Name: KEY   Date: _____

Class/Period: _____

Honors Chemistry
Final Exam Review Sheet

| **Scientific Method and Measurement** |

1. a) What is a hypothesis? Testable prediction about something that has been observed

   b) What is a theory? Explanation supported by many experiments

   c) What is a law? Summary of accepted facts about nature (law of gravity)

2. a) What is the difference between accuracy and precision? Accuracy refers to how close a measured value is to an actual value. Precision refers to how close a series of measurements are to each other.

   b) Determine the number of significant figures in the following numbers to show precision:

   1) 5370   3   3) 240.10   5   5) 431 801   6

   2) 0.00369 3   4) 2001   4   6) 10 235.0   6

3. Use the data table below to discern whether the students' measurements are *accurate only, precise only, both accurate and precise,* or *neither accurate nor precise.*

	Measurement 1	**Measurement 2**	**Measurement 3**	**Measurement 4**
Jameel	5.0 g	4.9 g	5.0 g	5.1 g
Cody	8.0 g	8.2 g	8.0 g	7.9 g
Rachel	2.0 g	12.0 g	8.0 g	20.0 g
Juan	10.0 g	9.9 g	10.1 g	9.9 g

   ****The accepted value of the rock's mass is 5.0 g

   a) Describe Jameel's measurements. Accurate and precise

   b) Describe Cody's measurements. Precise, but not accurate (Precise only)

   c) Describe Rachel's measurements. Neither accurate or precise

   d) Describe Juan's measurements. Precise, but not accurate (Precise only)

4. a) What piece of lab equipment measures <u>mass</u>? balance

   b) What piece of lab equipment most accurately measures <u>volume</u> of a *liquid*? Graduated cylinder

5. What is the formula for <u>density</u>? $D = \frac{mass}{volume}$

6. a) How is the volume of a regularly-shaped object, such as a box or book, found?

   Length (cm) x width (cm) x height(cm) = volume (cm^3)

b) What is the name of the method by which the volume of an irregularly-shaped object is found?

Volume by displacement – put some water in a graduated cylinder, measure the volume, put the object in the water, measure the volume of the water again, subtract the initial volume from the final volume, this is equivalent to the volume of the irregular object

7. Calculate the <u>density</u> of an object with a volume of 25 cm^3 and a mass of 50. g.

$D = \frac{50.g}{25\ cm^3}\ 2.0\ g/cm^3$ (2 sig figs because the decimal point after the 50. makes the zero significant)

8. Examine the data in the chart below. Use this data to calculate the <u>density</u> of an unknown object.

Initial Volume of Water	52.2 mL
Final Volume of Water	56.2 mL
Mass of Unknown Object	38.5 g

Volume of object = 56.2-52.2 = 4.0 cm^3 $D = \frac{38.5g}{4.0\ cm^3} = 9.6\ g/cm^3$ (2 sig figs because 4.0 has 2 sig figs)
(one decimal point because both measurements have 1 decimal point)

9. a) You are making a density column in a graduated cylinder with vegetable oil, honey, lamp oil, and water. Layer the order of liquids that you would have in the density column from <u>top to bottom</u>. The following chart lists the densities of each substance.

Liquid	Density
Vegetable Oil	0.91 g/mL
Honey	1.36 g/mL
Lamp Oil	0.80 g/mL
Water	1.00 g/mL

Top – lamp oil, vegetable oil, water, honey - bottom

b) Are the densities above *qualitative* or *quantitative* data?

Quantitative Explain. The mass and volume are measurements used to calculate the density. Any data involving measured numbers is quantitative.

c) Which of the following is a *qualitative* measurement? Explain why. The color and luster of the paperclip cannot be measured with numbers. You simply observe the characteristics with your senses.
   1. A paperclip has a mass of 1.0 g.
   2. A paperclip has a volume of two milliliters.
   3. A paperclip is made of a silver, lustrous metal

10. What do the following metric prefixes mean:

deci   1/10   deca   10
centi   1/100   hecto 100
milli   1/1000   kilo   1000

11. Describe the difference between an independent and dependent variable

Independent – the scientist sets this variable up (manipulates it) ahead of time. For example, she decides to take the temperature every 5 minutes. Time is the independent variable. This goes on the x-axis.

Dependent – this is what the scientist measures. In the example above, the scientist measures the temperature. This goes on the y-axis.

12. Round the following numbers to the indicated number of sig figs.

7.8604 to 4 sig figs   7.860   56.765 to 3 sig figs   56.8

123,000 to 2 sig figs   120,000   156 to 1 sig fig   200

13. Perform the following calculations. Make sure your answer has the correct number of sig figs.

8.75 cm × 2.0 cm = 18 cm   50 kg + 75.5 kg = 126 kg

10.5 m ÷ 2 m = 5 m   150.125 g – 70.5 g = 79.6 g

14. When measuring volume, 1 milliliter = 1 cm^3

Matter

15. Matter is anything with mass and volume

16. a) Which state/phase of matter is described as being tightly packed and highly organized with particles vibrating back and forth? solid

b) Which state/phase of matter is described as having disorganized particles as far apart as possible with a high degree of kinetic energy? gas

c) Which state/phase of matter is described as having particles that are relatively close together and "flow" while taking the shape of the container? Liquid

17. a) Fill in the blanks in the data table below.

Description	Physical or Chemical Change?	State/Phase Involved in Change?	Does Kinetic Energy Increase or Decrease?
water boils	physical	Liquid to gas	Increase
ice melts	Physical	solid to liquid	Increase
water vapor condenses	Physical	Gas to liquid	Decrease
iodine crystals sublime	physical	Solid to gas	increase

b) List the three main states/phases of matter by _increasing_ order of kinetic energy.

Solid → liquid → gas

18. A mixture that **is** uniform throughout is classified as a homogeneous mixture whereas a mixture that is **not** uniform in appearance is known as a heterogeneous mixture.

19. Fill in the chart below listing the physical properties of each type of mixture:

Mixture Type	Appearance/ Particle Size?	Heterogeneous or Homogeneous?	Tyndall Effect Positive or Negative?	Is there Settling: Yes or No?
Suspension	Large	Heterogeneous	Positive	Yes
Colloid	Medium	Homogeneous	Positive	No
Solution	small	homogeneous	negative	no

20. a) A cloudy mixture with no settling, and a positive Tyndall effect would be classified as a(n) colloid

b) On the other hand, a mixture with no settling, no visible layers, and a negative Tyndall effect would be classified as a(n) solution

21. If a cough medicine reads "shake before using," it is probably what specific type of heterogeneous mixture? suspension Explain how you know. "Shaking" indicates that it has settled into layers and needs to be mixed again.

22. a) A type of homogeneous mixture made of two or more metals melted together is known as a(n) alloy b) An example of this would be steel because it is made of iron and carbon. (Other common alloys are brass, 14K gold, and bronze)

23. Identify the following as a *chemical* or *physical* <u>property</u> or *chemical* or *physical* <u>change</u>.

a) copper reacts with oxygen to form a green patina   chemical

b) milk spoils   chemical

c) copper compounds are blue   physical

d) water evaporates on a hot summer day   physical

e) ice cream melts if not in the freezer   physical

f) fermentation of grapes to make wine   chemical

g) an iron nail rusts   chemical

h) combustion of wood   chemical

i) state of matter changes   physical

j) dissolving of chocolate in milk   physical

24. What are four pieces of evidence that a <u>chemical</u> change is taking place?

Production of gas (bubbling/fizzing)   precipitate (new solid) formed

Color change   presence of heat

Production smoke/light   new odor

25. Indicate whether the following can be separated by *physical*, *chemical*, or *nuclear* means.

a) atoms nuclear   b) compounds chemical   c) mixtures physical

26. List the 4 separation techniques for mixtures.

filtration   distillation

chromatography   crystallization

27. Which of the above methods would you use to separate the following mixtures?

a. sand and water   filtration

b. alcohol and water   distillation

c. sugar and water   crystallization

d. black ink   chromatography

28. a) Define the term atom in your own words (do not copy the definition from the book)! Smallest particle of an element that still has the properties of that element. All matter is made of atoms.

   b) The *atomic number* of an element is based on which <u>subatomic particle</u>? proton

   c) Which element has <u>atomic number</u> 8? Oxygen. The atomic number = # of protons.

   d) In a <u>neutral</u> atom, the number of protons are equal to the number of electrons.

29. Fill in the chart below concerning subatomic particles.

Subatomic Particle	Location	Charge	Job of Particle
proton	nucleus	positive	identifies the element
neutron	Nucleus	neutral	Along with proton, add mass to the atom
electron	Outside nucleus	negative	Involved in bonding

30. a) The majority of the mass of the atom is in which part of the atom? nucleus

   b) The mass number is equal to the number of protons and neutrons added together.

   c) An atom with 11 protons, 12 neutrons, and 11 electrons would have a mass number of 23

   d) An atom with 11 protons, 12 neutrons, and 11 electrons would have an atomic number of 11

   e) What would be the isotopic notation for an atom with 11 protons, 12 neutrons, and 11 electrons?

$$_{11}^{23}Na$$

31. Distinguish between <u>atomic mass</u> and <u>mass number</u>.
   **Atomic mass** – average mass of all existing isotopes of an element
   Mass number – sum of the protons and neutrons in an isotope

32. a) An **isotope** has the same numbers of protons but different numbers of neutrons.

   This causes isotopes to have the same atomic number but different masses.

   b) Examine the following isotope notation. Label the number on the top and bottom.

   Mass number ⟶ $_{6}^{13}C$
   Atomic number ⟶
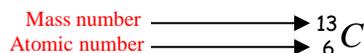
   c) Examine the following isotope: $_{90}^{210}Th$

   How many protons does this isotope contain? 90 How many neutrons does this isotope contain? 120

   d) Potassium-40 has more neutrons than an isotope of potassium-39.

33. a) Examine the following elements of potassium. Indicate the number of protons, neutron, and electrons in each.

Potassium-39	#p⁺19	#n°20	#e⁻19
Potassium-40	#p⁺19	#n°21	#e⁻19
Potassium -41	#p⁺19	#n°22	#e⁻19

   b) What is the most common isotope of potassium? Potassium-39
   c) How do you know? Because the mass of that isotope (39) is closest to the average atomic mass of all isotopes of potassium. The average atomic mass found on the periodic table is 39.10.

34. Find the <u>average atomic mass</u> of Element X if 51.83% of Element X occurring in nature has a mass of 106.905 amu and 48.17% of the atoms have mass of 108.905 amu.

<u>Mass</u> x   <u>% abundance</u> =   <u>Mass contribution</u>
106.905 x   .5183   =   55.4089
108.905 x   .4817   =   <u>52.4595</u>
                                   107.868

                                                    Identity of the Isotope: silver

35. Write the <u>full</u> electron configuration, orbital diagram, and short-hand electron configuration for titanium.

   a) full e⁻ configuration: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^2$

   b) orbital diagram: ↑↓   ↑↓   ↑↓ ↑↓ ↑↓   ↑↓   ↑↓ ↑↓ ↑↓   ↑↓   ↑ ↑ __ __ __
                          1s   2s   2p   3s   3p   4s   3d
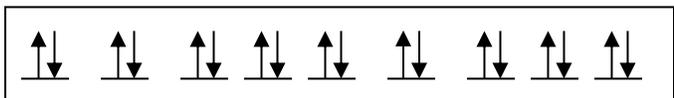
   c) short-hand electron configuration: $[Ar] 4s^2 3d^2$

36. What element has the orbital diagram below? potassium How do you know? 19 arrows = 19 electrons =

   potassium

   ↑↓ ↑↓ ↑↓ ↑↓ ↑↓ ↑↓ ↑↓ ↑↓ ↑↓ ↑
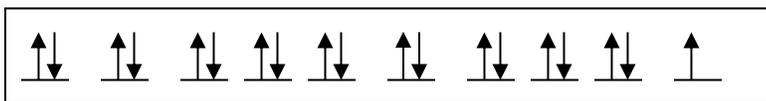
37. What element has the orbital diagram below? argon How do you know? 18 arrows = 18 electrons = argon

   ↑↓ ↑↓ ↑↓ ↑↓ ↑↓ ↑↓ ↑↓ ↑↓ ↑↓

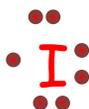38. Draw the Lewis/Electron Dot structure for the following elements:
   a) Sodium   b) Iodine   c) Aluminum   d) Oxygen

   Na   I   Al   O

   e) Lewis/Electron dot structures show what type of electrons? Valence electrons only

39. What is the name of the lowest, most stable energy level an electron occupies within an atom? Ground state

40. What happens within an atom when an electron undergoes excitation followed by de-excitation? Explain.
   When an electron gains energy, it is promoted to a higher energy level (it jumps up to a higher energy level). That is called excited state. It is very unstable. As the electron falls back down to ground state (lower energy level), it gives off photons of light energy. The wavelength of the light given off determines the color of the light given off.

41. How can the identity of an unknown be identified using the flame test? Explain.
Burn several elements in a flame to determine the color of the light given off. Then burn an unknown element in a flame. Compare the color of the unknown element to the color of the known elements. This works because all atoms of a given element have the same electron configuration and will always give off the same color (wavelength) of light.

Nuclear Chemistry

42.   a) $^{239}_{92}U \rightarrow {}^{239}_{93}Np + {}^{0}_{-1}\beta$ Is this alpha, beta, or gamma decay? Beta

       b) $^{210}_{84}Po \rightarrow {}^{206}_{82}Pb + {}^{4}_{2}He$ Is this alpha, beta, or gamma decay? alpha

       c) $^{14}_{6}C \rightarrow {}^{14}_{7}N + {}^{0}_{-1}\beta$ Is this alpha, beta, or gamma decay? beta

43. Fill in the chart below.

Type of Decay	Made From?	Isotopic Notation Symbol
Alpha	Helium nucleus (2 protons and 2 neutrons)	$^{4}_{2}He$
Beta Decay (β)	Electron	$^{0}_{-1}\beta$
gamma	photon with no charge and no mass	$^{0}_{0}\gamma$

44. a) What is radioactive decay? Spontaneous emission of particles and rays by a substance.

    b) What determines whether an atom is radioactive and unstable? If it spontaneously gives off particles and/or rays and turns into a new element. ONLY nuclear reactions can cause one element to turn into another element.

45. a) What is half –life? The amount of time it takes for one-half of a radioactive substance to decay.

    b) An isotope of cesium (cesium-137) has a half-life of 30 years. If 1.0 mg of cesium-137 decays over a period of 90 years, how many mg of cesium-137 would remain?
    Initial mass = 1.0 mg
    Half-life = 30 yrs
    Total time = 90 yrs   # of half-lives (n) = 90 ÷ 30 = 3 half-lives
    Final mass = ?

    $Mass_f = mass_i \left(\frac{1}{2}\right)^n = 1.0 \left(\frac{1}{2}\right)^3 = 0.125$ grams

46. a) Fusion involves atoms fusing (combining) of atoms whereas fission is when an atom splits into smaller particles

    b) Which nuclear process involves the production of every element heavier than helium? fusion

c) Which produces more energy: burning 100 g of coal, burning 100 g of gasoline, or using 100 g of uranium-238 in a nuclear power plant? 100 g of uranium Explain why. Uranium is radioactive. It undergoes nuclear reactions which give off much, much more energy than chemical reactions. Burning coal and gasoline are both chemical reactions. In chemical reactions, atoms are rearranged but are not changed into new elements.

Periodic Table

47. **Mendeleev** arranged the periodic table by atomic mass whereas the **modern** periodic table is arranged by atomic number

48. Rows on the periodic table are called periods and columns are called groups or families.

49. Fill in the blanks in the data table below regarding the Periodic Table of the Elements.

Group/Family Number	Group Name	Number of Valence Electrons
1	Alkali metals	1
2	Alkaline earth metals	2
3-12	Transition metals	2
13	n/a	3
14	n/a	4
15	n/a	5
16	n/a	6
17	halogens	7
18	Noble gases	8

50. Which group of <u>metals</u> is the most reactive group? Alkali metals Why? They have one valence electron which is lost very easily

51. Which group of <u>nonmetals</u> is the most reactive group? halogens Why? They have seven valence electrons and highly electronegative – very good at stealing one more electron to fill their outer shell

52. Which group of elements is the <u>least</u> reactive? Noble gases Why? They have a full outer shell of 8 valence electrons

53. a) Fill in the chart below by placing a check mark by the properties that match each type of element.

| Physical/Chemical Property	Metal	Nonmetal
Lustrous (means shiny)	√	
Brittle (means object can break easily)		√
Malleable (means object can flatten without breaking)	√	
Conductive (can carry a charge or heat)	√	
Dull (not shiny)		√
Reacts with Acid and $CuCl_2$	√	
Typically Gaseous at Room Temperature		√
Typically Solid at Room Temperature	√	

b) Unknown X is lustrous, malleable, and reactive with acid. This unknown is probably a(n) metal

c) Metals are located to the left of the staircase (with the exception of hydrogen) and nonmetals to the right of the staircase. Metalloids are located along the staircase (except for Aluminum).

54. Which of the following elements is **not** a nonmetal? Circle all that apply.
   a) calcium (metal)   b) oxygen   c) silicon (metalloid)   d) neon

55. What is . . .

a) atomic radius? Half the distance from nucleus to nucleus of 2 adjacent atoms

b) electronegativity? The ability of an atom to attract an electron into a bond

c) ionization energy? The amount of energy required to remove an electron from an atom
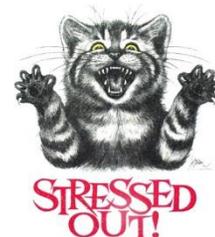
What does . . .

a) atomic radius do across a period? decrease down a group? increase

b) electronegativity do across a period? increase down a group? decrease

c) ionization energy do across a period? increase down a group? decrease

56. Why does electronegativity increase across a period as atomic number increases? As the number of protons increases, the positive charge in the nucleus increases. This makes it easier for an atom to attract an electron into a bond.

57. Why does ionization energy increase across a period as atomic number increases? As the number of protons increases, the positive charge in the nucleus increases. The valence electrons are also closer to the nucleus and therefore held tighter. This makes it more difficult for another atom to "steal" an electron.

58. Why does atomic radius decrease across a period as atomic number increases? As the number of protons increases, the positive charge in the nucleus increases. This pulls the closer to the nucleus resulting in a smaller radius.

59. What element has the highest ionization energy? Fluorine Why? It is very small and therefore the valence electrons are very close to the nucleus. It also already has 7 valence electrons and is very good at "stealing" an 8th valence electron to fill its outer shell.

60. Why do noble gases have electronegativity values of zero?
Because they already have 8 valence electrons and will not attract an electron into a bond.

61. Label the s, p, d, and f blocks on the following periodic table.
S block – 1st two columns – groups 1 and 2
P block – last 6 columns – groups 13-18
D block – columns 3-12 – transition metals
F block – two rows on bottom

62. What do the blocks represent in electron configuration?
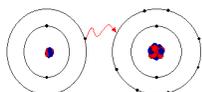The sublevels that electrons are located in

63. Energy level 1 has what sublevels? s only

64. Energy levels 2 and 3 have what sublevels? s and p

65. Energy levels 4 and 5 have what sublevels? s, p, and d

66. Energy levels 6 and 7 have what sublevels? s, p, d, and f

67. What is the octet rule?   Atoms will gain, lose, or steal electrons in order to have the stable valence electron of a noble gas with 8 valence electrons (s^2p^6).

68. An ion is a particle with an electrical charge created by the losing and/or gaining of electrons.

69. What is a cation (and how is it created)? Positive ion -   made when atoms LOSE electrons

70. What is an anion (and how is it created)? negative ion -   made when atoms GAIN electrons

71. a) Explain the difference between Mg and Mg^{+2}. Mg is a neutral atom with equal number of protons and electrons. Mg^{2+} is a magnesium ion that has lost 2 electrons.

    b) Explain the difference between Cl and Cl^{-1}. Cl is a neutral atom with equal number of protons and electrons. Cl^{1-} is a chlorine ion that has gained 1 electrons.

72. a) Will titanium form a *cation* or *anion*? Cation – metals generally lose electrons to become positively charged

    b) Will sulfur form a *cation* or *anion*?   Anion – nonmetals generally gain electrons to become negatively charged
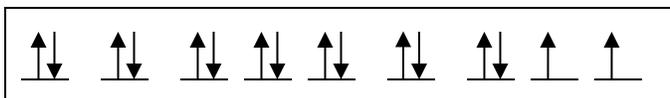
73. Examine the orbital diagram below. Will atoms of this element most likely *gain* or *lose* electrons? lose
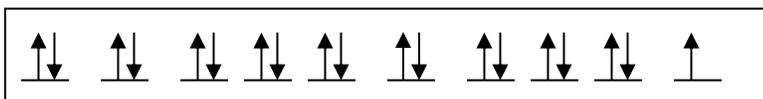
How many electrons will be gained or lost? 1

74. Examine the orbital diagram below. Will atoms of this element most likely *gain* or *lose* electrons? gain

How many electrons will be gained or lost? 2

75. Atoms are most stable when they have *filled* or *unfilled* sublevels? filled
How do they get these kinds of sublevels? by gaining, losing, or sharing electrons when they bond to another atom

76. How many total electrons do the following ions have?
Ca^{2+} 18 Li^{1+} 2 Co^{2+} 25
Al^{3+} 10 P^{3-} 18 O^{2-} 18 Br^{1-} 36

77. a) An atom with 7 valence electrons would most likely be in what state/phase of matter? gas

    b) An atom with 2 valence electrons would most likely be in what state/phase of matter? solid

    c) An atom with 8 valence electrons would most likely be in what state/phase of matter? gas

78. Why do elements in the same family/group have the similar physical and chemical properties?
They have the same number of valence electron

79. a) Fill in the chart below by placing a check mark by the properties that match each type of compound.

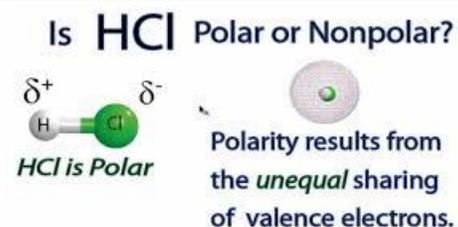| Description	Ionic	Covalent
can be polar or nonpolar		√
made of 2 nonmetals		√
made of metals and nonmetals	√	
made of cations and anions	√	
involves equal or unequal sharing of electrons to get full octet		√
involves Latin prefixes (mono-, di-, tri-, tetra-, etc)		√
will dissolve in water (not oil) and strongly conduct electricity	√	
involves gaining/losing electrons to get full octet	√	
Typically solid at room temperature	√	
Brittle solids, liquids, or gases at room temperature		√
High melting, boiling points, and densities	√	
Low melting, boiling points, and densities		√

80. a) Water's chemical formula is H_2O

   b) Is water polar or nonpolar? polar Why? See diagram on right. The two H-O bonds are polar. Oxygen is more electronegative so it pulls the electrons closer to the oxygen side of the atom. This makes the entire oxygen side of the atom slightly negative, while the hydrogen side of the atom is left slightly positive.

polar covalent bond
oxygen
polar covalent bond
hydrogen
+
hydrogen
+
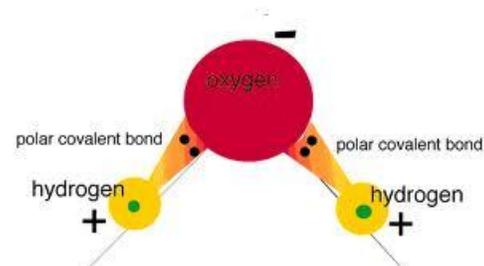
   c) What does the term *polar covalent* mean AND what creates this scenario? See water example above.
   When one atom in a bond is more electronegative than another atom, the electrons are pulled toward the more electronegative atom. This makes that side of the molecule more negative and the other side more positive. See also HCl example on right. Remember, Chlorine is much more electronegative than hydrogen so it pulls the electrons closer to it – unequal sharing.

Is HCl Polar or Nonpolar?

δ^+ δ^-
H   Cl

HCl is Polar

Polarity results from the *unequal* sharing of valence electrons.

   *****   The term "covalent" means electrons are being shared.
            "Polar" and "nonpolar" indicate if they sharing is equal or unequal.
            Polar means unequal sharing; nonpolar means equal sharing.

81. List the 7 diatomic elements.
   H_2, N_2, O_2, F_2, Br_2, Cl_2, I_2
   Are these molecules ionic or covalent? covalent
   Do they share electrons equally or unequally? equally
   Are the polar or nonpolar? Non-polar

82. a) How can an acid be easily recognized from a chemical formula? Acids begin with H

   b) Are acidic compounds held together by *ionic* or *covalent* bonds? covalent

83. a) How can an organic compound (specifically hydrocarbons) be easily recognized from a chemical formula?
Contains carbon and hydrogen

b) When an organic compound is described as an *alkane*, what type of bonds does it contain? single

c) What is the general formula for any **alkane**? C_nH_{2n+2}

d) What is the general formula for any **alkene**? C_nH_{2n}

e) What is the general formula for any **alkyne**? C_nH_{2n-2}

f) Are organic compounds held together by *ionic* or *covalent* bonds? Covalent, they are non-polar

84. Classify the following hydrocarbons as **alkanes**, **alkenes**, or **alkynes** based on their molecular formula.
CH_4 alkane C_5H_{10} alkene C_2H_6 alkane

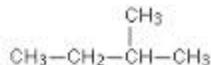C_3H_6 alkene C_7H_{12} alkyne C_9H_{16} alkyne

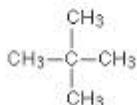85. What are isomers? Molecules with the same molecular formula but different structural formulas.
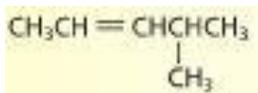
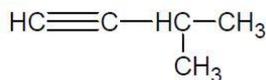86. Draw and name two isomers of C_5H_{12}.

Pentane $CH_3-CH_2-CH_2-CH_2-CH_3$

$$CH_3-CH_2-\overset{\overset{\textstyle CH_3}{|}}{CH}-CH_3$$ 2-methylbutane

$$CH_3-\overset{\overset{\textstyle CH_3}{|}}{\underset{\underset{\textstyle CH_3}{|}}{C}}-CH_3$$

2,2- dimethylpropane

87. Name the following organic molecule. $CH_3-CH_2-CH_2-CH_3$ butane
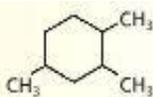
88. Name the following organic molecule.

$$CH_3CH=CH\overset{\overset{\textstyle }{}}{\underset{\underset{\textstyle CH_3}{|}}{CH}}CH_3$$ 4-methyl-2-pentene

89. Name the following organic molecule.

$$HC\equiv C-\overset{\overset{\textstyle }{}}{\underset{\underset{\textstyle CH_3}{|}}{HC}}-CH_3$$ 3-methyl-1-butyne

90. Name the following organic molecule.   1,2,4-trimethylcyclohexane

91. a) When is *hydro-* used as a prefix in the name of an acid? binary

b) What is always the ending of the name of the acid when *hydro-* is used as a prefix? -ic

92. When naming an oxyacid, or ternary acid, what rules do you apply?
Do not use prefix "hydro" – if there is an O, no hydro!
If the polyatomic ion ends in –ate, change the ending to –ic.
If the polyatomic ion ends in –ite, change the ending to –ous.

93. List the prefixes used to represent the number of each type of atom when naming covalent compounds.

One – mono	six - hexa
Two – di	seven - hepta
Three- tri	eight - octa
Four – tetra	nine - nona
Five – penta	ten - deca

94. List the Latin prefixes for numbers 1-10 used when naming organic compounds.

One – meth	six – hex	**NOTE they are the same as above except for
Two – eth	seven – hept	numbers one through four
Three- prop	eight - oct	
Four – but	nine - non	
Five – pent	ten - dec	

95. Fill in the blanks in the data table below.

Compound Name	Ionic, Covalent, Organic, or Acidic?	Chemical Formula
octane	Organic	C_8H_{18}
calcium hydroxide	Ionic	$Ca(OH)_2$
ammonium phosphate	Ionic	$(NH_4)_3PO_4$
disilicon hexachloride	covalent	S_2Cl_6
methane	organic	CH_4
carbon tetrafluoride	covalent	CCl_4

96. Fill in the blanks in the data table below.

Chemical Formula	Ionic, Covalent, Organic, BinaryAcid, or Oxyacid?	Compound Name
H_2SO_4	Oxyacid Acid	Sulfuric acid
HCl	Binary Acid	Hydrochloric acid
C_2H_6	Organic	ethane
PbO	Ionic	Lead (II) oxide
$Sr_3(PO_4)_2$	Ionic	Strontium phosphate
P_2O_5	Covalent	Diphosphorus pentoxide

97. a) When Pb^{+4} and SO_4^{-2} combine, what is the formula of the compound formed? Lead (II) sulfate

b) When NH_4^{+1} and CO_3^{-2} combine, what is the formula of the compound formed? Ammonium carbonate

c) Predict the chemical formula for a compound made from a lithium ion and the oxide ion. Li_2O
Li^{1+} O^{2-}

d) Predict the chemical formula for a compound made from a calcium ion and the chloride ion. $CaCl_2$
Ca^{2+} Cl^{1-}

98. a) What is the name of a compound made from an Fe^{+3} and an O^{-2} ion? Iron (III) oxide

    b) What is the name of a compound made from an Li^{+1} and an NO_2^{-1} ion? Lithium nitrite

99. a) Complete an atom inventory for 5 $(NH_4)_3PO_4$. Also indicate the number of <u>formula units</u>.

    5 formula units total

    N - 15   P - 5
    H - 60   O - 20

    b)   This compound is named ammonium phosphate

100. What does VSEPR stand for? Valence Shell Electron Pair Repulsion Theory
       Complete the following chart on VSEPR

Molecule	# valence electrons	Lewis structure	Molecular Geometry	Polar or Nonpolar	Bond angles
CCl_4	32		Tetrahedral	nonpolar	109.5
PH_3	8		trigonal pyramid	polar	<109.5
OF_2	20		Bent	polar	<109.5
CO_2	16		Linear	nonpolar	180
BF_3	24		Trigonal planar	nonpolar	120

Chemical Equations

101. What is a coefficient in a balanced equation? Large number in front of a compound. It tells how many molecules or formula units you have of a particular substance.

102. What is a subscript in a chemical formula? Small number written to the lower right of an atom. It tells how many atoms of an element are in a compound.

103. Why must chemical equations be balanced? Because of the Law of Conservation of Matter (Mass). You must have the same number of atoms of each type on both sides of the equation.
NOTE: you can have a different number of molecules on both sides because the atoms rearrange to make either larger or smaller molecules; but you must have the exact same number of atoms on both sides.

104. a) What is a reactant AND where is it located in the chemical equation? the beginning substances in a chemical reaction. They are written on the LEFT of the arrow.

b) What is a product AND where is it located in the chemical equation? the ending substances in a chemical reaction. They are written on the RIGHT of the arrow.

105. Label the following things in the chemical equation below: reactants, products, yields, coefficient, subscript

$$2\ KClO_{3(s)} \rightarrow 2\ KCl_{(s)}\ +\ 3\ O_{2(g)}$$

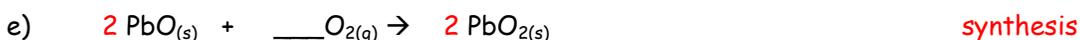reactant — subscript — products — coefficient — yields — coefficients — subscript
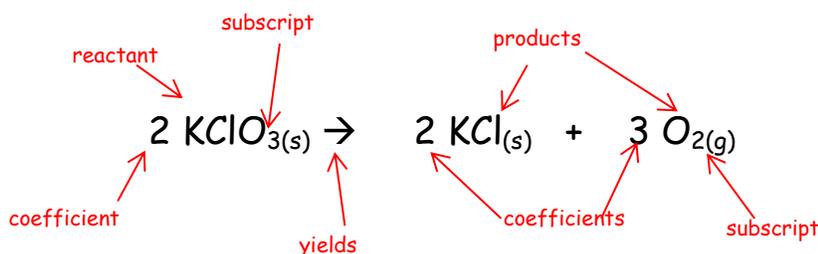
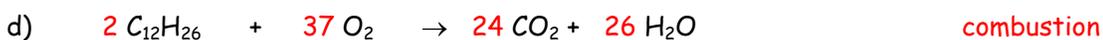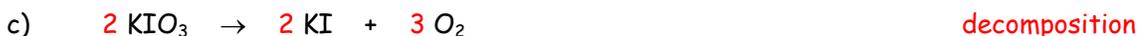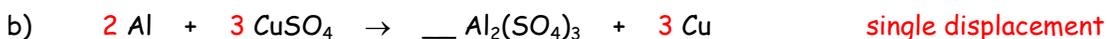106. In a chemical reaction, how do you indicate the state of matter an substance is in? By using the subscripts (s), (l), (g), and (aq) to the right of a substance. S = solid, L= liquid, G = gas, Aq = aqueous (dissolved in water)

107. Match the following reaction types with the correct description:

4 a. synthesis
3 b. decomposition
1 c. single displacement
5 d. double displacement
2 e. combustion

1. A single element is present on both sides
2. A hydrocarbon combines with oxygen to produce carbon dioxide and water
3. One compound breaks down into simpler compounds or elements
4. Two or more simpler elements or compounds combine to form one larger product
5. The cations and anions of two compounds trade places. One of the products formed is generally a solid precipitate.

108. Balance the following equations (in the small blanks) AND in the large blank to the right identify the type of reaction as single displacement, double displacement, synthesis, decomposition, or combustion.

a)   __ Li$_2$SO$_4$ +   __ Pb(NO$_3$)$_2$ →   2 LiNO$_3$ +   __ PbSO$_4$ double displacement

b)   2 Al   +   3 CuSO$_4$ →   __ Al$_2$(SO$_4$)$_3$ +   3 Cu   single displacement

c)   2 KIO$_3$ →   2 KI   +   3 O$_2$ decomposition

d)   2 C$_{12}$H$_{26}$ +   37 O$_2$ →   24 CO$_2$ +   26 H$_2$O   combustion

e)   2 PbO$_{(s)}$ +   ____O$_{2(g)}$ →   2 PbO$_{2(s)}$ synthesis

109. Write a balanced equation from the sentence below and identify the type of reaction in the blank.

Hydrogen gas reacts with oxygen gas to produce dihydrogen monoxide.   synthesis

$2H_2$ + O_2 → $2 H_2O$

The Mole

110. a) 1 mole = 6.02×10^{23} particles (representative particles). They could be atoms, ions, formula units, or molecules. (Avogadro's number)

   b) 1 mole = molar mass of an atom, formula unit, or molecule

111.   If you had a mole of blueberries and a mole of watermelons, how many of each would you have?
6.02×10^{23} blueberries and 6.02×10^{23} watermelons
Would a mole of blueberries or a mole of watermelons have more mass? Explain.
A mole of watermelons would have more mass because each watermelon has more mass than each blueberry.
If you had a mole of lithium atoms and a mole of oxygen atoms, how many of each would you have?
6.02×10^{23} lithium atoms and 6.02×10^{23} oxygen atoms
Would a mole of lithium atoms or a mole of oxygen atoms have more mass? Explain.
A mole of oxygen atoms would have more mass because each oxygen atom has more mass than each lithium atom.

112. Determine the <u>molar mass</u> of each of the following compounds:

a) C_6H_5Br 157.01 g/mol
   C   12.01 x 6 = 72.06
   H   1.01 x 5 =   5.05
   Br   79.90 x 1 = <u>79.90</u>
                         157.01 g/mol

b) $K_2Cr_2O_7$
   K   39.10 x 2 =   78.20   294.20 g/mol
   Cr   52.00 x 2 = 104.00
   O   16.00x 7 = <u>112.00</u>
                         294.20 g/mol

113. Calculate the:

a) number of moles in 38.0 grams of carbon $3.16\ moles\ C$

$38.0\ g\ C\ \ x\ \ \dfrac{1\ mole\ C}{12.01\ g\ C} = 3.16\ moles\ C$

b) mass (in grams) of 1.00 mole of potassium fluoride $58.1\ g\ KF$

$1.00\ mol\ KF\ \ x\ \ \dfrac{58.1\ g\ KF}{1.00\ mol\ KF} = 58.1\ g\ KF$

c) mass (in grams) of 0.254 moles of sodium nitrite $\qquad$ $17.5 \ g \ NaNO_2$

$$0.254 \ mol \ NaNO_2 \ \ x \ \ \frac{69.00g \ NaNO_2}{1 \ mol \ NaNO_2} \ = \ 17.5 \ g \ NaNO_2$$

d) number of atoms in 2.0 g helium $\qquad$ $3.0 \ x \ 10^{23} \ atoms \ He$

$$2.0 \ g \ He \ \ x \ \ \frac{1 \ mole \ He}{4.00 \ g \ He} \ \ x \ \ \frac{6.02 \ x \ 10^{23} \ atoms \ He}{1 \ mol \ He} = \ 3.0 \ x \ 10^{23} \ atoms \ He$$

e) mass (in grams) of 2.75 x 10^{42} formula units of iron(II) oxide $\qquad$ $3.28 \ x \ 10^{20} \ g \ FeO$

$$2.75 \ x \ 10^{42} f.u. FeO \ \ x \ \ \frac{1 \ mole \ FeO}{6.02 \ x \ 10^{23} \ f.u. \ FeO} \ \ x \ \ \frac{71.85 \ g \ FeO}{1 \ mol \ FeO} = \ 3.28 \ x \ 10^{20} \ g \ FeO$$