Quiz III   General Chemistry II   Lecture I   Summer 13   Dr. Hahn   25 pts   6/10 M   quiz # _____

Name _____Key_____   Name _____
(print name)   (sign name)   Please **show all work** for full credit.

1. Order from lowest to strongest intermolecular force.   Use (1) for strongest and (3) for weakest (3 pts)

Hydrogen bonding   dispersion force   dipole dipole force   *no partial credit*

____1____   ____3____   ____2____

2.   Choose one of the following molecules to complete the following series of questions.   Clearly state which one you chose otherwise, your answer ~~will be incorrect.~~ (If you do more than one, I will only grade the first one.) (9 pts total, 3 pts each letter)   *1 pt direction*   (b) not zero   © dipole-dipole

vector off — 1 pt

VSEPRT molecular shape = trigonal pyramidal   *1 pt per arrow*
I am working on this molecule (a) circle letter.

CH₃—O:—H   VSEPRT molecular shape = bent   (b) not zero   © H bonding
1 pt per arrow   I am working on this molecule (b) circle letter

1 pt per arrow

Cl—C—Cl H H   VSEPRT molecular shape = tetrahedral   (b) not zero
                         I am working on this molecule (c) circle letter   © dipole-dipole

a.   For the molecule shown, draw a dipole moment arrow for each bond in the molecule.   (The dipole moment arrow should look like   (+———→)   *no partial credit*

1 pt per arrow

b.   The dipole moment for the molecule as a whole is   [(zero) or (not zero)] (circle one)

c.   The intermolecular force for this molecule is [(London force) or (dipole-dipole) or (hydrogen bonding)] (circle one)   *C + H has same EN*

3.   Which one of the following molecules has a higher BP or MP?   [(CH₄) or (CH₃CH₂CH₂CH₃)] (circle one) (4 pts)   larger molecule has greater dispersion force   both has dispersion force intermolecular force – assume

4.   (a) If you want to melt 92.7 grams of water, what is the heat required, q ? (q = nΔH_fusion) (molar mass water is 18.02 grams/mole, ΔH_fusion for water = 6.02 kJ/mol) (6 pts)   (melt ΔH_fusion +)   (freeze ΔH_fusion –)

math 1 pt   92.7 g × $\frac{mol}{18.02 g}$ = 5.14 mol H₂O

q = (5.14 mol H₂O) × ($\frac{6.02 kJ}{mol}$) = 30.9 kJ   *attempt – 4 pt*

(b) The melting point of water is 0.00 °C.   What will be the temperature of the water at the end of the melting process ?   _0.00_ °C (3 pts)   (T does not change)

no partial credit

5. Extra Credit: (2 pts)

You have 13.5 grams of Na Cl (molar mass = 58.5 g/mol) and dissolve it in 100.0 mL of water which results in a 111.5 mL of total solution (density of pure water = 1.00 g / mL). What is the molarity (M) of the solution ? What is the molality (m) of the solution ? (show work) (1 pt molarity, 1 pt molality)

$$\text{molarity (M)} = \frac{\text{\# moles solute}}{\text{liter solution}} \quad \leftarrow 1\,pt.$$

$$\text{\# moles} \atop \text{NaCl} = 13.5\,\text{g NaCl} \times \frac{mol}{58.5\,g} = \frac{0.231}{NaCl}\,\text{moles}$$

$$\text{liter} \atop \text{solution} = 111.5\,\text{mL} \atop \text{solution} \times \frac{1\,liter}{1000\,mL} = \frac{0.1115}{solution}\,l$$

$$M = \frac{0.231\,mol\,NaCl}{0.1115\,l\,solution} = 2.07\,m \atop (\,molarity\,)$$

$$\text{molality (m)} = \frac{\text{\# moles solute}}{\text{kg solution}} \quad \leftarrow 1\,pt$$

$$\text{\# moles} \atop \text{NaCl} = 0.231\,\text{mole} \atop NaCl$$

$$\text{kg solvent} = 100.0\,\text{mL} \atop H_2O \times \frac{1.00\,g\,H_2O}{mL\,H_2O} \times \frac{1\,kg\,H_2O}{1000\,g\,H_2O} =$$

$$\text{kg solvent} = 0.1000\,kg \quad \leftarrow$$

$$m = \frac{0.231\,mol\,NaCl}{0.1000\,kg} = 2.31\,m \atop (\,molality\,)$$

(I made up these # so values may not match experimental reality.)

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(print name)   (sign name)   Please **show all work** for full credit.

1. Order from lowest to strongest intermolecular force. Use (1) for strongest and (3) for weakest (3 pts)

Hydrogen bonding   dispersion force   dipole dipole force

_____   _____   _____

2.   Choose one of the following molecules to complete the following series of questions. Clearly state which one you chose otherwise, your answer will be incorrect. (If you do more than one, I will only grade the first one.) (9 pts total, 3 pts each letter)
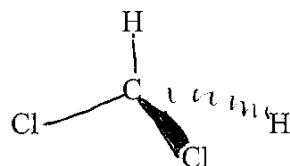
F—N(F)(F)   VSEPRT molecular shape = trigonal pyramidal

                               I am working on this molecule (a) circle letter.

CH_3—O—H   VSEPRT molecular shape = bent

                               I am working on this molecule (b) circle letter

H
|
Cl—C—H
   |
   Cl   VSEPRT molecular shape = tetrahedral

                               I am working on this molecule (c) circle letter

a.   For the molecule shown, draw a dipole moment arrow for each bond in the molecule. (The dipole moment arrow should look like (+———>)

b.   The dipole moment for the molecule as a whole is [(zero) or (not zero)] (circle one)

c.   The intermolecular force for this molecule is [(London force) or (dipole-dipole) or (hydrogen bonding)] (circle one)

3.   Which one of the following molecules has a higher BP or MP? [(CH_4) or ($CH_3CH_2CH_2CH_3$)] (circle one) (4 pts)

4.   (a) If you want to melt 92.7 grams of water, what is the heat required, q ? (q = $n\Delta H_{fusion}$) (molar mass water is 18.02 grams/mole, $\Delta H_{fusion\ for\ water}$ = 6.02 kJ/mol) (6 pts)

(b) The melting point of water is 0.00 °C. What will be the temperature of the water at the end of the melting process ? _____ °C (3 pts)

5. Extra Credit: (2 pts)

You have 13.5 grams of Na Cl (molar mass = 58.5 g/mol) and dissolve it in 100.0 mL of water which results in a 111.5 mL of total solution (density of pure water = 1.00 g / mL).   What is the molarity (M) of the solution ?   What is the molality (m) of the solution ? (show work)   (1 pt molarity, 1 pt molality)