

CHAPTER 7-PROBLEM SET

1. Arrange the following atoms in order of increasing effective nuclear charge experienced by the electrons in the $n = 3$ electron shell: K, Mg, P, Rh, Ti.
2. Using only the periodic table, arrange each set of atoms in order from largest to smallest:
(a) K, Li, Cs; (b) Pb, Sn, Si; (c) F, O, N.
3. Arrange each of the following sets of atoms and ions, in order of increasing size: (a) Se^{2-} , Te^{2-} , Se; (b) Co^{3+} , Fe^{2+} , Fe^{3+} ; (c) Ca, Ti^{4+} , Sc^{3+} ; (d) Be^{2+} , Na^+ , Ne.
4. Based on their positions in the periodic table, predict which atom of the following pairs will have the smaller first ionization energy: (a) Cl, Ar; (b) Be, Ca; (c) K, Co; (d) S, Ge; (e) Sn, Te.
5. Predict whether each of the following oxides is ionic or molecular: SnO_2 , Al_2O_3 , CO_2 , Li_2O , Fe_2O_3 , H_2O .
6. Arrange the following oxides in order of increasing acidity: CO_2 , CaO, Al_2O_3 , SO_3 , SiO_2 , P_2O_5 .
7. Compare the elements bromine and chlorine with respect to the following properties: (a) electron configuration, (b) most common ionic charge, (c) first ionization energy, (d) reactivity toward water, (e) electron affinity, (f) atomic radius. Account for the differences between the two elements.
8. The following observations are made about two hypothetical elements A and B: The $\text{A}-\text{A}$ and $\text{B}-\text{B}$ bond lengths in elemental A and B are 2.36 and 1.94 Å, respectively. A and B react to form the binary compound AB_2 , which has a linear structure (that is $\text{B}-\text{A}-\text{B} = 180^\circ$). Based on these statements, predict the separation between the two B nuclei in a molecule of AB_2 .
9. Identify two ions that have the following ground-state electron configurations: (a) $[\text{Ar}]$, (b) $[\text{Ar}]3\text{d}^5$, (c) $[\text{Kr}]5\text{s}^24\text{d}^{10}$.