Final Review

Mole Introductory Concepts.	Formula	Grams in one mole	Particles in one mole
1. lithium phosphide	_____	_____	_____
2. rubidium oxide	_____	_____	_____
3. strontium fluoride	_____	_____	_____
4. cobalt (III) sulfate	_____	_____	_____
5. nickel (II) oxalate	_____	_____	_____

ANSWERS
COLUMN 1
Li_3P
Rb_2O
SrF_2
$Co_2(SO_4)_3$
NiC_2O_4

COLUMN 2
52
186
126
406
147

COLUMN 3
6.02×10^{23}
for all

Mole Conversions

6. 50.0 grams of calcium carbonate to formula units. Answer: 3.01×10^{23} FORMULA UNITS

7. 25 moles of magnesium nitride to grams. Answer: 2500 GRAMS

8. 25 grams of iron (III) oxide to formula units. Answer: 9.4×10^{22} FORMULA UNITS

9. 3 moles of iron (III) sulfate to grams. Answer: 1200 GRAMS

Stoichiometry Review

10.) The reaction of sodium phosphate with iron (III) chloride produces 325.0 grams of iron (III) phosphate. How many grams of iron (III) chloride were reacted? Answer: 347.5 grams

11.) Use equation 6 to answer the following question. If you have 125 gram of iron (III) chloride how much salt could you make? Answer: 135 grams

12.) The decomposition reaction for hydrogen peroxide is given below.

$2H_2O_{2\,(l)} \Rightarrow 2H_2O_{\,(l)} + O_{2\,(g)}$

How many grams of hydrogen peroxide must be decomposed to produce 5.5 liters of oxygen gas at STP? Answer: 16.7 grams

Gas Law Section

13. A gas has a volume of 800 ml at 5 atm and 200K What will its volume be at 10 atm and 400 K?

Answer: 800 ml

14. A gas has a volume of 400 ml at 6 atm and 300 K. What will its volume be at 300 K and 4 atm?

Answer: 600 ml

15. A gas has a volume of 300 ml at 5 atm and 500 K. What will its volume be at 3 atm and 300 K?

Answer: 300 ml

16. IDEAL GAS LAW. Try a couple of these. R = .08205 Latm/moleK or 8.31 LkPa/mole K

P	*V*	*n*	*T*	
a. 1.09 atm	? L	0.0881 mol	302 K	*ans:* 2.00 L
b. 94.9 kPa	0.0350 L	? mol	55°C	*ans:* 1.22×10^{-3} mol
c. ? kPa	15.7 L	0.815 mol	− 20.°C	*ans:* 109 kPa
d. 0.500 atm	629 mL	0.0337 mol	? K	*ans:* 114 K
e. 0.950 atm	? L	0.0818 mol	19°C	*ans:* 2.06 L
f. 107 kPa	39.0 mL	? mol	27°C	*ans:* 1.67×10^{-3} mol

Heat Section

17. Using the following data and assuming that the metal was moved from boiling water to a styrofoam cup of water, calculate the mass of the piece of metal.

Mass of cup	2.24 grams
Mass of cup and water	135.07 grams
Initial temperature of water in cup	22.07 C
Final temperature of water in cup	24.5 C
Temperature of boiling water	100.4 C
Cp of metal	.449 J/gC
Cp of water	4.18 J/gC

ANSWER: 39.59 grams

18. If 250 grams of water are heated by a candle so that the temperature of the water raised from 25 to 45 C, how many calories were put into the can? If the candle lost .5 grams in mass while burning, how many calories per gram were in the candle? Cp of water is 1 calorie/gC

ANSWERS: 5000 calories
10,000 calories/gram

Dot Diagram Section:

Answer these questions and complete the table that follows:

19 - 20

Fill in the following blanks. **You will need to draw the diagram as you answer the questions.**

For the dot diagram for SO_2, the number of valence electrons is _____.

When drawing the skeleton structure, the element closest to the center of the periodic table should go in the middle. The element closest to the middle of the table in the case of SO_2 is _____.

DRAW the STRUCTURE NOW in SPACE 1.

After the skeleton structure is drawn, you should subtract two electrons per bond from the total number of valence electrons. The number of electrons you will need to subtract in this case is _____.

You will need to distribute the remaining electrons (14 in this case) around the atoms so that each atom has 8 electrons around it. Try this now in the space below. If you have enough electrons to put 8 around each atom, you are finished. If you do no have enough, continue below.

SPACE 1:

You should find that you did not have enough electrons to put 8 electrons around all of the atoms. In fact, you should be two electrons short. If you are two short, you will need to add a double bond on either side of the sulfur, and begin the process again. DRAW the new structure in SPACE 2 below:

SPACE 2:

In this case you will need to subtract _____electrons from the total, leaving you 12 electrons to distribute. Distribute them now so that each atom is surrounded by _____ electrons.
REMEMBER THAT ELECTRONS REPEL EACH OTHER, SO THE ATOMS WILL NOT BE IN A STRAIGHT LINE

Remember that if you had been four electrons short, you would have needed to add two double bonds or one triple bond.

Now look at the chart given to you in class (or use the web site in the bonding section). A single bond, a multiple bond, or an unshared pair of electrons count as one domain. How many domains do you see around the atom of sulfur? _____
Since there are 3 domains around the center, what is the name of the electron geometry?
_____

What is the name of the molecular geometry? _____

Still using the table, what are the bond angles for SO_2? _____

Polarity of bonds is determined by subtracting electronegativity differences. If the electronegativity difference is 0 - .2, the bond is NOT polar or NONPOLAR. If the difference is between .2 and 1.7, the bond is polar, meaning that electrons are shared unequally. What is the electronegativity difference between S and O? _____. Is this bond polar or nonpolar? _____

In a bond, electrons move toward the more electronegative element. In this case, which is the more electronegative element? _____. The more electronegative element will be the negative end of the bond, and the less electronegative element will be the positive end. Which is the negative end of the bond in this case? _____.

If you draw arrows toward the more electronegative element, you can determine polarity of the molecule. If the arrows look like they will cancel each other, the molecule will be nonpolar. If they do not cancel each other, the molecule will be polar. Do the arrows in this case look as if they will cancel each other?
_____
Since they don't cancel, will this molecule be polar, or nonpolar? _____.

Molecule	Dot Diagram	3D structure	electron domains around center	Electron Domain Geometry	Molecular Geometry	Appx. bond angles	Type of bond (polar or non-polar)	Type of Molecule (polar or non-polar)
CI_4 (I is iodine)								
SeO_2								
Answers			4 3	tetrahedral trigonal planar	tetrahedral bent	109.5 120	polar polar	non-polar polar