SECTION A – COVALENT BONDING (40 QUESTIONS)

1. A covalent bond forms when atoms _____.

A. transfer electrons
B. share electrons
C. become ions
D. lose protons
Answer: B

2. A molecule is defined as:

A. Two metals bonded
B. Two or more atoms covalently bonded
C. A charged particle
D. A neutral atom
Answer: B

3. Diatomic molecules exist because:

A. They have high energy
B. They are more stable than individual atoms
C. They are ionic compounds
D. They form triple bonds
Answer: B

4. A single covalent bond contains:

A. One shared pair of electrons
B. Two shared pairs
C. Three shared pairs
D. No shared electrons
Answer: A

5. Halogens typically form:

A. Four single bonds
B. Two single bonds
C. One single bond
D. No bonds
Answer: C

6. A sigma bond is formed by:

A. Parallel orbitals
B. Overlap centered between two atoms
C. Perpendicular orbitals
D. Ionic attraction
Answer: B

7. A pi bond forms when:

A. Orbitals overlap end-to-end
B. Parallel orbitals overlap
C. Two electrons are transferred
D. Electrons repulse
Answer: B

8. A triple bond contains:

A. Three sigma bonds
B. One sigma + two pi bonds
C. Three pi bonds
D. One pi bond only
Answer: B

9. Bond length _____ as bond strength increases.

A. increases
B. decreases
C. remains the same
D. doubles
Answer: B

10. Bond dissociation energy is:

A. Energy released in forming bonds
B. Energy required to break a bond
C. Heat from combustion
D. Energy to form ions
Answer: B

11. An endothermic reaction occurs when:

A. more energy is released than absorbed
B. energy required > energy released
C. no energy change

D. heat is lost to surroundings

Answer: B

12. An exothermic reaction:

A. absorbs heat
B. breaks all covalent bonds
C. releases more energy than required
D. has positive enthalpy

Answer: C

13. Group 16 atoms form:

A. one bond
B. two bonds
C. three bonds
D. four bonds

Answer: B

14. Group 15 atoms form:

A. 1 bond
B. 2 bonds
C. 3 bonds
D. 4 bonds

Answer: C

15. Group 14 atoms form:

A. 1 bond
B. 2 bonds
C. 3 bonds
D. 4 bonds

Answer: D

16. HF forms:

A. ionic bond
B. metallic bond
C. single covalent bond
D. double bond

Answer: C

17. A sigma bond is always present in:

A. single bonds only
B. double bonds only
C. triple bonds only
D. all covalent bonds
Answer: D

18. Double bonds contain:

A. 1 sigma only
B. 1 sigma + 1 pi
C. 2 sigma
D. 2 pi
Answer: B

19. Triple bonds are:

A. weaker than single
B. longer than single
C. shorter than single
D. same length as single
Answer: C

20. Covalent bonds commonly form between:

A. metal + metal
B. metal + nonmetal
C. nonmetal + nonmetal
D. noble gases only
Answer: C

21. A chemical bond forms to:

A. increase energy
B. increase instability
C. lower energy and become stable
D. lose electrons
Answer: C

22. Which is a diatomic molecule?

A. CO_2
B. O_2
C. H_2O

D. PCl_5

Answer: B

23. Nitrogen molecule contains:

A. single bond
B. double bond
C. triple bond
D. no bonds

Answer: C

24. Oxygen molecule contains:

A. single bond
B. double bond
C. triple bond
D. coordinate bond

Answer: B

25. A pi bond results from:

A. orbitals overlapping side-to-side
B. end-to-end overlap
C. electron transfer
D. ionic interaction

Answer: A

26. A bond with the highest dissociation energy is:

A. single
B. double
C. triple
D. coordinate

Answer: C

27. Bond energy is highest for:

A. longest bonds
B. intermediate bonds
C. shortest bonds
D. metallic bonds

Answer: C

28. What type of reaction releases heat?

A. exothermic
B. endothermic
C. decomposition
D. nuclear
Answer: A

29. Covalent compounds generally:

A. conduct electricity
B. have high melting points
C. are formed by nonmetals
D. are metals
Answer: C

30. Which statement is true?

A. Covalent bonds transfer electrons
B. Ionic bonds share electrons
C. Covalent bonds share electrons
D. Metallic bonds are covalent
Answer: C

31. Electron sharing is equal in:

A. ionic bonds
B. polar covalent bonds
C. nonpolar covalent bonds
D. coordinate bonds
Answer: C

32. A covalent compound is typically:

A. NaCl
B. MgO
C. CO_2
D. $CaCl_2$
Answer: C

33. A molecule with 2 atoms is called:

A. polyatomic
B. monatomic
C. diatomic

D. ionic

Answer: C

34. A shared pair of electrons is represented by:

A. two dots
B. one line
C. one arrow
D. brackets

Answer: B

35. In covalent bonding stability is achieved when atoms reach:

A. octet
B. duet
C. empty orbitals
D. fully positive charge

Answer: A

36. Which molecule contains a triple bond?

A. H_2
B. O_2
C. N_2
D. H_2O

Answer: C

37. CO_2 contains:

A. two single bonds
B. one double bond
C. two double bonds
D. triple bond

Answer: C

38. Covalent compounds tend to have:

A. high conductivity
B. high boiling points
C. low melting points
D. metallic luster

Answer: C

39. The bond between H and F in HF is:

A. ionic
B. metallic
C. polar covalent
D. nonpolar covalent
Answer: C

40. A pi bond occurs in:

A. CH_4
B. H_2
C. N_2
D. NaCl
Answer: C

SECTION B – NAMING MOLECULES & ACIDS (40 QUESTIONS)

41. N_2O is named:

A. nitrogen oxide
B. dinitrogen monoxide
C. nitrogen monoxide
D. mononitrogen oxide
Answer: B

42. P_2O_5 is named:

A. phosphorus oxide
B. diphosphorus oxide
C. diphosphorus pentoxide
D. pentaphosphorus dioxide
Answer: C

43. The prefix "mono–" is used:

A. on the first element always
B. not used for first element
C. only for metals
D. only for acids
Answer: B

44. CO is:

A. carbon dioxide
B. monocarbon monoxide
C. carbon monoxide
D. dicarbon oxide
Answer: C

45. CO_2 is:

A. carbon dioxide
B. monocarbon dioxide
C. carbon oxide
D. carbon trioxide
Answer: A

46. SO_3 is:

A. sulfur trioxide
B. sulfur oxide
C. trisulfur oxide
D. sulfide oxide
Answer: A

47. SF_6 is:

A. sulfur hexafluoride
B. sulfur fluoride
C. hexasulfur fluoride
D. fluorosulfur
Answer: A

48. Cl_2O_7 is:

A. chlorine oxide
B. dichlorine heptoxide
C. heptachlorine dioxide
D. chlorine heptaoxide
Answer: B

49. A binary molecular compound contains:

A. a metal + nonmetal
B. two nonmetals
C. two metals

D. metal + hydrogen

Answer: B

50. HCl (aq) is named:

A. hydrochlorous acid
B. hydrohydrogen chloride
C. hydrochloric acid
D. hydrogen chloride

Answer: C

51. Binary acids start with:

A. oxy
B. per
C. hydro
D. hypo

Answer: C

52. HBr(aq) is:

A. hydrobromic acid
B. hypobromous acid
C. bromic acid
D. hydrogen bromide

Answer: A

53. Oxyacids are acids containing:

A. hydrogen only
B. hydrogen + oxygen only
C. hydrogen + an oxyanion
D. hydrogen + metal

Answer: C

54. Oxyanions ending in –ate form acids ending in:

A. –ous
B. –ic
C. –ide
D. –ate

Answer: B

55. Oxyanions ending in –ite form acids ending in:

A. –ous
B. –ic
C. –ate
D. –ide
Answer: A

56. HNO_2 is:

A. nitric acid
B. nitrous acid
C. hyponitric acid
D. hydrogen nitrite
Answer: B

57. HNO_3 is:

A. nitrous acid
B. nitric acid
C. hyponitric acid
D. hydrogen nitrate
Answer: B

58. H_2SO_4 is:

A. sulfuric acid
B. sulfurous acid
C. hydrosulfuric acid
D. hyposulfurous acid
Answer: A

59. H_2SO_3 is:

A. sulfurous acid
B. sulfuric acid
C. hyposulfuric acid
D. hydrosulfuric acid
Answer: A

60. H_2CO_3 is:

A. carbonous acid
B. hydrogencarbonic acid
C. carbonic acid

D. carbonate acid
Answer: C

61. HF(aq) is:

A. hydrofluoric acid
B. fluoric acid
C. fluorous acid
D. hypofluorous
Answer: A

62. H_3PO_4 is:

A. phosphorous acid
B. phosphoric acid
C. hypophosphoric acid
D. hydrophosphate
Answer: B

63. H_3PO_3 is:

A. phosphoric acid
B. phosphorous acid
C. hydrophosphoric acid
D. perphosphoric acid
Answer: B

64. N_2F_4 is named:

A. nitrogen fluoride
B. dinitrogen tetrafluoride
C. tetranitrogen difluoride
D. mononitrogen difluoride
Answer: B

65. CCl_4 is:

A. carbon chloride
B. carbon tetrachloride
C. monocarbon tetrachlorine
D. tetracarbon chloride
Answer: B

66. SeO_2 is:

A. selenium dioxide
B. selenium monoxide
C. monoselenium dioxide
D. diselenium oxide
Answer: A

67. BrF_5 is:

A. bromine pentafluoride
B. bromine fluoride
C. pentabromine fluoride
D. monobromine pentafluoride
Answer: A

68. NO is:

A. nitrogen oxide
B. nitrogen monoxide
C. mononitrogen monoxide
D. mononitrogen oxide
Answer: B

69. NO_2 is:

A. nitrogen dioxide
B. nitrogen trioxide
C. dinitrogen oxide
D. nitrous oxide
Answer: A

70. N_2O_3 is:

A. nitrogen trioxide
B. dinitrogen trioxide
C. trinitrogen dioxide
D. nitrous oxide
Answer: B

71. Oxyacids always contain:

A. metal + oxygen
B. hydrogen + metal
C. hydrogen + polyatomic ion

D. only oxygen
Answer: C

72. The acid of chlorate (ClO_3^-) is:

A. chlorous acid
B. chloric acid
C. hypochlorous acid
D. perchloric acid
Answer: B

73. Hypochlorous acid corresponds to:

A. ClO_2^-
B. ClO^-
C. ClO_4^-
D. ClO_3^-
Answer: B

74. Perchlorate ion forms:

A. perchloric acid
B. chloric acid
C. chlorous acid
D. hypochlorous acid
Answer: A

75. HCl(g) is named:

A. hydrochloric acid
B. hydrogen chloride
C. chlorous acid
D. chlorine hydride
Answer: B

76. The prefix for 5 is:

A. penta
B. tetra
C. hexa
D. hepta
Answer: A

77. The prefix for 7 is:

A. hexa
B. hepta
C. nona
D. deca
Answer: B

78. The prefix "deca-" represents:

A. 8
B. 9
C. 10
D. 11
Answer: C

79. A molecule with two elements is:

A. polyatomic
B. binary
C. ionic
D. hydrated
Answer: B

80. An oxyacid ending in –ic comes from:

A. –ide
B. –ite
C. –ate
D. per–
Answer: C

SECTION C – LEWIS STRUCTURES & MOLECULAR STRUCTURES (40 QUESTIONS)

81. A structural formula shows:

A. exact number of atoms
B. arrangement of atoms and bonds
C. oxidation states
D. electron configurations
Answer: B

82. The central atom is usually the one with: