This print-out should have 8 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering. V1:1, V2:1, V3:1, V4:1, V5:2.

You will have 20 minutes for the quiz. Please make sure you write your version numbers on your scantron. Good luck!

ChemPrin3e T06 35

18:05, general, multiple choice, < 1 min, fixed.

001 (part 1 of 1) 5 points

How much heat is required to vaporize 50.0 g of water if the initial temperature of the water is 25.0°C and the water is heated to its boiling point where it is converted to steam? The specific heat capacity of water is 4.18 $J \cdot (^\circ C)^{-1} \cdot g^{-1}$ and the standard enthalpy of vaporization of water at its boiling point is 40.7 $kJ \cdot mol^{-1}$.

1. 169 kJ

2. 64.2 kJ

3. 40.7 kJ

4. 129 kJ **correct**

5. 23.5 kJ

Explanation:

$m = 50$ g $\qquad T_i = 25^\circ C$

$T_f = 100^\circ C \qquad C = 4.18$ J/g/°C

$\Delta H_{vap} = 40.7$ kJ/mol

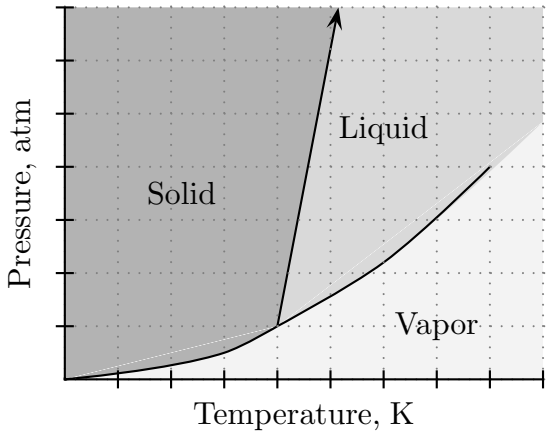
$$\begin{aligned} H &= m\,C\,\Delta T + \frac{m}{MM}\,\Delta H_{vap} \\ &= (50\text{ g})\,(4.18\text{ J/g/}^\circ\text{C}) \\ &\qquad \times (100 - 25)^\circ\text{C}\,\frac{1\text{ kJ}}{1000\text{ J}} \\ &\quad + \frac{50\text{ g}}{18\text{ g/mol}}\,(40.7\text{ kJ/mol}) \\ &= 128.731\text{ kJ} \end{aligned}$$

ChemPrin3e T08 34

14:10, basic, multiple choice, < 1 min, fixed.

002 (part 1 of 1) 5 points

The phase diagram for CO_2 is given below.



The triple point is at 5.1 atm and 217 K. What happens if $CO_2(\ell)$ at 30 atm and 450 K is released into a room at 1 atm and 298 K?

1. The liquid vaporizes. **correct**

2. The liquid remains stable.

3. The liquid and vapor are in equilibrium.

4. The liquid and solid are in equilibrium.

5. The liquid freezes.

Explanation:

Sparks dissolve 001

16:04, general, multiple choice, < 1 min, fixed.

003 (part 1 of 1) 5 points

For an endothermic dissolution process, as temperature increases, solubility

1. decreases.

2. increases. **correct**

3. stays the same.

Explanation:

Consider an endothermic process:

solid + heat → dissolved products

As heat is added, equilibrium will shift towards a higher concentration of dissolved products.

DAL Miscible

16:02, general, multiple choice, < 1 min, fixed.

004 (part 1 of 1) 5 points

Based simply on the molecular formula provided, which of the following compounds is least likely to be miscible in cyclohexane (C_6H_{12})?

1. methanol (CH_3OH) **correct**

2. benzene (C_6H_6)

3. phenol (C_6H_5OH)

4. Each contains a hydrocarbon unit and should be equally miscible.

5. naphthalene ($C_{10}H_8$)

Explanation:

ChemPrin3e T08 06

18:06, general, multiple choice, < 1 min, fixed.

005 (part 1 of 1) 5 points

Estimate the enthalpy of vaporization of CCl_4 given that at 25°C and 58°C its vapor pressure is 107 and 405 torr, respectively. Assume that the enthalpy of vaporization is independent of the temperature.

1. 486 $J \cdot mol^{-1}$

2. 48.6 $kJ \cdot mol^{-1}$

3. 142 $kJ \cdot mol^{-1}$

4. 3.98 $kJ \cdot mol^{-1}$

5. 33.1 $kJ \cdot mol^{-1}$ **correct**

Explanation:

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17:05, general, multiple choice, < 1 min, fixed.

006 (part 1 of 1) 5 points

Consider the solutions

I) 1.0 M Na_2SO_4,
II) 1.0 M NaCl, and
III) 1.0 M sugar.

What answer gives the expected order of decreasing (highest, next, lowest) osmotic pressure?

1. I, II, III **correct**

2. II, I, III

3. III, II, I

4. III, I, II

5. II, III, I

6. All would have the same osmotic pressure.

Explanation:

The equation for osmotic pressure is $\pi = M\,R\,T$ where π is the osmotic pressure, M is the molarity, and R and T are the same for the ideal gas law. If molarity increases then the osmotic pressure increases (they are directly proportional). Since this is a colligitive property, it is the number of moles of the particles that is important. Since sugar does not ionize, there is only one mole of particles present for each mole of sugar dissolved, so its effective molarity is 1.0 M. Each NaCl ionizes to give two ions so the effective molarity is $2(1.0) = 2.0$ M. And lastly Na_2SO_4; this also ionizes and gives three ions, so its effective molarity is $3(1.0) = 3.0$ M.

ChemPrin3e T08 60

17:02, general, multiple choice, < 1 min, fixed.

007 (part 1 of 1) 5 points

Calculate the vapor pressure at 25°C of a mixture of benzene and toluene in which the mole fraction of benzene is 0.650. The vapor pressure at 25°C of benzene is 94.6 torr and that of toluene is 29.1 torr.

1. 84.4 torr

2. 124 torr

3. 51.3 torr

4. 71.7 torr **correct**

5. 61.5 torr

Explanation:

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17:03, general, multiple choice, > 1 min, fixed.

008 (part 1 of 1) 5 points

30.2 g of glycerine ($C_3H_8O_3$) are dissolved in 150 g of water. What is the boiling point of the solution? (K_b of water = 0.515°C/m)

1. 1.13°C

2. 103.52°C

3. 100.10°C

4. 0.104°C

5. 101.13°C **correct**

Explanation:

$m_{C_3H_8O_3} = 30.2$ g $\qquad\qquad$ $m_{water} = 150$ g

$$\begin{aligned}\Delta T_b &= K_b\, m \\ &= K_b \frac{\text{mol glycerol}}{\text{kg water}} \\ &= (0.515\ ^\circ\text{C}/m) \left(\frac{\frac{30.2}{92.1}\ \text{mol } C_3H_8O_3}{0.150\ \text{kg water}} \right) \\ &= 1.13^\circ\text{C}\end{aligned}$$

$$T_b = T_b^0 + \Delta T_b = 101.13^\circ\text{C}$$