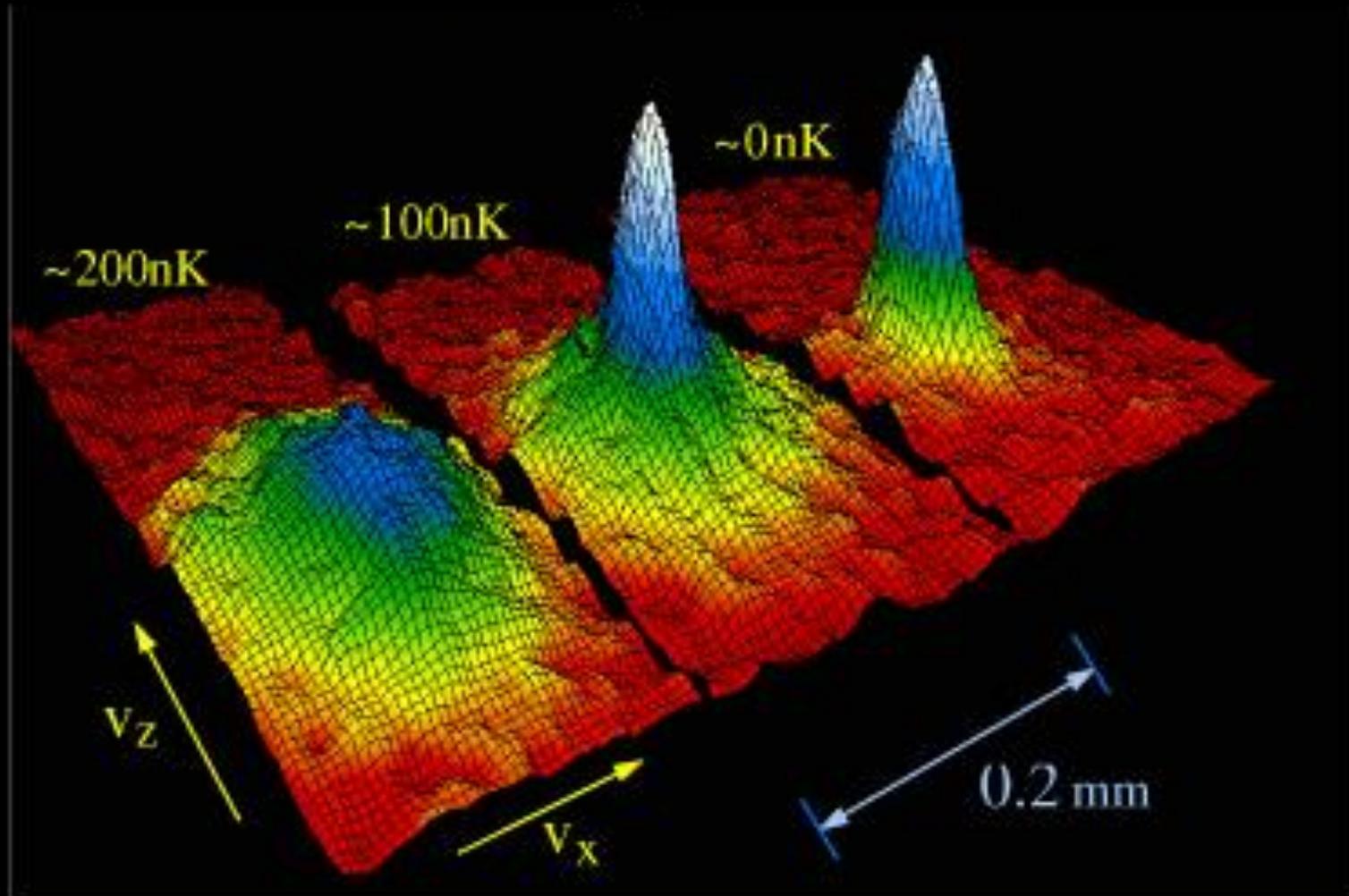
BONUS STATE OF MATTER

- BOSE – EINSTEIN CONDENSATE

- In 1995, technology enabled scientists to create a new state of matter, the Bose-Einstein condensate (BEC). Using a combination of lasers and magnets, a sample of rubidium was cooled to within a few degrees of absolute zero. At this extremely low temperature, molecular motion comes very close to stopping altogether. Since there is almost no kinetic energy being transferred from one atom to another, the atoms begin to clump together. There are no longer thousands of separate atoms, just one “super atom.” A BEC is used to study quantum mechanics on a macroscopic level. Light appears to slow down as it passes through a BEC, allowing study of the particle/wave paradox. A BEC also has many of the properties of a superfluid — flowing without friction. BECs are also used to simulate conditions that might apply in black holes.

BEC - RUBIDIUM

2 D velocity distributions



TODAY YOU WILL NEED:



REVIEW ACTIVITY

- On your whiteboard, write down one element, one compound, one homogeneous mixture, and one heterogeneous mixture – but not in that order. (30 seconds)
-
- Now, one at a time, take turns with your partner identifying which substance is which. (60 seconds)

REVIEW ACTIVITY

- Each person at your table will take 4 index cards and cut them in half.
- You will then write ONE SUBSTANCE on each of the halves.
 - Two Elements
 - Two Compounds
 - Two Homogenous Mixtures
 - Two Heterogenous Mixtures
- You May NOT Duplicate the substances at your table, so you must discuss what you are writing.

KINETIC MOLECULAR THEORY

- Sounds complicated, but very simple
- Kinetic - Motion/Movement
- Molecular – Relating to Molecules
- Kinetic Molecular Theory simply states that all molecules are constantly moving. This theory attempts to explain observable behavior of molecules.

KINETIC MOLECULAR THEORY

- When substances are heated, molecules move faster and further apart
- When substances are cooled, molecules move slower and closer together
- Temperature measures the average kinetic energy of a substance.
- How do the molecules move during phase changes?



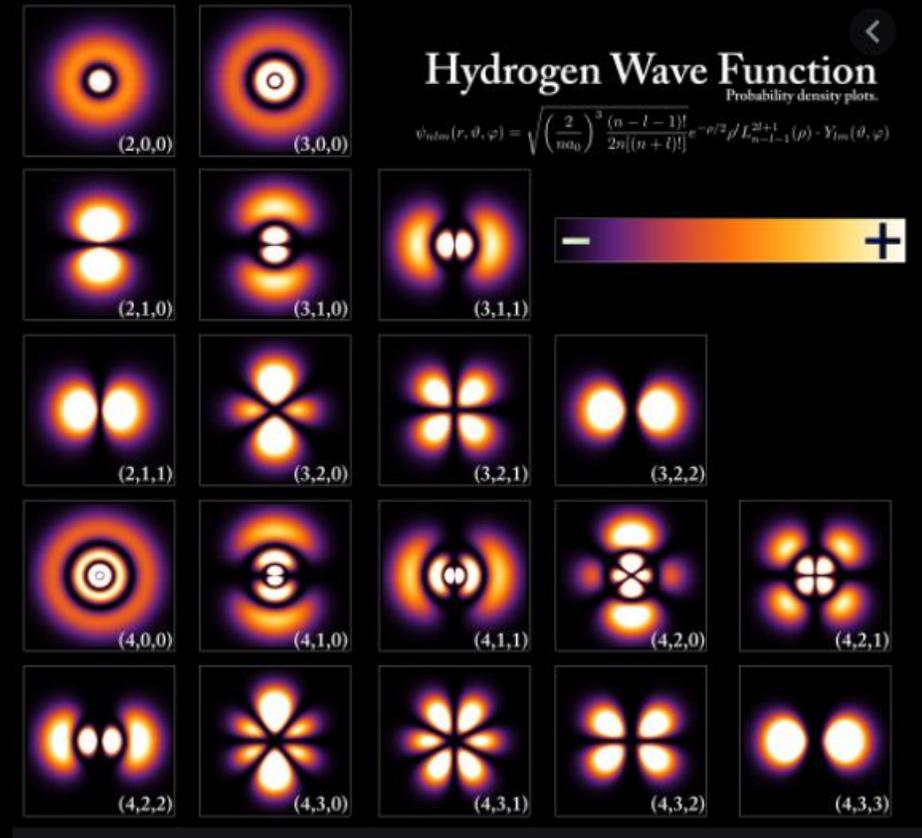
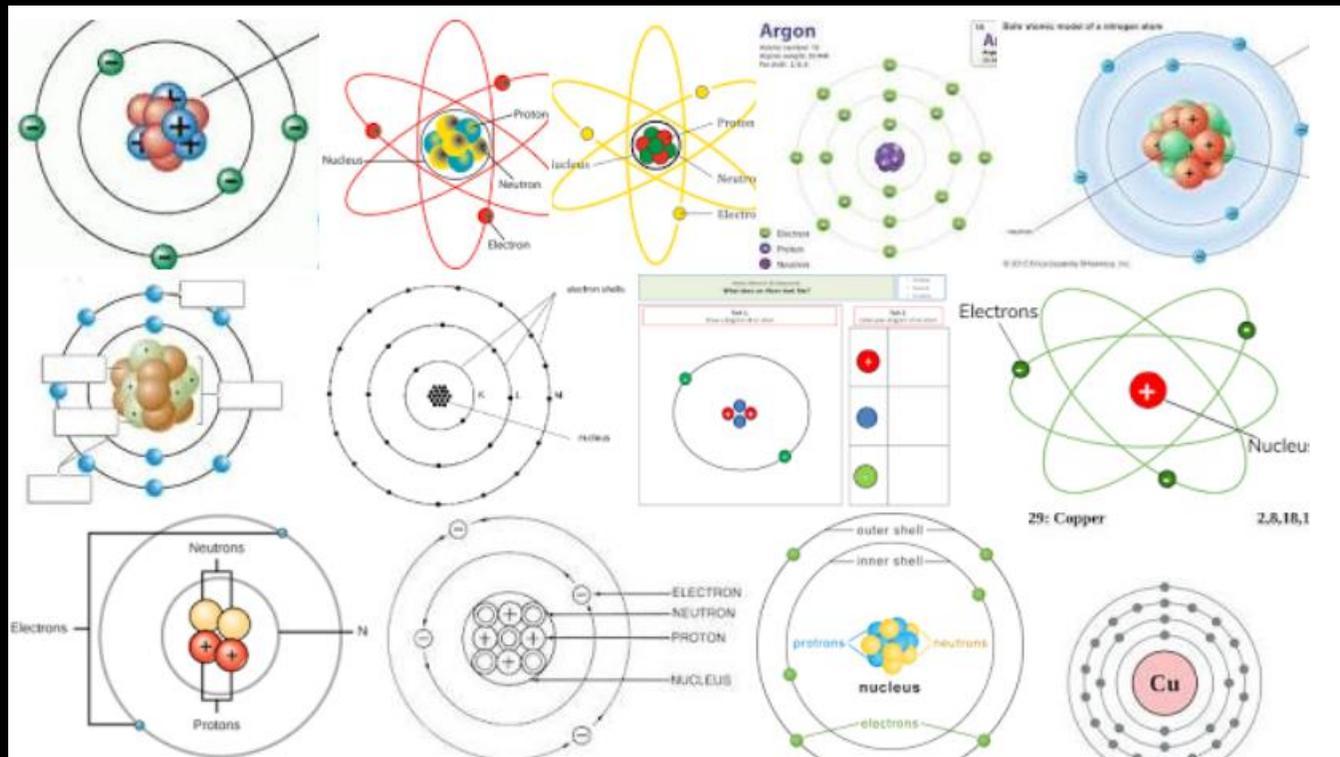
BELLWORK

- On your whiteboard, draw an atom and label the components

BASIC ATOMIC STRUCTURE

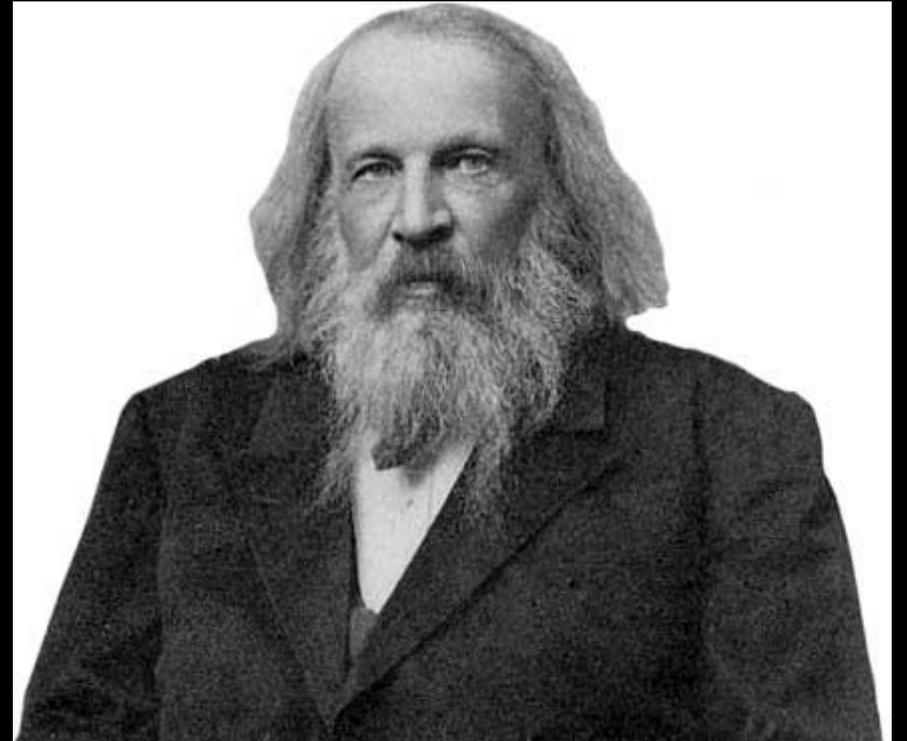
Particle	Charge	Location	Relative Size*
Proton	Positive	Nucleus	1
Neutron	Neutral	Nucleus	1
Electron	Negative	Orbitals	0

ATOM DIAGRAMS



PERIODIC TABLE BASICS

Dmitri Mendeleev created the periodic table in 1869. He developed the order by looking at the properties of each element, and then discovering that the properties repeated in a regular order. Due to this repeating order of properties, the table was called the PERIODIC Table of Elements, not just the Table of Elements.



TYPES OF ELEMENTS

- Metals
- Non-Metals
- Metalloids

											1												18	
1												2												18
H												13	14	15	16	17	He							
3	4												5	6	7	8	9	10						
Li	Be												B	C	N	O	F	Ne						
11	12												13	14	15	16	17	18						
Na	Mg	3	4	5	6	7	8	9	10	11	12	Al	Si	P	S	Cl	Ar							
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36							
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr							
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54							
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe							
55	56	57-	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86							
Cs	Ba	71	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn							
87	88	89-	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118							
Fr	Ra	103	Rf	Db	Sg	Bh	Hs	Mt	Ds	Uuu	Uub	Uut	Uuq	Uup	Uuh	Uus	Uuo							
Lanthanide series		57	58	59	60	61	62	63	64	65	66	67	68	69	70	71								
		La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu								
Actinide series		89	90	91	92	93	94	95	96	97	98	99	100	101	102	103								
		Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr								

Figure 1. Long version of periodic chart with 1-18 group numbering according to IUPAC recommendation.

ELEMENTAL PROPERTIES

Metals

Metalloids

Non-Metals

Shiny

Not as shiny as metals or as dull as non-metals

Dull in appearance

Malleable
Ductile

Not as malleable or as brittle

Brittle

Conductive

Semiconductors

Insulators (non-conductive)



ON YOUR WHITEBOARD:

Why do you think the metalloids are called metalloids?



Share your answer with your shoulder partner.



BASIC BONDING CONCEPTS

Ionic Bonding

- Caused by the TRANSFER of electrons from one atom to another
- Occurs between metals and non-metals
- Strongest type of bond

Covalent Bonding

- Caused by the SHARING of electrons between atoms
- Occurs between non-metals and non-metals
- Relatively weak bond