Topic 3.

SOLUTION CONCENTRATIONS: NORMALITY. MOLALITY. DILUTION

Theoretical QUESTIONS for preparation:

I. Concentrations depending on the mole unit

1. Normality
2. Molality

II. Dilutions

1. Concentrated and dilute solutions
2. Calculation of dilute solutions

TASKS

Example 1. How many grams of $K_3(PO_4)$ would I need for 100 ml of a 0.5 M (mol/L) solution? Calculate normality of the solution. Determine molality of final solution (ρ=1 g/ml).

GIVEN:

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QUESTION: _____

FORMULA:

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CALCULATIONS:

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ANSWER: _____

Example 2. What is molality of 12% (w/w) of KCl solution.

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QUESTION: _____

FORMULA:

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CALCULATIONS:

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ANSWER: _____

Example 3. Calculate the molality of a sulfuric acid solution containing 25.6 g of sulfuric acid in 195 g of water.

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QUESTION: _____

FORMULA:

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CALCULATIONS:

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ANSWER: _____

Example 4. What is the molal concentration corresponding to the solution of hydrochloric acid in gastric juice, if HCl mass fraction is 0.52% in it?

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QUESTION: _____

FORMULA:

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CALCULATIONS:

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ANSWER: _____

Example 5. There is 25 g $CaCl_2$ in 500 ml. What is its normality?

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QUESTION: _____

FORMULA:

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CALCULATIONS:

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ANSWER: _____

Example 6. You have a stock solution of 12 M HCl. You need to prepare 2 solutions:1) 500 mL of 1.5 M HCl and 2) 250 mL of 0.1 M HCl. Calculate for each case:

- How much of the stock solution should you take.
- How much water should you add to achieve the desired concentration.

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QUESTION: _____

FORMULA:

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CALCULATIONS:

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ANSWER: _____

Example 7. A 0.5 M solution of NaOH is available. A series of dilutions are made as follows:

1. 50 mL of the 0.5M solution is diluted to 250 mL. What is the molarity of the new solution?
2. 100 mL of the diluted solution from part (1) is further diluted to 1 L. What is the final molarity?

GIVEN:

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QUESTION: _____

FORMULA:

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CALCULATIONS:

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ANSWER: _____

Example 8. You are tasked with preparing 250 mL of a 0.2 M solution of Na_2CO_3 (sodium carbonate). How many grams of Na_2CO_3 are required? Determine the normality (N) of the solution if Na_2CO_3 reacts with acids, donating 2 moles of H+ per mole of Na_2CO_3. Molar mass of Na_2CO_3 = 105.99 g/mol.

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QUESTION: _____

FORMULA:

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CALCULATIONS:

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ANSWER: _____

Example 9. A chemist dissolves 12.6 g of KCl (potassium chloride) in 100 mL of water to make a solution. The density of the solution is 1.05 g/mL Calculate the molality (m) of the solution. What is the molarity (M) of the solution? Molar mass of KCl = 74.55 g/mol.

GIVEN:

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QUESTION: _____

FORMULA:

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CALCULATIONS:

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ANSWER: _____