Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

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| 17. | Which of the following covalent molecules does not have the proper Lewis dot formula? | |
| A) |  |
| B) |  |
| C) |  |
| D) |  |
| E) |  |

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| 18. | What is the formal charge on the chlorine atom in the chlorate ion, ClO3–, in the Lewis dot formula that minimizes formal charge? | |
| A) | +2 |
| B) | +1 |
| C) | 0 |
| D) | –1 |
| E) | –2 |

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| 19. | In which of the following species is resonance most likely to take place? | |
| A) |  |
| B) |  |
| C) |  |
| D) |  |
| E) |  |

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| 20. | The measure of the attraction that an atom has for the electrons in a chemical bond is called | |
| A) | electron affinity. |
| B) | ionization energy. |
| C) | electronegativity. |
| D) | resonance energy. |
| E) | lattice energy. |

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| 21. | Which molecule or ion has a trigonal planar molecular geometry? | |
| A) | PCl3 |
| B) | AsF3 |
| C) | HCN |
| D) | HCCH |
| E) | CO32– |

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| 22. | For which of the following molecules or ions do the electron pairs on the central nitrogen atom have a tetrahedral arrangement? | |
| A) | FNO |
| B) | NF2– |
| C) | NO2– |
| D) | N2F2 |
| E) | NO– |

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| 23. | Which of the following species would you expect to have the largest radius? | |
| A) | K+ |
| B) | Cl- |
| C) | Br- |
| D) | P |
| E) | Ca2+ |

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| 24. | An atom of which of the following elements has the highest electronegativity? | |
| A) | K |
| B) | Ba |
| C) | Si |
| D) | Br |
| E) | As |

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| 25. | In the Lewis dot formula that minimizes formal charge, how many lone pairs are around the central atom in the chlorate ion, ClO3–? | |
| A) | 0 |
| B) | 1 |
| C) | 2 |
| D) | 3 |
| E) | 4 |

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| 26. | A bond in which an electron pair is unequally shared by two atoms is | |
| A) | ionic. |
| B) | polar covalent. |
| C) | nonpolar covalent. |
| D) | coordinate covalent. |
| E) | metallic. |

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| 27. | What hybrid orbitals of sulfur are involved in the bonding in sulfur trioxide? | |
| A) | sp |
| B) | sp2 |
| C) | sp3 |
| D) | dsp2 |
| E) | d2sp3 |

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| 28. | The hybridization of the central atom in a molecule is described as sp2. The arrangement in space of the hybrid orbitals about that atom is | |
| A) | linear. |
| B) | trigonal planar. |
| C) | tetrahedral. |
| D) | trigonal bipyramidal. |
| E) | octahedral. |

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| 29. | When a carbon atom has sp3 hybridization, it has | |
| A) | four  bonds. |
| B) | three  bonds and one  bond. |
| C) | two  bonds and two  bonds. |
| D) | one  bond and three  bonds. |
| E) | four  bonds. |

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| 30. | Which of the following molecules does not have a permanent dipole moment? | |
| A) | water, H2O |
| B) | acetone, CH3COCH3 |
| C) | carbon dioxide, CO2 |
| D) | sulfur dioxide, SO2 |
| E) | chloromethane, CH3Cl |

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| 31. | Which of the following molecules has a dipole moment? | |
| A) | NF3 |
| B) | CCl4 |
| C) | SiCl4 |
| D) | SF6 |
| E) | BF3 |

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| 32. | The molecular geometry of the nitrite ion, NO2– , is best described as | |
| A) | bent. |
| B) | trigonal planar. |
| C) | tetrahedral. |
| D) | pyramidal. |
| E) | trigonal pyramidal. |

**Answer Key**

|  |  |
| --- | --- |
| 17. | D |
| 18. | C |
| 19. | A |
| 20. | C |
| 21. | E |
| 22. | B |
| 23. | C |
| 24. | D |
| 25. | B |
| 26. | B |
| 27. | B |
| 28. | B |
| 29. | E |
| 30. | C |
| 31. | A |
| 32. | A |

30. The electronic structure of which of the following species cannot be adequately described by a single Lewis formula?

A) POF3

B) NO3–

C) CS2

D) HNNH

E) H2NNH2

31. Which molecule or ion has a trigonal planar molecular geometry?

A) PCl3

B) AsF3

C) HCN

D) HCCH

E) CO32–

32. The hybridization of the central atom in a molecule is described as sp2. The arrangement in space of the hybrid orbitals about that atom is

A) linear.

B) trigonal planar.

C) tetrahedral.

D) trigonal bipyramidal.

E) octahedral.

33. Which of the following statements is true?

A) A bond is twice as strong as a single bond.

B) A  bond has cylindrical symmetry about the bonding axis.

C) A double bond consists of a  bond and a  bond.

D) A  bond results from the sideways overlap of hybridized orbitals.

E) A  bond is twice as strong as a  bond.

34. Which of the following molecules contains an sp3-hybridized carbon atom?

|  |  |
| --- | --- |
| A) |  |
| B) |  |
| C) |  |
| D) |  |
| E) |  |

35. What is the hybridization of the nitrogen atom in the nitrite ion?

A) s

B) sp

C) sp2

D) sp3

E) sp3d

36. Which of the following molecules does not have a permanent dipole moment?

A) water, H2O

B) acetone, CH3COCH3

C) carbon dioxide, CO2

D) sulfur dioxide, SO2

E) chloromethane, CH3Cl

37. What hybrid orbitals of sulfur are involved in the bonding in sulfur trioxide?

A) sp

B) sp2

C) sp3

D) dsp2

E) d2sp3

38. Which molecule is polar?

A) CF4

B) SO2

C) CS2

D) C2H4

E) C6H6

39. Which of the following descriptions of the electronic structure of O2 best accounts for both the bond energy and the magnetic properties?

A)



B)



C) a resonance hybrid of structures A and B

D) valence-bond theory

E) molecular orbital theory

40. The configuration (2s)2(2s\*)2(2py)1(2px)1 is the molecular orbital description for the ground state of

A) Li2+

B) Be2

C) B2

D) B22–

E) C2

**Answer Key**

|  |  |
| --- | --- |
| 30. | B |
| 31. | E |
| 32. | B |
| 33. | C |
| 34. | A |
| 35. | C |
| 36. | C |
| 37. | B |
| 38. | B |
| 39. | E |
| 40. | C |