

6. A compound is composed of 85.7% C, 14.3% H. It has an actual molar mass of 42.09 g/mol
a. Find the empirical formula. answer _____

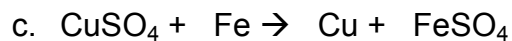
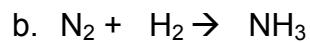
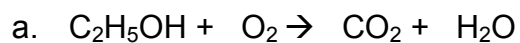
b. Determine its molecular formula. answer _____

7. For the following covalent compounds, give the Lewis structure, the molecular shape, and determine if it is polar or non-polar.

	NH ₃
Lewis Structure	
Molecular Shape	
Polar or Non-polar	

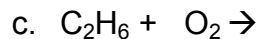
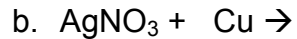
Chemical Reactions

8. Classify the type of reaction and balance



9. Predict the products and balance the following





10. Reactions that release heat are called _____.

11. Why do chemical equations have to be balanced? Do you change the subscripts or the coefficients?

12. Write the balanced chemical equation for the combustion of ethane, C_2H_6 .

Stoichiometry

13. A compound is composed of 85.7% C, 14.3% H. It has an actual molar mass of 42.09 g/mol

a. Find the empirical formula. answer _____

b. Determine its molecular formula. answer _____

14. A solution containing 8.743 g of barium nitrate is mixed with a solution containing 4.972 g of sodium sulfate. Solid barium sulfate is produced along with a solution of sodium nitrate.

a. Write out the formula equation for this reaction.

- b. Write the balanced equation for this reaction. What do the coefficients mean in the balanced equation?

- c. What is the limiting reactant? Circle the mole ratio conversion factors and box the molar mass conversion factors.

- d. If the final product was filtered, what is maximum amount of precipitate that can be collected (theoretical yield)?

- e. If 5.65 g of barium sulfate are actually collected, what is the percent yield?

Gas Laws

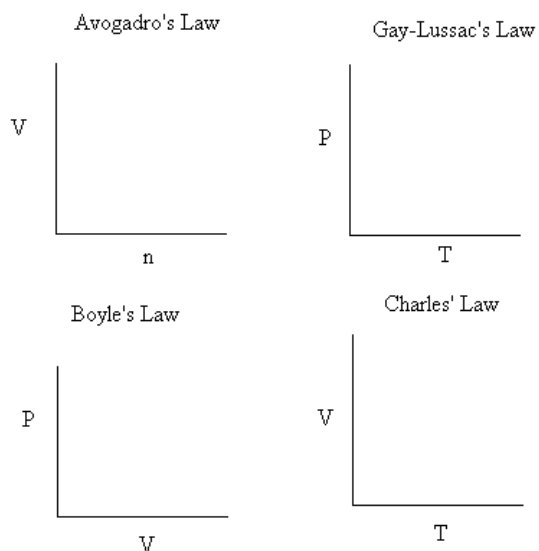
15. What are the four quantities that describe the state of a gas? Write the SI unit for each one.

16. Write the statements of the kinetic-molecular theory.

17. How does a gas produce pressure?

18. Give 3 examples each of gas diffusion and effusion.

19. State how the following quantities are related and sketch the curve on the axis provided.



20. Convert the

a. 0.895 atm

following into kPa.

b. 745 mm Hg

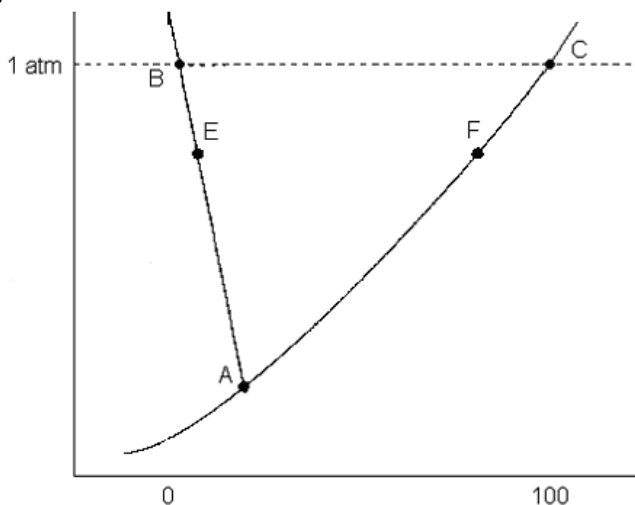
21. Under what conditions do gases behave like real gases?

22. A sample of a gas has a volume of 150 mL when its pressure is 0.947 atm. What will the volume of the gas be at a pressure of 0.987 atm, if the temperature remains constant?

23. A sample of a gas has a pressure of 3.00 atm at 25°C. What would the gas pressure be at 52°C, if the volume remains constant?

24. Calculate the volume of a 0.600 mol sample of gas at 15.0°C and a pressure of 120. kPa.

Liquids, solids, and solutions



25. Use the above phase change diagram to answer the following questions.

- Label the axes of the phase change diagram.
- Label the phases of the phase change diagram.
- What phase(s) exist at point A. _____
- What is point C called? _____
- what phase(s) exists along curve AC? _____

26. How does boiling occur?

27. If a pound of spaghetti is placed into 2 quarts of boiling water on Mt. Everest, and a pound of spaghetti is placed into 2 quarts of boiling water in Death Valley, which cook would be eating spaghetti first? Explain your answer.

28. Describe a situation in which water could boil at room temperature?

29. Compare how a beam of light travels through a solution, suspension, and colloid.

30. Describe the parts of an aqueous solution of sugar.

31. In chemistry, what is the general saying for predicting whether one substance will dissolve in another substance?

32. What do colligative properties depend on? List the four colligative properties.

33. What are emulsifiers? Give two examples.

34. Calculate the molarity of a solution that contains 20.0 g potassium dichromate in 500. mL of solution.

Equilibrium

35. Compare and contrast a reaction that goes to completion and one that is reversible.

36. Consider the reaction: $\text{AgCl}(s) \rightleftharpoons \text{Ag}^+(aq) + \text{Cl}^-(aq)$ What are the opposite processes occurring at equilibrium and how do their rates compare?

37. Write the equilibrium constant expression for the following chemical reaction:
 $\text{CaCO}_3(s) + 2\text{H}_3\text{O}^+(aq) \rightleftharpoons \text{Ca}^{2+}(aq) + \text{CO}_2(g) + 3\text{H}_2\text{O}(l)$

38. The K_{eq} of the above reaction equals 1.4×10^{-9} at 25°C . Does this indicate that the products or the reactants are favored?

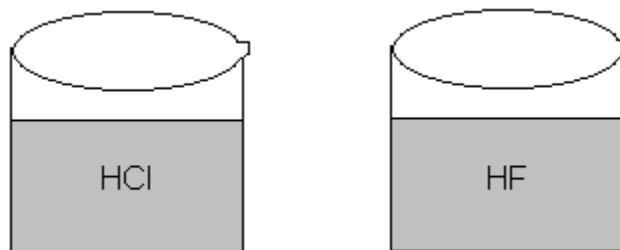
39. $2\text{SO}_2(g) + \text{O}_2(g) \rightleftharpoons 2\text{SO}_3(g)$

a) If the concentration of O_2 increases, how does the equilibrium shift? What happens to the concentration of SO_2 ?

b) If the volume of the container increases which direction will the equilibrium shift? What happens to the amounts of each substance?

40. Calculate K_{eq} for the synthesis of ammonia at 400°C if the following concentrations are present at equilibrium: $\text{N}_2(g) = 1.2 \text{ mol/L}$, $\text{H}_2(g) = 0.80 \text{ mol/L}$, and $\text{NH}_3(g) = 0.28 \text{ mol/L}$.

Acids and Bases



41. Identify the species (molecules and ions) present in the aqueous solutions above.

42. Write out the ionization reaction for the following acids:

a. Sulfuric acid

b. Perbromic acid

43. a) Write the self-ionization reaction of water.

b) Write the equilibrium constant expression for that reaction.

c) Write the numerical value of the equilibrium constant of water.

44. Fill in the following table:

Solution	[H ₃ O ⁺]	[OH ⁻]	pH	pOH
a.		6.25 x 10 ⁻²		
b.	1.34 x 10 ⁻⁶			
c.			6.2	
d.				10.8
0.00751 M NaOH				
0.00084 M HCl				

45. Write the neutralization reaction between the following acids and bases:

a. Nitric acid and potassium hydroxide

b. Hydroiodic acid and barium hydroxide

39. Fill in the following table:

Anion	Acid Formula	Acid Name
a. Dichromate		
b. carbonate		
c. cyanide		
d. phosphate		
e. sulfide		
f. chlorate		

40. The following data was obtained when a chemistry student performed a titration of 0.075 M HCl with 10.00 mL of NaOH of unknown concentration.

Initial volume of HCl: 15.00 mL

Final volume of HCl at end point: 35.50 mL

Find the concentration of the unknown NaOH solution.