Developing Online Learning Modules (and Lessons Learned)

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What?

• online learning modules available in onQ:
  • basic biology lab techniques and procedures + relevant theory
  • video and supporting documentation
  • pre- and post- assessments (quizzes)

• custom designed to support Queen’s Biology courses
  • lab courses
  • online courses?

• assigned by instructors
  • students self-register (linked through course onQ)
  • for grades, for completion, or as a refresher
Why?

- consistency
  - instructors
  - students
- efficiency
  - student time
  - lab time
How?

- Teaching and Learning Enhancement Grant
  - Developer
  - Videographer
- survey of faculty, staff and students
- collaborative development of modules
- testing, feedback, modification
- implementation
In this module, we will be looking at how to perform the calculations required to make up standard lab solutions. We will be focusing on understanding what information is relevant and then applying a calculation technique called Dimensional Analysis to solve for your solution making requirements.

**Additional Resources**

Below are a selection of resources to complement and extend material covered in the video.
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**Biology Lab Skills: Calculating Solutions**

- Calculating Solutions Pre-Quiz
- Calculating Solutions Post-Quiz
- Calculating Solutions - Module Video
- Calculating Solutions - Summary
- Calculating solutions - Common Errors

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Learning Objectives:

After watching this video, you should be able to:

- Identify relevant known and unknown chemical quantities from a problem
- Calculate unknown using the dilution formula $C_1V_1 = C_2V_2$
- Prepare a dilution from a stock solution and solvent
Instructions

Attempt this quiz before watching the video to gauge how much you already know about this topic.

Question 7 (1 point)

You want to make up a 500 mL solution that is 10.0 mM CaCl₂, and need to calculate how many grams of CaCl₂ you need. The molecular weight of CaCl₂ = 110.98 g/mol.

- 0.045
- 0.020
- 0.450
- 0.555
- 555 g

Save

Question 3 (3 points)

Match the correct definition to each of the following terms.

1. Molecular Weight (MW) [also called Formula Weight (FW)]
2. Atomic Weight (AW)
3. Molarity (M)
4. Solute
5. Solvent
6. Solution
“Pre-Quiz” vs “Post-Quiz” Scores

Experimental Approaches to Animal Physiology (BIOL401) students, n = 30

Average (%) increase:
- Calculations: + 21%
- Solutions: + 13%
- Dilutions: + 7%
- Pipetting: + 17%
BIOL401 Lab Skills Competition

Molarity Refresher

\[ M = \frac{\text{moles solute}}{\text{Liters of solution}} \]

For Our Problem:

150 mM NaCl

\[ C_1 V_1 = C_2 V_2 \]

- **C** = Stock Concentration
- **V** = Volume of Stock Transferred
- **C** = Final Dilution Concentration
- **V** = Final Dilution Volume
How did we do?

- Teaching and Learning Enhancement Grant
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Challenges

• technical difficulties
  • learning curve
  • software and hardware issues
  • construction!!

• opinions and expectations

• best intentions and collaborations

• hands-on learning

• future directions...