1. Which one of the following is most likely to be an ionic compound?
   A. KF       B. CCl₄       C. CS₂       D. CO₂       E. ICl

2. Which one of the following is most likely to be an ionic compound?
   A. GaAs     B. SrBr₂      C. NO₂      D. CBr₄      E. H₂O

3. Which one of the following is most likely to be an ionic compound?
   A. NCl₃       B. BaCl₂       C. CO       D. SO₂       E. SF₄

4. Which one of the following is most likely to be a covalent compound?
   A. Rb₂S     B. SrCl₂      C. CS₂      D. CaO      E. MgI₂

5. Which one of the following is most likely to be a covalent compound?
   A. KF       B. CaCl₂       C. SF₄       D. Al₂O₃       E. CaSO₄

6. A polar covalent bond would form in which one of the following pairs of atoms?
   A. Cl — Cl      B. Si — Si      C. Ca — Cl      D. Cr — Br      E. P — Cl

7. What type of chemical bond holds the atoms together within a water molecule?
   A. Ionic bond       B. Nonpolar covalent bond  C. Polar covalent  bond

8. A nonpolar covalent bond (i.e., pure covalent) would form in which one of the following pairs of atoms?
   A. Na — Cl     B. H — Cl     C. Li — Br     D. Se — Br     E. Br — Br

9. Which of the bonds below would have the greatest polarity (i.e., highest percent ionic character)?
   A. Si — P       B. Si — S      C. Si — Se      D. Si — Cl      E. Si — I

10. Classify the O — H bond in CH₃OH as ionic, polar covalent, or nonpolar covalent.
    A. ionic        B. polar covalent       C. nonpolar covalent

11. Classify the C — Cl bond in CCl₄ as ionic, polar covalent, or nonpolar covalent.
    A. ionic        B. polar covalent       C. nonpolar covalent

12. Classify the Ca — Cl bond in CaCl₂ as ionic, polar covalent, or nonpolar covalent.
    A. ionic        B. polar covalent       C. nonpolar covalent

13. What is the molar mass of ammonium nitrate?

14. How many oxygen atoms are present in 1.00 × 10⁻³ mole of ozone, O₃?
15. How many oxygen atoms are in 1.00 mol \( \text{SO}_3 \)?

16. What is the mass percent oxygen in copper(II) sulfate pentahydrate?

17. Calculate the percent composition by mass of all the elements in \( \text{Na}_2\text{CO}_3 \).

18. The molar mass of hydrazine is 32 g/mol and its empirical formula is \( \text{NH}_2 \). What is its molecular formula?

19. Ketoprofen is an anti-inflammatory drug which is 75.59% C, 5.51% H, and 18.90% O. If the molecular mass of ketoprofen is 254 g/mol, what is its molecular formula?

20. What is the empirical formula of a compound of uranium and fluorine that is composed of 67.6% uranium and 32.4% fluorine?

21. The percent composition by mass of a compound is 76.0% C, 12.8% H, and 11.2% O. The molar mass of this compound is 284.5 g/mol. What is the molecular formula of the compound?

22. A 0.600 g sample of a compound of arsenic and oxygen was found to contain 0.454 g of arsenic. What is the empirical formula of the compound?

23. 2.386 g of a compound containing only Carbon, Hydrogen and Oxygen undergoes combustion analysis to produce 5.77 g CO\(_2\) and 2.14 g H\(_2\)O. What is the empirical formula of this compound?

24. Vitamin C is essential for the prevention of scurvy. Combustion of a 2.00 gram sample of this Carbon, Hydrogen and Oxygen containing compound yields 2.998 g CO\(_2\) and 0.819 g H\(_2\)O. What is the empirical formula and percent composition of Vitamin C?

25. An 0.1888-g sample of a hydrocarbon produces 0.6270 g of CO\(_2\) and 0.1602 g H\(_2\)O in combustion analysis. Its molar mass is found to be 106 g/mol. For this hydrocarbon, determine A) Its percent composition; B) Its empirical formula and C) its molecular formula

26. Para-cresol is used as a disinfectant and in the manufacture of herbicides and artificial food flavors. A 0.4039-g sample of this carbon-hydrogen-oxygen containing compound yields 1.1518 g CO\(_2\) and 0.2694 g H\(_2\)O. What is the empirical formula of para-cresol?

Answers

14. 1.81 \( \times \) 10\(^{21} \) O atoms  
15. 1.81 \( \times \) 10\(^{24} \) O atoms  
16. 57.7% Oxygen
17. 43.4% Na, 11.3% C, 45.3% O  
18. \( \text{N}_2\text{H}_4 \)  
19. \( \text{C}_{18}\text{H}_{14}\text{O}_3 \)  
20. \( \text{UF}_6 \)
21. \( \text{C}_{18}\text{H}_{32}\text{O}_2 \)  
22. \( \text{As}_2\text{O}_3 \)  
23. \( \text{C}_{11}\text{H}_{20}\text{O}_3 \)  
24. \( \text{C}_2\text{H}_6\text{O}_3 \)  
25. A) 90.56% C 9.44% H  
b) \( \text{C}_4\text{H}_5 \)  
c) \( \text{C}_8\text{H}_{10} \)  
26. \( \text{C}_7\text{H}_8\text{O} \)