

Incorporating the OWL Online Homework system in the Teaching of Organic Chemistry at VCU



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Outline

- **Introduction**
 - Class information
 - Owl Online homework
- **Types of Owl Online Questions**
 - Tutor
 - Exercise
 - Simulation
 - Homework
- **Evaluation**
- **Discussion**



Class Materials

Textbook	Owl Homework system
Wade 6e	McMurry 6e
1. Intro & review	1, 2
2. Organic molecules	1, 2
3. Alkanes	3, 4
4. Study of chemical reactions	5
5. Stereochemistry	9
6. Alkyl halide	10
7. Nucleophilic addition and elimination	11
8. Reaction of Alkenes	6, 7
9. Alcohols	7, 17
10. Reaction of Alcohols	17



General Info of the Class

- 70 students, meet 3 x 50 min a week
- 40 lectures excluding exam days and holidays
- Teaching Methods
 - Lecture Clickers Quiz Online homework
 - Student leader sessions (off-class time)
- Assessment method:
 - three in-semester exams
 - a comprehensive final exam
 - a common part of 40 MC questions for
 - 3 sessions by different lecturers



Online homework of the Class

- Counted as 8% of the final grade
- 27 Online Homework assigned, total 63 questions
 - average: 2 per week about 4.66 questions
- Assessment method:
due 72 h after the starting time, unlimited trials
- 65% students → 80% grade of the online homework
80% students → 70% grade of the online homework

- Types of Questions (63)

tutor	22	exercise	7
Simulation	1	homework	33

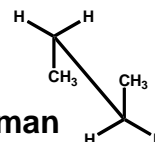


Owl Online Homework-Tutor

4d. Conformation III: Newman Projections

- Introduction

A short video showing how to draw Newman projections from 3-D structures

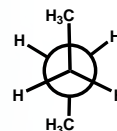


- Questions

5 sequential multiple choices to select the least or most favored conformation. Explain why is wrong or correct.

- Summary

Same questions in multiple trials
Interactive using Adobe Shockwave



Owl Online Homework-Exercise

6i. Writing reaction Mechanisms: Electrophilic additions to alkenes

- Introduction

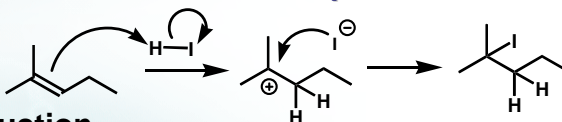
A short introduction

plus lessons on pushing electrons with arrows

- Reaction mechanism of an alkene reacting with HI

1. draw the first step with arrows
2. select intermediates
3. draw the 2nd step of addition of I⁻
4. Select the product
5. More about the reactions (reactivity)

- Summary



Owl Online-Simulation

6f. Markovnikov's Rule

- Introduction

A short introduction on the regio-specificity

- Running Experiments

1. type of reaction (halogenation)
2. Your reagents
3. Your goal of experiments
4. Select a reagent
5. experiments (observed product vs possible)
6. Run another experiment

- Formulate Conclusions

A set of question leading to the rule



Owl Online Homework-HW

9a. Basic Stereochemistry, Chirality

Status : 1

Status : 1 2 3 4 10:53 AM

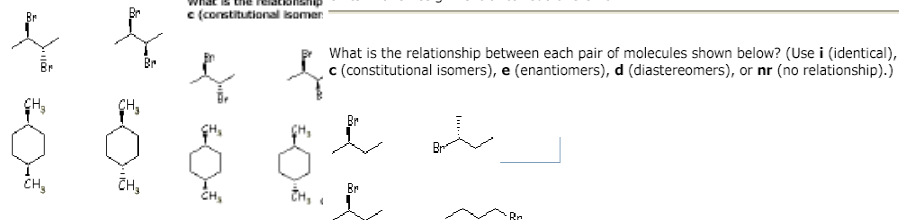
You must answer 2 of 4 questions correctly in the **SAME** attempt at this Unit to receive credit for it. After answering the questions in this Unit, press **Unit Menu** to go to other Units in this Assignment or to redo this Unit.

Score: Congratulations, you did it! Status : 1 2 3 4 10:55 AM

What is the relationship between each pair of molecules shown below? (Use **i** (identical), **c** (constitutional isomers), **e** (enantiomers), **d** (diastereomers), or **nr** (no relationship).)

Answer(s): () You must answer 2 of 4 questions correctly in the **SAME** attempt at this Unit to receive credit for it. After answering the questions in this Unit, press **Unit Menu** to go to other Units in this Assignment or to redo this Unit.

What is the relationship between each pair of molecules shown below? (Use **i** (identical), **c** (constitutional isomers), **e** (enantiomers), **d** (diastereomers), or **nr** (no relationship).)



Feedback:

For two compounds to be constitutional isomers, they must have the same molecular formula. Once that has been established, connectivity is the same.

CHECK ANSWER

Owl Online Homework-HW

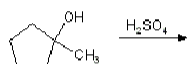
17h. Dehydration and conversion to RX

Status : 1 2 3

Draw the major organic product of the reaction shown below.

You must answer 2 of 3 questions correctly in the **SAME** attempt at this Unit to receive credit for it. After answering the questions in this Unit, press **Unit Menu** to go to other Units in this Assignment or to redo this Unit.

Draw the major organic product of the reaction shown below.



MarvinSketch Troubleshooting

MarvinSketch Troubleshooting

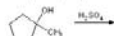
Submit OWM Response

Owl Online Homework-HW

Score:
Congratulations, you are **Correct**.

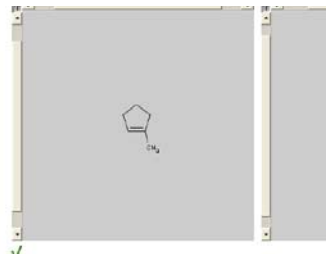
Answer(s): (Your response(s) are shown below, followed by the co

Draw the major organic product of the reaction shown below.



[MarvinSketch_Troubleshooting](#)

Your response:



✓

Feedback:

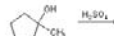
Heating an alcohol in the presence of a strong acid such as sulfuric acid or phosphoric acid results in the loss of water (dehydration) to form an alkene. The H and OH are lost from adjacent atoms. When elimination of water can occur in more than one way to produce isomeric alkene products, the more stable product is favored. This means that a more substituted alkene is favored over a less substituted one.

Score:

Sorry, you are **Incorrect**.

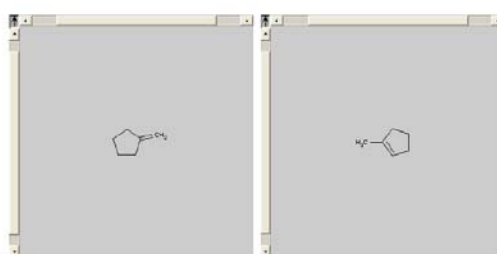
Answer(s): (Your response(s) are shown below, followed by the correct answer(s).)

Draw the major organic product of the reaction shown below.



[MarvinSketch_Troubleshooting](#)

Correct answer:



✗

Feedback:

Heating an alcohol in the presence of a strong acid such as sulfuric acid or phosphoric acid results in the loss of water (dehydration) to form an alkene. The H and OH are lost from adjacent atoms. When elimination of water can occur in more than one way to produce isomeric alkene products, the more stable product is favored. This means that a more substituted alkene is favored over a less substituted one.

Online-Homework Statistics

33 Owl homework questions had a total of 65 sub-questions

- Average per sub-question

	Avg	Std. Dev	Low	High
No of attempt	5.1	3.0	1.6	7.7
time per attempt	1.4	0.8	0.2	4.18 (min)
time per sub-question	7.9	5.4	1.3	30.0 (min)

- Average per question: 16.2 min; (Low 1.8, High 55)

- Average time on online homework per week
4.66 x 16.2 = 75.5 min (1 h 15 min)



Student Performances

Final comprehensive exam (40 questions)

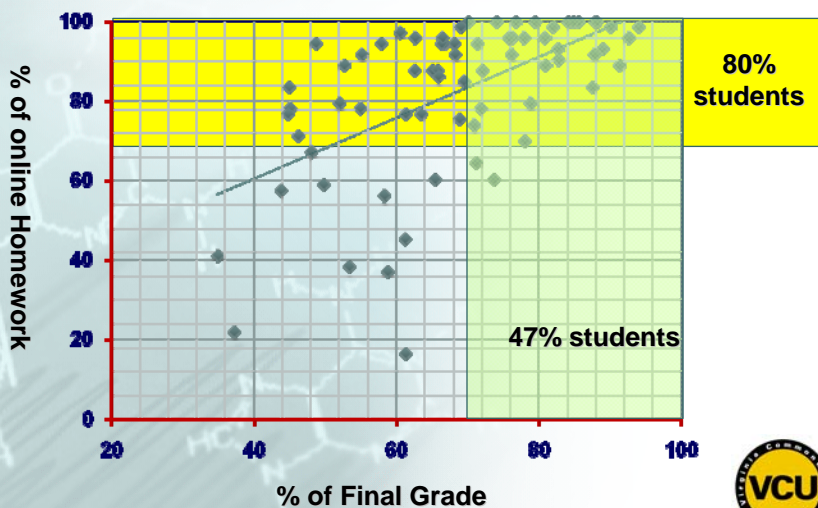
	Type A	Type B	Type C	
Avg (%)	56.0	62.6	54.5	57.8
Std Dev	16.9	15.6	17.7	
Max	85.0	87.5	92.5	
Min	27.5	30.0	20.0	

Online homework

- significantly higher than that of session with no online homework by 10%
- very helpful on the teaching of a large class for junior faculties



Correllational Analysis



How can we improve?

- **More Online Homework?**
1 hr 15 min per week good enough?
- **Which one?**
tutor -- 22 exercise -- 7 Simulation -- 1
homework -- 33 (65 sub-Q: 33 structure drawing)
Weakness: reaction mechanisms
- **How?**
Book questions to the online homework
optional vs required
- **Limit attempts in the assignments?**



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