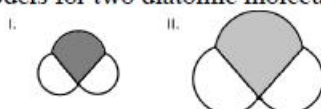


Molecular and Ionic Compound Structure and Properties
2.2 Intramolecular Forces and Potential Energy
Worksheet

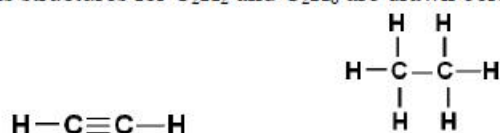
- 1) Draw representations of both ionic solids in each set that show the relative differences in the sizes of the four ions, the ratio of cations to anions, and the charge on each ion; identify which ionic solid will have the higher melting temperature; and justify your answer. (Formula units that contain two ions must be drawn as networks consisting of twelve ions in total. Formula units that contain more than two ions can be represented as a single formula unit.)
- NaCl or KBr
 - NaCl or MgS
 - BeF₂ or LiF
 - CaO or CaCl₂
 - MgO or Al₂O₃
- 2) Rank the following single bonds in order of increasing bond length: O – C, O – N, O – O, and O – F.
- 3) Which bond from each set has the greatest bond energy?
- N – O or N – F
 - B – F or B – Cl
 - B – C or O – F
 - C – O or C = O
 - P – Br or P – Cl
- 4) Which bond from each set is the longest?
- N – O or N = O
 - B – N or B – F
 - Si – O or Si – I
 - C – Cl or C – F
- 5) The spacing filling models for two diatomic molecules are shown below.



- Which structure has the longest bond lengths? Justify your answer.
- Which structure has the greatest bond energy between the central and a terminal atoms? Justify your answer.
- Which structure has the least potential energy associated with its bonds? Justify your answer.

- 6) The following questions refer to F_2 and Cl_2 .
- Draw the molecular model (space-filling or ball-and-stick) that would provide the best means for comparing the differences in bond length and bond energy.
 - Which structure has the longest bond length? Justify your answer.
 - Which bond has the greatest bond energy? Justify your answer.
 - Which structure has the least potential energy associated with its bond? Justify your answer.

- 7) The Lewis structures for C_2H_2 and C_2H_6 are drawn below.



- What is the bond order for the carbon-carbon bond in each structure?
 - Which structure has the shortest carbon-carbon bond length?
 - Which structure has the greatest carbon-carbon bond energy?
 - Provide an explanation for your answers to parts a) and b) using principles of chemical bonding.
 - The carbon-carbon bond contains the greatest amount of potential energy in which structure? Justify your answer.
- 8) This question deals with bonds in carbon dioxide and carbon disulfide.



- Which structure has the shortest bond length between the central and each terminal atom?
- Which structure has the greatest bond energy in its individual bonds?
- Provide an explanation for your answers to parts a) and b) using principles of chemical bonding.