

Chemical Bonding

Name - _____

1.) Which of the following atom pairs would you expect to form ionic bonds when they join?

- a.) Ba and S b.) P and Cl c.) Ca and O d.) Rb and I e.) O and H f.) S and O

2a.) Which compound has the smaller distance between the nuclei of the two ions involved NaCl or KBr?

Explain why.

Answer - NaCl. Both sodium and chlorine have fewer shells. With fewer shells the ions can be bonded closer together resulting in an overall smaller molecule.

b.) What happens to the force of electrostatic attraction between the two ions in an ionic bond as the ions get smaller? (think it through, logically)

Answer - Increases. Both the protons and electrons are closer together resulting in a stronger force between the positive nucleus and the negative electrons.

c.) What happens to the **strength of an ionic bond** as the ions involved get smaller? What happens to the intermolecular attractive forces as the atoms get smaller, and how does this affect the melting temperature? (think it through logically)

Answer - Strength increases. Atoms in a molecule become closer together resulting in distances BETWEEN molecules being smaller and thus increasing intermolecular forces. Melting temperature increases. Smaller ions have a greater intermolecular force resulting in a higher melting point.

NaCl = 801°C and KBr = 734°C

3.) Mg²⁺ and Na⁺ have roughly the same ionic radius. O²⁻ and F⁻ have roughly the same ionic radius as well.

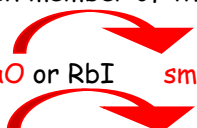
Which substance should have a higher melting temperature, NaF or MgO? Why?

Answer - A greater charge leads to a greater force of attraction. This force of attraction results in more energy being needed to separate the ions and a higher melting point.


MgO = 2852°C and NaF = 993°C

4.) Which member of the following pairs would you expect to have the higher melting point?


a.) CaO or RbI smaller



b.) LiF or NaCl smaller



c.) CsCl or BaS charge



d.) RbI or KCl smaller e.) BeO or MgS smaller

5a.) If extra electrons are added to a neutral atom O to make O^{2-} , the resulting ion has the same positive nuclear charge and an increased number of negative electrons surrounding the nucleus. What happens to the amount of electrostatic repulsion existing between the electrons?

Answer - Increase

b.) What happens to the volume occupied by the electrons due to the change in the amount of electron-electron repulsion (remember like charges don't like to be near each other).

Answer - Increase

c.) Negative ions are bigger/smaller (circle one) than the corresponding neutral atom.

6a.) If electrons are removed from a neutral atom of Mg to make Mg^{2+} , the resulting ion has the same positive nuclear charge and a decreased number of negative electrons surrounding the nucleus. What happens to the amount of electrostatic repulsion existing between the electrons?

Answer - Decrease.

b.) What happens to the volume occupied by the electrons due to the change in repulsion?

Answer - Decrease.

c.) Positive ions are bigger/smaller (circle one) than the corresponding neutral atom.

7.) Which of the following atom pairs would you expect to form covalent bonds when they join?

a.) S and O

c.) Fe and Cl

e.) H and S

b.) Ba and O

d.) N and O

f.) C and H

8a.) When the distance between two covalently bonded atoms increases, what happens to the electrostatic attraction of their nuclei to the shared electrons in a covalent bond?

Answer - Decreases. When the distance between nuclei and shared electrons increases the electrostatic attraction decreases.

b.) What would you expect to occur to the strength of the covalent bond between two identical halogen atoms when going down the halogen family from F_2 to I_2 ?

Answer - Decreases. When the distance between nuclei increases the electrostatic attraction decreases.

9.) What would you expect to occur to the strength of the covalent bond when the number of shared electrons increases?

Answer - Increases. When more electrons are shared there is a greater electrostatic attraction between nuclei and shared electrons. This results in a shorter bond length as the electrons are pulled closer.

10.) The distance between the nuclei of two atoms involved in a bond is called the bond length. What should happen to the bond length as the number of shared electrons in the bond increases? Why will this happen?

Answer - decreases. When more electrons are shared there is a greater electrostatic attraction between nuclei and shared electrons. This results in a shorter bond length as the electrons are pulled closer.

11.) Predict the formula of the compound formed by bonding together the following.

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|--------------|----------|--------------|----------|-------------|----------|--------------|-----------|
| a.) P and Cl | PCl_3 | d.) P and O | P_2O_3 | g.) H and O | H_2O | j.) C and Cl | CCl_4 |
| b.) B and O | B_2O_3 | e.) H and Se | H_2Se | h.) N and I | NI_3 | k.) Si and P | Si_3P_4 |
| c.) C and S | CS_2 | f.) F and O | F_2O | i.) B and C | B_4C_3 | l.) Si and S | SiS_2 |

