

1. Given two formulas representing the same compound:

Formula A CH_3

Formula B C_2H_6

Which statement describes these formulas?

- A) Formulas *A* and *B* are both empirical.
 B) Formula *A* is molecular, and formula *B* is empirical.
C) Formula *A* is empirical, and formula *B* is molecular.
 D) Formulas *A* and *B* are both molecular.

2. Which compound has both ionic and covalent bonding?

- A) CaCO_3 B) CH_3OH
 C) $\text{C}_6\text{H}_{12}\text{O}_6$ D) CH_2Cl_2

3. Which substance is an electrolyte?

- A) KOH B) CH_3OH
 C) H_2O D) $\text{C}_6\text{H}_{12}\text{O}_6$

4. Which formula represents a nonpolar molecule?

- A) H_2O **B) CH_4** C) HCl D) NH_3

5. Compared to a calcium atom, the calcium ion Ca^{2+} has

- A) more electrons B) fewer protons
 C) more protons **D) fewer electrons**

6. Which characteristic is a property of molecular substances?

- A) high melting point
 B) good heat conductivity
C) low melting point
 D) good electrical conductivity

7. The compounds C_2H_4 and C_4H_8 have the same

- A) boiling point at standard pressure
 B) molecular formula
C) empirical formula
 D) freezing point at standard pressure

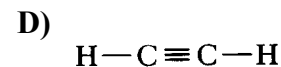
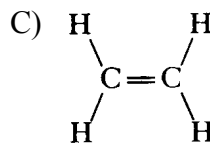
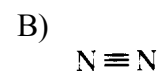
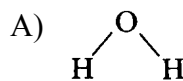
8. Which formula represents a tetrahedral molecule?

- A) Br_2 B) HBr **C) CH_4** D) CaCl_2

9. What is the gram-formula mass of $\text{Ca}_3(\text{PO}_4)_2$?

- A) 248 g/mol B) 279 g/mol
 C) 263 g/mol **D) 310. g/mol**

10. Which structural formula represents a linear nonpolar molecule containing two polar bonds?



11. The chemical bond between which two atoms is most polar?

- A) Si-O** B) S-Cl C) C-N D) H-H

12. Which statement correctly describes diamond and graphite, which are different forms of solid carbon?

- A) They differ in their molecular structure and properties.**
 B) They differ in their molecular structure, only.
 C) They differ in their properties, only.
 D) They do not differ in their molecular structure or properties.

13. What is the total number of moles of hydrogen in 1 mole of $(\text{NH}_4)_2\text{HPO}_4$?

- A) 9** B) 5 C) 7 D) 8

14. What occurs when an atom loses an electron?

- A) The atom's radius decreases and the atom becomes a positive ion.**
 B) The atom's radius increases and the atom becomes a negative ion.
 C) The atom's radius increases and the atom becomes a positive ion.
 D) The atom's radius decreases and the atom becomes a negative ion.

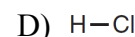
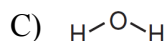
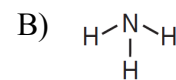
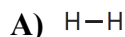
15. The gram-formula mass of a compound is 48 grams. The mass of 1.0 mole of this compound is

- A) 1.0 g B) 4.8 g **C) 48 g** D) 480 g

16. What is the total number of electron pairs shared between the two atoms in an O_2 molecule?

- A) 1 **B) 2** C) 6 D) 4

17. Which molecule has a nonpolar covalent bond?



18. Which element forms an ionic compound when it reacts with lithium?

- A) Kr **B) Br** C) Fe D) K

19. Which formulas represent two polar molecules?

- A) CO₂ and CH₄ **B) H₂O and HCl**
 C) CO₂ and HCl D) H₂O and CH₄

20. What is the molecular formula of a compound that has a molecular mass of 54 and the empirical formula C₂H₃?

- A) C₆H₉ **B) C₄H₆** C) C₂H₃ D) C₈H₁₂

21. The diagram below represents a water molecule.



This molecule is best described as

- A) polar with nonpolar covalent bonds
 B) nonpolar with polar covalent bonds
 C) nonpolar with nonpolar covalent bonds
D) polar with polar covalent bonds

22. A compound whose empirical formula is NO₂ could have a molecular mass of

- A) 39 B) 23 C) 120 **D) 92**

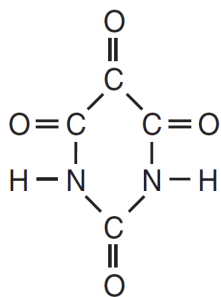
23. A compound has a molar mass of 90. grams per mole and the empirical formula CH₂O. What is the molecular formula of this compound?

- A) C₂H₄O₂ B) CH₂O
C) C₃H₆O₃ D) C₄H₈O₄

24. A solid substance is an excellent conductor of electricity. The chemical bonds in this substance are most likely

- A) metallic, because the valence electrons are stationary
 B) ionic, because the valence electrons are shared between atoms
C) metallic, because the valence electrons are mobile
 D) ionic, because the valence electrons are mobile

25. Given the formula for a compound:



Which molecular formula and empirical formula represent this compound?

- A) C₂HNO₂ and CHNO
B) C₄H₂N₂O₄ and C₂HNO₂
 C) C₂HNO₂ and C₂HNO₂
 D) C₄H₂N₂O₄ and CHNO

26. Which phrase describes the distribution of charge and the polarity of a CH₄ molecule?

- A) symmetrical and polar
 B) asymmetrical and polar
C) symmetrical and nonpolar
 D) asymmetrical and nonpolar

27. The table below shows properties of four solids, *A*, *B*, *C*, and *D*.

Substance	Melting Point	Conductivity in Solid State	Solubility in Water
<i>A</i>	high	no	soluble
<i>B</i>	high	yes	insoluble
<i>C</i>	high	no	insoluble
<i>D</i>	low	no	insoluble

Which substance could represent diamond, a network solid?

- A) *A* B) *B* **C) *C*** D) *D*

28. Which Lewis electron-dot diagram correctly represents a hydroxide ion?

- A) $[\text{:}\ddot{\text{O}}\text{:}\ddot{\text{H}}\text{:}]^{-}$ **B) $[\text{:}\ddot{\text{O}}\text{:}\ddot{\text{H}}\text{:}]^{-}$**
 C) $[\text{:}\ddot{\text{O}}\text{:}\text{:}\ddot{\text{H}}\text{:}]^{-}$ D) $[\text{:}\ddot{\text{O}}\text{:}\text{:}\text{H}\text{:}]^{-}$

29. What is the empirical formula of a compound that contains 28% iron, 24% sulfur, and 48% oxygen by mass?

- A) FeSO₄ **B) Fe₂(SO₄)₃**
 C) FeSO₃ D) Fe₂(SO₃)₃

30. Which type of substance can conduct electricity in the liquid phase but *not* in the solid phase?

- A) **ionic compound**
 B) metallic element
 C) nonmetallic element
 D) molecular compound

31. Which formula represents a molecular compound?

- A) NaI B) Kr C) LiOH **D) N₂O₄**

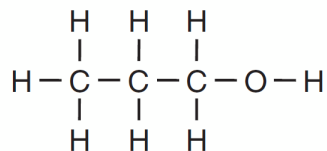
32. Which formula is both a molecular and an empirical formula?

- A) C₄H₈ B) C₆H₁₂O₆
 C) C₂H₄O₂ **D) C₃H₈O**

33. Which represents the greatest mass of chlorine?

- A) **1 mole of chlorine**
 B) 1 molecule of chlorine
 C) 1 gram of chlorine
 D) 1 atom of chlorine

34. Given the formula:



The bond between which two atoms has the greatest degree of polarity?

- A) H and C **B) H and O**
 C) C and O D) C and C

35. What is the gram-formula mass of (NH₄)₃PO₄?

- A) 112 g/mol B) 121 g/mol
C) 149 g/mol D) 242 g/mol

36. What is the total number of oxygen atoms in the formula MgSO₄ • 7 H₂O? [The • represents seven units of H₂O attached to one unit of MgSO₄ .]

- A) 11** B) 7 C) 5 D) 4

37. In which compound is the percent composition by mass of chlorine equal to 42%?

- A) HClO₄ (gram-formula mass = 100. g/mol)
 B) HClO (gram-formula mass = 52 g/mol)
C) HClO₃ (gram-formula mass = 84 g/mol)
 D) HClO₂ (gram-formula mass = 68 g/mol)

38. A certain substance is a poor conductor of electricity and has a high melting point. This substance is most likely

- A) SiO₂** B) C₆H₁₂O₆
 C) Cl₂ D) CO₂

39. Given the formula of a substance:



What is the total number of shared electrons in a molecule of this substance?

- A) 9 B) 6 C) 11 **D) 22**

40. What is the percent composition by mass of sulfur in the compound MgSO₄ (gram-formula mass = 120. grams per mole)?

- A) 46% B) 20% C) 53% **D) 27%**

Answer Key
open book unit 7 compounds

- | | | | |
|-----|----------|-----|----------|
| 1. | <u>C</u> | 37. | <u>C</u> |
| 2. | <u>A</u> | 38. | <u>A</u> |
| 3. | <u>A</u> | 39. | <u>D</u> |
| 4. | <u>B</u> | 40. | <u>D</u> |
| 5. | <u>D</u> | | |
| 6. | <u>C</u> | | |
| 7. | <u>C</u> | | |
| 8. | <u>C</u> | | |
| 9. | <u>D</u> | | |
| 10. | <u>D</u> | | |
| 11. | <u>A</u> | | |
| 12. | <u>A</u> | | |
| 13. | <u>A</u> | | |
| 14. | <u>A</u> | | |
| 15. | <u>C</u> | | |
| 16. | <u>B</u> | | |
| 17. | <u>A</u> | | |
| 18. | <u>B</u> | | |
| 19. | <u>B</u> | | |
| 20. | <u>B</u> | | |
| 21. | <u>D</u> | | |
| 22. | <u>D</u> | | |
| 23. | <u>C</u> | | |
| 24. | <u>C</u> | | |
| 25. | <u>B</u> | | |
| 26. | <u>C</u> | | |
| 27. | <u>C</u> | | |
| 28. | <u>B</u> | | |
| 29. | <u>B</u> | | |
| 30. | <u>A</u> | | |
| 31. | <u>D</u> | | |
| 32. | <u>D</u> | | |
| 33. | <u>A</u> | | |
| 34. | <u>B</u> | | |
| 35. | <u>C</u> | | |
| 36. | <u>A</u> | | |