5.111 Principles of Chemical Science: Week 1

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Progress Update

Over the past week I have:

1. Watched the first 3 lectures.
2. Completed associated lecture problems.
3. Completed an associated Chem olympiad problem.

Lecture Summary

In the past 3 lectures, we have covered:

1. Basic notation & course introduction.
2. Atomic structure and subatomic particles.
3. Wave-particle duality of light.

Reading Summary

I have read the following sections of Atkins and shall describe in voice what they are:

1. The fundamentals section of Atkins.
2. Sections covering wave-particle duality of light.

Lecture Problem

Problem: Describe how you would prepare 2.00 L of each solution listed:

1. 0.250 M NaOH from solid NaOH
2. 0.250 M NaOH from a 1.00 M stock solution of NaOH
3. 0.50 M HCl from concentrated (12 M) HCl

Solution: for (1), solve

$$0.25 = \frac{x}{2} \implies x = 0.5, \tag{1}$$

for (2), you start with 500ml of stock solution and add to 2 liters to quarter the molarity, and for (3) you see that

$$2/(12/0.5) = 0.083 \text{ liters of solution} \tag{2}$$

Olympiad Problem

Problem: Which hydrocarbon is 84.1% carbon by mass?

1. (A) CH_4
2. (B) C_2H_6
3. (C) C_4H_10
4. (D) C_8H_18

Solution: Let's go down the line:

1. 75%
2. $24/30 = 80\%$
3. $48 \ / \ (48 + 10) = 82.8\%$
4. $96 \ / \ (96 + 18) = 84.2\%$

Thus, D.