LeAP: Radicals

- Due Sep 19, 2024 at 11:59pm
- Points 5
- Questions 10
- Available Sep 1, 2024 at 12am - Sep 23, 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 23, 2024 at 11:59pm.

Attempt History

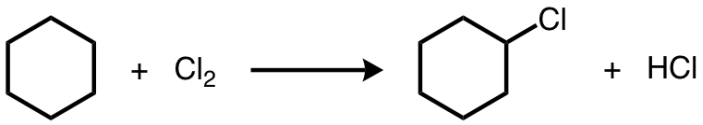
	Attempt	Time	Score
KEPT	Attempt 2	4 minutes	5 out of 5
LATEST	Attempt 2	4 minutes	5 out of 5
	Attempt 1	1,601 minutes	4.88 out of 5

ⓘ Correct answers are hidden.

Score for this attempt: 5 out of 5
Submitted Sep 18, 2024 at 1:02pm
This attempt took 4 minutes.

Question 1
0.5 / 0.5 pts

Use the reaction and table of bond dissociation energies to answer the question.



Bond	BDE (kJ/mol)
$H_3C–H$	439
$(H_3C)_2HC–H$	412
$H_3C–Cl$	350
$(H_3C)_2HC–Cl$	356
H–Cl	431
Cl–Cl	239

Calculate ΔH° for the **first propagation step** of the reaction using the values in the bond dissociation energy table. All values should be in units of kJ/mol. Enter your answer in the box. (Hint: Pay attention to the sign (+ or -) of your answer! Do not include units in your answer.)

-19

Question 2

0.5 / 0.5 pts

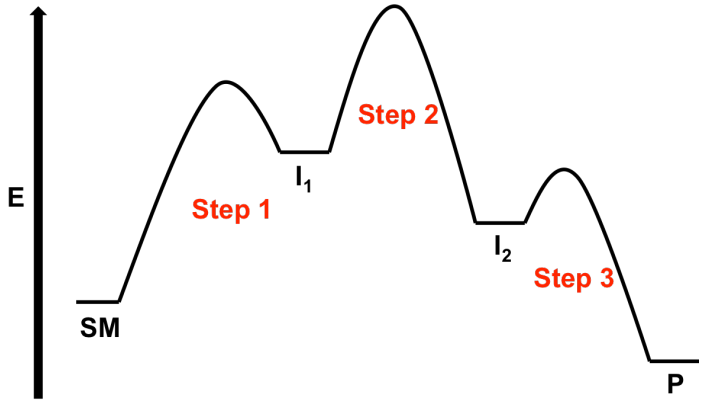
The ΔH° for a reaction is found to be -112 kJ/mol. Calculate the value of the equilibrium constant (K) for the reaction at 25 °C.

- 10^{20}
- 10^{-20}
- 10^{22}
- 10^{-22}

Question 3

0.5 / 0.5 pts

Use the reaction coordinate diagram shown below to answer questions 3-4.



Which step is the rate determining step (RDS)?

- ○ Step 1
- ◉ Step 2
- ○ Step 3

Question 4
0.5 / 0.5 pts

Consider the rate-determining step (RDS) that you identified in the previous problem. Which statement(s) about the RDS are TRUE? **Choose all that apply.**

- ☐ The RDS is endothermic.
- ☑ The RDS is exothermic.
- ☑ The RDS has an "early" transition state ($TS^{‡}$).
- ☐ The RDS has a "late" transition state ($TS^{‡}$).
- ☐ The transition state ($TS^{‡}$) in the RDS looks more like the starting material (SM).
- ☑ The transition state ($TS^{‡}$) in the RDS looks more like the first intermediate (I_1).
- ☐ The transition state ($TS^{‡}$) in the RDS looks more like the second intermediate (I_2).
- ☐ The transition state ($TS^{‡}$) in the RDS looks more like the final product (P).

Question 5
0.5 / 0.5 pts

Which factors influence the rate of a reaction? **Choose all that apply.**

- ☐ Equilibrium constant (K)
- ☑ Temperature
- ☑ Concentration
- ☑ Probability factor (A)
- ☐ ΔG°
- ☑ $\Delta G^{‡}$

Question 6
0.5 / 0.5 pts

Match each bolded, red carbon to the label that correctly describes its substitution.

$\mathbf{C}H(CH_3)_3$

Tertiary(3°)

$\mathbf{C}(CH_3)_4$

Quaternary(4°)

$\mathbf{C}H_3CH_3$

Primary(1°)

$\mathbf{C}H_2(CH_3)_2$

Secondary(2°)

$\mathbf{C}H_4$

Methyl

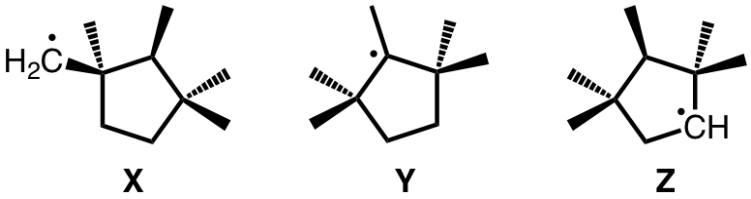
Question 7
0.5 / 0.5 pts

Hyperconjugation was a new concept that was introduced in the Radicals lecture packet. Which of the following statements accurately describe hyperconjugation? **Choose all that apply.**

- [x] Hyperconjugation is a weaker form of electron delocalization than conjugation.
- [ ] Hyperconjugation is a stronger form of electron delocalization than conjugation.
- [x] Hyperconjugation is a result of an interaction between a σ orbital and a p orbital.
- [ ] Hyperconjugation is a result of an interaction between two p orbitals.
- [x] Orbitals participating in a hyperconjugation interaction must be parallel to each other to interact.
- [ ] Orbitals participating in a hyperconjugation interaction must be perpendicular (90 degrees) to each other to interact.
- [x] Orbitals participating in a hyperconjugation interaction must be on adjacent atoms in order to interact.
- [x] The observation that more substituted radicals are more stable can be explained by hyperconjugation.

Question 8
0.5 / 0.5 pts

Rank the radicals from most stable to least stable.



X Y Z

- Most stable: X, Y, Z
- Most stable: Y, Z, X
- Most stable: X, Z, Y
- Most stable: Z, Y, X

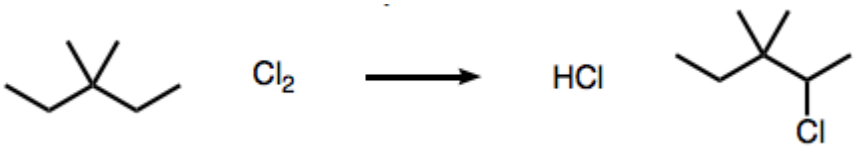
Question 9
0.5 / 0.5 pts

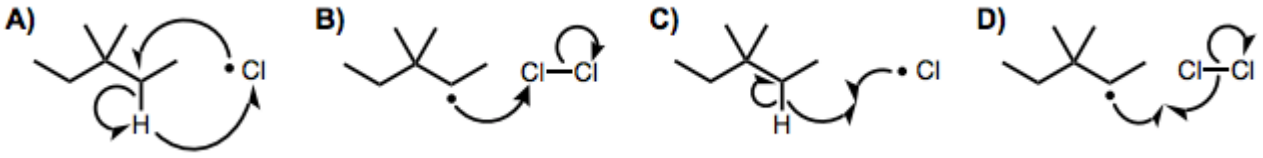
While examining radical halogenation reactions, we saw that different "reaction pathways" lead to the formation of different products. How does the difference in energy between the activation barriers of rate-determining steps ($\Delta\Delta G^{\ddagger}$) for these pathways affect the selectivity of the reactions and the products that are produced?

- A bigger difference in energy between activation barriers results in a more selective reaction. The reaction is relatively "clean" and mostly produces one product.
- A bigger difference in energy between activation barriers results in a less selective reaction. The reaction is "messy" and produces a more equivalent mixture of products.
- A smaller difference in energy between activation barriers results in a more selective reaction. The reaction is "messy" and produces a more equivalent mixture of products.
- The smaller the difference in energy between activation barriers results in a less selective reaction. The reaction is relatively "clean" and mostly produces one product.

Question 10
0.5 / 0.5 pts

What is correct arrow-pushing mechanism for the first propagation step of this reaction?





- ○ A
- ○ B
- ◉ C
- ○ D

Quiz Score: 5 out of 5