

Final Review Packet

When 100% correct, you will receive a

*15-point bonus sticker to place on the final exam. 😊

Deadline: Friday, June 7. NO EXCEPTIONS!!!!

Note 📌 The Final Exam will be worth two tests (= 200 points) and you will be allowed to use one page of notes (both sides).

Suggested study strategy:

- 1.) Organize all notes, homework, worksheets, etc.
- 2.) Complete the vocabulary review (pages 2-5). Try to use your own words, but look up terms for which you are unsure.
- 3.) Do problems 1-60. Check your work and put an X through each number (below) when you are confident you understand the solution, or CIRCLE it if more practice or help is needed.
- 4.) While completing this packet, organize your page of notes to include definitions, equations, sample problems, and helpful hints. Label each section "Atomic Theory," "Chemical Equations," etc., as you come to them.

Problems (circle those for which you might need additional help or practice)

1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56	57	58	59	60

*The bonus sticker will require passing a brief quiz where you will be asked to solve one of the problems found in this packet using only your page of notes and periodic table, so make sure you completely understand each one!



Warning: You may only turn in 4 new (ungraded) pages per day!!!

Section 1: Vocabulary Review

Use the spaces below to give brief (but accurate) definitions for each term. Check your notes first!

Chemistry:

Chemical Change:

Mixture:

Pure substance

Element:

Atom:

Molecule:

Compound:

Ground State (of an atom):

Excited State (of an atom):

emission (bright line) spectrum

Atomic Number:

Isotope:

Mass Number:

Atomic Mass:

Atomic Mass Unit: (hint: the word isotope and the number 12 is needed!)

Atomic Orbital:

Valence electrons:

Octet Rule:

Electronegativity:

Covalent Bond:

The VSEPR model (meaning of the acronym and what it's used for):

Polar covalent bond:

Diatomic elements (define AND list the "super seven"):

Empirical Formula:

Molecular Formula:

Lewis structure:

State the periodic law:

Avogadro's number

Mole:

Molar mass:

Precipitate:

Intermolecular force

Boiling point:

Molarity (give the equation used to calculate):

Absolute zero (define in terms of kinetic energy):

Bronsted-Lowry Acid:

Bronsted-Lowry Base:

Titration:

Salt:

Section 2: Problems*= Solve the following with correct units and significant figures =*

1. $7.5 \text{ cm} \times 2.4 \text{ cm} =$ _____

2. $8.33 \text{ K} + 18.1 \text{ K} =$ _____

3. $322 \text{ K} + 18.1 \text{ K} =$ _____

4. $0.00032 \text{ m} \times 14 \text{ m} =$ _____

5. $40.25 \text{ kg} - 2.25 \text{ kg} =$ _____

*Use dimensional analysis to make the following conversions):**Show work below*

6. $52.1 \text{ g} = ? \text{ kg}$

7. $0.850 \text{ mL} = ? \text{ L}$

8. $1.75 \text{ L} = ? \text{ mL}$

9. $0.010 \text{ mol Ag} = ? \text{ g Ag}$

How many significant figures are represented in each of the following numbers?

10. 1.0×10^{-3} _____

14. 1.201 _____

11. 0.012 _____

15. 1.20×10^4 _____

12. 200.010 _____

13. 1200 _____

Round each of the following numbers to 3 significant figures:

16. 1 0.0010101 _____

17. 124.500 _____

18. 125.32 _____

19. 23.500 _____

20. Convert using proper dimensional analysis: $45.0 \text{ ft/day} = ? \text{ cm/hr}$

21. Complete the following table:

	Symbol	Atomic #	Mass #	Protons	Electrons	Neutrons	Ionic Charge
a.	Zn		68				
b.	$^{32}\text{S}^{2-}$						
c.		82				125	+2

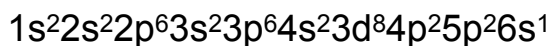
22. For an atom with atomic number = 15

- Write its electron configuration. _____
- Draw its orbital diagram (be sure to label the orbitals 1s, 2s...).
- How many valence electrons does this atom have? _____

23. An atom is found to have the electron configuration of $[\text{Kr}]5s^24d^{10}5p^5$

- Identify this element: _____
- What family does this element belong to? _____

24. Given the following electron configuration of an atom in an excited state,



- Identify this element: _____
- Identify the element in the same family that has the smallest atomic radii: _____
- Identify the element in the same period that is the least electronegative: _____

25. Write the correct chemical formula for each of the following ions:

- | | |
|---------------------|----------------------|
| a. phosphate _____ | f. sulfate _____ |
| b. hydroxide _____ | g. nitrate _____ |
| c. carbonate _____ | h. iodide _____ |
| d. dichromate _____ | i. oxide _____ |
| e. ammonium _____ | j. perchlorate _____ |

26. Using the periodic table below,

- Circle the only noble gas that does not have a p orbital.
- Number the groups 1A-8A
- Number the periods 1-7
- Label the 2-s block, the 3p-block, 5d-block, and the 4-f-block.
- Label the halogens, transition elements, alkaline earth metals, alkali metals, and the noble gases.
- Put an X through all seven elements that are naturally diatomic.

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt									

Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

27. Using the location of each on the periodic table, place the following elements in order of increasing electronegativity (least electronegative to most electronegative).

Zn, Ca, F, S, K, Rb:

_____ (least) _____ (most)

28. Write the formula for the ions involved in each of the following compounds:

(Example: $\text{Mg}_3(\text{AsO}_4)_2$ Mg^{2+} , AsO_4^{3-})

a. Na_2SO_4 _____

b. Al_2O_3 _____

c. $\text{Fe}_3(\text{PO}_4)_2$ _____

d. $\text{Sn}(\text{OH})_4$ _____

29. Complete the following table:

	Lewis Structure	Molecular Shape (VSEPR model)	Shape Name	Molecular Polarity
a. CHCl_3				
b. H_2O				
c. PO_3^{3-}	Brackets!			
d. SO_3				
e. NH_4^+	Brackets!			

30. Write the correct formula for the following compounds:

sulfur trioxide _____ calcium sulfate _____

phosphoric acid _____ hydrofluoric acid _____

mercuric fluoride _____ stannous nitrate _____

aluminum hydroxide _____ ammonium carbonate _____

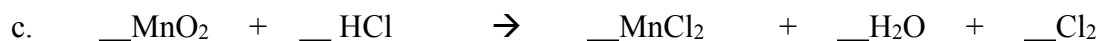
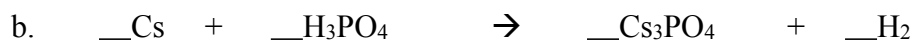
31. Write one proper name for each of the following compounds. (All hydrogen compounds are acids.)

- a. PbCl_4 _____
- b. NCl_4 _____
- c. S_3F_6 _____
- d. $\text{Hg}(\text{NO}_3)_2$ _____
- e. HNO_2 _____
- f. H_2S _____
- g. $\text{Fe}(\text{OH})_3$ _____
- h. $\text{Sn}_3(\text{PO}_4)_4$ _____

32. Write the correct chemical formula for each compound formed by the following:

	Nitrate	Phosphate	Fluoride	Sulfate	Hydroxide
Ammonium					
Potassium					
Calcium		$\text{Ca}_3(\text{PO}_4)_2$			
Aluminum					
Stannous					
Lead(IV)					

33. Balance the following equations:

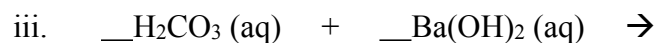
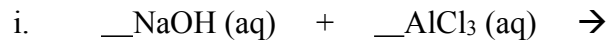


34. Predict whether a reaction will occur for each of the following. If a reaction takes place, write a balanced chemical equation (including phases). If a reaction does not take place, write No Rxn.

a. Single-replacement reaction:



b. Double-replacement reactions:



35. Aqueous solutions of magnesium chloride and sodium hydroxide are mixed together to produce solid magnesium hydroxide.

a. Write a complete balanced equation for this reaction (include phases).

b. What type of reaction is this? _____

c. How many grams of magnesium chloride are required to react with 9.10 grams of sodium hydroxide?

36. Calculate the percent composition by mass of barium chloride.

37. An unknown compound is composed of 71.0% silver, 7.9% carbon, and 21.1% oxygen.

a. Determine the empirical formula for this compound.

b. What is the molecular formula and name of this compound if it has been determined to have the molar mass of 303.8 grams?

Molecular Formula: _____ Compound name: _____

38.

a. Who is considered the father of modern atomic theory? _____

b. What part of the atom did JJ Thomson discover? _____

c. What two ways did Rutherford's research add to the understanding of the atom?

i. _____

ii. _____

d. Draw a diagram to represent Rutherford's famous Gold Foil Experiment.

39. Solve the following:

- a. Calculate the number of moles contained in 9.75 grams of cuprous nitrate.

- b. How many atoms are contained in 13.5 grams of mercury?

- c. What is the mass of 4.32×10^{25} molecules of ammonia (NH_3)?

40. Solve the following:

- a. Write a balanced chemical equation for the double replacement reaction that occurs between aqueous solutions of aluminum sulfate and calcium hydroxide.

- b. How many formula units of calcium hydroxide are needed to produce 0.0125 moles of aluminum hydroxide?

- c. How many grams of aluminum sulfate are needed to produce 17.8 grams of calcium sulfate?

41 Solid lithium hydroxide reacts with gaseous carbon dioxide to produce solid lithium carbonate and water.

- a. Write a balanced chemical equation for this reaction:

- b. How many grams of carbon dioxide are required to react with 5.00 grams of lithium hydroxide?



According to the above balanced chemical equation, if you place 5.00 grams of aluminum into 5.00 grams of sulfuric acid....

a. How many grams of aluminum sulfate can be produced?

b. What is the limiting reactant? _____

c. Which reactant is in excess and by how much?

d. If the actual yield of the aluminum sulfate is 5.35 grams, what is the percent yield?

43. From the data below, determine the activity series of these six elements: X, Y, Z, H, Mg, and Hg. Place your answers in the box shown below.

<u>Reactants</u>	<u>Observations</u>
Y + H ₂ SO ₄	Bubbles form
Y + MgCl ₂	No Reaction
Y + XSO ₄	A dark substance begins to form on the B metal
Z + HgCl ₂	A liquid metal begins to appear
Z + HCl	No Reaction
X + HNO ₃	Bubbles form

Answer:

Most Active -----> Least Active

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44. Write balanced chemical equations for the following reactions involving acids (include phases).

a. Carbon dioxide + water.

b. Aluminum metal + chloric acid (HClO_3).

c. Sodium bicarbonate (baking soda) + acetic acid.

45. Draw a number line representing pH=0 to pH=14 and the corresponding $[\text{H}^+]$ values. Then label the acid section, the base section, and the pH of a neutral solution.

46. Calculate the molarity of 1.60 L of a solution containing 0.025 grams of HNO_3 (a strong acid).

47. Solve the following (work not needed):

a. How many atoms are in one mole of molecular nitrogen? _____

b. How many total atoms are in one molecule of CO_2 ? _____

c. How many atoms are in 1.5 moles of NH_3 ? _____

48. a. What is the empirical formula of $\text{C}_6\text{H}_{18}\text{O}_3$? _____

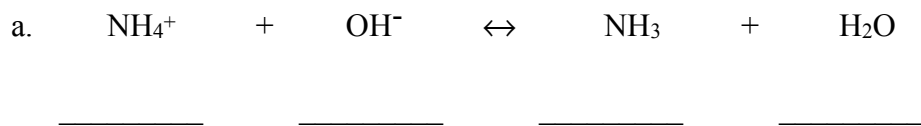
b. Which formula is both empirical and molecular?

i. P_4O_{10} ii. $\text{C}_{10}\text{H}_{22}$ iii. C_5H_{12} iv. N_2O_6

49.

- a. Write a nuclear equation for the alpha decay of gold-185
- b. Write a nuclear equation for the beta decay of sodium-24
- c. Write a nuclear equation for the alpha decay of Uranium-238.
- d. Write a nuclear equation for the beta decay of Iodine-131.

50. Label and connect the conjugate acid-base pairs in the following reactions:



51. It takes 12.5 mL of 0.0200 M NaOH to neutralize 87.0 mL of an unknown acid. What is the concentration of the unknown acid?

52. the type of bonding that occurs between the atoms/molecules/ions listed below.

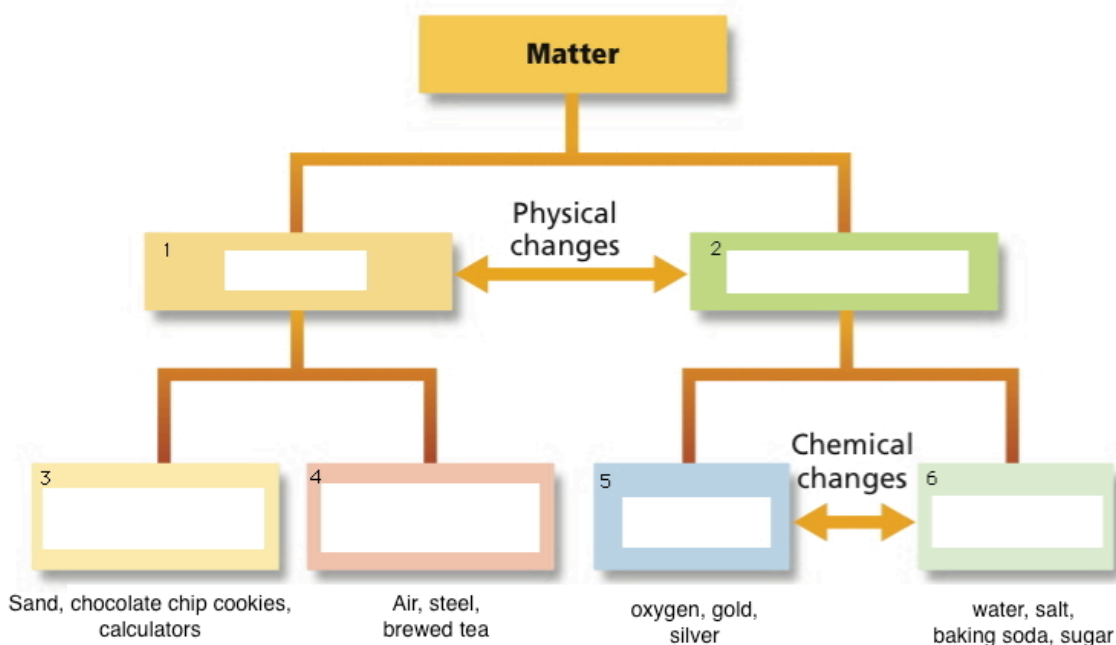
(Select: Ionic, polar covalent, nonpolar covalent, dipole-dipole, hydrogen bonding, dispersion forces.)

- a. _____ Between atoms of hydrogen and oxygen in a water molecule
- b. _____ Between molecules of water
- c. _____ Between atoms of bromine in a bromine molecule
- d. _____ Between molecules of bromine
- e. _____ Between ions of sodium and chlorine in sodium chloride
- f. _____ Between molecules of fluoromethane

53. Write the proper phases [(s), (g), or (l)] next to each of the following elements and compounds (assume normal conditions).



54. Complete the following table using the terms element, compound, mixture, heterogeneous, homogeneous, and pure substance.



55. What type of bonding explains why hydrogen (H₂) is a gas at room temperature? _____

56. What types of bonds are broken when melting ice? _____

57. a. What types of bonds exist *within* a molecule of NH₃? _____

b. What types of bonds exist *between* NH₃ molecules? _____

58. List the order of the electromagnetic spectrum from lowest energy to highest energy.

59. a. A student dissolves 20.0 grams of sodium sulfate in enough water to prepare 1.50 L of solution. What is the molarity of this solution?

b. How many grams of barium nitrate are in 200.0 mL of a 0.125 M solution?

c. 25.0 mL of a 0.750 M solution is diluted to volume of 250.0 mL. What is the concentration of the final solution?

60. If 50.0 mL of 0.200 M FeCl_3 solution is mixed with 75.00 mL of 0.200M K_3PO_4 , how many grams of solid FePO_4 will form?

If you were graded on the overall effort you put into this class, what grade do you think you would deserve? _____ (Please answer this as honestly as possible!)



That's it... You're Done! Good Luck on the Final!!!