|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. The hybridization of the nitrogen atom in the cation NH2+ is:   |  |  |  | | --- | --- | --- | |  | a. | *sp*2 | |  | b. | *sp*3 | |  | c. | *dsp* | |  | d. | *sp* | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | True | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2. In the molecule C2H4 the valence orbitals of the carbon atoms are assumed to be   |  |  |  | | --- | --- | --- | |  | a. | not hybridized | |  | b. | *sp* hybridized | |  | c. | *sp*2 hybridized | |  | d. | *sp*3 hybridized | |  | e. | *dsp* hybridized |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 3. Atoms that are *sp*2 hybridized form \_\_\_\_ pi bond(s).   |  |  |  | | --- | --- | --- | |  | a. | 0 | |  | b. | 1 | |  | c. | 2 | |  | d. | 3 | |  | e. | 4 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | multiple bonding | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 4. The hybridization of the central atom in XeF5+ is:   |  |  |  | | --- | --- | --- | |  | a. | *sp* | |  | b. | *sp*2 | |  | c. | *sp*3 | |  | d. | *dsp*3 | |  | e. | *d*2*sp*3 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 5. The hybridization of the central atom in ClF2+ is:   |  |  |  | | --- | --- | --- | |  | a. | *sp* | |  | b. | *sp*2 | |  | c. | *sp*3 | |  | d. | *dsp*3 | |  | e. | *d*2*sp*3 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 6. The hybridization of the central atom in I3– is:   |  |  |  | | --- | --- | --- | |  | a. | *sp* | |  | b. | *sp*2 | |  | c. | *sp*3 | |  | d. | *dsp*3 | |  | e. | *d*2*sp*3 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 7. The hybridization of the central atom in O3 is:   |  |  |  | | --- | --- | --- | |  | a. | *sp* | |  | b. | *sp*2 | |  | c. | *sp*3 | |  | d. | *dsp*3 | |  | e. | *d*2*sp*3 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 8. Which of the following molecules contains a central atom with *sp*2 hybridization?   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. |  |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 9. What hybridization is predicted for the nitrogen atom in the NO3– ion?   |  |  |  | | --- | --- | --- | |  | a. | *sp*2 | |  | b. | *sp*3 | |  | c. | *dsp*3 | |  | d. | *d*2*sp*3 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 10. Which of the following does not contain at least one pi bond?   |  |  |  | | --- | --- | --- | |  | a. | H2CO | |  | b. | CO2 | |  | c. | C2H2 | |  | d. | C3H8 | |  | e. | All of the above (A-D) contain at least one pi bond. |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | True | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | multiple bonding | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/24/2017 6:10 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 11. Consider the following Lewis structure:            Which statement about the molecule is false?   |  |  |  | | --- | --- | --- | |  | a. | There are 10 sigma and 2 pi bonds. | |  | b. | C-2 is *sp*2 hybridized with bond angles of 120°. | |  | c. | Oxygen is *sp*3 hybridized. | |  | d. | This molecule contains 28 valence electrons. | |  | e. | There are some H–C–H bond angles of about 109° in the molecule. |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 12. Which statement about N2 is false?   |  |  |  | | --- | --- | --- | |  | a. | It is a gas at room temperature. | |  | b. | The oxidation state is +3 on one N and –3 on the other. | |  | c. | It has one sigma and two pi bonds between the two atoms. | |  | d. | It can combine with H2 to form NH3. | |  | e. | It has two pairs of nonbonding electrons. |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 13. Consider the following Lewis structure:            What is the hybridization of the atoms O, C-1, C-2, and C-4?   |  |  |  | | --- | --- | --- | |  | a. | *sp*3          *sp*3          *sp*          *sp*2 | |  | b. | *sp*           *sp*3           *sp*          *sp* | |  | c. | *sp*           *sp*2           *sp*          *sp*2 | |  | d. | *sp*2          *sp*3          *sp*2         *sp*3 | |  | e. | *sp*3          *sp*            *sp*          *sp*2 O          C-1         C-2         C-4 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |
| --- |
| Consider the molecule and the following hybridization choices: |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 14. What is the hybridization of the carbon atom that is double-bonded to oxygen?   |  |  |  | | --- | --- | --- | |  | a. | *sp* | |  | b. | *sp*2 | |  | c. | *sp*3 | |  | d. | *dsp*3 | |  | e. | *d*2*sp*3 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 9-1 | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 15. What is the hybridization of the carbon atom that is bonded to chlorine?   |  |  |  | | --- | --- | --- | |  | a. | *sp* | |  | b. | *sp*2 | |  | c. | *sp*3 | |  | d. | *dsp*3 | |  | e. | *d*2*sp*3 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 9-1 | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 16. What is the hybridization of the nitrogen atom?   |  |  |  | | --- | --- | --- | |  | a. | *sp* | |  | b. | *sp*2 | |  | c. | *sp*3 | |  | d. | *dsp*3 | |  | e. | *d*2*sp*3 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 9-1 | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 17. What is the hybridization of the oxygen atom?   |  |  |  | | --- | --- | --- | |  | a. | *sp* | |  | b. | *sp*2 | |  | c. | *sp*3 | |  | d. | *dsp*3 | |  | e. | *d*2*sp*3 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 9-1 | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 18. The hybridization of I in IF4– is   |  |  |  | | --- | --- | --- | |  | a. | *sp* | |  | b. | *sp*2 | |  | c. | *sp*3 | |  | d. | *dsp*3 | |  | e. | *d*2*sp*3 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 19. The hybridization of Cl in ClF2+ is   |  |  |  | | --- | --- | --- | |  | a. | *sp* | |  | b. | *sp*2 | |  | c. | *sp*3 | |  | d. | *dsp*3 | |  | e. | *d*2*sp*3 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 20. Consider the molecule:                 Specify the hybridization of each carbon atom.  ​   |  |  |  |  |  | | --- | --- | --- | --- | --- | | C-1 | C-2 | C-3 | C-4 | C-5 |  |  |  |  | | --- | --- | --- | |  | a. | *sp*2          *sp*2          *sp*2          *sp*3          *sp* | |  | b. | *sp*2          *sp*2          *sp*2          *sp*3          *sp*3 | |  | c. | *sp*2          *sp*2          *sp*3          *sp*3          *sp*2 | |  | d. | *sp*2          *sp*2          *sp*3          *sp*3          *sp*3 | |  | e. | *sp*2          *sp*           *sp*            *sp*2          *sp* |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/2/2017 6:32 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 21. The hybridization of the central atom, Al, in AlBr3 is   |  |  |  | | --- | --- | --- | |  | a. | *sp* | |  | b. | *sp*2 | |  | c. | *sp*3 | |  | d. | *dsp*3 | |  | e. | *d*2*sp*3 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 22. The hybridization of Se in SeF6 is   |  |  |  | | --- | --- | --- | |  | a. | *sp* | |  | b. | *sp*2 | |  | c. | *sp*3 | |  | d. | *dsp*3 | |  | e. | *d*2*sp*3 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 23. The hybridization of Br in BrF3 is   |  |  |  | | --- | --- | --- | |  | a. | *sp* | |  | b. | *sp*2 | |  | c. | *sp*3 | |  | d. | *dsp*3 | |  | e. | *d*2*sp*3 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 24. The hybridization of the lead atom in PbCl4 is   |  |  |  | | --- | --- | --- | |  | a. | *dsp*2 | |  | b. | *sp*2 | |  | c. | *d*2*sp*3 | |  | d. | *dsp*3 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 25. The hybridization of the central atom in NO3– is   |  |  |  | | --- | --- | --- | |  | a. | *p*3 | |  | b. | *sp*2 | |  | c. | *sp*3 | |  | d. | *sp* | |  | e. | *dsp*2 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |
| --- |
| Tetracyanoethylene has the skeleton shown below:  From its Lewis structure determine the following: |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 26. How many sigma and pi bonds are in the molecule?   |  |  |  | | --- | --- | --- | |  | a. | 4 sigma and 5 pi | |  | b. | 6 sigma and 8 pi | |  | c. | 9 sigma and 8 pi | |  | d. | 9 sigma and 9 pi | |  | e. | 5 sigma and 8 pi |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 9-2 | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | multiple bonding | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/2/2017 6:35 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 27. How many nonbonded electron pairs are in the molecule?   |  |  |  | | --- | --- | --- | |  | a. | 0 | |  | b. | 2 | |  | c. | 4 | |  | d. | 5 | |  | e. | 8 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 9-2 | | *KEYWORDS:* | bonding | Chemistry | covalent bonding | general chemistry | Lewis dot formula | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 28. How many of the atoms are *sp*2 hybridized?   |  |  |  | | --- | --- | --- | |  | a. | 2 | |  | b. | 4 | |  | c. | 6 | |  | d. | 8 | |  | e. | 10 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 9-2 | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 29. How many of the atoms are *sp* hybridized?   |  |  |  | | --- | --- | --- | |  | a. | 2 | |  | b. | 4 | |  | c. | 6 | |  | d. | 8 | |  | e. | 10 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 9-2 | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 30. In which of the compounds below is there more than one kind of hybridization (*sp*, *sp*2, *sp*3) for carbon?   |  |  | | --- | --- | | I. | CH3CH2CH2CH3 | | II. | CH3CH = CHCH3 | | III. | CH2 = CH – CH = CH2 | | IV. | H – C ≡ C – H |  |  |  |  | | --- | --- | --- | |  | a. | II and III | |  | b. | II only | |  | c. | III and IV | |  | d. | I, II, and III | |  | e. | III only |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 31. Complete the Lewis structure for the following molecule:                 This molecule has \_\_\_\_\_\_\_\_\_\_ sigma and \_\_\_\_\_\_\_\_\_\_ pi bonds.   |  |  |  | | --- | --- | --- | |  | a. | 4, 5 | |  | b. | 6, 3 | |  | c. | 11, 5 | |  | d. | 13, 2 | |  | e. | 13, 3 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | multiple bonding | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 32. Which of the following substances contains two pi bonds?   |  |  |  | | --- | --- | --- | |  | a. | C2H4 | |  | b. | C3H8 | |  | c. | C2H2 | |  | d. | C2H6 | |  | e. | CH4 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | multiple bonding | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. Consider the molecule C2H4. The hybridization of each C atom is   |  |  |  | | --- | --- | --- | |  | a. | *sp* | |  | b. | *sp*2 | |  | c. | *sp*3 | |  | d. | *dsp*3 | |  | e. | *d*2*sp*3 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 34. A π (pi) bond is the result of the   |  |  |  | | --- | --- | --- | |  | a. | overlap of two *s* orbitals | |  | b. | overlap of an *s* orbital and a *p* orbital | |  | c. | overlap of two *p* orbitals along their axes | |  | d. | sidewise overlap of two parallel *p* orbitals | |  | e. | sidewise overlap of two *s* orbitals |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | multiple bonding | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 35. When a carbon atom has *sp*3 hybridization, it has   |  |  |  | | --- | --- | --- | |  | a. | four π bonds | |  | b. | three π bonds and one σ bond | |  | c. | two π bonds and two σ bonds | |  | d. | one π bond and three σ bonds | |  | e. | four σ bonds |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |
| --- | --- | --- |
| Consider the skeletal structure shown below:   |  |  | | --- | --- | |  | N—C—C—N |   Draw the Lewis structure and answer the following: |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 36. How many of the atoms are *sp* hybridized?   |  |  |  | | --- | --- | --- | |  | a. | 0 | |  | b. | 1 | |  | c. | 2 | |  | d. | 3 | |  | e. | 4 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 9-3 | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 37. How many pi bonds does the molecule contain?   |  |  |  | | --- | --- | --- | |  | a. | 0 | |  | b. | 2 | |  | c. | 4 | |  | d. | 6 | |  | e. | 7 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 9-3 | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | multiple bonding | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |
| --- |
| Use the molecules below to answer the next three questions. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 38. Which molecule(s) have *p* orbitals that share an electron pair to create π bonding?   |  |  |  | | --- | --- | --- | |  | a. | I | |  | b. | II | |  | c. | III | |  | d. | all of the above | |  | e. | none of the above |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 9-4 | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | multiple bonding | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 39. Which molecule(s) have at least one carbon atom that is *sp* hybridized?   |  |  |  | | --- | --- | --- | |  | a. | I | |  | b. | II | |  | c. | III | |  | d. | all of the above | |  | e. | none of the above |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 9-4 | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40. Which molecule(s) have equivalent C–C bonds throughout the molecule?   |  |  |  | | --- | --- | --- | |  | a. | I | |  | b. | II | |  | c. | III | |  | d. | all of the above | |  | e. | none of the above |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.5 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 9-4 | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | molecular orbital and delocalized bonding | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 41. Whenever a set of equivalent tetrahedral atomic orbitals is required, an atom will adopt a set of *sp*3 orbitals.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | True | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | True / False | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 42. The hybridization of the B in BH3 is *sp*3.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | True / False | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 43. The hybridization of a molecule is measured to determine the shape of the molecule.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | True / False | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 44. Which of the following statements is true?   |  |  |  | | --- | --- | --- | |  | a. | Electrons are never found in an antibonding MO. | |  | b. | All antibonding MOs are higher in energy than the atomic orbitals of which they are composed. | |  | c. | Antibonding MOs have electron density mainly outside the space between the two nuclei. | |  | d. | None of the above is true. | |  | e. | Two of the above statements are true. |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | molecular orbital theory | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 45. Which of the following statements is (are) incorrect?   |  |  | | --- | --- | | I. | The hybridization of boron in BF3 is *sp*2. | | II. | The molecule XeF4 is nonpolar. | | III. | The bond order of N2 is three. | | IV. | The molecule HCN has two pi bonds and two sigma bonds. |   ​   |  |  |  | | --- | --- | --- | |  | a. | All four statements are correct. | |  | b. | II is incorrect. | |  | c. | I and IV are incorrect. | |  | d. | II and III are incorrect. | |  | e. | II, III, and IV are incorrect. |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/2/2017 4:41 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 46. Which of the following molecules contains the shortest C–C bond?   |  |  |  | | --- | --- | --- | |  | a. | C2H2 | |  | b. | C2H4 | |  | c. | C2H6 | |  | d. | C2Cl4 | |  | e. | b and d |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bond order | bonding | bonding theories | Chemistry | general chemistry | molecular orbital theory | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. The electron configuration of a particular diatomic species is (σ2s)2(σ\*2s)2(σ2p)2(π2p)2(π\*2p)4. What is the bond order for this species?   |  |  |  | | --- | --- | --- | |  | a. | 1.5 | |  | b. | 1 | |  | c. | 0.5 | |  | d. | 0 | |  | e. | 2 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | bond order | bonding | bonding theories | Chemistry | general chemistry | molecular orbital theory | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 48. What is the bond order of He2+?   |  |  |  | | --- | --- | --- | |  | a. | 0 | |  | b. |  | |  | c. | 1 | |  | d. |  | |  | e. | 2 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bond order | bonding | bonding theories | Chemistry | general chemistry | molecular orbital theory | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 49. If four orbitals on one atom overlap four orbitals on a second atom, how many molecular orbitals will form?   |  |  |  | | --- | --- | --- | |  | a. | 1 | |  | b. | 4 | |  | c. | 8 | |  | d. | 16 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | molecular orbital theory | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 50. Larger bond order means greater bond strength.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | True | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.2 | | *QUESTION TYPE:* | True / False | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bond order | bonding | bonding theories | Chemistry | general chemistry | molecular orbital theory | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 51. When an electron pair is shared in the area centered on a line joining the atoms, a σ (sigma) bond is formed.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | True | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.2 | | *QUESTION TYPE:* | True / False | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | multiple bonding | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 52. As the bond order of a bond increases, the bond energy \_\_\_\_\_\_ and the bond length \_\_\_\_\_\_.   |  |  |  | | --- | --- | --- | |  | a. | increases, increases | |  | b. | decreases, decreases | |  | c. | increases, decreases | |  | d. | decreases, increases | |  | e. | More information is needed to answer this question. |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bond order | bonding | bonding theories | Chemistry | general chemistry | molecular orbital theory | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 53. When comparing Be2 and H2:   |  |  |  | | --- | --- | --- | |  | I. | Be2 is more stable because it contains both bonding and antibonding valence electrons. | |  | II. | H2 has a higher bond order than Be2. | |  | III. | H2 is more stable because it only contains σ1s electrons. | |  | IV. | H2 is more stable because it is diamagnetic, whereas Be2 is paramagnetic. |   ​   |  |  |  | | --- | --- | --- | |  | a. | I, II | |  | b. | III only | |  | c. | II, III | |  | d. | II, III, IV | |  | e. | III, IV |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/2/2017 4:27 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 54. If a molecule demonstrates paramagnetism, then :   |  |  |  | | --- | --- | --- | |  | I. | The substance can have both paired and unpaired electrons. | |  | II. | The bond order is not a whole number. | |  | III. | It can be determined by drawing a Lewis structure. | |  | IV. | It must be an ion. |   ​   |  |  |  | | --- | --- | --- | |  | a. | I, II | |  | b. | I, II, IV | |  | c. | II, III | |  | d. | I only | |  | e. | All of the above are correct. |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/2/2017 4:30 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 55. For which of the following diatomic molecules would the bond order become greater if an electron is removed (i.e., if the molecule is converted to the positive ion in its ground state)?   |  |  |  | | --- | --- | --- | |  | a. | B2 | |  | b. | C2 | |  | c. | P2 | |  | d. | F2 | |  | e. | Na2 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 56. The configuration (σ2s)2(σ2s\*)2(π2py)1(π2px)1 is the molecular orbital description for the ground state of   |  |  |  | | --- | --- | --- | |  | a. | Li2+ | |  | b. | Be2 | |  | c. | B2 | |  | d. | B22– | |  | e. | C2 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 57. Which of the following species is paramagnetic?   |  |  |  | | --- | --- | --- | |  | a. | C2 | |  | b. | B2 | |  | c. | N2 | |  | d. | Li2 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | True | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 58. Which of the following species has the largest dissociation energy?   |  |  |  | | --- | --- | --- | |  | a. | O2 | |  | b. | O2– | |  | c. | O22– | |  | d. | O2+ | |  | e. | O22+ |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bond order | bonding | bonding theories | Chemistry | general chemistry | molecular orbital theory | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 59. The fact that O2 is paramagnetic can be explained by   |  |  |  | | --- | --- | --- | |  | a. | the Lewis structure of O2 | |  | b. | resonance | |  | c. | a violation of the octet rule | |  | d. | the molecular orbital diagram for O2 | |  | e. | hybridization of atomic orbitals in O2 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 60. For how many of the following does the bond order decrease if you add one electron to the neutral molecule?                B2, C2, P2, F2   |  |  |  | | --- | --- | --- | |  | a. | 0 | |  | b. | 1 | |  | c. | 2 | |  | d. | 3 | |  | e. | 4 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 61. Which of the following diatomic molecules has a bond order of 2?   |  |  |  | | --- | --- | --- | |  | a. | B2 | |  | b. | O2 | |  | c. | P2 | |  | d. | F2 | |  | e. | Na2 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | True | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 62. Which of the following has the largest bond order?   |  |  |  | | --- | --- | --- | |  | a. | N2 | |  | b. | N2– | |  | c. | N22– | |  | d. | N2+ | |  | e. | N22+ |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bond order | bonding | bonding theories | Chemistry | general chemistry | molecular orbital theory | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 63. How many of the following: F2, B2, O2, N2 , are paramagnetic?   |  |  |  | | --- | --- | --- | |  | a. | 0 | |  | b. | 1 | |  | c. | 2 | |  | d. | 3 | |  | e. | 4 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 64. Order the following from shortest to longest bond:                C2, B2, H2, N2   |  |  |  | | --- | --- | --- | |  | a. | H2, N2, C2, B2 | |  | b. | N2, C2, B2, H2 | |  | c. | C2, N2, H2, B2 | |  | d. | C2, B2, H2, N2 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 65. Which charge(s) on an O2 ion would give a bond order of 2.5?   |  |  |  | | --- | --- | --- | |  | a. | –2 | |  | b. | –1 | |  | c. | +1 | |  | d. | two of these | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bond order | bonding | bonding theories | Chemistry | general chemistry | molecular orbital theory | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 66. For how many of the following does bond order decrease if you take away one electron from the neutral molecule?                B2, C2, P2, F2   |  |  |  | | --- | --- | --- | |  | a. | 0 | |  | b. | 1 | |  | c. | 2 | |  | d. | 3 | |  | e. | 4 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 67. Which of the following has the shortest bond length?   |  |  |  | | --- | --- | --- | |  | a. | O22– | |  | b. | O2 | |  | c. | O2– | |  | d. | O2+ | |  | e. | Two of these have the shortest bond length. |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 68. Which of the following has a bond order of 1.5?   |  |  |  | | --- | --- | --- | |  | a. | O2+ | |  | b. | N2 | |  | c. | O2– | |  | d. | C2 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bond order | bonding | bonding theories | Chemistry | general chemistry | molecular orbital theory | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 69. How many unpaired electrons in the F22+ ion are based on molecular orbital theory? The  order of the molecular orbitals are (σ2s)(σ\*2s)(σ2p)(π2p)(π\*2p)(σ\*2p).   |  |  |  | | --- | --- | --- | |  | a. | 0 | |  | b. | 1 | |  | c. | 2 | |  | d. | 3 | |  | e. | 4 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 2/9/2017 7:53 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 70. A species has the following MO configuration:             (σ1s)2(σ1s\*)2(σ2s)2(σ2s\*)2(σ2p)2(π2p)2 This substance is   |  |  |  | | --- | --- | --- | |  | a. | paramagnetic with one unpaired electron | |  | b. | paramagnetic with two unpaired electrons | |  | c. | paramagnetic with three unpaired electrons | |  | d. | paramagnetic with four unpaired electrons | |  | e. | diamagnetic |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 71. What is the bond order of Ne2?   |  |  |  | | --- | --- | --- | |  | a. | 0 | |  | b. |  | |  | c. | 1 | |  | d. |  | |  | e. | 2 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bond order | bonding | bonding theories | Chemistry | general chemistry | molecular orbital theory | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 72. What is the bond order of C2+?   |  |  |  | | --- | --- | --- | |  | a. | 0 | |  | b. |  | |  | c. | 1 | |  | d. |  | |  | e. | 2 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bond order | bonding | bonding theories | Chemistry | general chemistry | molecular orbital theory | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 73. Which of the following statements is false?   |  |  |  | | --- | --- | --- | |  | a. | C2 is paramagnetic. | |  | b. | C2 is diamagnetic. | |  | c. | The carbon-carbon bond in C22– is stronger than the one in CH3CH3. | |  | d. | The carbon-carbon bond in C22– is shorter than the one in CH3CH3. | |  | e. | Two of the above. |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 74. According to MO theory, F2 should be diamagnetic.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | True | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | True / False | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 75. The H2– ion is more stable than H2 since it has an additional electron to produce a net lowering of energy.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | True / False | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 76. Paramagnetism is associated with paired electrons.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | True / False | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 77. Which of the following statements about the molecule BN is false?   |  |  |  | | --- | --- | --- | |  | a. | It is paramagnetic. | |  | b. | Its bond order is 2. | |  | c. | The total number of electrons is 12. | |  | d. | It has two pi bonds. | |  | e. | All of these are true. |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.4 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 78. Which of the following statements about the species CN– is false?   |  |  |  | | --- | --- | --- | |  | a. | It is paramagnetic. | |  | b. | The total number of electrons is 14. | |  | c. | Its bond order is 3. | |  | d. | It has two pi bonds. | |  | e. | All of these are true. |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.4 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 79. Which of the nitrogen-containing molecules below is paramagnetic in its lowest energy state?   |  |  |  | | --- | --- | --- | |  | a. | N2 | |  | b. | NO | |  | c. | NH3 | |  | d. | N2H4 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.4 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 80. Which of the following statements is incorrect?   |  |  |  | | --- | --- | --- | |  | a. | For the molecule NO, the molecular orbital model is preferred over the localized electron model because NO contains an unpaired electron. | |  | b. | Electrons in antibonding orbitals will cause a molecule to be paramagnetic. | |  | c. | According to the molecular orbital model, when bonding occurs between hydrogen and bromine to make HBr, the 1*s* orbital of the hydrogen atom no longer exists. | |  | d. | Antibonding electrons are higher in energy than the atomic orbitals from which they came. | |  | e. | At least two of the above are incorrect. |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.4 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 81. Which of the following molecules or ions is not paramagnetic in its ground state?   |  |  |  | | --- | --- | --- | |  | a. | O2 | |  | b. | O2+ | |  | c. | B2 | |  | d. | NO | |  | e. | F2 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.4 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 82. Which of the following electron distributions among the molecular orbitals best describes the NO molecule?   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | σ2s | σ2s\* | π2py=π2px | σ2pz | π2py\*=π2px\* | σ2pz\* |  |  |  |  | | --- | --- | --- | |  | a. | 2            2              4              2              4                2 | |  | b. | 2            2              4              2              4                1 | |  | c. | 2            2              4              1              3                0 | |  | d. | 2            2              4              2              2                0 | |  | e. | 2            2              4              2              1                0 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.4 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | molecular orbital theory | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/2/2017 4:35 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 83. Consider the molecular orbital energy level diagrams for O2 and NO. Which of the following is true?   |  |  |  | | --- | --- | --- | |  | I. | Both molecules are paramagnetic. | |  | II. | The bond strength of O2 is greater than the bond strength of NO. | |  | III. | NO is an example of a homonuclear diatomic molecule. | |  | IV. | The ionization energy of NO is smaller than the ionization energy of NO+. |   ​   |  |  |  | | --- | --- | --- | |  | a. | I only | |  | b. | I and II | |  | c. | I and IV | |  | d. | II and III | |  | e. | I, II, and IV |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 9.4 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/2/2017 4:36 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 84. In the molecular orbital description of CO:   |  |  |  | | --- | --- | --- | |  | a. | The highest energy electrons occupy antibonding orbitals. | |  | b. | Six molecular orbitals contain electrons. | |  | c. | There are two unpaired electrons. | |  | d. | The bond order is 3. | |  | e. | All of the above are false. |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.4 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 85. Consider the molecular orbital description of the NO– anion. Which of the following statements is false?   |  |  |  | | --- | --- | --- | |  | a. | NO– is paramagnetic. | |  | b. | NO– is isoelectronic with CO. | |  | c. | The bond energy in NO+ is greater than the bond energy in NO–. | |  | d. | The bond order in NO– is 2. | |  | e. | Statements A through D are false. |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.4 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 86. Which of the following has the greatest bond strength?   |  |  |  | | --- | --- | --- | |  | a. | B2 | |  | b. | O2– | |  | c. | CN– | |  | d. | O2+ | |  | e. | NO– |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 9.4 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 87. The bond order in the NO molecule is   |  |  |  | | --- | --- | --- | |  | a. | 1 | |  | b. |  | |  | c. | 2 | |  | d. |  | |  | e. | 3 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bond order | bonding | bonding theories | Chemistry | general chemistry | molecular orbital theory | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 88. The CO molecule has the bond order:   |  |  |  | | --- | --- | --- | |  | a. | 0 | |  | b. | 1 | |  | c. | 2 | |  | d. | 3 | |  | e. | 4 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bond order | bonding | bonding theories | Chemistry | general chemistry | molecular orbital theory | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 89. The bond order for CN– is 2.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.4 | | *QUESTION TYPE:* | True / False | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bond order | bonding | bonding theories | Chemistry | general chemistry | molecular orbital theory | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 90. Which of the following statements about the CO32– ion is false?   |  |  |  | | --- | --- | --- | |  | a. | The orbitals on the carbon atom are *sp*2 hybridized. | |  | b. | The ion is expected to be diamagnetic. | |  | c. | The C–O bonds are different lengths. | |  | d. | The ion has a total of 24 electrons. | |  | e. | All the above statements are true. |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.5 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | molecular orbital and delocalized bonding | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 91. The following statements concern molecules that require resonance. Which is true?   |  |  |  | | --- | --- | --- | |  | a. | The pi bonding is most clearly delocalized. | |  | b. | The sigma bonding is most clearly delocalized. | |  | c. | Both the sigma and pi bonding are delocalized. | |  | d. | The benzene molecule is best described by the MO theory. | |  | e. | The benzene molecule is best described by the localized electron model. |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.5 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | molecular orbital and delocalized bonding | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 92. Sulfur trioxide is known to be planar with all the oxygen atoms equidistant from the central sulfur atom. On the basis of these facts, which of the following conclusions may be drawn concerning this molecule?  I.   It can be represented by three equivalent resonance structures.  II. The dipoles associated with each S–O bond are equal in magnitude.  III. The sulfur atom is *sp*2 hybridized.   |  |  |  | | --- | --- | --- | |  | a. | I only | |  | b. | II only | |  | c. | III only | |  | d. | I and II only | |  | e. | I, II, and III |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.5 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | molecular orbital and delocalized bonding | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/2/2017 4:37 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 93. How many electrons are involved in pi bonding in benzene, C6H6?   |  |  |  | | --- | --- | --- | |  | a. | 12 | |  | b. | 30 | |  | c. | 3 | |  | d. | 6 | |  | e. | 18 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.5 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | molecular orbital and delocalized bonding | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 94. Which of these statements about benzene is true?   |  |  |  | | --- | --- | --- | |  | a. | All carbon atoms in benzene are *sp*3 hybridized. | |  | b. | Benzene contains only π bonds between C atoms. | |  | c. | The bond order of each C–C bond in benzene is 1.5. | |  | d. | Benzene is an example of a molecule that displays ionic bonding. | |  | e. | All of these statements are false. |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.5 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 95. Consider the benzene molecule. Which of the following statements about the molecule is false?   |  |  |  | | --- | --- | --- | |  | a. | All six C–C bonds are known to be equivalent. | |  | b. | Each carbon atom is *sp*2 hybridized. | |  | c. | The localized electron model must invoke resonance to account for the six equal C–C bonds. | |  | d. | It has delocalized pi bonding in the molecule. | |  | e. | The pi bonds of carbon involve *sp*2 orbitals. |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.5 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | molecular orbital and delocalized bonding | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/2/2017 4:38 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 96. The C–C–H bond angles in ethylene, C2H4, are 120°. What is the hybridization of the carbon orbitals?   |  |  | | --- | --- | | *ANSWER:* | *sp*2 | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 97. The mixing of native atomic orbitals to form special orbitals for bonding is called \_\_\_\_\_\_\_\_\_\_.   |  |  | | --- | --- | | *ANSWER:* | hybridization | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 98. Consider three molecules – A, B, C. Molecule A has a hybridization of *sp*3. Molecule B has two more effective pairs (electron pairs around the central atom) than molecule A. Molecule C consists of one σ bond and two π bonds. Give the molecular structure, hybridization, bond angles, and an example for each molecule.   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | *ANSWER:* | |  |  |  |  | | --- | --- | --- | --- | |  | **Molecule A** | **Molecule B** | **Molecule C** | | Molecular Structure | tetrahedral | octahedral | linear | | Hybridization | *sp*3 | *d*2*sp*3 | *sp* | | Bond Angles | 109.5° | 90°, 180° | 180° | | Example | CH4 | SF6 | CO | | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 99. Consider the structure of glycine, the simplest amino acid:  a) Indicate the hybridizations at each N and C atom in the molecule. b) What is the total number of bonds in the molecule? c) What is the total number of π bonds in the molecule?   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | *ANSWER:* | |  |  |  | | --- | --- | --- | | a) | C1 | *sp*2 | |  | C2 | *sp*3 | |  | N | *sp*3 | | b) | 10 | bonds | | c) | 1 | π bond | | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 100. A(n) \_\_\_\_\_\_\_\_\_\_ molecular orbital is lower in energy than the atomic orbital of which it is composed.   |  |  | | --- | --- | | *ANSWER:* | bonding | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.2 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding orbital | bonding theories | Chemistry | general chemistry | molecular orbital theory | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 101. The number of molecular orbitals formed is always \_\_\_\_\_\_\_\_\_\_ the number of atomic orbitals combined.   |  |  | | --- | --- | | *ANSWER:* | the same as | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.2 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | molecular orbital theory | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 102. \_\_\_\_\_\_\_\_\_\_ is the difference between the number of bonding electrons and the number of antibonding electrons divided by two.   |  |  | | --- | --- | | *ANSWER:* | Bond order | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.2 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bond order | bonding | bonding theories | Chemistry | general chemistry | molecular orbital theory | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 103. \_\_\_\_\_\_\_\_\_\_ causes a substance to be attracted into the inducing magnetic field.   |  |  | | --- | --- | | *ANSWER:* | Paramagnetism | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 104. Draw a molecular orbital diagram for O2 and N2. Using molecular orbital theory, explain why the removal of one electron in O2 strengthens bonding, while the removal of one electron in N2 weakens bonding.   |  |  | | --- | --- | | *ANSWER:* | The bond order for N2 is 3, but removing an electron will make the bond order 2.5. The bond order for O2 is 2, but removing an electron will make the bond order 2.5. In N2 the electron is removed from a bonding orbital (σ2p), whereas in O2 the electron is removed from an antibonding orbital (π2p\*).  See Sec. 9.3 of Zumdahl, Chemistry | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 105. Give the bond order for each of the following:   |  |  | | --- | --- | | a) | H2 | | b) | H2+ | | c) | H2– | | d) | CN– | | e) | CN | | f) | CN+ |  |  |  | | --- | --- | | *ANSWER:* | a) 1 b)  c)  d) 3 e)  f) 2 | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.4 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 106. Which of the following are paramagnetic?                O2 O2– O22– B2 C2 N2 F2 CN– P2   |  |  | | --- | --- | | *ANSWER:* | O2, O2–,B2 | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.4 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 107. The concept of \_\_\_\_\_\_\_\_\_\_ is required for certain molecules because the localized electron model assumes electrons are located between a given pair of atoms in a molecule.   |  |  | | --- | --- | | *ANSWER:* | resonance | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.5 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | molecular orbital and delocalized bonding | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 108. Explain the concept of delocalization of electrons in SO3. Indicate how this idea relates to resonance.   |  |  | | --- | --- | | *ANSWER:* | When we draw the Lewis dot structure for SO3, we must share a pair of electrons from one of the oxygens back to the sulfur to give the sulfur an octet. Since there are three equivalent oxygens in the Lewis structure, we can represent this equally well with three different Lewis structures. In each of these structures, there is a double bond to one of the oxygens. The double bond, therefore, is delocalized over the molecule, and these three Lewis structures are resonance structures that, as a set, represent that delocalization. See Sec. 9.5 of Zumdahl, *Chemistry*. | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 9.5 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | molecular orbital and delocalized bonding | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 109. The hybridization of the central atom in SF4 is:   |  |  |  | | --- | --- | --- | |  | a. | *sp* | |  | b. | *sp*2 | |  | c. | *sp*3 | |  | d. | *dsp*3 | |  | e. | *d*2*sp*3 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 110. Which of the following contains the strongest bond?   |  |  |  | | --- | --- | --- | |  | a. | N2 | |  | b. | N2– | |  | c. | N22– | |  | d. | N2+ | |  | e. | N22+ |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bond energy | bonding | bonding theories | Chemistry | general chemistry | molecular orbital theory | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 111. Which of the following contains the shortest bond?   |  |  |  | | --- | --- | --- | |  | a. | N2 | |  | b. | N2– | |  | c. | N22– | |  | d. | N2+ | |  | e. | N22+ |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bond order | bonding | bonding theories | Chemistry | general chemistry | molecular orbital theory | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 112. Which of the following has the highest bond dissociation energy?   |  |  |  | | --- | --- | --- | |  | a. | N2 | |  | b. | N2– | |  | c. | N22– | |  | d. | N2+ | |  | e. | N22+ |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bond energy | bonding | bonding theories | Chemistry | general chemistry | molecular orbital theory | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 113. Which charge(s) on an N2 ion would give a bond order of 2.5?   |  |  |  | | --- | --- | --- | |  | a. | –2 | |  | b. | –1 | |  | c. | +1 | |  | d. | +2 | |  | e. | two of the choices |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bond order | bonding | bonding theories | Chemistry | general chemistry | molecular orbital theory | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 114. For how many of the following does the bond order increase if you add one electron to the neutral molecule?                B2, C2, P2, F2   |  |  |  | | --- | --- | --- | |  | a. | 0 | |  | b. | 1 | |  | c. | 2 | |  | d. | 3 | |  | e. | 4 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | diatomic molecule | general chemistry | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 115. Which of the following molecules or ions does not contain a central atom with *sp*2 hybridization?   |  |  |  | | --- | --- | --- | |  | a. | nitrate | |  | b. | carbonate | |  | c. | sulfite | |  | d. | C2H4 | |  | e. | BF3 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 116. Which of the following molecules or ions contains a central atom with *dsp*3 hybridization?   |  |  |  | | --- | --- | --- | |  | a. | SO42- | |  | b. | SF4 | |  | c. | SiF4 | |  | d. | ClO42- | |  | e. | all of these contain a central atom with *sp*3 hybridization |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 117. Which of the following molecules or ions does not contain a central atom with *sp*2 hybridization?   |  |  |  | | --- | --- | --- | |  | a. | nitrate | |  | b. | ozone | |  | c. | H3O+ | |  | d. | CH3+ | |  | e. | SO2 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 118. Which of the following molecules or ions does not contain a central atom with *d*2*sp*3 hybridization?   |  |  |  | | --- | --- | --- | |  | a. | XeF5+ | |  | b. | IF4- | |  | c. | SF6 | |  | d. | SeF5- | |  | e. | all of these contain a central atom with *d*2*sp*3 hybridization |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 9.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | bonding | bonding theories | Chemistry | general chemistry | hybridization | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:36 PM | | *DATE MODIFIED:* | 3/4/2016 4:36 PM | |

|  |
| --- |
| The skeletal structure of a compound that comes from the hemp plant, *Cannabis sativa,* is shown below*.* Use this skeletal structure to answer the next **two (2)** questions.  ​ |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 119. How many hydrogen atoms are in this molecule?   |  |  |  | | --- | --- | --- | |  | a. | 18 | |  | b. | 30 | |  | c. | 35 | |  | d. | 28 | |  | e. | 26 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Hemp Plant 1 | | *DATE CREATED:* | 3/8/2017 11:10 PM | | *DATE MODIFIED:* | 3/8/2017 11:19 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 120. How many carbon atoms have **no** hydrogen atoms attached to them?   |  |  |  | | --- | --- | --- | |  | a. | 7 | |  | b. | 8 | |  | c. | 9 | |  | d. | 10 | |  | e. | 11 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Hemp Plant 1 | | *DATE CREATED:* | 3/8/2017 11:21 PM | | *DATE MODIFIED:* | 3/8/2017 11:22 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 121. Which of the following statements regarding the skeletal structure of the organic molecule shown below is/are **true**?    I.   A sp2 hybrid orbital on C-1 overlaps with a sp hybrid orbital on C-2 to form the sigma bond between       C-1 and C-2.  II.  The π bonds between C-2 and C-3 are formed from overlap of sp hybrid orbitals.  III. There are 10 sigma bonds in this molecule.  IV. The bond angle about C-2 is 109.5o.  V. The lone pair on the nitrogen atom is in a sp2 orbital.   |  |  |  | | --- | --- | --- | |  | a. | I only | |  | b. | II and V only | |  | c. | III only | |  | d. | I and III only | |  | e. | II, IV and V only |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *DATE CREATED:* | 3/8/2017 11:23 PM | | *DATE MODIFIED:* | 3/27/2017 12:14 AM | |

|  |
| --- |
| The skeletal structure of a compound that comes from the hemp plant, *Cannabis sativa,* is shown below. Use this skeletal structure to answer the next **two (2)** questions. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 122. How many hydrogen atoms are in this molecule?   |  |  |  | | --- | --- | --- | |  | a. | 18 | |  | b. | 30 | |  | c. | 35 | |  | d. | 28 | |  | e. | 26 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Hemp Plant 2 | | *DATE CREATED:* | 3/8/2017 11:29 PM | | *DATE MODIFIED:* | 3/8/2017 11:32 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 123. How many carbon atoms have **no** hydrogen atoms attached to them?   |  |  |  | | --- | --- | --- | |  | a. | 7 | |  | b. | 8 | |  | c. | 9 | |  | d. | 10 | |  | e. | 11 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Hemp Plant 2 | | *DATE CREATED:* | 3/8/2017 11:32 PM | | *DATE MODIFIED:* | 3/8/2017 11:34 PM | |

|  |
| --- |
| The skeletal structure of a compound that comes from the hemp plant, *Cannabis sativa,* is shown below. Use this skeletal structure to answer the next **two (2)** questions. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 124. How many hydrogen atoms are in this molecule?   |  |  |  | | --- | --- | --- | |  | a. | 18 | |  | b. | 30 | |  | c. | 35 | |  | d. | 28 | |  | e. | 26 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Hemp Plant 3 | | *DATE CREATED:* | 3/8/2017 11:35 PM | | *DATE MODIFIED:* | 3/8/2017 11:46 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 125. How many carbon atoms have **no** hydrogen atoms attached to them?   |  |  |  | | --- | --- | --- | |  | a. | 7 | |  | b. | 8 | |  | c. | 9 | |  | d. | 10 | |  | e. | 11 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Hemp Plant 3 | | *DATE CREATED:* | 3/8/2017 11:47 PM | | *DATE MODIFIED:* | 3/8/2017 11:48 PM | |

|  |
| --- |
| The skeletal structure of a mildly narcotic compound that comes from the medicinal plant *Leonurus sibiricus,* is shown below*.* Use this skeletal structure to answer the next **two (2)** questions.  ​ |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 126. How many hydrogen atoms are in this molecule?   |  |  |  | | --- | --- | --- | |  | a. | 40 | |  | b. | 30 | |  | c. | 34 | |  | d. | 28 | |  | e. | 36 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Leonurus sibiricus 1 | | *DATE CREATED:* | 3/8/2017 11:49 PM | | *DATE MODIFIED:* | 3/9/2017 1:21 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 127. How many carbon atoms have **no** hydrogen atoms attached to them?   |  |  |  | | --- | --- | --- | |  | a. | 3 | |  | b. | 4 | |  | c. | 5 | |  | d. | 6 | |  | e. | 7 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Leonurus sibiricus 1 | | *DATE CREATED:* | 3/9/2017 12:27 AM | | *DATE MODIFIED:* | 3/9/2017 12:28 AM | |

|  |
| --- |
| The skeletal structure of a compound isolated from the Indian plant, *Rauwolfia tetraphylla*is shown below*.*Use this skeletal structure to answer the next **three (3)**questions. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 128. How many hydrogen atoms are in this molecule?   |  |  |  | | --- | --- | --- | |  | a. | 40 | |  | b. | 30 | |  | c. | 34 | |  | d. | 28 | |  | e. | 36 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Rauwolfia tetraphylla 1 | | *DATE CREATED:* | 3/9/2017 12:55 AM | | *DATE MODIFIED:* | 3/9/2017 1:17 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 129. How many carbon atoms have **no** hydrogen atoms attached to them?   |  |  |  | | --- | --- | --- | |  | a. | 3 | |  | b. | 4 | |  | c. | 5 | |  | d. | 6 | |  | e. | 7 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Rauwolfia tetraphylla 1 | | *DATE CREATED:* | 3/9/2017 1:22 AM | | *DATE MODIFIED:* | 3/9/2017 1:23 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 130. How many carbon atoms are sp2 hybridized?   |  |  |  | | --- | --- | --- | |  | a. | 6 | |  | b. | 4 | |  | c. | 2 | |  | d. | 5 | |  | e. | 3 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Rauwolfia tetraphylla 1 | | *DATE CREATED:* | 3/9/2017 1:24 AM | | *DATE MODIFIED:* | 3/9/2017 1:25 AM | |

|  |
| --- |
| The skeletal structure of a compound isolated from fruits of the tree, *Vitex agnuscastus,*is shown below*.* Use this skeletal structure to answer the next **three (3)** questions. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 131. How many hydrogen atoms are in this molecule?   |  |  |  | | --- | --- | --- | |  | a. | 34 | |  | b. | 30 | |  | c. | 40 | |  | d. | 28 | |  | e. | 36 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Vitex agnuscastus 1 | | *DATE CREATED:* | 3/9/2017 1:29 AM | | *DATE MODIFIED:* | 3/9/2017 1:34 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 132. How many carbon atoms have **no** hydrogen atoms attached to them?   |  |  |  | | --- | --- | --- | |  | a. | 3 | |  | b. | 4 | |  | c. | 5 | |  | d. | 6 | |  | e. | 7 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Vitex agnuscastus 1 | | *DATE CREATED:* | 3/9/2017 1:35 AM | | *DATE MODIFIED:* | 3/9/2017 1:36 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 133. How many carbon atoms are sp2 hybridized?   |  |  |  | | --- | --- | --- | |  | a. | 6 | |  | b. | 4 | |  | c. | 2 | |  | d. | 5 | |  | e. | 3 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Vitex agnuscastus 1 | | *DATE CREATED:* | 3/9/2017 1:36 AM | | *DATE MODIFIED:* | 3/9/2017 1:38 AM | |

|  |
| --- |
| The skeletal structure of a compound isolated from the South American plant, *Austroeupatorium inulifolium* is shown below*.* Use this skeletal structure to answer the next **three (3)** questions. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 134. How many hydrogen atoms are in this molecule?   |  |  |  | | --- | --- | --- | |  | a. | 34 | |  | b. | 36 | |  | c. | 25 | |  | d. | 28 | |  | e. | 30 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Austroeupatorium inulifolium 1 | | *DATE CREATED:* | 3/9/2017 1:39 AM | | *DATE MODIFIED:* | 3/9/2017 1:44 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 135. How many carbon atoms have **no** hydrogen atoms attached to them?   |  |  |  | | --- | --- | --- | |  | a. | 3 | |  | b. | 4 | |  | c. | 5 | |  | d. | 6 | |  | e. | 7 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Austroeupatorium inulifolium 1 | | *DATE CREATED:* | 3/9/2017 1:45 AM | | *DATE MODIFIED:* | 3/9/2017 1:48 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 136. How many atoms are sp2 hybridized?   |  |  |  | | --- | --- | --- | |  | a. | 6 | |  | b. | 10 | |  | c. | 12 | |  | d. | 8 | |  | e. | 13 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Austroeupatorium inulifolium 1 | | *DATE CREATED:* | 3/9/2017 1:48 AM | | *DATE MODIFIED:* | 3/9/2017 1:51 AM | |

|  |
| --- |
| The skeletal structure of loratadine (Claritin®), which is one of the top-selling antihistamines in the United States, is shown below. Use this skeletal structure to answer the next **three (3)** questions. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 137. How many hydrogen atoms are in this compound?   |  |  |  | | --- | --- | --- | |  | a. | 21 | |  | b. | 17 | |  | c. | 20 | |  | d. | 29 | |  | e. | 23 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Loratadine 1 | | *DATE CREATED:* | 3/9/2017 1:53 AM | | *DATE MODIFIED:* | 3/9/2017 1:59 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 138. How many carbon atoms have **no** hydrogen atoms attached to them?   |  |  |  | | --- | --- | --- | |  | a. | 4 | |  | b. | 5 | |  | c. | 6 | |  | d. | 7 | |  | e. | 8 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Loratadine 1 | | *DATE CREATED:* | 3/9/2017 2:01 AM | | *DATE MODIFIED:* | 3/9/2017 2:02 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 139. How many atoms are sp2 hybridized?   |  |  |  | | --- | --- | --- | |  | a. | 10 | |  | b. | 18 | |  | c. | 13 | |  | d. | 16 | |  | e. | 12 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Loratadine 1 | | *DATE CREATED:* | 3/9/2017 2:03 AM | | *DATE MODIFIED:* | 3/9/2017 2:04 AM | |

|  |
| --- |
| Use the following skeletal structure of the potent antitumor compound called dolastatin 10 to answer the next **two** (**2**) questions. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 140. Lone pairs are not shown in this skeletal structure. How many lone pairs would be present if all lone pairs were shown?   |  |  |  | | --- | --- | --- | |  | a. | 21 | |  | b. | 18 | |  | c. | 24 | |  | d. | 19 | |  | e. | 20 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Dolastatin10 1 | | *DATE CREATED:* | 3/9/2017 2:06 AM | | *DATE MODIFIED:* | 3/9/2017 2:09 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 141. How many carbon atoms have **no** hydrogen atoms attached to them?   |  |  |  | | --- | --- | --- | |  | a. | 5 | |  | b. | 6 | |  | c. | 8 | |  | d. | 9 | |  | e. | 4 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Dolastatin10 1 | | *DATE CREATED:* | 3/9/2017 2:10 AM | | *DATE MODIFIED:* | 3/9/2017 2:11 AM | |

|  |
| --- |
| Use the following skeletal structure of the potent antitumor compound called dolastatin 15 to answer the next **two** (**2**) questions. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 142. Lone pairs are not shown in this skeletal structure. How many lone pairs would be present if all lone pairs were shown?   |  |  |  | | --- | --- | --- | |  | a. | 22 | |  | b. | 18 | |  | c. | 24 | |  | d. | 20 | |  | e. | 26 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Dolastatin15 1 | | *DATE CREATED:* | 3/9/2017 2:25 AM | | *DATE MODIFIED:* | 3/9/2017 2:30 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 143. How many carbon atoms have **no** hydrogen atoms attached to them?   |  |  |  | | --- | --- | --- | |  | a. | 9 | |  | b. | 12 | |  | c. | 14 | |  | d. | 8 | |  | e. | 10 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Dolastatin15 1 | | *DATE CREATED:* | 3/9/2017 2:31 AM | | *DATE MODIFIED:* | 3/9/2017 2:32 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 144. Use the skeletal structure of the compound shown below to determine which of the following statements, I-IV, is/are **false**.  Note: internuclear means between nuclei.    I.  The π bond between C-2 and C-3 is formed by overlap of sp2 hybrid orbitals. II. There are twelve σ bonds in this molecule. III. The C-2 and C-3 atoms cannot rotate about the internuclear axis between the two atoms since the π bond would break. IV. A sp2 hybrid orbital on C-1 overlaps with a sp hybrid orbital on C-2 to form the sigma bond    between C-1 and C-2.   |  |  |  | | --- | --- | --- | |  | a. | I and IV | |  | b. | II and III | |  | c. | IV only | |  | d. | I-III | |  | e. | III and IV |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *DATE CREATED:* | 3/9/2017 2:33 AM | | *DATE MODIFIED:* | 3/27/2017 12:34 AM | |

|  |
| --- |
| **Complete the Lewis structure** below of the organic molecule, obtained from the hemp plant, *Cannabis sativa.*Using both the completed Lewis structure and only the concepts taught about the hybridization model; answer the following questions:    ​ |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 145. What is the approximate bond angle about the atom labeled 2?   |  |  |  | | --- | --- | --- | |  | a. | 60o | |  | b. | 90o | |  | c. | 109o | |  | d. | 120o | |  | e. | 180o |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Cannabis sativa 1 | | *DATE CREATED:* | 3/9/2017 4:30 AM | | *DATE MODIFIED:* | 3/9/2017 4:38 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 146. What is the approximate bond angle about the atom labeled 5?   |  |  |  | | --- | --- | --- | |  | a. | 60o | |  | b. | 90o | |  | c. | 109o | |  | d. | 120o | |  | e. | 180o |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Cannabis sativa 1 | | *DATE CREATED:* | 3/9/2017 4:39 AM | | *DATE MODIFIED:* | 3/9/2017 6:49 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 147. How many atoms are sp3 hybridized?   |  |  |  | | --- | --- | --- | |  | a. | 6 | |  | b. | 7 | |  | c. | 8 | |  | d. | 9 | |  | e. | 10 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Cannabis sativa 1 | | *DATE CREATED:* | 3/9/2017 6:50 AM | | *DATE MODIFIED:* | 3/10/2017 12:50 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 148. How many p bonds are in this organic molecule?   |  |  |  | | --- | --- | --- | |  | a. | 3 | |  | b. | 4 | |  | c. | 5 | |  | d. | 6 | |  | e. | 7 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Cannabis sativa 1 | | *DATE CREATED:* | 3/9/2017 7:02 AM | | *DATE MODIFIED:* | 3/9/2017 7:06 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 149. What is the hybridization of the atom labeled 1?   |  |  |  | | --- | --- | --- | |  | a. | sp | |  | b. | sp2 | |  | c. | sp3 | |  | d. | dsp3 | |  | e. | d2sp3 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Cannabis sativa 1 | | *DATE CREATED:* | 3/9/2017 7:06 AM | | *DATE MODIFIED:* | 3/9/2017 7:08 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 150. What is the hybridization of the atom labeled 3?   |  |  |  | | --- | --- | --- | |  | a. | sp | |  | b. | sp2 | |  | c. | sp3 | |  | d. | dsp3 | |  | e. | d2sp3 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Cannabis sativa 1 | | *DATE CREATED:* | 3/9/2017 7:08 AM | | *DATE MODIFIED:* | 3/9/2017 7:10 AM | |

|  |
| --- |
| **Complete the Lewis structure** below of the organic molecule, obtained from the hemp plant, *Cannabis sativa.*  Using both the completed Lewis structure and only the concepts taught about the hybridization model; answer the following questions: |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 151. What is the approximate bond angle about the atom labeled 3?   |  |  |  | | --- | --- | --- | |  | a. | 60o | |  | b. | 90o | |  | c. | 109o | |  | d. | 120o | |  | e. | 180o |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Cannabis sativa 2 | | *DATE CREATED:* | 3/9/2017 7:11 AM | | *DATE MODIFIED:* | 3/9/2017 7:15 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 152. How many atoms are sp2 hybridized?   |  |  |  | | --- | --- | --- | |  | a. | 8 | |  | b. | 9 | |  | c. | 10 | |  | d. | 11 | |  | e. | 12 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Cannabis sativa 2 | | *DATE CREATED:* | 3/9/2017 7:19 AM | | *DATE MODIFIED:* | 3/9/2017 7:20 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 153. How many p bonds are in this organic molecule?   |  |  |  | | --- | --- | --- | |  | a. | 3 | |  | b. | 4 | |  | c. | 5 | |  | d. | 6 | |  | e. | 7 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Cannabis sativa 2 | | *DATE CREATED:* | 3/9/2017 7:20 AM | | *DATE MODIFIED:* | 3/9/2017 7:21 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 154. What is the hybridization of the atom labeled 1?   |  |  |  | | --- | --- | --- | |  | a. | sp | |  | b. | sp2 | |  | c. | sp3 | |  | d. | dsp3 | |  | e. | d2sp3 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Cannabis sativa 2 | | *DATE CREATED:* | 3/9/2017 7:22 AM | | *DATE MODIFIED:* | 3/9/2017 7:24 AM | |

|  |
| --- |
| **Complete the Lewis structure** below of the organic molecule, obtained from the hemp plant, *Cannabis sativa.*Using both the completed Lewis structure and only the concepts taught about the hybridization model; answer the following questions: |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 155. What is the approximate bond angle about the atom labeled 5?   |  |  |  | | --- | --- | --- | |  | a. | 60o | |  | b. | 90o | |  | c. | 109o | |  | d. | 120o | |  | e. | 180o |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Cannabis sativa 3 | | *DATE CREATED:* | 3/9/2017 7:25 AM | | *DATE MODIFIED:* | 3/9/2017 7:34 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 156. How many atoms are sp2 hybridized?   |  |  |  | | --- | --- | --- | |  | a. | 8 | |  | b. | 9 | |  | c. | 10 | |  | d. | 11 | |  | e. | 12 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Cannabis sativa 3 | | *DATE CREATED:* | 3/9/2017 7:35 AM | | *DATE MODIFIED:* | 3/9/2017 7:35 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 157. How many p bonds are in this organic molecule?   |  |  |  | | --- | --- | --- | |  | a. | 3 | |  | b. | 4 | |  | c. | 5 | |  | d. | 6 | |  | e. | 7 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Cannabis sativa 3 | | *DATE CREATED:* | 3/9/2017 7:36 AM | | *DATE MODIFIED:* | 3/9/2017 7:40 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 158. What is the hybridization of the atom labeled 3?   |  |  |  | | --- | --- | --- | |  | a. | sp | |  | b. | sp2 | |  | c. | sp3 | |  | d. | dsp3 | |  | e. | d2sp3 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Cannabis sativa 3 | | *DATE CREATED:* | 3/9/2017 7:40 AM | | *DATE MODIFIED:* | 3/9/2017 7:41 AM | |

|  |
| --- |
| **Complete the Lewis structure** below of the organic molecule, Lucentamycin A, a marine-derived peptide natural product that is toxic to living cells. Using both the completed Lewis structure and only the concepts taught about the hybridization model; answer the following **four (4)** questions: |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 159. What is the approximate bond angle about the atom labeled 2?   |  |  |  | | --- | --- | --- | |  | a. | 60o | |  | b. | 90o | |  | c. | 109.5o | |  | d. | 120o | |  | e. | 180o |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Lucentamycin A 1 | | *DATE CREATED:* | 3/9/2017 7:42 AM | | *DATE MODIFIED:* | 3/9/2017 7:46 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 160. How many carbon atoms are sp3 hybridized?   |  |  |  | | --- | --- | --- | |  | a. | 13 | |  | b. | 15 | |  | c. | 16 | |  | d. | 18 | |  | e. | 25 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Lucentamycin A 1 | | *DATE CREATED:* | 3/9/2017 7:47 AM | | *DATE MODIFIED:* | 3/9/2017 7:48 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 161. How many atoms are sp2 hybridized?   |  |  |  | | --- | --- | --- | |  | a. | 25 | |  | b. | 13 | |  | c. | 18 | |  | d. | 15 | |  | e. | 21 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Lucentamycin A 1 | | *DATE CREATED:* | 3/9/2017 7:49 AM | | *DATE MODIFIED:* | 3/9/2017 7:50 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 162. What is the total number of unhybridized p orbitals present in the carbon atoms of ring A?   |  |  |  | | --- | --- | --- | |  | a. | 5 | |  | b. | 6 | |  | c. | 7 | |  | d. | 0 | |  | e. | 9 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Lucentamycin A 1 | | *DATE CREATED:* | 3/9/2017 7:50 AM | | *DATE MODIFIED:* | 3/9/2017 7:53 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 163. What is the hybridization of the atom labeled 1?   |  |  |  | | --- | --- | --- | |  | a. | sp | |  | b. | sp2 | |  | c. | sp3 | |  | d. | dsp3 | |  | e. | d2sp3 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Lucentamycin A 1 | | *DATE CREATED:* | 3/9/2017 7:54 AM | | *DATE MODIFIED:* | 3/9/2017 7:55 AM | |

|  |
| --- |
| **Complete the Lewis structure** below of the organic molecule, amoxicillin, which belongs to the family of semisynthetic penicillins. Using both the completed Lewis structure and only the concepts taught about the hybridization model, answer the next **five (5)** questions. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 164. How many atoms in the completed Lewis structure use hybrid orbitals with bond angles of approximately 109.5o between them?   |  |  |  | | --- | --- | --- | |  | a. | 14 | |  | b. | 16 | |  | c. | 13 | |  | d. | 15 | |  | e. | 18 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | amoxicillin 1 | | *DATE CREATED:* | 3/9/2017 7:57 AM | | *DATE MODIFIED:* | 3/9/2017 8:01 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 165. How many atoms in the completed Lewis structure use hybrid orbitals with bond angles of approximately 120o between them?   |  |  |  | | --- | --- | --- | |  | a. | 12 | |  | b. | 9 | |  | c. | 8 | |  | d. | 14 | |  | e. | 6 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | amoxicillin 1 | | *DATE CREATED:* | 3/9/2017 8:02 AM | | *DATE MODIFIED:* | 3/9/2017 8:03 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 166. How many atoms in the completed Lewis structure are sp2 hybridized?   |  |  |  | | --- | --- | --- | |  | a. | 12 | |  | b. | 10 | |  | c. | 8 | |  | d. | 14 | |  | e. | 6 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | amoxicillin 1 | | *DATE CREATED:* | 3/9/2017 8:03 AM | | *DATE MODIFIED:* | 3/9/2017 8:04 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 167. How many atoms in the completed Lewis structure are sp3 hybridized?   |  |  |  | | --- | --- | --- | |  | a. | 14 | |  | b. | 16 | |  | c. | 13 | |  | d. | 15 | |  | e. | 18 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | amoxicillin 1 | | *DATE CREATED:* | 3/9/2017 8:05 AM | | *DATE MODIFIED:* | 3/9/2017 8:06 AM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 168. How many lone pairs are in the completed Lewis structure?   |  |  |  | | --- | --- | --- | |  | a. | 15 | |  | b. | 20 | |  | c. | 12 | |  | d. | 18 | |  | e. | 10 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | amoxicillin 1 | | *DATE CREATED:* | 3/9/2017 8:06 AM | | *DATE MODIFIED:* | 3/9/2017 8:07 AM | |

|  |
| --- |
| **Complete the Lewis structure** below of an organic molecule isolated from the South American plant, *Austroeupatorium inulifolium.* Using both the completed Lewis structure and only the concepts taught about the hybridization model, answer the next **four (4)** questions. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 169. How many atoms in the completed Lewis structure use hybrid orbitals with bond angles of approximately 109.5o between them?   |  |  |  | | --- | --- | --- | |  | a. | 14 | |  | b. | 17 | |  | c. | 19 | |  | d. | 15 | |  | e. | 18 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Austroeupatorium inulifolium 2 | | *DATE CREATED:* | 3/9/2017 10:53 PM | | *DATE MODIFIED:* | 3/9/2017 11:02 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 170. How many atoms in the completed Lewis structure use hybrid orbitals with bond angles of approximately 120o between them?   |  |  |  | | --- | --- | --- | |  | a. | 12 | |  | b. | 9 | |  | c. | 8 | |  | d. | 14 | |  | e. | 6 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Austroeupatorium inulifolium 2 | | *DATE CREATED:* | 3/9/2017 11:02 PM | | *DATE MODIFIED:* | 3/9/2017 11:04 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 171. How many atoms in the completed Lewis structure are sp2 hybridized?   |  |  |  | | --- | --- | --- | |  | a. | 12 | |  | b. | 9 | |  | c. | 8 | |  | d. | 14 | |  | e. | 6 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Austroeupatorium inulifolium 2 | | *DATE CREATED:* | 3/9/2017 11:05 PM | | *DATE MODIFIED:* | 3/9/2017 11:07 PM | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 172. How many atoms in the completed Lewis structure are sp3 hybridized?   |  |  |  | | --- | --- | --- | |  | a. | 14 | |  | b. | 17 | |  | c. | 19 | |  | d. | 15 | |  | e. | 18 |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Austroeupatorium inulifolium 2 | | *DATE CREATED:* | 3/9/2017 11:07 PM | | *DATE MODIFIED:* | 3/9/2017 11:08 PM | |