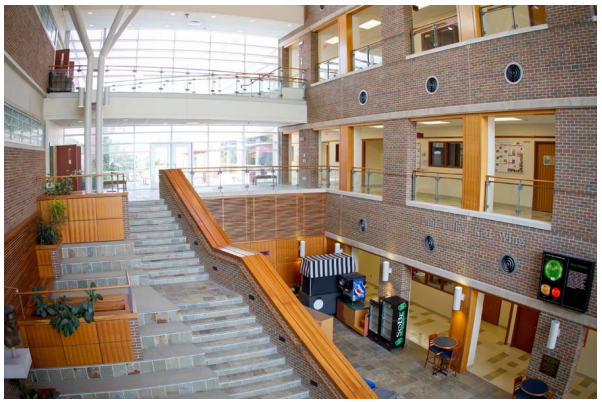
Specifications Grading

Active Learning in Organic Chemistry Workshop
June 16, *2022*



Justin Houseknecht, PhD

Overview

- Principles
- Course design
- Cumulative assessments
- Initial attempts
- Retakes
- Broader applications

Joshua Ring
Lenoir-Rhyne University

Alternative Grading Slack - https://join.slack.com/t/alternativegrading/shared_invite/zt-1axxe936b-YKgyuGwn_4IOsdzy0AmH6w

Principles

- Demonstrate proficiency on a percentage of LOs
  - Truly proficient at some things
  - No partial credit / pass-fail
- Number of LOs determines grade
  - Essential / Foundational LOs
  - General / Additional LOs
- Multiple opportunities to demonstrate proficiency

I wonder how this relates to active retrieval we were talking about today. Could a student master a LO in the short term but later on not retain the skill or knowledge?

- *What does literature (or experience) says about traditional testing (exams) over a course structured around learning objectives?*
  - Improved student agency
  - Frequent, low-stakes assessment
  - Improved metacognitive skills

Course Design - *What is happening in the regular class periods??*

- Flipped classroom
- Active, collaborative learning

Are there any reports of people doing Specs with a more traditional teaching style or at least not flipped classroom?

it seems like you would need a lot of objectives

- Josh more recently and Jennifer
  - closer to 18 per semester

- Justin has too many
  - Class = 24
  - Lab = 10-12

*These outcomes are **much** less specific than the topic-level outcomes we discussed on Tuesday, but much more specific and content-related than the course-level outcomes we discussed.*

Class Learning Outcomes:

#	Learning Objective
	Understand the course structure and review
1	**Predict and explain presence of peaks in mass spectrometry**
2	**Predict and explain presence of peaks in infrared spectroscopy**
3	Provide structure(s) consistent with MS and IR data
4	**Predict and explain chemical shift and integration in NMR spectroscopy**
5	**Predict and explain spin-spin splitting in NMR spectroscopy**
6	Provide structure(s) consistent with MS, IR, and NMR data
7	Describe the stability of conjugated alkenes and ions using MO theory
8	Predict products and describe the Diels-Alder reaction
9	Describe the stability of aromatic molecules with MO theory
10	**Describe and predict products of EAS reactions**
11	Synthesize polysubstituted aromatics using EAS reactions
12	Name aldehydes and ketones and describe their irreversible reactions
13	**Describe the reactions of aldehydes and ketones with O nucleophiles**
14	**Describe the reactions of aldehydes and ketones with N nucleophiles**
15	Name and describe properties of carboxylic acids and their derivatives
16	Describe the synthesis and reactions of carboxylic acids
17	Describe the synthesis and reactions of acid chlorides and anhydrides
18	**Describe the synthesis and reactions of esters**
19	**Describe the synthesis and reactions of amides and nitriles**
20	**Describe the formation and reactivity of enols and enolates**
21	Describe the alkylation reactions of enolates and enamines
22	**Describe the condensation reactions of aldehydes and ketones**
23	**Describe the condensation reactions of esters**
24	Describe amino acid properties and synthesis
25	Synthesize peptides from unprotected amino acids
26	Demonstrate understanding of safe practice in the organic chemistry laboratory

Foundational Learning Outcomes (12) in **bold**.

February 22nd

12 – Name aldehydes and ketones and describe their irreversible reactions

*Complete OWL EAS modules **by Tue. 2/22 @ 12:30 am***

*Complete Moodle EAS Reflection **by Tue. 2/22 @ 12:30 am***

Read Sections 19.1-3, 7, and 11

1) Introduction – watch mini-lecture
2) **[19.1]** Name aldehydes and ketones
3) **[19.2-3]** Oxidation reactions – watch mini-lecture
   a) See also 17.7
   b) Prepare aldehydes and ketones from alcohols
   c) Prepare carboxylic acids from aldehydes
4) **[19.7]** Irreversible reactions of aldehydes and ketones
   a) See also 17.4 and 17.5
   b) Describe mechanisms
   c) Predict products
   d) Provide reagents that would form given alcohol
5) **[19.11]** The Wittig Reaction
   a) Phosphorous ylides – describe synthesis, structure, and reactivity
   b) Describe mechanism of the Wittig reaction
   c) Prepare alkenes using the Wittig reaction

*Complete Perusall Chap 19 Intro Learning Outcomes by **Tue. 2/22 @ 12:30 am***

Complete book problems

*Complete OWL Chap 19 Intro modules by **Tue. 3/15 @ 12:30 am***

*Complete Moodle Chap 19 Intro Reflection by **Tue. 3/15 @ 12:30 am***

Our lab and lecture grade is bundled together. I wonder if someone has developed a grading scheme for this type of course…

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Organic 1

- Essentials (6)
  - Technique labs
  - Lab practical
- Additionals (6)
  - Synthesis labs
- Revisions limited
  - Within 1 week of return
  - Only 2 major and 5 minor

Organic 2

- Essentials (5)
  - Lab completion
  - Data
- Additionals (5)
  - Lab reports
- Revisions limited
  - Within 1 week of return
  - Only 2 major and 5 minor

Cumulative Assessments

- *This system -- without some complex adaptations -- doesn't seem to work with interwoven objectives… where would I include a question that incorporates both objectives to see that they see connections?*
  - Foundational learning objectives
  - Midterm and final exams
  - Challenge learning objectives

Why? If the concepts were considered to be "mastered" why was the cummulative exam necessary?

- *Has anyone who uses the ACS standardized exam tried spec grading? Are they compatible with one another?*

- *Hence, I'm surprised that this* [sliding scale] *is how the final was handled. It seems a bit game-like.*

*I read an implication that exams *can't* be structured around learning objectives... and I don't think that's true...*

- Mastery-based testing
  - Exam 1 is LOs 1-3
  - Exam 2 is LOs 1-6
  - Exam 3 is LOs 1-9
  - etc

Initial Attempts

- *How much time is given between introducing the concept and demonstrating mastery? Are quests routinely one day a week?*

How much class time was used for initial quest attempts?

- 10 minutes per LO
- Immediate review of solutions

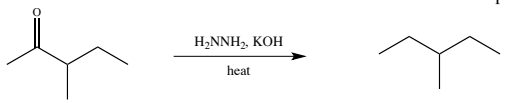
Houseknecht **Chem 302** Spring 2022

Name_____

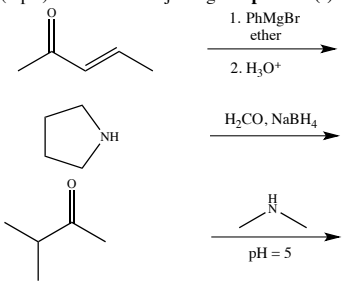
I _____ (sign name) affirm that my work upholds the highest standards of honesty and academic integrity at Wittenberg, and that I have neither given nor received any unauthorized assistance.

Quiz 14 – Describe the reactions of aldehydes and ketones with nitrogen nucleophiles

1. (2 pts) Provide **all intermediates** and **all electron movement** for formation of the products below.



2. (3 pts) Provide the major organic **product(s)**:



I do want to ask how they were given feedback on the first attempt. Just the grade? How do they know why they were wrong, and get a chance to improve before they retake the quest?

Are students presented with an example of a perfect answer or a rubric used to determine what level is considered perfection?

- Sample quizzes with video solution
- Review solution immediately after attempt
- Return attempts w/in 48 hrs

Retakes

- *Does this mean that each student was given an individualized retake, based on what EOs and GOs they failed in the original quest?*
  - Retakes 1 at a time
  - Retake tokens
  - Not returned
- *Also were quests also given in the same period of time as quest retakes?*

How often do students not realize they are out of time to make a passing grade? I think that you would need deadlines for some of the EOs.

- Justin
  - ”Infinite” retakes on EOs
  - Passing grade at midterm requires at least 4 foundational LOs and 2 additional LOs
- Josh
  - 3 weeks / 3 retake attempts

could or are the quests multiple choice so they can be adapted for scantron test in large classes?

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