LeAP: Resonance, Conjugation, Aromaticity

- Due Aug 29, 2024 at 11:59pm
- Points 5
- Questions 8
- Available until Sep 2, 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 2, 2024 at 11:59pm.

Attempt History

	Attempt	Time	Score
KEPT	Attempt 2	2 minutes	5 out of 5
LATEST	Attempt 2	2 minutes	5 out of 5
	Attempt 1	144 minutes	4.5 out of 5

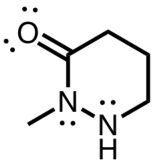
ⓘ Correct answers are hidden.

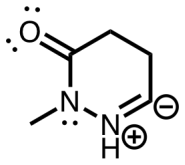
Score for this attempt: 5 out of 5
Submitted Aug 27, 2024 at 9:44pm
This attempt took 2 minutes.

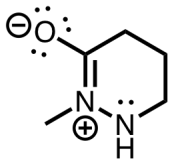
Question 1
1 / 1 pts

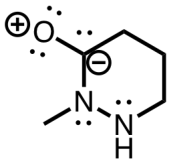
Use the structure of Molecule X to answer questions 1-2. All bonds and lone pairs have been drawn in for you in Molecule X.

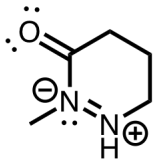
Which structure(s) are valid resonance contributors(s) for Molecule X? In other words, which structures would you consider when drawing the resonance hybrid? **Choose all that apply.** (Hint: Remember to draw in the implied hydrogen atoms and to check for octets.)

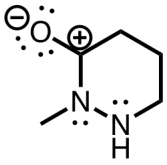
Molecule X 


A)


B)


C)


D)


E)

- [ ] A
- [x] B
- [ ] C
- [ ] D
- [x] E

Question 2
0.5 / 0.5 pts

Which resonance contributor is the dominant (strongest) resonance contributor?

- (•) Molecule X
- ( ) A
- ( ) B
- ( ) C
- ( ) D
- ( ) E

Question 3
0.5 / 0.5 pts

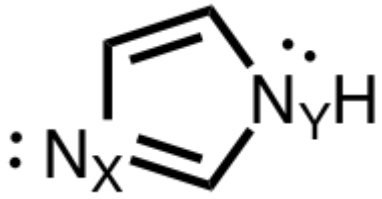
We expect nitrogen atoms with “4 things” around them to be sp^3 hybridized and trigonal pyramidal. However, in some cases these nitrogen atoms adopt an sp^2 hybridization and trigonal planar molecular geometry instead. Why do these nitrogen atoms adopt an sp^2 hybridization and trigonal planar molecular geometry?

- ( ) Electron delocalization **lowers** the energy of the electrons, which **destabilizes** the molecule.
- ( ) Electron delocalization **raises** the energy of the electrons, which **destabilizes** the molecule.

- Electron delocalization **raises** the energy of the electrons, which **stabilizes** the molecule.
- Electron delocalization **lowers** the energy of the electrons, which **stabilizes** the molecule.

Question 4
0.5 / 0.5 pts

Answer questions 4-5 using the structure of imidazole shown below.



What is the hybridization of N_X and N_Y?

- N_X is sp^2 hybridized. N_Y is sp^2 hybridized.
- N_X is sp^2 hybridized. N_Y is sp^3 hybridized.
- N_X is sp^3 hybridized. N_Y is sp^3 hybridized.
- N_X is sp^3 hybridized. N_Y is sp^2 hybridized.

Question 5
1 / 1 pts

Consider your answer to the previous problem, and the atomic orbitals that each N atom possesses. What kind of atomic orbitals hold the lone pairs of N_X and N_Y? (Hint: Consider the bonds attached to N_X. What orbitals are used to make each bond? What orbital is not used for bonding?)

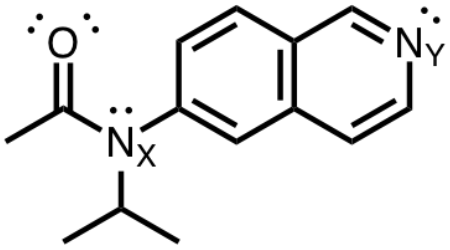
- An sp^2 orbital holds the lone pair on N_X. An sp^2 orbital holds the lone pair on N_Y.
- A p orbital holds the lone pair on N_X. A p orbital holds the lone pair on N_Y.
- An sp^2 orbital holds the lone pair on N_X. A p orbital holds the lone pair on N_Y.
- An sp^3 orbital holds the lone pair on N_X. An sp^3 orbital holds the lone pair on N_Y.
- A p orbital holds the lone pair on N_X. An sp^3 orbital holds the lone pair on N_Y.

Question 6

0.5 / 0.5 pts

Use the structure of Molecule Z shown below to answer questions 6-8.

Molecule Z



Which orbitals hold the lone pairs on the oxygen and nitrogen atoms? (Hint: Identify the hybridization of each atom first. Once you know what orbitals an atom has, identify what each orbital is doing.)

- (selected) Both oxygen lone pairs are in sp2 orbitals. N_X lone pair is in a p orbital. N_Y lone pair is in an sp2 orbital.
- Both oxygen lone pairs are in p orbitals. N_X lone pair is in a p orbital. N_Y lone pair is in a p orbital.
- One oxygen lone pair is in a p orbital, the other is in an sp2 orbital. N_X lone pair is in an sp3 orbital. N_Y lone pair is in a p orbital.
- One oxygen lone pair is in a p orbital, the other is in an sp2 orbital. N_X lone pair is in an sp3 orbital. N_Y lone pair is in an sp2 orbital.

Question 7

0.5 / 0.5 pts

What is the total number of electrons in the **conjugated** system in Molecule Z?

- 10
- 20
- (selected) 14
- 6

Question 8

0.5 / 0.5 pts

Does Molecule Z contain an aromatic or antiaromatic system? What is the total number of electrons in the aromatic or antiaromatic system?

- There are 6 electrons in the aromatic system.
- (selected) There are 10 electrons in the aromatic system.

- There are 12 electrons in the antiaromatic system.
- There are 4 electrons in the antiaromatic system.

Quiz Score: 5 out of 5