

Summer Assignment – Honors Chem 2/AP Chemistry

*****This assignment will be due the FIRST DAY OF HONORS CHEM 2, AUGUST 8, 2022*****

*****Please complete the following problems on your own paper, and either put them in a three-ring folder or staple together.*****

1. Perform the indicated operations and round your answers to the proper number of significant figures. Assume that all answers were obtained from measurements.

a. $(2.11 \times 10^{-3}) + (1.54 \times 10^{-3})$

c. $(4.56 + 18.7)/(1.23 \times 10^2)$

b. $(1.54 \times 10^{-3}) + (2.11 \times 10^{-2})$

d. $(1.23 \times 10^{-2})(4.56 + 1.87)$

2. Make the following conversions:

a. 0.75 kg to milligrams

c. 2390 g to kg

b. 1500 millimeters to km

d. 0.52 km to meters

3. How many cubic meters (m^3) are there in 4312 cubic centimeters (cm^3)?

4. The helium gas stored inside a large weather balloon weighs 13.558 grams. What is the volume of this balloon if the density of helium is 0.1786 g/L?

5. A rectangular block of copper metal weighs 1896 grams. The dimensions of the block are 8.4 cm by 5.5 cm by 4.6 cm. From this data, what is the density of copper?

6. Write the formula for the following compounds:

a. ammonium sulfide

g. lead(II) phosphate

b. sodium nitrate

h. diphosphorus pentoxide

c. copper(II) bromide

i. cobalt(III) acetate

d. aluminum sulfate

j. nickel(II) nitrate

e. zinc nitrate

k. tin(II) chloride

f. silver carbonate

l. antimony(III) chloride

7. Write the name of the following compounds:

a. KF

g. NH_4NO_3

b. $CaSO_4$

h. IF_5

c. HCl

i. $NaHCO_3$

d. $SbCl_3$

j. $Ba(OH)_2$

e. As_4O_{10}

f. NH_4Cl

8. Write the electron configuration (long way) for sulfur.

9. Write the orbital notation (boxes or lines) for magnesium.

10. Write the electron configuration using the Noble Gas core method for radium.

11. Write a balanced equation and indicate the reaction type (single or double replacement, decomposition, or composition/synthesis) for each of the following:
- Sodium hydroxide (aq) + sulfuric acid (aq) \rightarrow sodium sulfate (aq) + water (l)
 - Magnesium (s) + oxygen (g) \rightarrow magnesium oxide (s)
 - Ammonium phosphate (aq) + barium hydroxide (aq) \rightarrow ammonia (aq) + water (l) + barium phosphate (s)
12. Calculate the percentage composition of the following compounds:
- Iron(III) oxide
 - Silver oxide
13. $4 \text{ FeCr}_2\text{O}_7 + 8 \text{ K}_2\text{CO}_3 + \text{O}_2 \rightarrow 2 \text{ Fe}_2\text{O}_3 + 8 \text{ K}_2\text{CrO}_4 + 8 \text{ CO}_2$
- How many grams of iron(II) dichromate are required to produce 44.0 grams of carbon dioxide?
 - How many grams of oxygen gas are required to produce 100.0 grams of ferric oxide?
 - If 300.0 grams of iron(II) dichromate react, how many grams of oxygen gas will be consumed?
 - How many grams of iron (III) oxide will be produced from 300.0 grams of ferrous dichromate?
14. What is the volume of a sample of oxygen gas that has a mass of 50.0 grams and is under a pressure of 1.20 atm at 27.0°C?
15. What is the molarity of 245.0 grams of H_2SO_4 dissolved in 1.00 L of solution?
16. What is the molarity of 5.30 grams of Na_2CO_3 dissolved in 400.0 mL solution?
17. Calculate the empirical formula of a compound which has the following percentage composition: 40.2 % K, 26.9% Cr, and 32.9% O.
18. In what order are the elements listed on the PRESENT periodic table?
19. What name is given to the elements in a vertical column on the periodic table?
20. What name is given to the elements in a horizontal row on the periodic table?
21. What volume of silver metal will weigh exactly 2500.0 grams? The density of silver is 10.5 g/cm³.
22. Write the formula for the following compounds:
- sodium chromate
 - chromium(III) bisulfate
 - potassium permanganate
 - silver perchlorate
 - potassium phosphate
 - nickel(II) iodide
23. Write the name of the following compounds:
- FeCl_3
 - HF
 - PbSO_4
 - P_2O_5
 - $\text{Ba}(\text{NO}_3)_2$

24. Write the electron configuration using the Noble Gas core method for californium.
25. Write a balanced equation for the following double replacement reactions:
- Calcium hydroxide (aq) + nitric acid (aq) \rightarrow
 - Chromium (III) sulfite (aq) + sulfuric acid (aq) \rightarrow
 - Zinc chloride (aq) + ammonium sulfide (aq) \rightarrow
 - Silver acetate (aq) + potassium chromate (aq) \rightarrow
26. Determine the percentage of sodium in sodium sulfate.
27. Given the reaction $S + O_2 \rightarrow SO_2$
- How many grams of sulfur must be burned to give 100.0 grams of SO_2 ?
 - How many grams of oxygen will be required for the reaction in part a?
28. What is the volume at STP of a sample of CO_2 that has a volume of 75.0 mL at $30.0^\circ C$ and 680 mm Hg?
29. The thermite reaction has been used to weld railroad tracks. The reaction is
 $Fe_2O_3 (s) + 2 Al (s) \rightarrow 2 Fe (s) + Al_2O_3 (s)$
How many grams of iron(III) oxide would be needed to produce 15.0 grams of iron?
30. What is the molarity of 5.00 grams of NaOH in 750.0 mL of solution?
31. How many moles of Na_2CO_3 are in 10.0 mL of a 0.20 M solution?
32. How many moles of NaCl are contained in 100.0 mL of a 0.20 M solution?
33. What is the significance of the zig zag line running diagonally down and to the right near the right side of the periodic table?
34. 28.5 grams of iron shot is added to a graduated cylinder containing 45.5 mL of water. The water level rises to the 49.1 mL mark. From this information, calculate the density of iron.
35. Write a balanced equation for the following double and single replacement reactions:
- Sulfuric acid (aq) + potassium hydroxide (aq) \rightarrow
 - Mercury (II) sulfate (aq) + ammonium nitrate (aq) \rightarrow
 - Iron (s) + copper (II) sulfate (aq) \rightarrow
 - Zinc (s) + sulfuric acid (aq) \rightarrow
36. $6 NaOH + 2 Al \rightarrow 2 Na_3AlO_3 + 3 H_2$
- How much aluminum is required to produce 17.5 grams of hydrogen?
 - How many moles of NaOH are required to produce 3.0 grams of hydrogen?
 - How many moles of hydrogen can be prepared from 1.0 grams of aluminum?
37. A rigid container holds a gas at a pressure of 0.55 atm at $-100^\circ C$. What will the pressure be when the temperature is increased to $200^\circ C$?
38. What weight in grams of H_2SO_4 would be needed to make 750.0 mL of a 2.00 M solution?
39. Calculate the empirical formulas for a compound containing 77% Fe and 22.3 % O.

40. Metals _____ electrons. (Gain or lose)
41. Nonmetals _____ electrons. (Gain or lose)
42. Write the electron configuration (long way) for barium.



43. If 20.0 grams of KOH react with 15.0 grams of $(\text{NH}_4)_2\text{SO}_4$, calculate the following:
- the grams of NH_3 produced
 - the cm^3 of NH_3 produced at STP
44. A volume of 20.0 L of O_2 is warmed from -30.0°C to 85.0°C . What is the new volume, if the pressure is kept constant?
45. How many electrons are in the valence shell of:
- the Halogens?
 - the Oxygen family?
 - the alkali metals?
 - the boron family?
 - the neon gases?
 - the alkaline earth metals?
 - the carbon family?
 - the nitrogen family?
46. Each period on the periodic table represents a(n) _____ in the atom.
47. An essential amino acid which cannot be made (synthesized) by the body and must be obtained in the diet is methionine. What is the percentage of carbon, nitrogen, and sulfur in this amino acid if the formula of methionine is $\text{CH}_3\text{SCH}_2\text{CH}_2\text{CHNH}_2\text{COOH}$?
48. Ammonia is produced by the reaction of nitrogen and hydrogen according to this balanced equation:
- $$\text{N}_2 (\text{g}) + 3 \text{ H}_2 (\text{g}) \rightarrow 2 \text{ NH}_3 (\text{g})$$
- What volume of ammonia would be produced if 13.4 grams of hydrogen gas reacted with nitrogen at STP?
49. What is the weight of ethyl alcohol that exactly fills a 200.0 mL container? The density of ethyl alcohol is 0.789 g/mL.
50. Calculate the density of helium in g/L if a balloon with a capacity of 5.00 L holds 0.890 grams.
51. Write the formulas for the following compounds:
- aluminum hydroxide
 - cobalt(II) oxide
 - iron(III) permanganate
 - ammonium chromate
 - nitrogen triiodide
 - ammonium dichromate
 - iron(III) bicarbonate
 - ammonium perchlorate
 - cobalt(III) acetate
 - cobalt(II) hydroxide
 - iron(II) chromate
 - iron(III) bromide
 - zinc sulfate
 - boron phosphide
 - zinc carbonate
 - copper(II) bisulfate
 - ammonia
 - barium bisulfite

52. Write the name of the following compounds:

- | | |
|-----------------------------------|---|
| a. NaOH | h. CsF |
| b. NI ₃ | i. Cu ₂ S |
| c. ClF ₃ | a. Hg ₂ O |
| d. P ₃ H ₅ | b. NaH |
| e. UF ₆ | c. OsO ₄ |
| f. NBr ₃ | d. XeF ₂ |
| g. Cl ₂ O ₃ | e. Ca(C ₂ H ₃ O ₂) ₂ |

53. Write the electron configuration (long way) for sodium.

54. Write the orbital notation (boxes or lines) for fluorine.

55. Write the electron configuration using the Noble Gas core method for gold.

56. Write a balanced equation and indicate the reaction type (single or double replacement, decomposition, or composition/synthesis) for each of the following:

- Ammonium nitrite (s) → nitrogen (g) + water (l)
- Ammonia (g) + oxygen (g) → nitrogen (II) oxide (g) + water (l)
- Barium chloride (aq) + sodium sulfate (aq) → sodium chloride (aq) + barium sulfate (s)
- Iron(III) oxide (s) + carbon monoxide (g) → iron (s) + carbon dioxide (g)
- Magnesium hydroxide (aq) + ammonium phosphate (aq) → magnesium phosphate (s) + ammonia (g) + water (l)
- Magnesium hydroxide (aq) + phosphoric acid (aq) → magnesium phosphate (s) + water (l)