Answer on Question#45844-Chemistry, Organic Chemistry

Question:

1) We need 5 L of 0.2 M Na_2HPO_4 (MW = 141.96) solution for today's assay. How many grams should I weigh out?

2) We need 1 L of 50 mM Guaiacol (MW = 124.1) solution for today's assay. How many grams should I weigh out?

Solution:

1)

Molarity, symbolized M, is defined as the number of moles of solute per liter of solution:

$$M = (\text{moles of solute})/(\text{liters of solution})$$

0.2 M Na_2HPO_4 solution means that there is 0.2 moles of Na_2HPO_4 per 1 liter of solution.

Therefore, we need to add 1 mole of Na_2HPO_4 to prepare 5 L of 0.2 M solution:

$$\text{moles of solute} = M\times(\text{liters of solution}) = (0.2\ \text{mol}/\cancel{L})\times 5\ \cancel{L} = 1\ \text{mol}$$

One mole of Na_2HPO_4 is found to be **141.96 grams** (MW).

2)

50 mM Guaiacol solution means that there is 50 mmoles of Guaiacol per 1 liter of solution.

Therefore, we need to add 50 mmoles of Guaiacol to prepare 1 L of 50 mM solution:

$$\text{moles of solute} = M\times(\text{liters of solution}) = (50\ \text{mmol}/\cancel{L})\times 1\ \cancel{L} = 1\ \text{mmol}$$

One mole of Guaiacol is found to be 124.1 grams (MW).
Mass of 50 mmoles (50×10^{-3}moles)of Guaiacol is:
m= (molar mass)×(number of moles)= $(124.1\ g/\cancel{mol})\times 50\times10^{-3}\ \cancel{mol} = \mathbf{6.205\ g}$

Answer: You need 141.96 grams of Na_2HPO_4 and 6.205 grams of Guaiacol.