Accompanying Questions
Topic 08: Solutions and Empirical Formula

Objective:

This is to provide guiding questions to help you comprehend the material we have covered in this section of the class. These questions or very similar questions have been answered within the video lecture and/or live class.

Instructions and Notes:

- Most of these questions/concepts are taken or derived from the chapters in the Chemistry: Atoms First 2e Online Textbook (OpenStax)
- Book sections covered: 1.2, 11.2, 11.3, 6.3, 6.4, 6.2

Submission:

Students do not submit this and it is not graded.

Helpful Tips:

- These questions or very similar questions may appear on the exams so I strongly recommend that you complete them.
- Download the lectures and rewatch the lectures.
- Pause the lectures and rewind them through concepts you don't fully understand.
- Go to tutoring in the ASTC or MESA, ask your classmates in our Discord room, watch YouTube Videos, come to office hours, etc.

In-Lecture Questions

Lecture 1 of 3

1. Name and describe the two different types of matter.
2. Name and describe the two different types of mixtures.
3. What does "Like dissolves like" mean?
4. What does immiscible mean? Give an example of two immiscible materials.
5. What does miscible mean? Give an example of two miscible materials.
6. What is an example of a miscible liquid and solid?
7. What does partially miscible mean?

Lecture 2 of 3

8. What two things make up a solution? Which is more and which is less?
9. What do you annotate a chemical formula with if it is dissolved in water?
10. Write the names and equations for the three concentration equations we are using in this topic.
11. Describe all of the variables in the molarity equation.
12. In the molarity equation, what can we convert moles to using the periodic table?

13. A teaspoon of table sugar contains about 0.01 mol sucrose. What is the molarity of sucrose if a teaspoon of sugar has been dissolved in a cup of tea with a volume of 200 mL?
14. Calculate the molarity of 6.52 g of $CoCl_2$ (128.9 g/mol) dissolved in an aqueous solution with a total volume of 75.0 mL.
15. How many grams of $CaCl_2$ (110.98 g/mol) are contained in 250.0 mL of a 0.200-M solution of calcium chloride?
16. What volume of a 1.50-M KBr solution contains 66.0 g KBr?
17. What is a hint that you should be using the molarity equation?
18. In the dilution equation, pick a version and describe all of the variables.
19. What is the concentration of the solution that results from diluting 25.0 mL of a 2.04-M solution of CH_3OH to 500.0 mL?
20. A laboratory experiment calls for 0.125 M HNO3. What volume of 0.125 M HNO_3 can be prepared from 0.250 L of 1.88 M HNO_3?
21. What volume of a 0.575-M solution of glucose, $C_6H_{12}O_6$, can be prepared from 50.00 mL of a 3.00-M glucose solution?
22. What is a hint you should be using the dilution equation.
23. Describe all of the variables in the mass percent equation.
24. A bottle of a tile cleanser contains 135 g of HCl and 775 g of water. What is the percent by mass of HCl in this cleanser?
25. What volume of concentrated HCl solution (37.2% HCl) contains 125 g of HCl? The density of this solution is 1.19 g/mL.

Lecture 3 of 3

26. Describe all of the variables of the percent composition equation.
27. A 24.81-g sample of a gaseous compound containing only carbon, oxygen, and chlorine is determined to contain 3.01 g C, 4.00 g O, and 17.81 g Cl. What is this compound's percent composition?
28. To three significant digits, what is the mass percentage of iron in the compound Fe_2O_3?
29. What is an empirical formula?
30. What is the ratio of atoms called in a chemical formula?
31. When calculating an empirical formula from experimental mass or percent data, what do we need to do first?
32. Write out the 5 steps (Com's way) for determining the empirical formula.
33. What is the empirical formula of a compound if a sample contains 0.130 g of nitrogen and 0.370 g of oxygen?
34. What is the empirical formula of a compound containing 40.0% C, 6.71% H, and 53.28% O?