Supporting Laboratories, Metacognition, and Active Learning

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Gradescope User Summit
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My General Chemistry Classes:

• 2 Classes of 30-40, active learning classroom

• Class assignments:
  • Reading Checks (daily, pre-class, online)
  • Active learning/HW (daily, in-and-post-class, paper)
  • Weekly quiz (paper)
  • Optional requiz

• Weekly labs: taught by faculty
  • Prelab (safety and procedure-oriented, online)
  • Lab activities (scaffolded inquiry, worksheet-style)
  • Lab quiz the next week (paper)

• No/minimal TA support
Active Learning: POGIL (Process-Oriented Guided Inquiry Learning)

www.pogil.org
Active Learning Activity (Exploration Phase):

HW25 - Solubility

Part I. The ten vials you've been given contain these ten compounds, plus a few mL of water.

<table>
<thead>
<tr>
<th>KI</th>
<th>CaCO₃</th>
<th>Co(NO₃)₂</th>
<th>CuCl₂</th>
<th>MgO</th>
<th>MnO₂</th>
</tr>
</thead>
</table>

(ethanol)   (acetone)   (pentane)

Based on...

- your observations of how and whether these compounds mix with water in the vials,
- what the types of compounds these are, and
- the intermolecular forces present in the original compounds,

...organize the ten compounds into four groups. Describe each group with a name based on their intermolecular-forces.

Group A:  

Group B:
Grading Active Learning Activities:

(All student work used with permission.)
Active Learning over Zoom (in Gradescope):

- Group collaboration in 3-4 person breakout rooms.
- Identifying “facilitator” role helped keep groups on track.
- Paper activities translated well to online format!
Metacognition

- Awareness of one’s own thinking, knowledge, and performance (“Do you know what you do and don’t know?”)
- Exam wrappers:
  - For pre-quiz assessment
  - For post-exam reflection
Pre-Quiz Reflection

Used multiple-choice (+ “dummy” question) as a survey.

Puts that week’s objectives in front of students.

Asks students’ to reflect on their confidence
(and even suggests some approaches.)
**Q2 Quiz 4 Analysis**

0.1 Points

Take a look at your grades and feedback on Gradescope for Quiz 4, as well as the Quiz 4 Answer Key posted on Canvas. (https://oit.instructure.com/courses/9134/files/1691303?module_item_id=557120)

Note that, in Gradescope, my feedback is viewable when you click on each question, so you can see my notes on why points were deducted!

Identify:

1) A question where you made a mistake.

2) Describe the mistake that you made.

3) What the correct answer should have been.

For example:

"1) I missed question 7a.

2) I didn’t divide by the number of liters of solution.

3) The correct answer should have been 0.300 mol / 2 L = 0.150 L"

If you had a perfect score on the quiz, or didn’t take it for a legitimate reason, indicate that below.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-0.0</td>
<td>Identifies question, mistake, and fix</td>
</tr>
<tr>
<td>2</td>
<td>-0.0</td>
<td>Perfect score! :)</td>
</tr>
<tr>
<td>3</td>
<td>-0.0</td>
<td>Didn’t take quiz</td>
</tr>
<tr>
<td>4</td>
<td>-0.05</td>
<td>Includes some analysis or discussion, but doesn’t identify specific question, mistake, and fix</td>
</tr>
<tr>
<td>5</td>
<td>-0.1</td>
<td>Answer missing/blank</td>
</tr>
</tbody>
</table>

**SUBMISSION SPECIFIC ADJUSTMENTS**

Point Adjustment 0

Provide comments specific to this submission
Laboratories

- “Standard” worksheet labs
- Remote labs
- Rubric-based lab writeups
Grading by Submission

You are grading one of 48 submissions in Group volumes with units

Grade the whole group instead

<table>
<thead>
<tr>
<th>Volume of water sample:</th>
<th>Tap water</th>
<th>Well water</th>
<th>Sports Drink</th>
<th>Distilled water</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 mL</td>
<td>30 mL</td>
<td>30 mL</td>
<td>30 mL</td>
<td>30 mL</td>
</tr>
</tbody>
</table>

Initial EDTA buret reading: 5.8 mL

Final EDTA buret reading: 12.2 mL

Volume of EDTA used: 6.4 mL

Moles of EDTA used: 6.4e-5 mol

Moles of Ca²⁺ reacted with EDTA:

Moles of CaCO₃ reacted with EDTA:

Equivalent Mass of CaCO₃ reacted:

CaCO₃ equivalent concentration, g/L:

CaCO₃ equivalent concentration, mg/L:

Hardness classification (see below):

Hardness classifications, (U.S. Geological Survey)

3.2: Buret Readings

- **TOTAL POINTS:** 0.6 / 0.6 pts

- **1:**
  Correct: Buret readings and total volume reported, with (at least some) units

- **2:**
  Units missing from all titration volume data
In-Person Labs

4.1: Experiments with Water Hardness

55 OF 55 GRADED

TOTAL POINTS
0.8 / 0.8 pts

1 -0.0
Records observations in a manner that can be generally followed and reproduced

2 -0.4
Records some notes on experiment, but not in a manner that is clear enough to be readily reproduced

3 -0.8
Answer missing/blank

Provide comments specific to this submission

APPLY PREVIOUSLY USED COMMENTS

Submission: 10 of 55
Q2.1 Molecular-Level Picture

0.5 Points

Sketch molecular-level pictures (pictures that imagine "zooming in" to see what is present at the scale of molecules and atoms) of two of the solutions you’ll look at today – a dilute solution of blue food dye in water, and a concentrated solution of blue food dye in water.

You should sketch molecular-level illustrations of both dilute and concentrated solutions on paper (or another means, if you choose) and then upload a photo of them here.

[If you’re having trouble thinking about how to begin, think about using one symbol to represent water molecules and a different symbol to represent dye molecules.]

2.1: Molecular-Level Picture

61 OF 61 GRADED

TOTAL POINTS
0.5 / 0.5 pts

1 -0.0
Reasonable drawings showing dye molecules and a contrast between dilute and concentrated solution

2 -0.25
Doesn’t clearly represent both dilute and concentrated solution

3 -0.5
Answer missing/blank
Q4.4
0.2 Points

In cells D3 through D31 in your spreadsheet, enter the approximate color of light for each wavelength, based on the diagram below. (If we were in the lab, we could stick a slip of paper into the spectrophotometer and see a dot of colored light on it.)

![Diagram of the electromagnetic spectrum](https://electromagneticspectrumscience.weebly.com/visible-light.html)

What is the wavelength of maximum absorbance for each solution? (you may have more than one)

$\lambda_{\text{max}}$ for concentrated blue solution (nm) = 

$\lambda_{\text{max}}$ for dilute blue solution (nm) = 

concentrated: 630 nm

dilute: 630 nm
Q6.5
0.5 Points

Attach a copy of your graph (You can export from Excel as a PDF, see https://www.investintech.com/resources/blog/archives/8125-how-to-excel-chart-to-pdf.html, or take a clear screenshot or picture and upload that).

Be sure your graph is properly labelled and titled.

Lab 1 Data and Graphs.pdf
Next term: Matrix-style rubrics for formal lab writeups. (currently in beta)
Thanks:

Oregon Tech Winter 2021 CHE202 students (work shared with permission)
Oregon Tech Chemistry Colleagues:
    Addie Clark, Travis Lund, Christy VanRooyen (+ we’re hiring!)

Questions:

Email: Seth.Anthony@oit.edu

(I am happy to share resources!)

Join me in the Extended Q&A room to continue our conversation!