

Take-Home Quiz
Topic 03: Lewis Structures and Bonding

Objective:

This is to assess your comprehension of the material we have covered so far and to help prepare you for the exam.

Instructions and Notes:

- Most of the quiz problems are from or adapted from “Exercises” at the end of the chapters in the Chemistry: Atoms First 2e Online Textbook (OpenStax)
- You must *CLEARLY LABEL* all problems and *SHOW ALL WORK* neatly and legibly to receive credit. If the problems do not require calculations/work then you must explain how you got the answer. (can be a few words up to a few sentences or even a few arrows)
- If the problem requires calculations, the answers should be highlighted or boxed.
- Book sections covered: 1.2, 2.4, 3.6, 3.7, 4.1, 4.2, 4.4

Submission:

The quiz is usually due ~1 week after we start this section (see our due date schedule). Summer session is due sooner. This should be scanned as a single PDF and submitted online through Canvas. The file cannot be larger than 20 Mb (20,000 kB).

Helpful Tips:

- Start as soon as we're done with the lecture.
- Refer to the lecture and/or videos (if available).
- Use the corresponding chapter in the book to help you through difficult problems/concepts.
- There are answers and solutions available to the odd numbered problems (book number not quiz number) on the OpenStax website under “Student Resources”. It is not advised to rely on the solutions because you will not have access to the solutions during the exam. Only use the solutions as a last resort. Struggling is good and that is when you are learning the most!
- Work together with your classmates.
- Go to tutoring in the ASTC or MESA, ask your classmates in our Discord room, watch YouTube Videos, come to office hours, etc.
- To ensure your mastery of the material, do the quiz multiple times.

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4.4 Lewis Symbols and Structures

(From Chapter 4.4 #34) Write the Lewis symbols for each of the following ions:

- 1) As^{3-} 2) I^- 3) Be^{2+} 4) O^{2-}
5) Ga^{3+} 6) Li^+ 7) N^{3-}

(From Chapter 4.4 #35) Many monatomic ions are found in seawater, including the ions formed from the following list of elements. Write the Lewis symbols for the monatomic ions formed from the following elements:

- 8) Cl 9) Na 9) Mg 10) Ca
11) K 12) Br 13) Sr 14) F

3.7 Ionic and Molecular Compounds

(From Chapter 3.7 #95) Using the periodic table, predict whether the following chlorides are ionic or covalent:

- 15) KCl 16) NCl_3 17) ICl 18) MgCl_2 19) PCl_5 20) CCl_4

(From Chapter 3.7 #96) Using the periodic table, predict whether the following chlorides are ionic or covalent:

- 21) SiCl_4 22) PCl_3 23) CaCl_2 24) CsCl 25) CuCl_2 26) CrCl_3

(From Chapter 3.7 #97) For each of the following compounds, state whether it is ionic or covalent. If it is ionic, write the symbols for the ions involved:

- 27) NF_3 28) BaO skip this one) $(\text{NH}_4)_2\text{CO}_3$
skip this one) $\text{Sr}(\text{H}_2\text{PO}_4)_2$ 29) IBr 30) Na_2O

(From Chapter 3.7 #98) For each of the following compounds, state whether it is ionic or covalent, and if it is ionic, write the symbols for the ions involved:

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- 31) KClO_4 skip this one) $\text{Mg}(\text{C}_2\text{H}_3\text{O}_2)_2$ 32) H_2S
33) Ag_2S 34) N_2Cl_4 skip this one) $\text{Co}(\text{NO}_3)_2$

(From Chapter 3.7 #99) For each of the following pairs of ions, write the symbol for the formula of the compound they will form.

- 36) Ca^{2+} , S^{2-} skip this one) NH_4^+ , SO_4^{2-} 37) Al^{3+} , Br^-
skip this one) Na^+ , HPO_4^{2-} skip this one) Mg^{2+} , PO_4^{3-}

(From Chapter 3.7 #100) For each of the following pairs of ions, write the symbol for the formula of the compound they will form.

- 38) K^+ , O^{2-} skip this one) NH_4^+ , PO_4^{3-} 39) Al^{3+} , O^{2-}
skip this one) Na^+ , CO_3^{2-} skip this one) Ba^{2+} , PO_4^{3-}

4.1 Ionic Bonding

40) (From Chapter 4.1 #1) Does a cation gain protons to form a positive charge or does it lose electrons?

41) (From Chapter 4.1 #3) Which of the following atoms would be expected to form negative ions in binary ionic compounds? P, I, Mg, Cl, In, Cs, O, Pb, Co

42) (From Chapter 4.1 #3) Which of the following atoms would be expected to form positive ions in binary ionic compounds? P, I, Mg, Cl, In, Cs, O, Pb, Co?

43) (From Chapter 4.1 #4). Which of the following atoms would be expected to form negative ions in binary ionic compounds? Br, Ca, Na, N, F, Al, Sn, S, Cd

44) (From Chapter 4.1 #4) Which of the following atoms would be expected to form positive ions in binary ionic compounds? Br, Ca, Na, N, F, Al, Sn, S, Cd

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(From Chapter 4.1 #5) Predict the charge on the monatomic ions formed from the following atoms in binary ionic compounds:

45) P 46) Mg 47) Al 48) O 49) Cl 50) Cs

(From Chapter 4.1 #4) Predict the charge on the monatomic ions formed from the following atoms in binary ionic compounds:

51) I 52) Sr 53) K 54) N 55) S 56) In

4.2 Covalent Bonding

57) (From Chapter 4.2 #11) Why is it incorrect to speak of a molecule of solid NaCl?

58) (From Chapter 4.2 #12) What information can you use to predict whether a bond between two atoms is covalent or ionic?

(From Chapter 4.2 #13) Predict which of the following compounds are ionic and which are covalent, based on the location of their constituent atoms in the periodic table:

59) Cl₂CO 60) MnO 61) NCl₃ 62) CoBr₂ 63) K₂S 64) CO

65) CaF₂ 65) HI 66) CaO 67) IBr 68) CO₂

4.4 Lewis Symbols and Structures

(From Chapter 4.4 #36) Write the Lewis symbols of the ions in each of the following ionic compounds and the Lewis symbols of the atom from which they are formed:

69) MgS 70) Al₂O₃ 71) GaCl₃ 72) K₂O 73) Li₃N 74) KF

(From Chapter 4.4 #39) Write Lewis structures for the following:

75) H₂ 76) HBr 77) PCl₃ 78) SF₂ 79) H₂CCH₂ 80) HNNH

81) H₂CNH 82) NO⁻ 83) N₂ 84) CO 85) CN⁻

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1.2 Phases and Classification of Matter

86) (From Chapter 1.2 #8) Why is an object's mass, rather than its weight, used to indicate the amount of matter it contains?

87) (From Chapter 1.2 #9) What properties distinguish solids from liquids? Liquids from gases? Solids from gases?

88) (From Chapter 1.2 #10) How does a heterogeneous mixture differ from a homogeneous mixture? How are they similar?

89) (From Chapter 1.2 #11) How does a homogeneous mixture differ from a pure substance? How are they similar?

90) (From Chapter 1.2 #12) How does an element differ from a compound? How are they similar?

91) (From Chapter 1.2 #13) How do molecules of elements and molecules of compounds differ? In what ways are they similar?

92) (From Chapter 1.2 #14) How does an atom differ from a molecule? In what ways are they similar?

93) (From Chapter 1.2 #18) A sulfur atom and a sulfur molecule are not identical. What is the difference?

94) (From Chapter 1.2 #19) How are the molecules in oxygen gas, the molecules in hydrogen gas, and water molecules similar? How do they differ?

95) (From Chapter 1.2 #20) Why are astronauts in space said to be "weightless," but not "massless"?

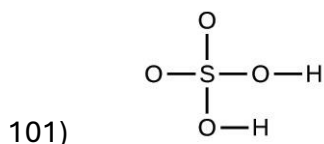
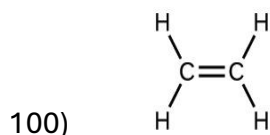
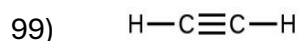
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2.4 Chemical Formulas

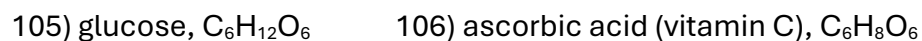
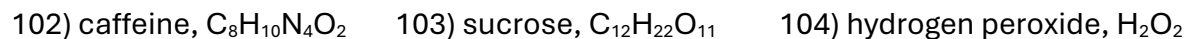
96) (From Chapter 2.4 #27) Explain why the symbol for an atom of the element oxygen and the formula for a molecule of oxygen differ.

97) (From Chapter 2.4 #28) Explain why the symbol for the element sulfur and the formula for a molecule of sulfur differ.

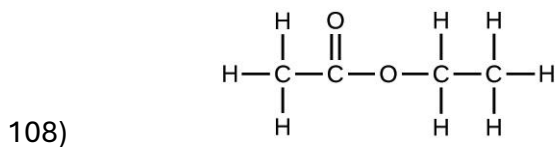
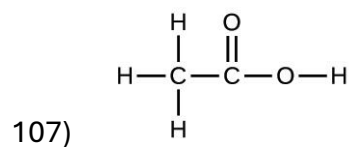
(From Chapter 2.4 #29) Write the molecular and empirical formulas of the following compounds:



(From Chapter 2.4 #31) Determine the empirical formulas for the following compounds:



(From Chapter 2.4 #33) Write the empirical formulas for the following compounds:



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109) (From Chapter 2.4 #37) Write a sentence that describes how to determine the number of moles of a compound in a known mass of the compound if we know its molecular formula.

110) (From Chapter 2.4 #41) How are the molecular mass and the molar mass of a compound similar and how are they different?

(From Chapter 2.4 #43) Calculate the molar mass of each of the following:

111) S_8 112) C_5H_{12} 113) $Sc_2(SO_4)_3$

114) CH_3COCH_3 (acetone) 115) $C_6H_{12}O_6$ (glucose)

(From Chapter 2.4 #45) Calculate the molar mass of each of the following:

116) the anesthetic halothane, $C_2HBrClF_3$ 117) the herbicide paraquat, $C_{12}H_{14}N_2Cl_2$

118) caffeine, $C_8H_{10}N_4O_2$ 119) urea, $CO(NH_2)_2$ 120) a typical soap, $C_{17}H_{35}CO_2Na$