

Chapter 12 Worksheet 1

Name:

Answer key

UGA MyID:

Instructions:

- Please enter your first and last name as it appears on the eLC roster (do not use a nickname).
- Your UGA myID is a combination of letters and numbers (example: mine is aw00285). **Do not use your 81x number.**
- If you do not have a printer, type your answers in the boxes then upload the worksheet template to Gradescope by Sunday, January 17th at 11:59 p.m. Write your work on separate sheets of paper, convert to a PDF and upload to the dropbox on eLC.
- If you have a printer download the worksheet, write your answers and show your work on the worksheet template, convert it to a PDF and upload to Gradescope by Sunday, January 17th at 11:59 p.m. You do not need to upload anything to eLC.

Part 1: CHEM 1211 Review

Question 1: Select all the non-polar molecules

- ☒ A. CS_2
- ☐ B. CH_2Cl_2
- ☐ C. SBr_2
- ☐ D. OF_2
- ☒ E. XeF_2
- ☒ F. XeF_4
- ☐ G. IBr_4^+
- ☒ H. IBr_4^-
- ☐ I. All molecules are polar.

See class solution.

Question 2: Potassium chloride is used as a substitute for sodium chloride for individuals with high blood pressure. Identify the limiting reactant and determine the mass of the excess reactant remaining when 7.00 g of chlorine gas reacts with 5.00 g of potassium to form potassium chloride.

- ☐ A. Chlorine is the limiting reactant; 1.14 g of potassium remain.
- ☐ B. Potassium is the limiting reactant; 2.00 g of chlorine remain.
- ☒ C. Potassium is the limiting reactant; 2.47 g of chlorine remain.
- ☐ D. Chlorine is the limiting reactant; 3.07 g of potassium remain.
- ☐ E. Potassium is the limiting reactant; 4.50 g of chlorine remain.

See class solution

Question 3: A 10.00 g sample of a soluble barium salt is treated with an excess of sodium sulfate (Na_2SO_4) to precipitate 11.21 g BaSO_4 ($M = 233.4$). Which barium salt is it?

- ☒ A. BaCl_2 ($M = 208.2$)
- ☐ B. $\text{Ba}(\text{O}_2\text{CH})_2$ ($M = 227.3$)
- ☐ C. $\text{Ba}(\text{NO}_3)_2$ ($M = 261.3$)
- ☐ D. BaBr_2 ($M = 297.1$)

See class solution

Question 4: Potassium iodide reacts with lead(II) nitrate in a precipitate reaction. What minimum volume of 0.200 M potassium iodide solution is required to completely precipitate all of the lead in a 155.0 mL of 0.112 M lead(II) nitrate?

- ☐ A. 348 mL
- ☐ B. 86.8 mL
- ☒ C. 174 mL
- ☐ D. 43.4 mL
- ☐ E. None of these

See class solution

Part 2: Chapter 12

Question 1: List the IMFs in the substances below. (Select all that apply, separate your options using commas).

- A. dipole-dipole forces
- C. hydrogen bonding
- D. ion-dipole forces
- E. dispersion forces
- F. ionic bond
- G. induced-dipole-dipole

1. H_2 and H_2O

E, G

2. LiI

F, E

3. CH_3OH

A, C, E

4. CH_3CH_3

E

5. CH_2F_2

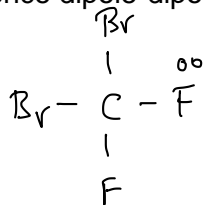
A, E

6. LiI and H_2O

E, D

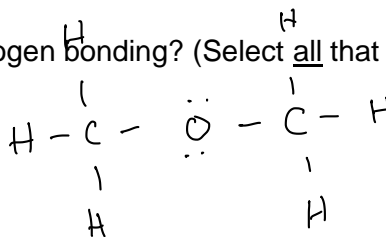
Question 2: Molecules of which substances experience dipole-dipole interactions? (Select all that apply, separate your options using commas).

- A. CF_4
- ☒ B. CF_2Br_2
- ☒ C. SO_2
- ☒ D. $CFCI_3$
- ☒ E. CO



Question 3: Which of the following molecules can interact as hydrogen bonding? (Select all that apply, separate your options using commas).

- ☒ A. NH_3
- B. CH_3OCH_3
- ☒ C. HF
- D. CH_3CN
- ☒ E. CH_3OH
- ☒ F. CH_3NH_2
- ☒ G. CH_3CO_2H



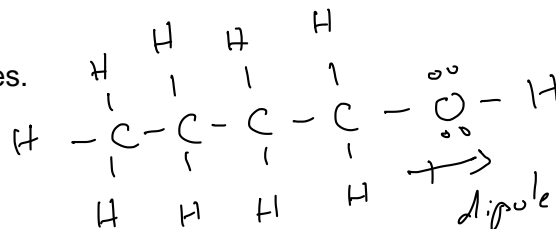
Hydrogens are not
not connected to
N, O, or F

Question 4: Which of the following pairs is arranged with the particle of higher polarizability listed first? *(size, charge)* *> anions more polarizable than cations*

☒ A. Se^{2-} , S^{2-}
 B. I^- , I^-
 C. Mg^{2+} , Mg
 D. Br , I *larger, higher*

Question 5: Pentane ($\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$) and neopentane ($\text{C}(\text{CH}_3)_4$) both have the C_5H_{12} formula. Which compound has stronger induced dipole, induced dipole forces?

- ☒ A. Pentane ($\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$)
 B. Neopentane $\text{C}(\text{CH}_3)_4$
 C. Both experience the same forces.



Question 6. In liquid propanol,

which intermolecular forces are present?

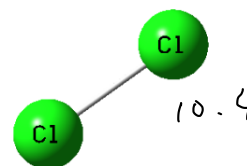
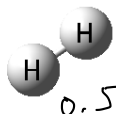
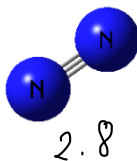
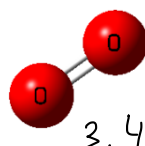
- ☒ A. Dispersion, hydrogen bonding and dipole-dipole forces are present.
 B. Only dipole-dipole and ion-dipole forces are present.
 C. Only dispersion and dipole-dipole forces are present.
 D. Only hydrogen bonding forces are present

Question 7: Identify all the correct pairs describing the change with higher strength of intermolecular forces of a liquid. (Select all that apply, separate your options using commas).

- ☒ A. Boiling Point, Increases
☒ B. Surface tension, Increases
☒ C. Freezing Point, Decreases
☒ D. Vapor pressure, Decreases
☒ E. Viscosity, Increases

Question 8:

Which row do you think has the correct heats of vaporization associated with the compound (in its liquid form)?



- | | | | |
|--|------|-----|------|
| A. 0.5 | 10.4 | 2.8 | 3.4 |
| B. 10.4 | 0.5 | 3.4 | 2.8 |
| <input checked="" type="radio"/> C. 2.8 | 3.4 | 0.5 | 10.4 |
| <input checked="" type="radio"/> D. None of these. | | | |

Question 9:

In an aqueous solution, which cation would you expect to experience the strongest ion-dipole interaction with water?

- A. Na^+
☒ B. Mg^{2+}
 C. Ca^{2+}
 D. K^+

(smallest ion of the same charge)

Question 10:

The boiling point of $\text{HCl} < \text{HBr} < \text{HI}$. Which molecule is the most polar?

☐

- A. HI
B. HCl
C. HBr

2.1, H

3.0, Cl

2.8, Br

2.5, I

\rightarrow (HCl has the largest dipole moment according to electronegativity differences)

Question 11:

Why is the trend in boiling point ($\text{HCl} < \text{HBr} < \text{HI}$) reversed?

☐

- A. The trend for polarity was wrong
B. Boiling point is not dependent on the polarity of the molecules
C. London forces
D. Boiling point is more dependent on mass than intermolecular attractions

\rightarrow HI has the largest electron cloud and polarizability.

Question 12:

Which of the following statements is correct? (Select all that apply, separate your options using commas).

Strength of
IMFs decides

all physical
properties

- A. KCl will have a higher vapor pressure at 25 °C than HF
B. NH_3 will have a lower boiling point than BeO
C. NH_3 will have a lower vapor pressure at -50 °C than NO
D. N_2 will have a higher boiling point than NO
E. $\text{CH}_3\text{CH}_2\text{CH}_3$ will have a lower vapor pressure at -50 °C than CH_3OCH_3

A. IMFs:
 $\text{KCl} > \text{HF}$,
hence lower

B. $\text{BeO} > \text{NH}_3$, C. $\text{NH}_3 > \text{NO}$, D. $\text{NO} > \text{N}_2$
E. $\text{CH}_3\text{OCH}_3 > \text{CH}_3\text{CH}_2\text{CH}_3$

Question 13:

Solutions of benzene (C_6H_6) and toluene (C_7H_8) are ideal. At 30 °C, the vapor pressure of pure benzene is 125 mm Hg while that of pure toluene is 39.0 mm Hg. If a solution is prepared by mixing 1 mol of benzene and 2 mol of toluene at 30 °C, the vapor at equilibrium will have

☐

- A. more moles of benzene than toluene.
B. more moles of toluene than benzene.
C. the same number of moles of toluene as of benzene.

$P_{\text{benzene}} = 125 \text{ mm Hg}$
 $P_{\text{toluene}} = 39.0 \text{ mm Hg}$
Each substance has a specific vapor pressure that is dictated by the strength of IMFs. $P \propto n$ (number of moles)

Question 14:

The equilibrium vapor pressure of a given liquid will decrease if

☐

- A. the liquid is moved to a container in which its surface area is much smaller.
B. the volume of liquid in the container is decreased.
C. the volume of the vapor phase is increased.
D. the temperature is decreased.

Vapor pressure of a liquid is only dependent on the temperature.

liquid \rightleftharpoons gas (vapor) \Rightarrow Equilibrium.
For all other changes, some vapor will condense or vice-versa, but the vapor pressure value is maintained.