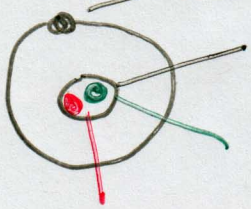
4/25/19

Quiz #1

1. 

— An element is identified by how many protons it has.

2. substance — matter that has a consistent formula throughout
compound — a substance composed of two or more elements
molecule — a set of atoms that are bound together

compound but not a molecule → NaCl
molecule but not a compound → O_2, H_2

3. mixture — a combination of two or more substances
homogeneous mixture — consistent composition throughout; components are not easily separated → salt water
heterogeneous mixture — variable composition throughout; components are easily separable → sand + water

4. length volume mass temperature time
meter liter kilogram Kelvin second

5. a) 250 mg m=milli 10^{-3} 250. → 0.250 g
$250 \times 10^{-3} \rightarrow 2.5 \times 10^{-1}$

b) 58 μg μ=micro 10^{-6} 000058 → .000058 g
$58 \times 10^{-6} \rightarrow 5.8 \times 10^{-5}$

c) 73.4 kg k=kilo 10^{3} 73.400 → 73400 g
$73.4 \times 10^{3} \rightarrow 7.34 \times 10^{4}$

d) 6.19 cg c=centi 10^{-2} 00.619 → 0.0619 g
6.19×10^{-2}

e) 420 ng n=nano 10^{-9} 000000420. → 0.000000420
$420 \times 10^{-9} \rightarrow 4.2 \times 10^{-7}$

6) intensive property – a property that does not depend the amount of a substance → density, temperature
extensive property – a property that does depend on the amount of substance → mass, volume

7) density = 0.841 g/mL Mass 12.0 mL

$D = \frac{M}{V}$ $D \cdot V = m = 0.841 \frac{g}{mL} \times 12.0 mL = 10.092 g$

8) How moles in 20.0 g of H_2O.

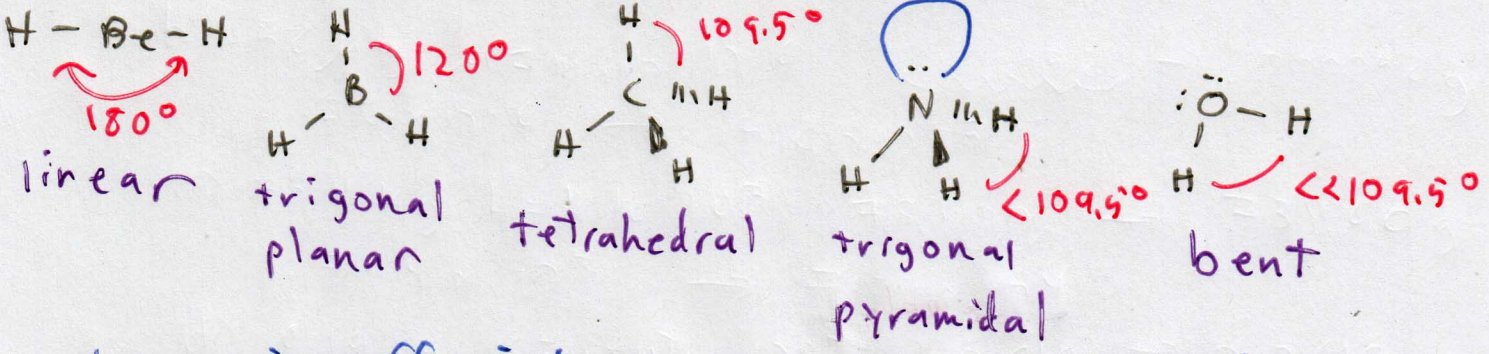
molar mass = 1×O + 2×H = 16.00 + 2(1.01)
= 18.02 g H_2O/mol

$20.0 g \times \frac{1}{18.02 g/mol} = 1.11 mol$

9) atomic number = # of protons
Mass number = # of protons + # of neutrons
isotopes – atoms of the same element with different numbers of neutrons (same # protons)
– the mass number is different between isotopes

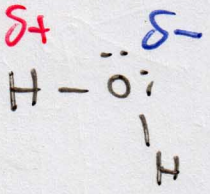
10) law of definite proportions – a substance will have a fixed ratio of elements
law of multiple proportions – elements can combine in different ratios to produce different substances.

VSPER – valence shell electron pair repulsion



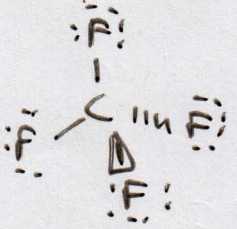
lone pairs effectively cause more repulsion than bonding pairs, so lone pairs will cause a small change in geometry

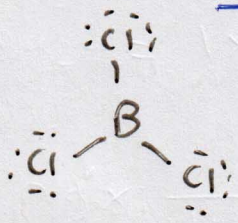
polar - has an imbalance in charge
(has a positive end and a negative end)

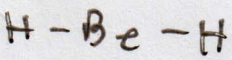


A bond becomes polar when there is a difference in the electronegativity of the atoms in the bond.

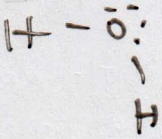
The bond in H_2 is non-polar because there is no difference in electronegativity.

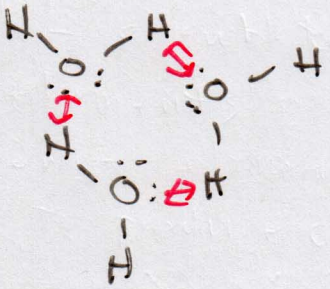




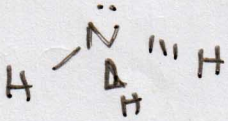


In these three cases, even though the bonds may be polar, because the molecules are symmetric, the bonds are exactly balanced with each other so the polarity of the individual bonds is canceled out, making the molecule as a whole non-polar.



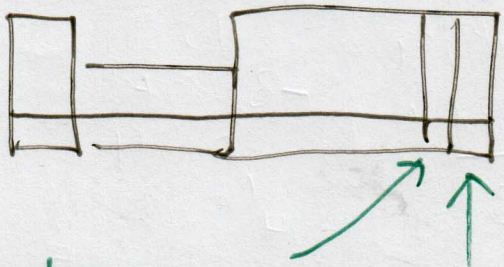


Besides the fact that the bonds in water are polar, the shape is not symmetric (it's bent), so the polarity of the bonds does not cancel out, so the molecule is polar.



Ammonia is also polar because its shape is not symmetric (the lone pair does not cancel)

The shape of HCN is linear (single, double, and triple bonds are all counted the same). Even though its linear, HCN is polar because it has two different bonds.



groups - a column on the periodic table

period - a row on the periodic table

halogens - fluorine, chlorine, bromine

noble gasses - neon, helium, argon (don't normally react)

F: $1s^2 2s^2 2p^5$

Cl: $1s^2 2s^2 2p^6 3s^2 3p^5$

Br: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^5$

Halogens all have similar chemical behavior because they have the same number of valence electrons.

Exam #1

- Topics from Quiz #1 (4/16/19)
- Chapter 3 - no experiments (3.5 - 3.8)
  - electron configurations (through Ar)
    - shells, subshells, orbitals
  - periods, groups (halogens + noble gasses)
- Chapter 4 (all sections)
  - identifying monatomic ion charges (4.4)
  - octet rule (4.4)
  - naming compounds with monatomic ions (4.5)
  - electronegativity (4.7)
  - ionic versus covalent bonds
  - no covalent names (no mono, di, tri)
  - polyatomic ions (names + formulas)
  - Lewis dot structures
  - VSEPR theory
  - molecular polarity