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| 1. How many electrons can the shell with a principal quantum number of 1 hold?

|  |  |  |
| --- | --- | --- |
|   | a.  | 1 |
|   | b.  | 2 |
|   | c.  | 4 |
|   | d.  | 8 |

|  |  |
| --- | --- |
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 2. How many electrons can the shell with a principal quantum number of 2 hold?

|  |  |  |
| --- | --- | --- |
|   | a.  | 1 |
|   | b.  | 2 |
|   | c.  | 4 |
|   | d.  | 8 |

|  |  |
| --- | --- |
| *ANSWER:* | d |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 3. What is the ground-state electronic configuration of a nitrogen atom (nitrogen: atomic number 7)?

|  |  |  |
| --- | --- | --- |
|   | a.  | 1*s*22*s*12*p*4 |
|   | b.  | 1*s*22*s*2*2p3* |
|   | c.  | 1*s*12*s*12*p*5 |
|   | d.  | 1*s*22*s*22*p*2 |

|  |  |
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| *ANSWER:* | b |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 4. What is the ground-state electronic configuration of a fluorine atom (fluorine: atomic number 9)?

|  |  |  |
| --- | --- | --- |
|   | a.  | 1*s*12*s*12*p*7 |
|   | b.  | 1*s*22*s*22*p*5 |
|   | c.  | 1*s*22*s*22*p*6 |
|   | d.  | 1*s*02*s*22*p*7 |

|  |  |
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| *ANSWER:* | b |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 5. What is the ground-state electronic configuration of a fluoride anion (fluorine: atomic number 9)?

|  |  |  |
| --- | --- | --- |
|   | a.  | 1*s*22*s*22*p*2 |
|   | b.  | 1*s*22*s*22*p*5 |
|   | c.  | 1*s*22*s*22*p*6 |
|   | d.  | 1*s*22*s*22*p*7 |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 6. What is the ground-state electronic configuration of a sodium cation (sodium: atomic number 11)?

|  |  |  |
| --- | --- | --- |
|   | a.  | 1*s*22*s*22*p*63*s1* |
|   | b.  | 1*s*22*s*22*p*53*s*1 |
|   | c.  | 1*s*22*s*22*p*6 |
|   | d.  | 1*s*22*s*22*p*63*s*2 |

|  |  |
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| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 7. Which of the following species has an atom that has an unfilled valence shell of electrons?

|  |  |  |
| --- | --- | --- |
|   | a.  | molecular hydrogen, H2 |
|   | b.  | hydroxide anion, HO− |
|   | c.  | boron trifluoride, BF3 |
|   | d.  | water, H2O |

|  |  |
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| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 8. Which of the following species has an atom that has an unfilled valence shell of electrons?

|  |  |  |
| --- | --- | --- |
|   | a.  | molecular bromine, Br2 |
|   | b.  | fluoride anion, F− |
|   | c.  | ammonia, NH3 |
|   | d.  | aluminum trichloride, AlCl3 |

|  |  |
| --- | --- |
| *ANSWER:* | d |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| 9. Which of the following species possesses a formal charge?

|  |  |  |
| --- | --- | --- |
|   | a.  | BH3 |
|   | b.  | BH4 |
|   | c.  | CCl4 |
|   | d.  | H2S |

|  |  |
| --- | --- |
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 10. Which of the following species possesses a formal charge?

|  |  |  |
| --- | --- | --- |
|   | a.  | CCl4 |
|   | b.  | SiCl4 |
|   | c.  | AlCl4 |
|   | d.  | PCl3 |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 11. Which of the following compounds is an aldehyde?

|  |  |  |
| --- | --- | --- |
|   | a.  | CH3CH2CH2COOH |
|   | b.  | CH3CH2CHO |
|   | c.  | CH3CH2CH2OH |
|   | d.  | CH3CH2COCH3 |

|  |  |
| --- | --- |
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| 12. Which of the following compounds is an alcohol?

|  |  |  |
| --- | --- | --- |
|   | a.  | CH3CH2COOH |
|   | b.  | CH3CH2OCH3 |
|   | c.  | CH3CH2CH2OH |
|   | d.  | CH3CH2CHO |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| 13. Which of the following compounds is a carboxylic acid?

|  |  |  |
| --- | --- | --- |
|   | a.  | CH3CH2COOH |
|   | b.  | CH3CH2OCH3 |
|   | c.  | CH3CH2CH2OH |
|   | d.  | CH3CH2CHO |

|  |  |
| --- | --- |
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 14. Which of the following compounds is a ketone?

|  |  |  |
| --- | --- | --- |
|   | a.  | CH3CH2COOH |
|   | b.  | CH3CH2CHO |
|   | c.  | CH3CH2CH2OH |
|   | d.  | CH3COCH3 |

|  |  |
| --- | --- |
| *ANSWER:* | d |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 15. Which of the following compounds is a ketone?

|  |  |  |
| --- | --- | --- |
|   | a.  | CH3CH2COOH |
|   | b.  | CH3CH2CHO |
|   | c.  | CH3CH2CH2OH |
|   | d.  | CH3COCH3 |

|  |  |
| --- | --- |
| *ANSWER:* | d |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 16. Which of the following compounds is a carboxylic ester?

|  |  |  |
| --- | --- | --- |
|   | a.  | CH3CH2COOH |
|   | b.  | CH3CH2OCH3 |
|   | c.  | CH3CH2COOCH3 |
|   | d.  | CH3CH2COCH3 |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| 17. Which of the following is a tertiary alcohol?

|  |  |  |
| --- | --- | --- |
|   | a.  | CH3CH2OCH3 |
|   | b.  | (CH3)3COH |
|   | c.  | (CH3)2CHOH |
|   | d.  | CH3CH2CH2OH |

|  |  |
| --- | --- |
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 18. Which of the following is a tertiary amine?

|  |  |  |
| --- | --- | --- |
|   | a.  | CH3CH2N(CH3)2 |
|   | b.  | (CH3)3CNH2 |
|   | c.  | CH3CH2NHCH3 |
|   | d.  | CH3CH2NHCH(CH3)2 |

|  |  |
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| *ANSWER:* | a |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 19. Which of the following is a primary amine?

|  |  |  |
| --- | --- | --- |
|   | a.  | CH3CH2NHCH3 |
|   | b.  | CH3CH2NHCH(CH3)2 |
|   | c.  | CH3CH2N(CH3)2 |
|   | d.  | (CH3)3CNH2 |

|  |  |
| --- | --- |
| *ANSWER:* | d |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 20. Which of the following is trigonal planar?

|  |  |  |
| --- | --- | --- |
|   | a.  | boron trifluoride, BF3 |
|   | b.  | methyl anion, CH3− |
|   | c.  | methane, CH4 |
|   | d.  | ammonia, NH3 |

|  |  |
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| *ANSWER:* | a |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 21. Which of the following molecules is not linear?

|  |  |  |
| --- | --- | --- |
|   | a.  | H2O |
|   | b.  | CO2 |
|   | c.  | HC≡CH |
|   | d.  | Cl2 |

|  |  |
| --- | --- |
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| 22. What is the approximate value of the H−C−H bond angles in methane, CH4?

|  |  |  |
| --- | --- | --- |
|   | a.  | 90° |
|   | b.  | 109° |
|   | c.  | 120° |
|   | d.  | 180° |

|  |  |
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| *ANSWER:* | b |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 23. What is the approximate C−C−C bond angle in propene, CH3CH=CH2?

|  |  |  |
| --- | --- | --- |
|   | a.  | 90° |
|   | b.  | 109° |
|   | c.  | 120° |
|   | d.  | 180° |

|  |  |
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| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 24. What is the approximate C−C−C bond angle in propyne, HC≡CCH3?

|  |  |  |
| --- | --- | --- |
|   | a.  | 90° |
|   | b.  | 109° |
|   | c.  | 120° |
|   | d.  | 180° |

|  |  |
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| *ANSWER:* | d |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| 25. What is the approximate H−C−O bond angle in formaldehyde, H2C=O?

|  |  |  |
| --- | --- | --- |
|   | a.  | 90° |
|   | b.  | 109° |
|   | c.  | 120° |
|   | d.  | 180° |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 26. Which of the following elements has the highest electronegativity?

|  |  |  |
| --- | --- | --- |
|   | a.  | N |
|   | b.  | C |
|   | c.  | O |
|   | d.  | S |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 27. Which of the following elements has the highest electronegativity?

|  |  |  |
| --- | --- | --- |
|   | a.  | C |
|   | b.  | P |
|   | c.  | Si |
|   | d.  | Cl |

|  |  |
| --- | --- |
| *ANSWER:* | d |
| *POINTS:* | 1 |
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| 28. Which of the following bonds is the most polar?

|  |  |  |
| --- | --- | --- |
|   | a.  | F−F |
|   | b.  | H−F |
|   | c.  | C−H |
|   | d.  | C−Si |

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| *ANSWER:* | b |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 29. Which of the following bonds is the most polar?

|  |  |  |
| --- | --- | --- |
|   | a.  | O−H |
|   | b.  | C−H |
|   | c.  | C−C |
|   | d.  | H−H |

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| *ANSWER:* | a |
| *POINTS:* | 1 |
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| 30. Which of the following bonds is a polar covalent bond?

|  |  |  |
| --- | --- | --- |
|   | a.  | Na−F |
|   | b.  | C−H |
|   | c.  | C−O |
|   | d.  | Cl−Cl |

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| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 31. Which of the following bonds is a polar covalent bond?

|  |  |  |
| --- | --- | --- |
|   | a.  | Na−Cl |
|   | b.  | C−Cl |
|   | c.  | C−H |
|   | d.  | Cl−Cl |

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| *ANSWER:* | b |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 32. Which of the following is an ionic bond?

|  |  |  |
| --- | --- | --- |
|   | a.  | Br−Br |
|   | b.  | C−Cl |
|   | c.  | C−S |
|   | d.  | Na−O |

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| *ANSWER:* | d |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 33. Which of the following is an ionic bond?

|  |  |  |
| --- | --- | --- |
|   | a.  | F−F |
|   | b.  | C−H |
|   | c.  | Li−O |
|   | d.  | C−N |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 34. Which of the following bonds has the smallest dipole moment?

|  |  |  |
| --- | --- | --- |
|   | a.  | C−N |
|   | b.  | C−O |
|   | c.  | C−F |
|   | d.  | O−H |

|  |  |
| --- | --- |
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| 35. Which of the following bonds has the smallest dipole moment?

|  |  |  |
| --- | --- | --- |
|   | a.  | Li−Cl |
|   | b.  | C−H |
|   | c.  | O−H |
|   | d.  | H−Cl |

|  |  |
| --- | --- |
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 36. Which of the following molecules has a molecular dipole moment?

|  |  |  |
| --- | --- | --- |
|   | a.  | **1** |
|   | b.  | **2** |
|   | c.  | **3** |
|   | d.  | **4** |

|  |  |
| --- | --- |
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| 37. Which of the following molecules has a molecular dipole moment?

|  |  |  |
| --- | --- | --- |
|   | a.  | **1** |
|   | b.  | **2** |
|   | c.  | **3** |
|   | d.  | **4** |

|  |  |
| --- | --- |
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| 38. Which of the following molecules has a molecular dipole moment?

|  |  |  |
| --- | --- | --- |
|   | a.  | CO2 |
|   | b.  | BF3 |
|   | c.  | NH3 |
|   | d.  | CH4 |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| 39. Which of the following molecules has a molecular dipole moment?

|  |  |  |
| --- | --- | --- |
|   | a.  | H2O |
|   | b.  | CO2 |
|   | c.  | HC≡CH |
|   | d.  | Cl2 |

|  |  |
| --- | --- |
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 40. Which of the following best represents the shape of the 2*s* atomic orbital of carbon?

|  |  |  |
| --- | --- | --- |
|   | a.  | **1** |
|   | b.  | **2** |
|   | c.  | **3** |
|   | d.  | **4** |

|  |  |
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| *ANSWER:* | a |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 41. Which of the following best represents the shape of a 2*p* atomic orbital of carbon?

|  |  |  |
| --- | --- | --- |
|   | a.  | **1** |
|   | b.  | **2** |
|   | c.  | **3** |
|   | d.  | **4** |

|  |  |
| --- | --- |
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 42. Which of the following best represents an *sp*2 hybridized atomic orbital of carbon which overlaps with the 1*s* atomic orbital of hydrogen to form a C−H σ bonding molecular orbital in ethene, H2C=CH2

|  |  |  |
| --- | --- | --- |
|   | a.  | **1** |
|   | b.  | **2** |
|   | c.  | **3** |
|   | d.  | **4** |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 43. Which of the following best represents an *sp*3 hybridized atomic orbital containing the lone pair of electrons of ammonia, NH3?

|  |  |  |
| --- | --- | --- |
|   | a.  | **1** |
|   | b.  | **2** |
|   | c.  | **3** |
|   | d.  | **4** |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 44. Which atomic orbitals overlap to form the C=O bond of acetone, (CH3)2C=O?

|  |  |  |
| --- | --- | --- |
|   | a.  | C 2*sp*3 + O 2*sp*2 |
|   | b.  | C 2*sp*2 + O 2*p* |
|   | c.  | C 2*sp*2 + O 2*sp*2 |
|   | d.  | C 2*sp*3 + O 2*sp* |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 45. Which atomic orbitals overlap to form the C−O bond of dimethyl ether, (CH3)2O?

|  |  |  |
| --- | --- | --- |
|   | a.  | C 2*sp*3 + O 2*sp*2 |
|   | b.  | C 2*sp*2 + O 2*p* |
|   | c.  | C 2*sp*2 + O 2*sp*2 |
|   | d.  | C 2*sp*3 + O 2*sp*3 |

|  |  |
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| *ANSWER:* | d |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 46. What is the approximate value of the length of the C=C bond in ethane, CH2=CH2?

|  |  |  |
| --- | --- | --- |
|   | a.  | 121 pm |
|   | b.  | 134 pm |
|   | c.  | 142 pm |
|   | d.  | 154 pm |

|  |  |
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| *ANSWER:* | b |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. What is the approximate value of the length of the C≡C bond in ethyne, HC≡CH?

|  |  |  |
| --- | --- | --- |
|   | a.  | 121 pm |
|   | b.  | 134 pm |
|   | c.  | 142 pm |
|   | d.  | 154 pm |

|  |  |
| --- | --- |
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 48. Which of the following statements is *not* true regarding resonance structures?

|  |  |  |
| --- | --- | --- |
|   | a.  | All resonance structures must have the same number of electrons |
|   | b.  | Each atom in all of the resonance structures must have a complete shell of valence electrons |
|   | c.  | All resonance structures must have the same arrangement of atoms |
|   | d.  | All resonance structures must be valid Lewis structures |

|  |  |
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| *ANSWER:* | b |
| *POINTS:* | 1 |
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| 49. Which of the following statements is *not* true regarding resonance structures?

|  |  |  |
| --- | --- | --- |
|   | a.  | Each resonance structure is in rapid equilibrium with all of the other structures |
|   | b.  | The resonance structures may have different energies |
|   | c.  | All resonance structures must have the same arrangement of atoms |
|   | d.  | All resonance structures must have the same number of electrons |

|  |  |
| --- | --- |
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 50. Which of the following statements is *not* true about the carbonate anion, CO32−?

|  |  |  |
| --- | --- | --- |
|   | a.  | All of the oxygen atoms bear the same amount of charge |
|   | b.  | All of the carbon-oxygen bonds are the same length |
|   | c.  | The carbon atom bears the negative charge |
|   | d.  | It is basic |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 51. Which of the following statements is *not* true about the acetate anion, CH3CO2−?

|  |  |  |
| --- | --- | --- |
|   | a.  | The oxygen atoms bear the same amount of charge |
|   | b.  | The two carbon-oxygen bonds are the same length |
|   | c.  | The carbon atom bears the negative charge |
|   | d.  | It is basic |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| 52. Rank the following in order of decreasing importance as a contributing resonance structure to the molecular structure of acetone, CH3COCH3 (more important > less important)

|  |  |  |
| --- | --- | --- |
|   | a.  | **1** > **2** > **3** |
|   | b.  | **1** > **3** > **2** |
|   | c.  | **2** > **1** > **3** |
|   | d.  | **3** > **1** > **2** |

|  |  |
| --- | --- |
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 53. Which of the following resonance structures is the least important contributor to the resonance hybrid of the acetate anion, CH3COO−?

|  |  |  |
| --- | --- | --- |
|   | a.  | **1** |
|   | b.  | **2** |
|   | c.  | **3** |
|   | d.  | **4** |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 54. How many electrons are there in the valence shell of the carbon atom of a methyl cation, CH3+?

|  |  |  |
| --- | --- | --- |
|   | a.  | 4 |
|   | b.  | 5 |
|   | c.  | 6 |
|   | d.  | 7 |

|  |  |
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| *ANSWER:* | c |
| *POINTS:* | 1 |
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| 55. How many electrons are there in the valence shell of the carbon atom of the methyl anion, CH3−?

|  |  |  |
| --- | --- | --- |
|   | a.  | 2 |
|   | b.  | 4 |
|   | c.  | 6 |
|   | d.  | 8 |

|  |  |
| --- | --- |
| *ANSWER:* | d |
| *POINTS:* | 1 |
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| 56. How many electrons are there in the valence shell of the oxygen atom of water?

|  |  |  |
| --- | --- | --- |
|   | a.  | 2 |
|   | b.  | 4 |
|   | c.  | 6 |
|   | d.  | 8 |

|  |  |
| --- | --- |
| *ANSWER:* | d |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 57. How many electrons are there in the valence shell of the nitrogen atom of ammonia?

|  |  |  |
| --- | --- | --- |
|   | a.  | 4 |
|   | b.  | 5 |
|   | c.  | 6 |
|   | d.  | 8 |

|  |  |
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| *ANSWER:* | d |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 58. What is the approximate value of the H−C−H bond angles in a methyl cation, CH3+?

|  |  |  |
| --- | --- | --- |
|   | a.  | 90° |
|   | b.  | 109° |
|   | c.  | 120° |
|   | d.  | 180° |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 59. What is the approximate value of the H−C−H bond angles in a methyl anion, CH3−?

|  |  |  |
| --- | --- | --- |
|   | a.  | 90° |
|   | b.  | 109° |
|   | c.  | 120° |
|   | d.  | 180° |

|  |  |
| --- | --- |
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 60. Which atomic orbitals overlap to form the carbon-hydrogen σ bonding molecular orbitals of ethane, CH3CH3?

|  |  |  |
| --- | --- | --- |
|   | a.  | C2*p* + H1*s* |
|   | b.  | C2*sp* + H1*s* |
|   | c.  | C2*sp*2 + H1*s* |
|   | d.  | C2*sp*3 + H1*s* |

|  |  |
| --- | --- |
| *ANSWER:* | d |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 61. Which atomic orbitals overlap to form the carbon-hydrogen σ bonding molecular orbitals of ethene, H2C=CH2?

|  |  |  |
| --- | --- | --- |
|   | a.  | C2*p* + H1*s* |
|   | b.  | C2*sp* + H1*s* |
|   | c.  | C2*sp*2 + H1*s* |
|   | d.  | C2*sp*3 + H1*s* |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 62. Which atomic orbitals overlap to form the carbon-carbon σ and π bonding molecular orbitals of ethene, H2C=CH2?

|  |  |  |
| --- | --- | --- |
|   | a.  | C2*sp*3 + C2*sp*3, and C2*p* + C2*p* |
|   | b.  | C2*sp*2 + C2*sp*2, and C2*sp*2 + C2*sp*2 |
|   | c.  | C2*sp*2 + C2*sp*2, and C2*p* + C2*p* |
|   | d.  | C2*sp*3 + C2*sp*3, and C2*sp*2 + C2*sp*2 |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 63. Which atomic orbitals overlap to form the carbon-hydrogen σ bonding molecular orbitals of ethyne, HC≡CH?

|  |  |  |
| --- | --- | --- |
|   | a.  | C2*p* + H1*s* |
|   | b.  | C2*sp* + H1*s* |
|   | c.  | C2*sp*2 + H1*s* |
|   | d.  | C2*sp*3 + H1*s* |

|  |  |
| --- | --- |
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 64. Which atomic orbitals overlap to form the carbon-carbon σ molecular bonding orbital of ethyne, HC≡CH?

|  |  |  |
| --- | --- | --- |
|   | a.  | C2*p* + C2*p* |
|   | b.  | C2*sp* + C2*sp* |
|   | c.  | C2*sp*2 + C2*sp*2 |
|   | d.  | C2*sp*3 + C2*sp*3 |

|  |  |
| --- | --- |
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 65. Which of the following is a primary (1°) alcohol?

|  |  |  |
| --- | --- | --- |
|   | a.  | **1** |
|   | b.  | **2** |
|   | c.  | **3** |
|   | d.  | **4** |

|  |  |
| --- | --- |
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 66. Which of the following is a tertiary (3°) alcohol?

|  |  |  |
| --- | --- | --- |
|   | a.  | **1** |
|   | b.  | **2** |
|   | c.  | **3** |
|   | d.  | **4** |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 67. Which of the following is a primary (1°) amine?

|  |  |  |
| --- | --- | --- |
|   | a.  | **1** |
|   | b.  | **2** |
|   | c.  | **3** |
|   | d.  | **4** |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 68. Which of the following is a secondary (2°) amine?

|  |  |  |
| --- | --- | --- |
|   | a.  | **1** |
|   | b.  | **2** |
|   | c.  | **3** |
|   | d.  | **4** |

|  |  |
| --- | --- |
| *ANSWER:* | d |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 69. Which of the following is an carboxylic ester?

|  |  |  |
| --- | --- | --- |
|   | a.  | **1** |
|   | b.  | **2** |
|   | c.  | **3** |
|   | d.  | **4** |

|  |  |
| --- | --- |
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 70. What is the approximate strength of the C−C bond of ethane?

|  |  |  |
| --- | --- | --- |
|   | a.  | 376 kJ/mol (90 kcal./mol) |
|   | b.  | 422 kJ/mol (101 kcal./mol) |
|   | c.  | 556 kJ/mol (133 kcal./mol) |
|   | d.  | 727 kJ/mol (174 kcal./mol) |

|  |  |
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| *ANSWER:* | a |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 71. Which of the circled bonds is the strongest?

|  |  |  |
| --- | --- | --- |
|   | a.  | **1** |
|   | b.  | **2** |
|   | c.  | **3** |
|   | d.  | **4** |

|  |  |
| --- | --- |
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 72. Which of the following resonance structures makes the largest contribution to the structure of [H2CCHO] −?

|  |  |  |
| --- | --- | --- |
|   | a.  | **1** |
|   | b.  | **2** |
|   | c.  | **3** |
|   | d.  | **4** |

|  |  |
| --- | --- |
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| 73. Which of the following shows curved arrows that correctly accounts for the differences between the two structures?

|  |  |  |
| --- | --- | --- |
|   | a.  | **1** |
|   | b.  | **2** |
|   | c.  | **3** |
|   | d.  | **4** |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 74. Which of the following statements is not true?

|  |  |  |
| --- | --- | --- |
|   | a.  | The *sp*3C−H bond of an alkane is weaker than the *sp*C−H bond of an alkyne. |
|   | b.  | The carbon-carbon triple bond of an alkyne is shorter than the carbon-carbon bond of alkenes. |
|   | c.  | The carbon-carbon triple bond of an alkene is exactly three times as strong as a carbon-carbon single bond of an alkane. |
|   | d.  | The *sp*3C−H bond of an alkane is longer than the *sp*C−H bond of an alkyne. |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 75. Which of the following is/are tetrahedral?

|  |  |
| --- | --- |
| **1.** |  methane, CH4 |
| **2.** |  methyl carbocation, CH3+ |
| **3.** |  methyl carbanion, CH3− |
| **4.** |  methyl radical, CH3⋅ |

​

|  |  |  |
| --- | --- | --- |
|   | a.  | only **1** and **2** |
|   | b.  | only **1** and **3** |
|   | c.  | only **1** and **4** |
|   | d.  | only **2** and **3** |

|  |  |
| --- | --- |
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
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| 76. The following two structural formulas  represent isomers.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | False |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | True / False |
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| 77. Consider the following structural formula.               The following is a resonance structure.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | False |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | True / False |
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| 78. Overlap of the two atomic orbitals as shown could result in the formation of a π bond.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

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| --- | --- |
| *ANSWER:* | True |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | True / False |
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| 79. Consider the following molecular model.            The condensed structural formula would be

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
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| *ANSWER:* | True |
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| 80. The hybridization on the numbered carbon atoms in the following compound would be Carbon 1 *sp*3 and Carbon 2 *sp*2.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | True / False |
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| 81. There are eight valence in a methyl anion, CH3−.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | True / False |
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| 82. The following species forms during an organic reaction.                      The formal charge on the carbon atom indicated by the arrow is +1.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | True / False |
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| 83. In drawing the Lewis structure for an organic compound, the carbon atoms should always be shown with eight total electrons.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | True / False |
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| 84. Consider the structure of urea given below.                    To complete the Lewis structure,  six nonbonding electrons should be added,  two to each of the nitrogen atoms and two to the oxygen atom.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | False |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | True / False |
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| 85. The curved arrows in the resonance structure for the acetate ion shown below                                    indicate the following alternative resonance structure for the acetate ion.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | True / False |
| *HAS VARIABLES:* | False |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 86. The maximum number of electrons that a molecular orbital can contain is four.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | False |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | True / False |
| *HAS VARIABLES:* | False |
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| 87. The following molecules all contain the same functional group except 2.

|  |  |  |  |
| --- | --- | --- | --- |
| CH3OH | CH3OCH3 | CH3CH2OH | CH3CH(OH)CH3 |
| 1 | 2 | 3 | 4 |

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | True / False |
| *HAS VARIABLES:* | False |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 88. The percent *s* character in an *sp*2 hybridized orbital is approximately 33%.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | True / False |
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| 89. The formal charges in the complex should below are 0 on each H, –1 on N, and +1 on B.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | False |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | True / False |
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| 90. The most electronegative elements in the periodic table are generally found toward the right in a horizontal row and toward the top in a column.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | True / False |
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| 91. Different compounds with the same molecular formula are called \_\_\_\_\_\_\_\_\_\_.

|  |  |
| --- | --- |
| *ANSWER:* | isomers |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Completion |
| *HAS VARIABLES:* | False |
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| 92. The formal charge on carbon in carbon monoxide is\_\_\_\_\_\_.

|  |  |
| --- | --- |
| *ANSWER:* | minus one-1 |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Completion |
| *HAS VARIABLES:* | False |
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| 93. The approximate H–C–H bond angle in methane is \_\_\_\_\_\_°.

|  |  |
| --- | --- |
| *ANSWER:* | 109.5109 |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Completion |
| *HAS VARIABLES:* | False |
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| 94. The following molecule contains an \_\_\_\_\_\_\_\_\_\_\_\_\_functional group.                                        ​

|  |  |
| --- | --- |
| *ANSWER:* | aldehyde |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Completion |
| *HAS VARIABLES:* | False |
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| 95. The following molecule is classified as a \_\_\_\_\_\_\_\_\_\_amine.

|  |  |
| --- | --- |
| *ANSWER:* | secondary2° |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Completion |
| *HAS VARIABLES:* | False |
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| 96. Provide a neatly drawn figure to show the atomic orbitals that overlap to form each of the bonds in water (H2O) and which contain the lone pair of electrons. Label each orbital with its hybridization.

|  |  |
| --- | --- |
| *ANSWER:* |  |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Subjective Short Answer |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 97. Provide a neatly drawn figure to show the atomic orbitals that overlap to form each of the bonds in ammonia (NH3) and which contain the lone pair of electrons. Label each orbital with its hybridization.

|  |  |
| --- | --- |
| *ANSWER:* |  |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Subjective Short Answer |
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| 98. Provide a neatly drawn figure to show the atomic orbitals that overlap to form each of the bonds in ethene (ethylene, H2C=CH2). Label each bond (e.g., C*–*H σ bond) and indicate which atomic orbitals contribute to this bond (e.g., C 2*sp*3 + H 1*s*).

|  |  |
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| *ANSWER:* |  |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Subjective Short Answer |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 99. Provide a neatly drawn figure to show the atomic orbitals that overlap to form each of the bonds in ethyne (acetylene, HC≡CH). Label each bond (e.g., C*–*H σ bond) and indicate which atomic orbitals contribute to this bond (e.g., C 2*sp*3 + H 1*s*).

|  |  |
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| *POINTS:* | 1 |
| *QUESTION TYPE:* | Subjective Short Answer |
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| 100. Draw bond-line structures of all of the alkanes that have the formula C5H12.

|  |  |
| --- | --- |
| *ANSWER:* |  |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Subjective Short Answer |
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| 101. Draw bond-line structures of all of the alcohols that have the formula C4H10O.

|  |  |
| --- | --- |
| *ANSWER:* |  |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Subjective Short Answer |
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| 102. Draw bond-line structures of all of the aldehydes that have the formula C5H10O.

|  |  |
| --- | --- |
| *ANSWER:* |  |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Subjective Short Answer |
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| 103. Draw bond-line structures of all of the ketones that have the formula C5H10O.

|  |  |
| --- | --- |
| *ANSWER:* |  |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Subjective Short Answer |
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| 104. Draw bond-line structures of all of the primary (1°) alcohols that have the formula C5H12O.

|  |  |
| --- | --- |
| *ANSWER:* |  |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Subjective Short Answer |
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| 105. Draw bond-line structures of all of the tertiary (3°) alcohols that have the formula C6H14O.

|  |  |
| --- | --- |
| *ANSWER:* |  |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Subjective Short Answer |
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| 106. Draw bond-line structures of all of the secondary (2°) amines that have the formula C4H9N.

|  |  |
| --- | --- |
| *ANSWER:* |  |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Subjective Short Answer |
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| 107. Draw bond-line structures of all of the tertiary (3°) amines that have the formula C5H11N.

|  |  |
| --- | --- |
| *ANSWER:* |  |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Subjective Short Answer |
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| 108. Circle all of the *sp*2 hybridized atoms in the following molecular structure.

|  |  |
| --- | --- |
| *ANSWER:* |  |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Subjective Short Answer |
| *HAS VARIABLES:* | False |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 109. Circle all of the *sp* hybridized atoms in the following molecular structure.

|  |  |
| --- | --- |
| *ANSWER:* |  |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Subjective Short Answer |
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| 110. Convert the following structure into a bond-line drawing.

|  |  |
| --- | --- |
| *ANSWER:* |  |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Subjective Short Answer |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 111. Convert the following structure into a bond-line drawing.

|  |  |
| --- | --- |
| *ANSWER:* |  |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Subjective Short Answer |
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| 112. What is the molecular formula of Ritalin, shown below?

|  |  |
| --- | --- |
| *ANSWER:* | C14H19NO2 |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Subjective Short Answer |
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| 113. What is the molecular formula of aspartame, shown below?

|  |  |
| --- | --- |
| *ANSWER:* | C14H18N2O5 |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Subjective Short Answer |
| *HAS VARIABLES:* | False |
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| 114. Circle and name the functional groups in the following molecule.

|  |  |
| --- | --- |
| *ANSWER:* |  |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Subjective Short Answer |
| *HAS VARIABLES:* | False |
| *DATE CREATED:* | 3/12/2015 3:24 PM |
| *DATE MODIFIED:* | 3/12/2015 3:24 PM |

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| 115. Circle and name the functional groups in the following molecule.

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| *ANSWER:* |  |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Subjective Short Answer |
| *HAS VARIABLES:* | False |
| *DATE CREATED:* | 3/12/2015 3:24 PM |
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| Match the following compounds with their appropriate molecular geometry.

|  |  |  |  |
| --- | --- | --- | --- |
| a.  | Ethane | b.  | Formaldehyde |
| c.  | Thiocyanate (SCN-) | d.  | Hydronium Ion |
| e.  | Ozone  |  |  |

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| --- | --- |
| *QUESTION TYPE:* | Matching |
| *HAS VARIABLES:* | False |
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| 116. Linear

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |

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| 117. Tetrahedral

|  |  |
| --- | --- |
| *ANSWER:* | a |
| *POINTS:* | 1 |

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| 118. Bent

|  |  |
| --- | --- |
| *ANSWER:* | e |
| *POINTS:* | 1 |

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| 119. Trigonal Planar

|  |  |
| --- | --- |
| *ANSWER:* | b |
| *POINTS:* | 1 |

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| 120. Trigonal Pyramidal

|  |  |
| --- | --- |
| *ANSWER:* | d |
| *POINTS:* | 1 |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Match the following compounds with their appropriate bond type.

|  |  |  |  |
| --- | --- | --- | --- |
| a.  | H3N→BF3 | b.  | HCl |
| c.  | KBr | d.  | CH4 |

|  |  |
| --- | --- |
| *QUESTION TYPE:* | Matching |
| *HAS VARIABLES:* | False |
| *DATE CREATED:* | 4/18/2017 7:07 AM |
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| 121. Ionic Bond

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| *ANSWER:* | c |
| *POINTS:* | 1 |

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| 122. Dative Bond

|  |  |
| --- | --- |
| *ANSWER:* | a |
| *POINTS:* | 1 |

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| 123. Covalent Bond

|  |  |
| --- | --- |
| *ANSWER:* | d |
| *POINTS:* | 1 |

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| 124. Polar Covalent Bond

|  |  |
| --- | --- |
| *ANSWER:* | b |
| *POINTS:* | 1 |

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| 125. In the given ion given, what is the formal charge of nitrogen, carbon, and sulfur, respectively?​

|  |  |  |
| --- | --- | --- |
|   | a.  | -2, +1, and 0. |
|   | b.  | 0, -2, and +1. |
|   | c.  | -2, 0, and +1. |
|   | d.  | +1, 0, and -2. |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
| *DATE CREATED:* | 4/18/2017 7:13 AM |
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| 126. How many resonating structures are shown by aniline?

|  |  |  |
| --- | --- | --- |
|   | a.  | 3 |
|   | b.  | 4 |
|   | c.  | 5 |
|   | d.  | 6 |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
| *DATE CREATED:* | 4/18/2017 7:20 AM |
| *DATE MODIFIED:* | 4/18/2017 7:21 AM |

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| 127. Fill the appropriate electronic configuration in the blank.​K (1*s*22*s*22*p*63*s*23*p*64*s*1) + Cl (1*s*22*s*22*p*63*s*23*p*5) → K+ \_\_\_\_\_ + Cl- (1*s*22*s*22*p*63*s*23*p*6)

|  |  |  |
| --- | --- | --- |
|   | a.  | (1*s*22*s*22*p*63*s*23*p*64*s*2) |
|   | b.  | (1*s*22*s*22*p*63*s*23*p*65*s*1) |
|   | c.  | (1*s*22*s*22*p*63*s*23*p*6) |
|   | d.  | (1*s*22*s*22*p*63*s*23*p*64*s*1) |

|  |  |
| --- | --- |
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
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| 128. The energy released on the addition of an electron to an atom or a molecule is called \_\_\_\_\_.

|  |  |  |
| --- | --- | --- |
|   | a.  | electron affinity |
|   | b.  | ionization energy |
|   | c.  | resonance energy |
|   | d.  | delocalization |

|  |  |
| --- | --- |
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | False |
| *DATE CREATED:* | 4/18/2017 7:23 AM |
| *DATE MODIFIED:* | 4/18/2017 7:39 AM |

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| 129. Which of the 3 structures shown below has the shortest bond length? Justify your answer.​

|  |  |
| --- | --- |
| *ANSWER:* | Structure 1 has the shortest bond length. It is an alkyne that possesses *sp* hybrid orbitals. As the percent *s*-character of *sp* hybridized orbitals in alkynes is close to 50%, the bond length of the alkyne is the shortest. This is the reason the bonds are shorter and stronger. |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Objective Short Answer |
| *HAS VARIABLES:* | False |
| *DATE CREATED:* | 4/18/2017 7:41 AM |
| *DATE MODIFIED:* | 4/18/2017 7:43 AM |

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