

Session 1

Review – Bouncing between volume and mass and moles (Although density is given for each substance you may not need to use it in the problem)

1. How many moles of ammonia molecules are found in 58.23 grams of ammonia gas?
(if the density of ammonia gas = 0.00089 g/mL)

2. How many moles of silver atoms are found in 1.0 pound of silver? (if the density of silver = 10.49 g/cm³)

3. How many grams would a piece of zinc film weigh if it was made up of 2.3 moles of zinc atoms? (if the density of zinc = 7.13 g/cm³)

4. How many grams of gold are found in a 2.00 cm³ block of gold? (if the density of gold = 19.3 g/cm³)

5. How many moles of water molecules are found in 10.0 mL of water (if the density of water = 0.998 g/mL)

6. How many moles of hydrogen atoms are found in 1.25 moles of water molecules?

7. How many moles of sulfate ions are found in 0.85 moles of sodium sulfate?

8. How many moles of sodium ions are found in 1.59 moles sodium phosphate?

9. How many moles of nitrate ions are found in 25.6 grams of zinc nitrate?

Watch this video about making a solution in a volumetric flask

How to use a volumetric flask (3:24 mins)

<https://youtu.be/g9uVFYYSogQ>

Molarity Made Easy: How to Calculate Molarity and Make Solutions (Ketzbook, 8:46ms)

<https://youtu.be/KLjWa9cE2uk>

10. What is the concentration (in units of molarity) if you place 12.5 grams of NaCl into a 250.00 mL volumetric flask and fill to the line with water?

11. What is the concentration (in units of mg/mL) if you place 12.5 grams of NaCl into a 250.00 mL volumetric flask and fill to the line with water?

12. What is the concentration (in units % m/v) if you place 12.5 grams of NaCl into a 250.00 mL volumetric flask and fill to the line with water?

13. How many grams of NaCl would you need to make 500.00 mL of a 1.2 M solution?

14. How many grams of glucose would you need to make 250.00 mL of a 0.75 M solution?

15. How many grams of NaCl would you need to make 150.00 mL of 15% solution?

16. Which solution has more **sodium ions**?

a. 25.0 mL of 1.2 M sodium chloride solution

b. 25.0 mL of 2.5 M sodium sulfate solution

17. Which solution has more sodium ions?

a. 50.0 mL of 1.5 M NaCl solution

b. 50.0 mL of 15% NaCl solution

18. Which solution contains more solute?

a. 100.0 mL of 25% of Solute A

b. 120.0 mL of 5 mg/dL of Solute A

19. Which solution is more concentrated?

a. 14% glucose solution

b. 1.2 M glucose solution

20. Convert 15.5% glucose solution to units of molarity

21. Convert 0.5115 M solution of NaCl to % (m/v)

22. How many grams of testosterone are in 25.5 mL of blood serum if the concentration is 0.682 mg/mL?

23. What is the % (w/v) concentration of a hormone if 0.0012 g are detected in every 0.100 L?

24. What is the % (w/v) if 0.012 moles of potassium iodide is dissolved in 100.0 mL of solution?

Consider you have 500.0 mL of 0.85 % solution of NaCl

25. How many moles of NaCl are in the solution?

26. How many grams of NaCl are in the solution?

27. How many moles of NaCl are in 75.0 mL of this same solution?

28. How many **grams** of NaCl are in 2.0 mL of the same solution?

29. You want to make 250.00 mL of 4.5 % solution of glucose. How many grams will you add to the empty flask?

30. Consider you have 16 fl oz of orange juice which contains 120 mg/236 mL of Vitamin C. How many grams of Vitamin C are in contained in 16 fl oz ?

31. How many moles of Vitamin C are in 100.0 mL of 0.0852 M solution?

32. How many grams of Vitamin C are in 280.0 mL of 0.0852 M solution if the molar mass of Vitamin C = 176.14 g/mol?

Session 2

33. Find the concentration (in mEq/L) of sodium ions if 100. mg of sodium chloride is dissolved in 236.6 mL of solution?

34. Find the concentration (in mEq/L) of sodium ions if 100.0 mg of sodium chloride is dissolved in 16 fl oz of solution?

35. Find the concentration (in mEq/L) of potassium ions if 100.0 mg of potassium chloride is dissolved in 250.0 mL of solution?

36. Find the concentration (in mEq/L) of magnesium ions if 100.0 mg of magnesium chloride is dissolved in 236.6 mL of solution?

37. Consider you have a solution of Na^+ with the concentration of 20.0 mEq/L. How many milligrams of **Na⁺** are in 10.0 mL of the solution?

38. Consider you have a solution of Ca^{2+} with the concentration of 20.0 mEq/L. How many milligrams of **Calcium ions** are in 10.0 mL of the solution?

39. The normal concentration of calcium ions in human blood is 5.0 mEq/L. How many mg of calcium ions are in a pint of blood?

40. How many grams of magnesium chloride would you add to a 100.0 mL volumetric flask if you wanted to make a 2.5 mEq/L solution (mEq of Mg^{2+} charge)

41. How many mL of 1.5 M stock solution would you need to transfer into an empty 250.0 mL flask to make 0.05 M solution?
42. How many mL of 0.6 M dilute solution can you make with 10.0 mL of a 3.0 M stock solution
43. Imagine you made a 250.0 mL stock solution by dissolving 0.535 grams of KIO_3 in water. Then you removed 20.0 mL of the stock solution and diluted it with enough water to make a new 150.0 mL solution. What is the concentration of the final solution?
44. Imagine you transferred 5.0 mL of 1.5 M NaCl stock solution and diluted it to make a new 250.0 mL solution. How many grams of NaCl would you need to make a second 250.0 mL solution at the same concentration?

Session 3 – Labster Solutions

Session 4 – Mid-Unit Discussion Assignment

Session 5 - – See Practice Problem Set with Answer Key

Session 6

Definitions (relationship between pX and concentration of [X])

$$\text{pH} = -\log[\text{H}^+] \quad \text{pOH} = -\log[\text{OH}^-]$$

$$[\text{H}^+] = 10^{-\text{pH}} \quad [\text{OH}^-] = 10^{-\text{pOH}}$$

Relationships between H+ and OH-

$$[\text{H}^+][\text{OH}^-] = 1 \times 10^{-14}$$

$$\text{pH} + \text{pOH} = 14$$

45. Find the pH of an acidic solution with $[\text{H}^+] = 1.3 \times 10^{-4} \text{ M}$ M

46. Find the pH of a basic solution with $[\text{H}^+] = 2.75 \times 10^{-12} \text{ M}$ M

47. Find the pH of a basic solution if $\text{pOH} = 3.77$

48. Find the pOH of a basic solution of the $[\text{OH}^-] = 0.0125 \text{ M}$ M

49. Find the pH of a basic solution of the $[\text{OH}^-] = 0.0125 \text{ M}$ M

50. What is the pH of 50.0 mL of 0.01 M HCl strong acid solution?

51. What is the pH of 25.0 mL of 0.01 M H_2SO_4 strong acid solution?

52. What is pH of 2.2×10^{-4} M $\text{Ca}(\text{OH})_2$ strong base solution?

53. Consider you have an unknown concentration of a strong-monoprotic acid like HCl or HNO_3 in a beaker. After calibrating the pH meter, you place it into the acid. According to the reading, what is the concentration of acid in the container? (Round to 2 sig figs)



54. Now imagine that you add 15.5 mL of DI water to the acid in the beaker described in problem #53. Assuming the volumes are additive, what will be displayed on the pH meter? Answer to 2 places after the decimal.

55. Consider you now have a beaker of NaOH (strong base). After rinsing the pH meter, you place it into the base. According to the pH reading, what is the concentration of NaOH in the container? (Round to 2 sig figs)



56. Now imagine that you add 15.5 mL of DI water to the base in the cylinder described in problem #55. Assuming the volumes are additive, what will be displayed on the pH meter? Answer to 2 places after the decimal.

Session 7 - Labster Acids and Bases

Session 8 - Canvas grader for homework – No Exam for this Unit