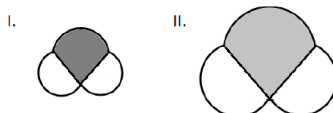


## Unit 2.2

### Intramolecular Forces and Potential Energy

Please use a separate sheet of paper to answer the following questions.

- For each pair, identify which solid will have the higher melting temperature and justify your answer.
  - NaCl or KBr
  - NaCl or MgS
  - BeF<sub>2</sub> or LiF
  - CaO or CaCl<sub>2</sub>
  - MgO or Al<sub>2</sub>O<sub>3</sub>
- Rank the following single bonds in order of increasing bond length: O–C, O–N, O–O and O–F.
- Which bond from each set as the greatest bond energy?
  - N–O or N–F
  - B–F or B–Cl
  - C–O or C=O
  - P–Br or P–Cl
- 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
- The space filling models for two molecules are shown below.



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

Name: \_\_\_\_\_

Date: \_\_\_\_\_

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 answer 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 these two answers using principles of chemical bonding.