

LeAP: SN2 Mechanism

- Due Sep 26, 2024 at 11:59pm
- Points 5
- Questions 10
- Available Sep 1, 2024 at 12am - Sep 30, 2024 at 11:59pm
- Time Limit None
- Allowed Attempts 2

Instructions

Lecture Application Practices (LeAPs) serve as initial opportunities for students to apply the information they've gathered from the pre-lecture videos and in-person lectures/lecture videos.

Students are strongly encouraged to complete LeAPs on the same day that the corresponding topic is completed in class. However, to provide consistent due dates, sets of LeAPs will be due on Thursdays at 11:59 PM - Chicago time. See the Weekly Schedules or Course Calendar for specific due dates for each activity.

Each LeAP is worth 5 points. Credit will be awarded based on accuracy. There is no time limit. Students will receive two attempts for each assignment and the highest score will be recorded in the gradebook. LeAPs may consist of multiple-choice, calculation, ranking, choose all that apply, and fill in the blank type questions.

This quiz was locked Sep 30, 2024 at 11:59pm.

Attempt History

	Attempt	Time	Score
KEPT	Attempt 2	23 minutes	5 out of 5
LATEST	Attempt 2	23 minutes	5 out of 5
	Attempt 1	245 minutes	4 out of 5

⚠ Correct answers are hidden.

Score for this attempt: 5 out of 5

Submitted Sep 24, 2024 at 5:11pm

This attempt took 23 minutes.



Question 1

0.5 / 0.5 pts

Which characteristic listed below does NOT describe an SN2 mechanism?

☒ Unimolecular

- ☐ Stereospecific
- ☐ Concerted
- ☐ rate = $k[\text{Nu}][\text{E-LG}]$



Question 2

0.5 / 0.5 pts

Rank the following electrophiles from most reactive (1) to least reactive (4) in an $\text{S}_{\text{N}}2$ reaction.

1

Chloromethane



2

1-Chlorohexane



3

2-Chloro-4-methylpentane



4

3-Chloro-3-methylpentane



Question 3

0.5 / 0.5 pts

Which of the following **charged** nucleophiles is most reactive in DMSO solvent?

- ☐ SCH_3^-
- ☒ OCH_3^-



Question 4

0.5 / 0.5 pts

Which of the following molecules are negatively charged nucleophiles? **Choose all that apply.**

- ☒ $\text{LiN}(\text{CH}_3)_2$
- ☒ NaI
- ☒ KN_3
- ☐ HSCH_3



Question 5

0.5 / 0.5 pts

An S_N2 mechanism takes place when 3-(bromomethyl)pentane is added to each nucleophile listed below. Which nucleophile will also require an acid-base step after the substitution step in order to produce a neutral (not charged) product?

☐ $\text{LiN}(\text{CH}_3)_2$

☐ NaI

☐ KN_3

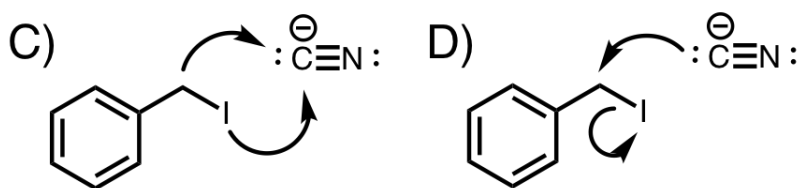
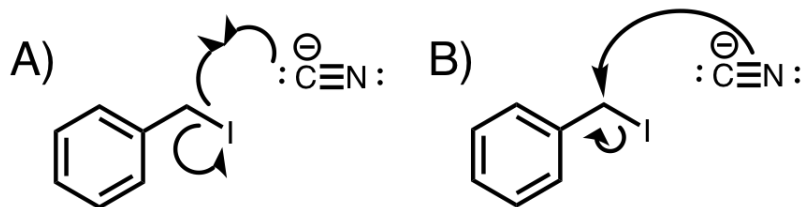
☒ HSCH_3



Question 6

0.5 / 0.5 pts

Which option shown below correctly depicts the arrow-pushing for an S_N2 mechanism?



☐ A

☐ B

☐ C

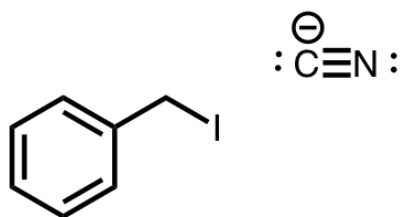
☒ D



Question 7

0.5 / 0.5 pts

What are the HOMO and LUMO in the S_N2 reaction shown below?



HOMO: C sp orbital

☒ LUMO: C-I σ^*

HOMO: C sp^3 orbital

☐ LUMO: C-I σ^*

HOMO: C-N σ orbital

☐ LUMO: I sp^3

HOMO: C-N π^* orbital

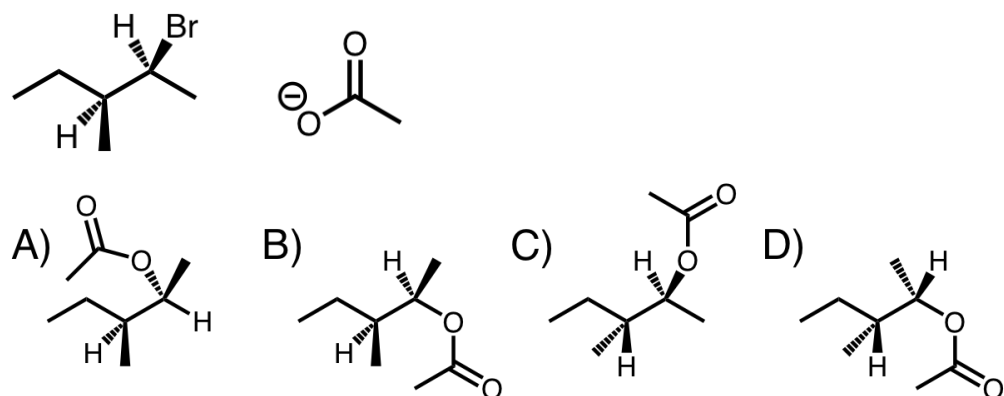
☐ LUMO: C-I σ



Question 8

0.5 / 0.5 pts

Which product correctly shows the stereochemistry produced by backside attack and inversion in the reaction shown below.



☐ A

☒ B

☐ C

☐ D



Question 9

0.5 / 0.5 pts

Consider the $\text{S}_{\text{N}}2$ reaction between H_3CNH_2 and (S)-(1-bromoethyl)cyclopentane to answer problems 9-10.

How will the rate of the reaction change if (S)-(1-bromoethyl)cyclopentane is replaced by (bromomethyl)cyclopentane. (Hint: Draw out the structure of this new electrophile.)

☒ The rate will increase because (bromomethyl)cyclopentane is a less hindered electrophile.

☐ The rate will decrease because (bromomethyl)cyclopentane is a more hindered electrophile.



The rate will not change because the rate has no dependence on the characteristics of the electrophile.



The rate will increase because (bromomethyl)cyclopentane is a stronger nucleophile.



The rate will decrease because (bromomethyl)cyclopentane is a weaker nucleophile.

The α carbon in (S)-(1-bromoethyl)cyclopentane is 2° , and the α carbon in (bromomethyl)cyclopentane is 1° . The rate of the reaction would increase because the 1° α carbon would be less bulky/less sterically hindered, and the Nu could reach the α carbon more easily.



Question 10

0.5 / 0.5 pts

How will the rate of the reaction change if the $-\text{Br}$ in (S)-(1-bromoethyl)cyclopentane is replaced with $-\text{Cl}$?



The rate will decrease because Cl is a less stable conjugate base.



The rate will increase because Cl is a more stable conjugate base.



The rate will not change.



The rate will increase because Cl is a less electronegative atom than Br.

The rate will decrease because $-\text{Cl}$ is a worse leaving group than $-\text{Br}$.

Br is the better leaving group because it is a larger atom (atom effect) and a weaker (more stable) conjugate base than Cl.

Quiz Score: 5 out of 5