

Chemistry II bonding questions/problems – Part I

Types of bonds and bond polarity:

- 1) Some plant fertilizer compounds are $(\text{NH}_4)_2\text{SO}_4$, $\text{Ca}_3(\text{PO}_4)_2$, K_2O , P_2O_5 , and KCl . Which of these compounds contain both ionic and covalent bonds?
- 2) What are the trends for electronegativity?
- 3) WITHOUT using an electronegativity table, predict the order of increasing electronegativity in each of the following groups (then check yourself with a table):
 - a) C, N, O
 - b) S, Se, Cl
 - c) Si, Ge, Sn
 - d) Tl, S, Ge
- 4) WITHOUT using an electronegativity table, predict which bond in each of the following groups will be the most polar (then check yourself with a table):
 - a) C–F, Si–F, Ge–F
 - b) P–Cl, S–Cl
 - c) S–F, S–Cl, S–Br
 - d) Ti–Cl, Si–Cl, Ge–Cl
- 5) Which of the following incorrectly shows bond polarity? Show the correct bond polarity for those that are incorrect.
 - a) δ^+ H–F δ^-
 - b) δ^+ Cl–I δ^-
 - c) δ^+ Si–S δ^-
 - d) δ^+ Br–Br δ^-
 - e) δ^+ O–P δ^-
- 6) Rank the following bonds in order of INCREASING ionic character (from most covalent to most ionic):
N–O, Ca–O, C–F, Br–Br, K–F

Draw the Lewis structures for the following:

- 1) HF
- 2) N_2
- 3) NH_3
- 4) CH_4
- 5) CF_4
- 6) NO^+
- 7) HCN (central atom is carbon)
- 8) PH_3
- 9) CHCl_3
- 10) NH_4^+

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| 11) H_2CO (central atom is carbon) | 12) SeF_2 |
| 13) O_2 | 14) HBr |
| 15) POCl_3 | 16) SO_4^{2-} |
| 17) XeO_4 | 18) ClO_4^- |
| 19) PO_4^{3-} | 20) SO_3^{2-} |
| 21) ClO_2^- | |

Ions, Ionic Size:

- 7) Write the electron configurations for
 a) the cations Mg^{2+} , K^+ , and Al^{3+}
 b) the anions N^{3-} , O^{2-} , F^- , and Te^{2-}
- 8) Which of the following ions have noble gas electron configurations?
 a) Fe^{2+} , Fe^{3+} , Sc^{3+} , Co^{3+}
 b) Tl^+ , Te^{2-} , Cr^{3+}
 c) Pu^{4+} , Ce^{4+} , Ti^{4+}
 d) Ba^{2+} , Pt^{2+} , Mn^{2+}
- 9) Which noble gas has the same electron configuration as each of the ions in the following compounds?
 a) cesium sulfide
 b) strontium fluoride
 c) calcium nitride
 d) aluminum bromide
- 10) For each of the following groups, place the atoms and ions in order of DECREASING size:
 a) Cu , Cu^+ , Cu^{2+}
 b) Ni^{2+} , Pd^{2+} , Pt^{2+}
 c) O , O^- , O^{2-}
 d) La^{3+} , Eu^{3+} , Gd^{3+} , Yb^{3+}
 e) Te^{2-} , I , Cs^+ , Ba^{2+} , La^{3+}
- 11) Predict the empirical formulas of the ionic compounds formed from the following pairs of elements.
 a) Al and S
 b) K and N
 c) Mg and Cl
 d) Cs and Br