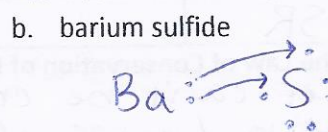
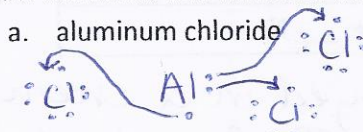
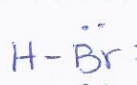


SPRING FINAL EXAM REVIEWBonding & Nomenclature (foldable):**1. Fill in the blanks****a. Ionic bonding -**Occurs between a metal and a nonmetal.Electrons are transferred**b. Covalent bonding -**Occurs between a nonmetal and a nonmetal or metalloidElectrons are shared**2. Which type of compound uses prefixes in the name? Ionic or Covalent?****3. Which type of compound uses the charges to write the formula? Ionic or Covalent?****4. Define:****a. Octet Rule -** In a chemical bond, atoms will have 8 valence electrons - except H only gets 2.**b. Ion -** an atom that has a charge because it has gained or lost electrons**c. Cation -** atoms that have a positive (+) charge b/c they have lost electrons**d. Anion -** ions that have a negative (-) charge b/c they have gained electrons.**5. List the charge of each element when it forms an ion****a. Oxygen** -2**b. Nitrogen** -3**c. Barium** +2**d. Chlorine** -1**6. When naming compounds, what elements get Roman numerals next to them? transition metals****7. Name the following ionic compounds****a. BaF₂** barium fluoride**b. MnBr₂** manganese (II) bromide**c. Mg(NO₃)₂** magnesium nitrate**8. Write the formula for these ionic compounds****a. magnesium oxide** MgO**b. copper (II) fluoride** CuF₂**c. beryllium phosphate** Be₃(PO₄)₂**9. Name the following covalent compounds****a. IF₃** iodine trifluoride**b. Si₄Cl** tetrasilicon monochloride**c. Cl₂O₈** dichlorine octoxide**10. Write the formula for these covalent compounds****a. diarsenic pentoxide** As₂O₅**b. sulfur hexachloride** SCl₆**c. diiodine heptanitride** I₂N₇**11. Name the following acids****a. H₃N** hydronitric acid**b. H₂SO₃** sulfurous acid**c. H₃PO₄** phosphoric acid**12. Write the formula for these acids****a. nitrous acid** HNO₂**b. nitric acid** HNO₃**c. hydrophosphoric acid** H₃P**13. Draw the Lewis Dot transfers for the following ionic compounds (dots = valence electrons)****14. Draw the Lewis Dot structure for the following covalent compounds****a. CF₄** total valence e⁻ = 4 + 4(1) = 32**b. HBr** total valence e⁻ = 1 + 7 = 8

H can't have more than 2!

"hydro" = binary
polyatomic = no "hydro"
-ate → -ic
-ite → -ous

Name: _____

Class Period: _____

15. What do the subscripts in a chemical formula tell you?

How many of each type of atom or ion are in the compound

16. How many of each atom are in $\text{Fe}_3(\text{PO}_4)_2$?

$\text{Fe} = 3$

$\text{P} = 1 \times 2 = 2$

$\text{O} = 4 \times 2 = 8$

Total = 13
(3 + 2 + 8)

17. Calculate the % composition of each element in $\text{Ca}_3(\text{PO}_4)_2$

$\text{Ca} = 40.078 \times 3 = 120.234$

$\text{P} = 30.974 \times 2 = 61.948$

$\text{O} = 15.999 \times 8 = 127.992$

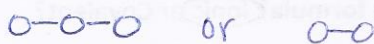
$\% \text{Ca} = \frac{120.234}{310.174} \times 100 = 38.8\% \text{Ca}$

$\% \text{P} = \frac{61.948}{310.174} \times 100 = 20.0\% \text{P}$

$\% \text{O} = \frac{127.992}{310.174} \times 100 = 41.3\% \text{O}$

18. Sketch the different molecular shapes

a) Linear



d) Trigonal Pyramidal



b) Bent



c) Trigonal Planar



e) Tetrahedral

Types of Reactions (foldable) & Balancing:

19. In your own words, describe what happens in each of the 5 types of chemical reactions:

a. Synthesis – 2 or more substances combine together to form one product

b. Decomposition – one compound (reactant) breaks apart into separate pieces

c. Single Replacement – a single element switches places with something in a compound

d. Double Replacement – 2 compounds (ionic) switch partners with each other

e. Combustion – something burns in O_2 to form CO_2 & H_2O

20. Determine whether the following equations are synthesis (S), decomposition (D), single replacement (SR), double replacement (DR), or combustion (C). Then balance them.

Type of Rxn	Chemical Equation
S	$\text{S}_8 + 8 \text{O}_2 \rightarrow 8 \text{SO}_2$
DR	$\text{ZnSO}_4 + \text{Li}_2\text{CO}_3 \rightarrow \text{ZnCO}_3 + \text{Li}_2\text{SO}_4$
D	$2 \text{H}_2\text{O} \rightarrow 2 \text{H}_2 + \text{O}_2$
S	$8 \text{Fe} + \text{S}_8 \rightarrow 8 \text{FeS}$
C	$\text{C}_3\text{H}_8 + 5 \text{O}_2 \rightarrow 3 \text{CO}_2 + 4 \text{H}_2\text{O}$
SR	$2 \text{BN} + 3 \text{F}_2 \rightarrow 2 \text{BF}_3 + \text{N}_2$

← already balanced

21. What is the Law of Conservation of Mass?

Matter can't be created or destroyed in a chemical reaction (mass of reactants = mass of products)

22. When 127 g of copper reacts with 32 g of oxygen gas to form copper (II), no copper or oxygen is left over. How much copper (II) oxide is produced? $2\text{Cu} + \text{O}_2 \rightarrow 2\text{CuO}$

$$127 + 32 = x$$

$$x = 159 \text{ g}$$

The reason chem. equations have to be balanced

23. What are the 4 symbols used to identify physical states in a chemical equation? What do they mean? (s) = solid (l) = liquid (g) = gas (aq) = aqueous solution (dissolved in water)
24. List the seven diatomic elements. What does this mean? (You will need to memorize them) $H_2, N_2, O_2, F_2, Cl_2, Br_2, I_2$ when they are by themselves (not in a compound), they get a subscript 2
- Molar Conversions & Stoichiometry (fill-in notes & flow chart):

25. Define a mole

the SI unit for the amount of a substance

26. What is Avogadro's number?

6.02×10^{23} - the number of particles in 1 mole

27. What are the 3 types of particles, and what substances do they represent?

atom = element

molecule = covalent compound

formula unit = ionic compound

28. How many atoms are in 1.25 moles Sulfur?

multiply top, divide bottom

$$\frac{1.25 \text{ mol S} \times 6.02 \times 10^{23} \text{ atoms S}}{1 \text{ mol S}} = 7.53 \times 10^{23} \text{ atoms S}$$

29. How many moles of SO_3 are in 2.4×10^{24} molecules of SO_3 ?

$$\frac{2.4 \times 10^{24} \text{ molec. } SO_3}{6.02 \times 10^{23} \text{ molec. } SO_3} \times \frac{1 \text{ mol } SO_3}{1 \text{ mol } SO_3} = 4.0 \text{ mol } SO_3$$

30. The molar mass of an element is the mass of one mole of the element.

31. Where do you find the molar mass of any element?

Periodic Table

32. Calculate the molar mass of $Al_2(SO_4)_3$

$$Al = 26.982 \times 2 = 53.964$$

$$S = 32.066 \times 3 = 96.198$$

$$O = 15.999 \times 12 = 191.988$$

$$= 342.15 \text{ g/mol}$$

33. What is the mass of 5.4 moles of aluminum?

from Periodic Table

$$\frac{5.4 \text{ mol Al} \times 26.982 \text{ g Al}}{1 \text{ mol Al}} = 145.7 = 150 \text{ g Al}$$

34. How many moles are present in 87.2 grams of SO_2 ?

$$S = 32.066 \times 1 = 32.066$$

$$O = 15.999 \times 2 = 31.998$$

$$64.064$$

from P.T.

$$\frac{87.2 \text{ g } SO_2}{64.064 \text{ g } SO_2} \times \frac{1 \text{ mol } SO_2}{1 \text{ mol } SO_2} = 1.36 \text{ mol } SO_2$$

35. What is STP an abbreviation for?

Standard Temperature and Pressure

36. At STP, what is the volume of 1 mole of any gas?

$$1 \text{ mol} = 22.4 \text{ L}$$

37. How much space would 3.8 moles of CO_2 occupy at STP?

$$\frac{3.8 \text{ mol } CO_2 \times 22.4 \text{ L } CO_2}{1 \text{ mol } CO_2} = 85 \text{ L } CO_2$$

38. List the 3 conversion factors that use the mole.

1 mol = 6.02×10^{23} particles (atoms, molecules, formula units)

1 mol = grams from Periodic Table

1 mol = 22.4 L of gas (@ STP)

39. How many atoms are in 2.5 grams of sulfur?

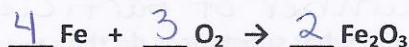
from P.T.

$$\frac{2.5 \text{ g S} \times 1 \text{ mol S} \times 6.02 \times 10^{23} \text{ atoms S}}{32.066 \text{ g S} \times 1 \text{ mol S}} = 4.7 \times 10^{22} \text{ atoms S}$$

48. Define the following terms

- Limiting Reactant – Reactant that limits the amount of product that can be made
- Excess Reactant – Reactant that ~~when~~ you will have extra left over of once the limiting reactant runs out.
- Theoretical Yield – the amount of product that is possible to make (calculated)
- Actual Yield – The amount of product that is actually made.

49.



- a) Identify the molar ratios from the equation above

$$\text{Fe} : \text{O}_2 = 4 : 3$$

$$\text{Fe}_2\text{O}_3 : \text{O}_2 = 2 : 3$$

$$\text{Fe} : \text{Fe}_2\text{O}_3 = 4 : 2 \text{ or } 2 : 1$$

- b) If you have 24.16 moles of oxygen, how many moles of iron do you need for a complete reaction?

$$\frac{24.16 \text{ mol O}_2}{3 \text{ mol O}_2} \times 4 \text{ mol Fe} = 32.21 \text{ mol Fe}$$

- c) How many moles of Fe_2O_3 can be produced from 12.9 moles of iron?

$$\frac{12.9 \text{ mol Fe}}{4 \text{ mol Fe}} \times 2 \text{ mol Fe}_2\text{O}_3 = 6.45 \text{ mol Fe}_2\text{O}_3$$

50.



- a) What mass of silver can be produced from 52.8 g Al?

from P.T. $\frac{52.8 \text{ g Al}}{26.982 \text{ g Al}} \times \frac{1 \text{ mol Al}}{2 \text{ mol Al}} \times \frac{6 \text{ mol Ag}}{1 \text{ mol Ag}} \times 107.868 \text{ g Ag} = 633 \text{ g Ag}$

← from P.T.

- b) How many atoms of aluminum are needed to produce 132.7 g Al_2S_3 ?

from P.T. $\frac{132.7 \text{ g Al}_2\text{S}_3}{150.164 \text{ g Al}_2\text{S}_3} \times \frac{1 \text{ mol Al}_2\text{S}_3}{1 \text{ mol Al}_2\text{S}_3} \times \frac{2 \text{ mol Al}}{1 \text{ mol Al}} \times 6.02 \times 10^{23} \text{ atoms Al} = 1.06 \times 10^{24} \text{ atoms Al}$

Solutions: $\text{Al} = 26.982 \times 2 = 53.964$
 $\text{S} = 32.066 \times 3 = 96.198 + 150.164$

51. Define:

- Solution – mixture of 2 or more substance that are evenly combined (homogeneous mixture)
- Solute – part of the solution that is being dissolved (present in the smaller amount)
- Solvent – Part of the solution doing the dissolving – what the solute is dissolving into (present in the larger amount)
- Solubility – The amount of solute that is possible to dissolve in a given solvent at certain temperatures.

52. What is the difference between an unsaturated, saturated, and supersaturated solution?

Saturated – already has the maximum amount of solute
 unsaturated – can still dissolve more solute (not full yet)
 Supersaturated – has more solute dissolved in it than what should be possible.

53. List 3 factors that cause a solid solute to dissolve faster.

Increase temperature (hotter)

Decrease particle size

Agitation (stirring, mixing)

54. What 2 factors will keep a gas dissolved in a liquid solution? (How would you keep your soda from going flat?)

Decrease temperature (colder – keep in refrigerator)

Increase pressure (keep cap on bottle)

55. What does molarity measure?

The concentration of a solution

56. What is the molarity of a solution that has 1.5 mol KOH in 3.2 L of solution?

$$M = \frac{\text{mol}}{L}$$

$$M = \frac{1.5 \text{ mol}}{3.2 \text{ L}} = 0.47 \text{ M}$$

57. How many moles of KNO_3 are in 527 ml of 0.84 M solution?

$$M = \frac{\text{mol}}{L}$$

$$0.84 = \frac{x}{0.527}$$

$$x = 0.44 \text{ mol}$$

58. What volume of 0.94 M NH_4Cl solution would I need to make 120 ml of .426 M solution?

$$M_1 V_1 = M_2 V_2$$

$$0.94 \times x = 0.426 (120 \text{ ml})$$

$$x = 54 \text{ ml}$$

59. List the properties of acids.

- $\text{pH} < 7$
- taste sour (like lemons)
- turn litmus paper RED
- react w/ metals

60. List the properties of bases.

- $\text{pH} > 7$
- taste bitter (like soap)
- turn litmus paper BLUE
- slippery, soapy feeling

• Conduct electrical current (electrolytes)

• React w/ indicators

Both acids & bases

61. What does pH measure?

How acidic or basic a solution is

62. What range of pH values are acidic solutions?

Basic solutions? Acids = 0 - 7

Bases = 7 - 14

63. What type of solution has an equal amount of

H^+ and OH^- ions? $\text{H}^+ = \text{OH}^- \rightarrow \text{H}_2\text{O} = \text{H}_2\text{O}$

Neutral

64. What is an indicator? a chemical that changes color to tell if something is an acid or base

65. What is the Arrhenius definition of an acid and

base? Acid - produces H^+ in solution

Base - produces OH^- in solution

66. What is the Bronsted - Lowry definition of an

acid and base? Acid - donates H^+ in reactions

Base - accepts H^+ in reactions

67. What is the pH of a solution that has a

hydrogen ion concentration of $2.5 \times 10^{-6} \text{ M}$? Is

this an acid or a base? $\text{pH} = -\log(2.5 \times 10^{-6})$

$$\text{pH} = 5.6$$

Acid ($\text{pH} < 7$)

68. Which compound is the most soluble at 30°C ? Least soluble?

most = KI

least = SO_2

69. How many grams of KCl can dissolve in 100g of water at 90°C ? (on the curve)

55 g

70. Identify the following solutions as unsaturated, saturated, or supersaturated.

a. 100 g NaNO_3 @ 30°C

above the curve

= Supersaturated

b. 60 g NH_4Cl @ 80°C

below the curve

= unsaturated

c. 85 g KNO_3 @ 50°C

on the curve

= saturated

