

Physical Science-Chemistry Final Review

Can this statement be supported by the scientific method?
 "Chocolate chip is the best ice cream flavor."
 Why? **No, It is an opinion**

Use the Scientific Method to figure out if a substance is a liquid or solid. (The first step is done for you.)
 Step 1: Observe: the substance changes shape.
 Step 2: Hypothesis: the sub is a liq
 Step 3: Exp: Does it change volume? Data: no
 Step 4: Conclusion: sub must be a liquid

Liquid	Color	Burns?	Volume	Reacts with Baking Soda?
A	Clear	No	35 mL	Yes
B	Clear	Yes	12 mL	No
C	Clear	No	46 mL	Yes
D	Clear	No	88 mL	No

Make a reasonable conclusion from the above data table.
Liquid A & C are probably the same liquid

How is a solid different from a liquid?
Liquids change shape, solids don't

How is a solid similar to (like) a liquid?
Both retain (keep) volume

How is a liquid different from a gas?
Gases take the form of their container

How is a liquid similar to (like) a gas?
Both can change shapes

What causes a substance to change phase?
add or take away energy

When a substance changes phase, is this a physical or chemical change?
its still water

The temperature at which a solid turns to liquid is called: **melting point**

The temperature at which a liquid turns to a gas is called: **boiling point**

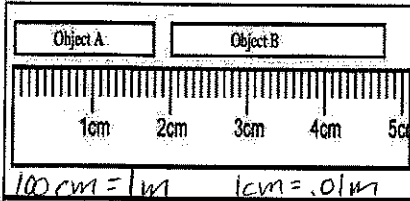
The temperature at which a gas turns to liquid: **condensation point**

The temperature at which a liquid turns to a solid: **freezing point**

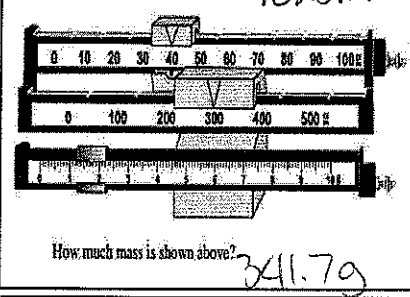
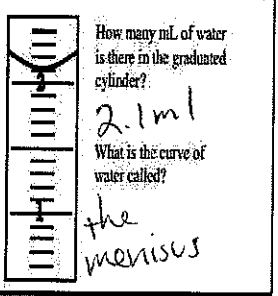
When a solid turns straight to a gas is called: **sublimation**

At what temperature does water melt? **0°C**

At what temperature does water boil? **100°C**



How many millimeters is object A? **18 mm**
 How many millimeters is object B? **28 mm**
 How many centimeters is object A? **1.8 cm**
 How many centimeters is object B? **2.8 cm**
 How many meters is object A? **0.018 m**
 How many meters is object B? **0.028 m**



Which of the two cylinders above is more precise?
The right one
 Why? **the graduations are more specific**

Which object is the less dense?
A
 Why? **more volume**

Which object is the less dense?
A
 Why? **less mass**

What unit do you use to measure the following?

Length: **meters**
 Mass: **gram**
 Volume: **Liter**
 Density: **g/cm³ or g/mL**

Mixture (M) or Substance (S) (non-mixture)?	1. Substance or non-mixture	2. Mixture	3. Heterogeneous Mixture	4. Matter	5. Element	6. Homogeneous Mixture	7. Compound
Salt Water: M	Chicken Soup: M	Water: S	Salt: S	Silver: S	Chex Mix: M	Salt Water: Ho	Chicken Soup: He
Tomato Soup: Ho	Plain Jello: Ho	Jello with Fruit: He	Chex Mix: He				

What do we call things that can be felt and seen, but we cannot touch and has no mass?
Energy

Anything that takes up space and has mass (you can touch it, feel it, see it, etc):
Matter

Draw the metric prefixes chart here:
K H D base d c m

What is the correct order shortest to longest?
 Kilogram, milligram, Megagram, gram, centimeter, microgram
milli, centi, meter, kilo, Mega

Convert the following

3.2 kilometers = **3200** meters
 0.23 centimeters = **0.00023** micrometers
 0.12 liter = **120** milliliters
 2500 milliliters = **2.5** liters
 4500 grams = **4.5** kilograms
 9 kilograms = **9,000** grams

Which is bigger?
 Mega- or kilo-? **Mega**
 Centi- or milli-? **Centi**
 Micro- or milli-? **milli**
 Centi- or micro-? **Centi**
 Kilograms or grams? **kilo**

How Big Are They Really?
 A centimeter is the width of: **thumb**
 The size of a liter is: **bigger than a quart**
 A meter is how many feet? **3.3 ft**
 A gram is about: **\$ bill**
 A millimeter is the width of: **Angerail**

A 15 g object has a volume of 30 cm³. Find its density.
 $d = \frac{m}{V} = \frac{15g}{30cm^3} = 0.5g/cm^3$

A 12 g object has a volume of 6 mL. Find its density.
 $\frac{12g}{6mL} = 2g/mL$

A 35 mL object has a density of 2 g/mL. Find its mass.
 $35mL \cdot 2g/mL = 70g$

How do you measure the mass of a liquid?
push it under

How do you measure the volume of a floating object?
push it under

Which is more dense: liquid iron or solid iron?
solid iron

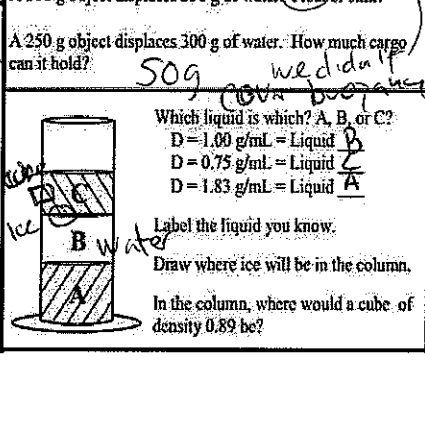
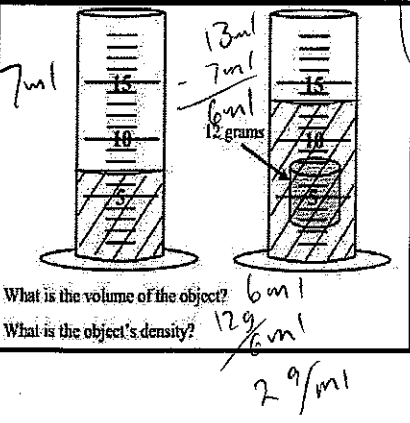
Which is more dense: gaseous CO₂ or liquid CO₂?
liquid CO₂

Which is more dense: liquid water or solid water?
liquid water

A 200 g object displaces 150 g of water. Float or sink?
float

A 300 g object displaces 350 g of water. Float or sink?
float

A 250 g object displaces 300 g of water. How much cargo can it hold?
50g



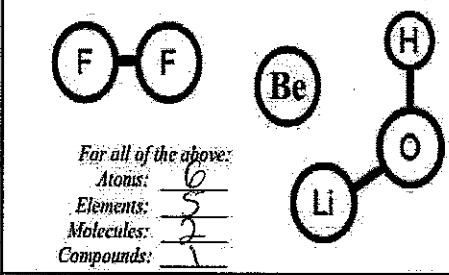
- Isotope **D**
 - Atomic mass **A**
 - Atomic # **F**
 - Neutral atom **B**
 - Ion **C**
 - Mass # **E**
- A. An average of all the isotopes; the mass of average atom.
 B. An atom with an equal number of electrons and protons.
 C. An atom with more or less electrons than protons.
 D. A variation of an element with a different number of neutrons.
 E. Total number of protons and neutrons in the nucleus.
 F. Number of protons; determines the element.
- Metal or Non-metal?
- M** Titanium (Ti) **N** Neon (Ne)
M Sodium (Na) **H** Hydrogen (H)
N Chlorine (Cl) **M** Nickel (Ni)

- | | |
|-------------------------------|--|
| 1. Transition Metals <u>D</u> | A. Become positive ions. |
| 2. Noble Gases <u>E</u> | B. Gain electrons, becoming negative ions |
| 3. Metals <u>A</u> | C. Compounds formed when electrons are shared. |
| 4. Nonmetals <u>B</u> | D. Do not have consistent oxidation numbers. |
| 5. Ionic <u>F</u> | E. Do not combine into compounds. |
| 6. Covalent <u>C</u> | F. Compounds formed between positively and negatively charged atoms. |

8 protons and 10 electrons. Neutral atom or ion? -2
 16 protons and 18 electrons. Neutral atom or ion? -2
 20 protons and electrons. Neutral atom or ion? 20
 Give the element abbreviation and charge.
 16 protons and 18 electrons. Element: S Charge: -2
 35 protons and 36 electrons. Element: Br Charge: -1
 Nitrogen with 10 electrons. Charge: -3

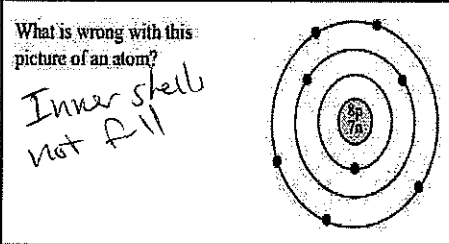
How many valence electrons?
 Helium (He) 2 Lithium (Li) 1
 Calcium (Ca) 2 Aluminum (Al) 3
 Sulfur (S) 6 Nitrogen (N) 5
 Calcium and Mg or Be have the same reactivity.
 Oxygen and S, Se have the same reactivity.
 Helium and Ne, Ar have the same reactivity.

Give the symbol and atomic number of these elements.
 Oxygen (O) 8 Boron (B) 5
 Nitrogen (N) 7 Bromine (Br) 35
 Helium (He) 2 Iron (Fe) 26
 Sodium (Na) 11 Mercury (Hg) 80



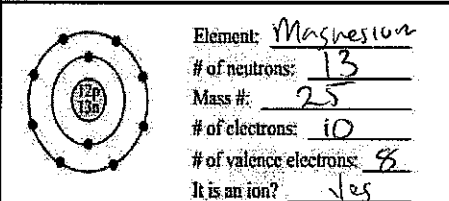
- | | |
|------------------------|---|
| 1. Bohr <u>C</u> | A. Discovered that atoms have a nucleus. |
| 2. Dalton <u>Z</u> | B. Realized that there was a smallest part of matter. |
| 3. Democritus <u>B</u> | C. Discovered that electrons are in distinct orbits. |
| 4. Rutherford <u>A</u> | D. Discovered the electron. |
| 5. Thompson <u>D</u> | E. Theorized that atoms cannot be changed chemically. |

Give the symbol and number of protons for these elements.
 Aluminum (Al) 13 Lithium (Li) 3
 Phosphorus (P) 15 Magnesium (Mg) 12
 Argon (Ar) 18 Silver (Ag) 47
 Copper (Cu) 29 Gold (Au) 79



"Atoms are solid." Respond and give reasons for your response.
No - made up of mostly empty space. Gold Foil Experiment

How many Aluminums in Al_2O_3 ? 2
 How many Magnesiums in $MgCl_2$? 1
 How many Sodiums in Na_3N ? 3
 How many Oxygens in $Li(NO_3)$? 3

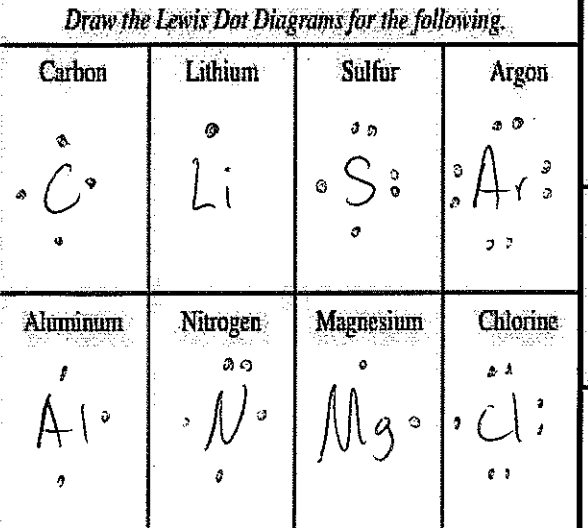


Are these different elements?
 Element A: 17 protons; 18 electrons; 16 neutrons.
 Element B: 18 protons; 18 electrons; 18 neutrons.
Why? Yes different # protons
 Are these different isotopes of one another?
 Element A: 12 protons; 11 electrons; 13 neutrons.
 Element B: 12 protons; 12 electrons; 14 neutrons.
Why? Yes, different # of neutrons
 Are these different isotopes of one another?
 Element A: 18 protons; 18 electrons; 18 neutrons.
 Element B: 19 protons; 18 electrons; 19 neutrons.
Why? No not same element

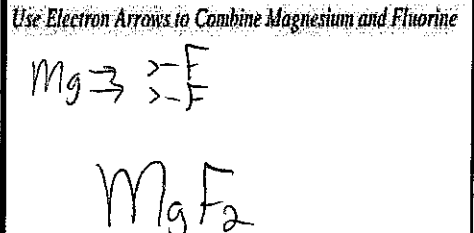
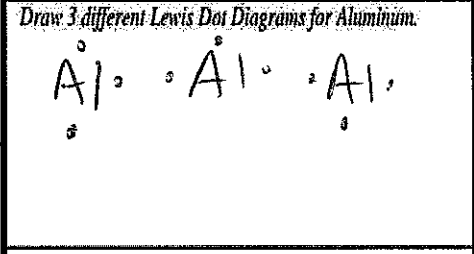
How many electrons are gained or lost?
 K^+ Lost 1 Fe^{2+} Lost 2
 B^{3+} Los 3 F^- Gain 1
 S^{2-} gain 2 N^{3-} Gain 3
 He^0 — Si^{4+} lost or gain 4

- | | |
|-------------------------------|---|
| 1. Oxidation #s <u>B</u> | A. Tells you that atoms are more stable with 8 valence electrons. |
| 2. Octet Rule <u>A</u> | B. A molecule of two atoms of the same element. |
| 3. Diatomic Molecule <u>B</u> | C. When dissolved in water, a compound that allows electricity to pass. |
| 4. Electrolyte <u>C</u> | D. How many electrons are gained or lost. |
| 5. Valence Electrons <u>E</u> | E. Outermost electrons of an atom. |

Give symbols and number of valence electrons for these:
 Aluminum (Al) 3 Beryllium (Be) 2
 Neon (Ne) 8 Sodium (Na) 1
 Chlorine (Cl) 7 Calcium (Ca) 2
 Boron (B) 3 Sulfur (S) 6
 Give these elements with oxidation # in ion notation
 Oxygen O^{2-} Boron B^{3+}
 Nitrogen N^{3-} Bromine Br^{-}
 Helium He^0 Potassium K^{+}
 Carbon C^{-4} Hydrogen H^{+}



How many total atoms in Al_2O_3 ? 5
 How many total atoms in $MgCl_2$? 3
 How many total atoms in Na_3N ? 4
 How many total atoms in $Li(NO_3)$? 5
 How many electrons will be gained or lost by:
 K Lost 1 Ar 0
 Al L3 Br 6
 O 6 Ca 2
 Be L2 H L1



	Ionic, Covalent, or Polyatomic?	Use Prefixes?	Compound Name
Al ₂ O ₃	Ionic	No	Aluminum Oxide
O ₂ F ₂	C	Y	not on
BeF ₂	I	N	
K ₂ (CO ₃)	P	N	Find
N ₂ F ₂	C	Y	
SF ₆	C	Y	
Al ₂ (CrO ₄) ₃	P	N	
P ₂ S ₅	C	Y	
NaN ₃	I	N	
MgO	I	N	
PbF ₂	C	Y	
CO ₂	C	Y	

Metal or Non-metal?

M Cobalt (C)
M Sodium (N)
N Fluorine (F)
N Argon (A)
M Magnesium (M)
M Nickel (N)

Give the total charge:

Ca²⁺ +6
Ca²⁺O²⁻ 0
Mg²⁺F⁻ +1
Na⁺F⁻ -1
Al³⁺S²⁻ -1
Al³⁺O²⁻ ~~Al~~ -1
O²⁻ -6
Mg²⁺(NO₃)⁺ +1

1. Products E	A. Chemicals are mixed and get hot.
2. Exothermic A	B. The chemicals before the reaction.
3. Physical change F	C. When chemical bonds are broken and new substances are formed.
4. Chemical reaction C	D. A chemical reaction that gets cold.
5. Endothermic D	E. The result of a chemical reaction.
6. Reactants B	F. No new chemicals are formed.

1. Coefficient B	A. Correct way to smell chemicals
2. Wafting A	B. Tells you the number of molecules.
3. Ammonia C	C. Should never be combined with Chlorine bleach.
4. Arrow D	D. Means "produces" or "creates".
5. Precipitate F	E. Tells you the number of atoms in a chemical formula.
6. Subscript E	F. When a liquid turns cloudy. Means a solid was formed.

Endothermic or Exothermic Reaction?

X Two chemicals are mixed and get hot?
N Heat goes into the reaction?
N An activated cold pack?
N Two chemicals are mixed and get cold?
X Combustion?
X Heat comes out of a reaction?
X An activated heat pack?

Chemical or Physical Change?

L Bubbles are formed. P Evaporation
P Melting P Ripping
L Gets cold L Photosynthesis
L Color changes L Gets hot
Y Boiling L Changes smell
L Digestion P Dissolving Salt
L Changes temperature C Combustion
P Chewing L Changes taste

Write the balanced ionic compounds for the following:

Li⁺ and O²⁻: Li₂O
K⁺ and S²⁻: K₂S
Na⁺ and N³⁻: Na₃N
Li⁺ and F⁻: LiF
Al³⁺ and O²⁻: Al₂O₃
Ca²⁺ and P³⁻: Ca₃P₂
Mg²⁺ and Cl⁻: MgCl₂
Al³⁺ and (NO₃)⁻: Al(NO₃)₃

Write the balanced ionic formulas for the following:

Li and Cl: Li⁺Cl⁻ LiCl
Mg and O: Mg²⁺O²⁻ MgO
Al and S: Al³⁺S²⁻ Al₂S₃
Mg and N: Mg²⁺N³⁻ Mg₃N₂
K and (CrO₄): K⁺(CrO₄)²⁻ K₂(CrO₄)

Find the atomic masses for the following elements

A. Lithium = 7 E. Aluminum = 27
B. Helium = 4 F. Bromine = 80
C. Iron = 56 G. Uranium = 238
D. Silver = 108 H. Nickel = 59

Find the molecular mass of the following compounds.

Cl₂ 2x35 = 70amu
Li₂O 2x7 + 1x16 = 30amu
Na(NO₃) 23 + 14 + 3x16 = 85amu

How many total molecules are there?

2 2H₂O 2 2Ba₃N₂ 3 3CF₄
5 5Na₂S 4 4Br₂ 2 2K(OH)

How many total atoms are there?

6 2H₂O 10 2Be₃N₂ 18 3CF₄
15 5Na₂S 8 4Br₂ 6 2K(OH)

Draw the Lewis Dot Diagram for molecular Fluorine (F₂).

Short hand F-F

Using shorthand, make Oxygen Dichloride

$\begin{matrix} 1+4+1 \\ -C- \\ \hline \# \text{ of electrons: } 6 \\ S+3 \\ N \equiv \\ \hline \# \text{ of electrons: } 8 \end{matrix}$

O-Cl
|
Cl

Products are on the right side of a chemical reaction.
Reactants are on the left side of a chemical reaction.
The arrow points to the products

Circle the first reactant: (C₆H₁₂O₆ + 6O₂) → 6CO₂ + 6H₂O + energy
(glucose)

Open or closed reaction?

closed
Will the mass of his products be greater than, less than, or equal to his reactants?
Products are trapped
Why? products are trapped

What does this set up allow us to prove?
Law of Conservation of Mass

Type of Reaction

DD
A or S
D
C
SD

Balance these reactions:

2 K₂N + 3 Ca(CrO₄) → 1 Ca₃N₂ + 3 K₂(CrO₄)

4 Fe + 3 O₂ → 2 Fe₂O₃

2 NH₃ → 1 N₂ + 3 H₂

4 NH₃ + 5 O₂ → 4 NO + 6 H₂O

1 Mg + 2 Ag(NO₃) → 1 Mg(NO₃)₂ + 2 Ag

Name the first product: Carbon Dioxide
How many hydrogen atoms on the product side? 12
How many oxygen atoms on the reactant side? 18
Is this respiration or photosynthesis? not correct
What kind of reaction is it? combustion
Endothermic or exothermic? makes energy

Write the following reaction, being sure to use the correct ionic formulas (balanced ionic compounds).
"Magnesium Bromide reacts with Lithium Oxide to produce Magnesium Oxide and Lithium Bromide"

$Mg^{2+}Br_2^{-1} + Li_2O^{2-} \rightarrow MgO^{2-} + 2LiBr^{-1}$

Expand out these compounds.

3NaCl = NaCl + NaCl + NaCl
4MgO = MgO + MgO + MgO + MgO
(OH)₂ = OH + OH

Write the following in reaction notation.

2BeCl₂ = Be₂Cl₄ Li₂O = Li₂O
4Na = Na₄ 6K₂S = K₁₂S₆
3Al₂O₃ = Al₆O₉ 7H₂O = H₁₄O₇

1. Molecular Mass C	A. When the reactants equal the products.
2. Closed System B	B. When the reaction is closed and gases can't escape.
3. The Law of Conservation of Mass E	C. How heavy a compound or molecule is.
4. Open System D	D. When gases aren't caught by the experimental setup.
5. Atomic Mass F	E. In a closed reaction mass cannot be lost.
6. Balanced Reaction A	F. The decimal numbers on the periodic table.

4Li + O₂ → 2Li₂O If 10 g of Lithium reacts with 10g + 12g ? g 12 g of molecular Oxygen, how much Lithium Oxide is produced?
22g

Mg + Cl₂ → MgCl₂ If 9 g of Magnesium reacts with Chlorine to produce 35 g of Magnesium Chloride, how much Chlorine was used in the reaction?
26g

2NaF + K₂O → Na₂O + 2KF Using the numbers given, find how much Na₂O was produced in the reaction.
8g + 9g ?g 11g
6g

Why do we balance chemical reactions?
to Prove Law of Conservation of Mass