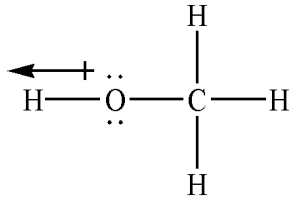
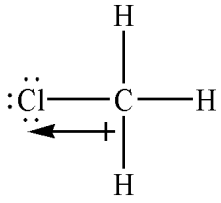
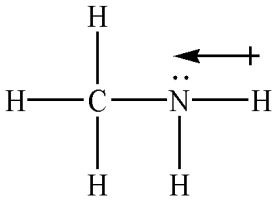
question chapter 1

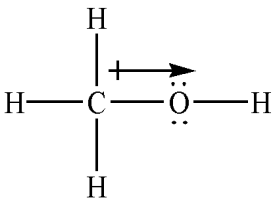
Multiple Choice
Identify the choice that best completes the statement or answers the question.

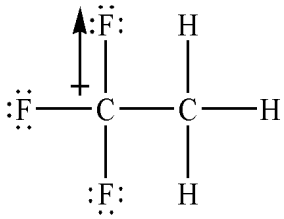
____ 1. Which of the following Lewis structures shows an incorrectly drawn bond dipole?

a.


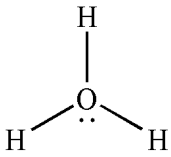
d.


b.


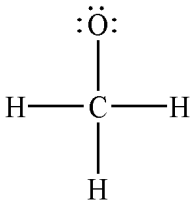
e.


c.


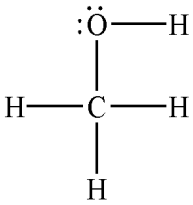
____ 2. What is the formal charge on the oxygen atom in each of the following Lewis structures?



Structure A



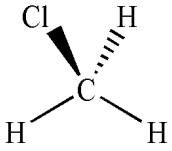
Structure B

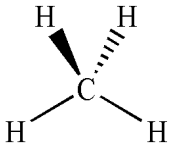


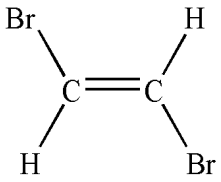
Structure C

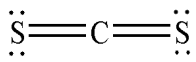
a. **A**: 0, **B**: 1-, **C**: 1+
b. **A**: 1+, **B**: 1-, **C**: 0
c. **A**: 1-, **B**: 1+, **C**: 0
d. **A**: 1-, **B**: 1-, **C**: 1-
e. **A**: 1+, **B**: 1+, **C**: 1-

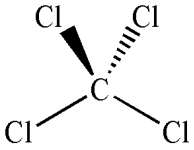
____ 3. Which of the following molecules has a net dipole moment?

a. 

b. 

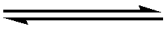
c. 

d. 

e. 

____ 4. Which of the following arrow conventions is used to show the relationship of two chemical species as resonance structures?

a. 

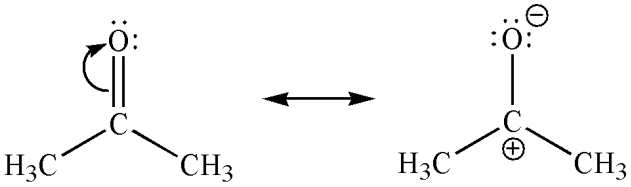
b. 

c. 

d. 

e. Both a and b

____ 5. Two resonance structures of the same molecule are shown here. Which of the following statements about the two structures are true?



Structure A **Structure B**

I. The two structures are in equilibrium with each other.
II. The electrons are distributed differently in each of the structures.
III. Structure **A** contributes more to the resonance hybrid than structure **B**.

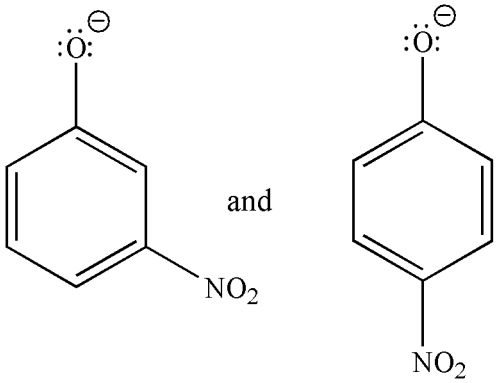
a. I, II, III
b. I and III
c. II and III
d. II
e. III

____ 6. Which of the following statements about atomic orbitals is *false*?

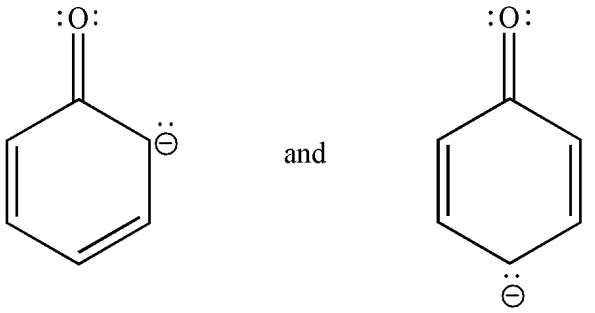
a. A 1*s* orbital is spherically symmetrical.
b. An atomic orbital may contain zero, one, or two electrons.
c. A 2*s* orbital and a 2*p* orbital are equal in energy.
d. A $2p_x$ orbital and a $2p_y$ orbital are equal in energy.
e. A 2*p* orbital is not spherically symmetrical.

____ 7. Which of the following pairs are related as resonance structures? All nonzero formal charges are shown.

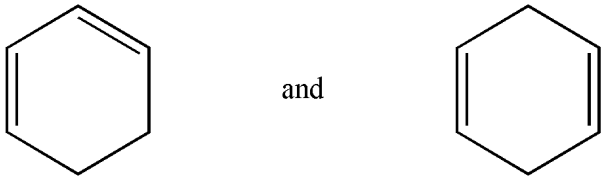
a.



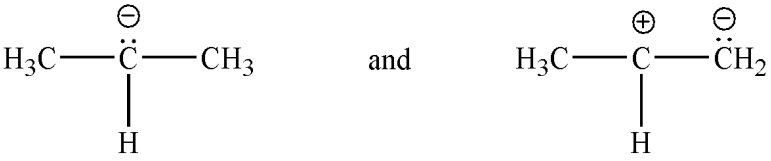
b.



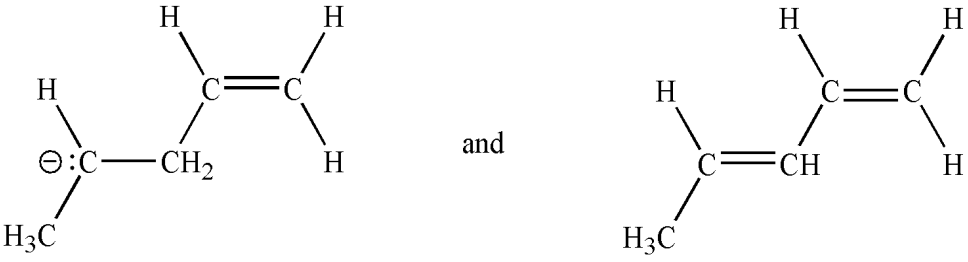
c.



d.



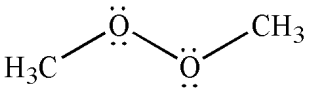
e.



Short Answer

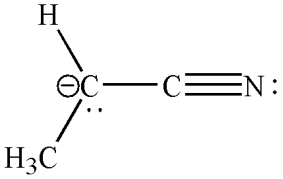
8. A student wrote the following electron configuration for a ground state, neutral nitrogen atom: $1s^2 2s^2 2p_x^2 2p_y^1$. Explain why the configuration does not describe the lowest energy state of a ground state nitrogen atom and provide the lowest energy electron configuration for nitrogen.

9. Using curved arrow formalism, show the homolytic cleavage of the O—O bond in dimethyl peroxide. Draw the products of the reaction, including all lone pairs and unpaired electrons.

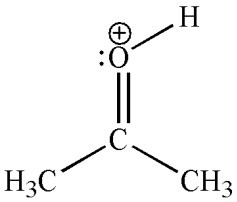


dimethyl peroxide

10. The Lewis structure of the anion shown has an additional resonance structure that is a more important representation for this anion. Draw the better resonance contributor, using curved arrow formalism to show how the new structure is obtained from the original structure.



11. The Lewis structure shown has an additional resonance contributor. Draw this contributor and determine which structure is a better contributor to the resonance hybrid. Provide a brief explanation for your choice.



12. Draw a Lewis structure for methyl cation, $^{+}CH_3$.

13. Draw a Lewis structure for acetamide, CH_3CONH_2.