

Chemistry 105, Chapter 9 Exercises

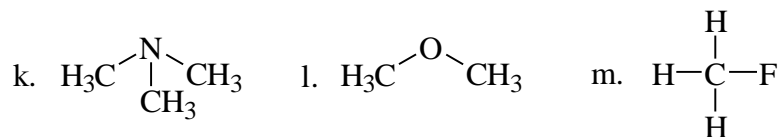
Lattice Energy

1. For each pair, choose the compound with the higher lattice energy.
a. CaS or BaS b. NaF or MgO c. NaF or NaCl d. K₂O or K₂S e. Al₂O₃ or MgO

Intermolecular Forces

2. Indicate the predominant intermolecular force (dipole, H-bond, dispersion, ionic) in each of the following :

- a. C₂H₂ b. HF c. Br₂ d. V₂O₅ e. CH₃NH₂ f. HO-OH g. CCl₄ h. InCl₃
i. Xe j. N₂



Intermolecular Forces and Physical Properties

3. Arrange the following in order of decreasing boiling point.



4. Arrange the following in order of increasing boiling point.



5. Why does HI have a higher boiling point than HBr?
6. Why does GeH₄ have a lower vapor pressure than SiH₄?
7. Why does H₂O₂ have a higher melting point than C₃H₈?
8. Why does NaCl have a much slower evaporation rate than CH₃OH?
9. Why does Br₂ have a lower melting point than NaBr?
10. Why does C₂H₅OH have a lower vapor pressure than C₄H₁₀?
11. Why does H₂O have a higher boiling point than H₂Te?
12. Why does $\begin{array}{c} \text{H}_3\text{C}-\text{C}-\text{OH} \\ || \\ \text{O} \end{array}$ have a lower boiling point than $\begin{array}{c} \text{C}_6\text{H}_5-\text{C}-\text{OH} \\ || \\ \text{O} \end{array}$?
13. Which will evaporate faster CH₃OH or CH₃F?
14. Which has a higher vapor pressure C₃H₇OH or C₂H₅OCH₃?

15. Which has a lower vapor pressure LiCl or CCl₄?
16. For each of the following pairs, choose the member with the lower boiling point.
- | | | |
|---|--|--------------------------------------|
| a. NaCl or PCl ₃ | d. LiCl or CCl ₄ | g. N ₂ or Cl ₂ |
| b. C ₃ H ₇ OH or C ₂ H ₅ OCH ₃ | e. CH ₃ OH or CH ₃ F | |
| c. HI or HCl | f. H ₂ O or SO ₂ | |

Types of Substances

17. Classify each of the following solids as metallic, network covalent, ionic, or molecular.
- It is insoluble in water, melts above 500°C, and does not conduct electricity either as a solid, or molten.
 - It dissolves in water but does not conduct electricity as an aqueous solution, as a solid, or molten.
 - It dissolves in water, melts above 100°C, and conducts electricity when present in an aqueous solution.
 - It melts below 100°C and is insoluble in water.
 - It conducts electricity only when melted.
 - It is insoluble in water and conducts electricity.
18. Of the four general types of solids, which one(s):
- are generally low-boiling?
 - are ductile and malleable?
 - are generally soluble in nonpolar solvents?
 - are generally insoluble in water?
 - have very high melting points?
 - conduct electricity as solids?
19. Classify each of the following species as molecular, network covalent, ionic, or metallic.
- | | | | | | | | |
|--------|------------------------------------|----------------------------------|--------------------|----------------------------------|--------------------|--|-------------------|
| a. Na | b. Na ₂ SO ₄ | c. C ₆ H ₆ | d. C ₆₀ | e. W | f. NO ₂ | g. (NH ₄) ₂ CO ₃ | h. F ₂ |
| i. SiC | j. C(graphite) | k. KO ₂ | l. Au | m. C ₂ H ₂ | | | |

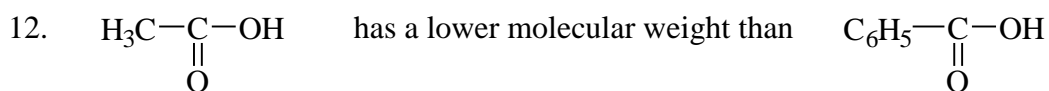
Heating Water

20. Calculate the amount of heat required to transform 1 L (1000g) of H₂O(s) at 0°C to steam at 100°C? The specific heat for ice is 0.5 cal/g°C. The heat of fusion for ice is 80 cal/g. The heat of vaporization for water is 540 cal/g.
21. Calculate the amount of heat required to transform an ice cube (30 g) from -5°C to steam at 100°C.

Answers to Exercises

1. a. CaS b. MgO c. NaF d. K₂O e. Al₂O₃
2. Indicate the predominant intermolecular force (dipole, H-bond, dispersion, ionic) in each of the following :
- | | | | | | | |
|---------------|--------------|---------------|---------------|--------------|--------------|-----------|
| a. dispersion | b. H-bonding | c. dispersion | d. ionic | e. H-bonding | f. H-bonding | |
| g. dispersion | h. ionic | i. dispersion | j. dispersion | k. dipole | l. dipole | m. dipole |

3. highest B.P. $I_2 > Br_2 > Cl_2 > F_2$ lowest B.P.
4. lowest B.P. $He < Ne < Ar < Xe$ highest B.P.
5. HI has a greater molecular weight than HBr therefore the dispersion forces are greater.
6. GeH_4 has a greater molecular weight than SiH_4 therefore the dispersion forces are greater.
7. H_2O_2 is capable of H-bonding whereas C_3H_8 exhibits weaker dispersion forces.
8. NaCl is ionic whereas CH_3OH exhibits weaker H-bonding?
9. Br_2 exhibits dispersion forces whereas NaBr possesses stronger ionic bonds.
10. C_2H_5OH exhibits H-bonding whereas C_4H_{10} exhibits weaker dispersion forces.
11. H_2O is capable of H-bonding whereas H_2Te is not.



therefore the dispersions forces are weaker.

13. CH_3F will evaporate faster.
14. $C_2H_5OCH_3$ will have the higher vapor pressure.
15. LiCl will have the lower vapor pressure.
16. The following will have the lower boiling point.
 - a. PCl_3
 - b. $C_2H_5OCH_3$
 - c. HCl
 - d. CCl_4
 - e. CH_3F
 - f. SO_2
 - g. N_2
17. Classify each of the following solids as metallic, network covalent, ionic, or molecular.
 - a. network covalent
 - b. molecular
 - c. ionic
 - d. molecular
 - e. ionic
 - f. metallic
18. Of the four general types of solids, which one(s):
 - a. molecular
 - b. metallic
 - c. molecular
 - d. metallic and network covalent
 - e. network covalent
 - f. metallic
19. Classify each of the following species as molecular, network covalent, ionic, or metallic.
 - a. metallic
 - b. ionic
 - c. molecular
 - d. molecular
 - e. metallic
 - f. molecular
 - g. ionic
 - h. molecular
 - i. network covalent
 - j. network covalent
 - k. ionic
 - l. metallic
 - m. molecular
20. 720 kcal
21. 22 kcal