

231

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McCord CH302

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MWF 2pm - 3pm

Exam 1

Fall 2018

Sep 19, 2018

Wednesday 7:30 - 9:00 PM

BUR 106

Remember to refer to the Periodic Table handout that is separate from this exam copy.

NOTE: Please keep this exam copy intact (all pages still stapled - including this cover page). You must turn in ALL the materials that were distributed. This means that you turn in your exam copy (name and signature included), bubble sheet, periodic table handout, and all scratch paper. Please also have your UT ID card ready to show as well.

This print-out should have 20 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

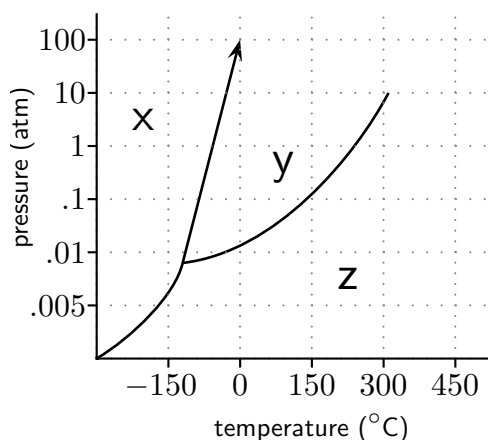
001 5.0 points

A 335 g scoop of ice at -15°C is added to 836 g of hot water at 70°C in an insulated container. All the ice melts and the temperature reaches equilibrium. What is the final temperature inside the container?

1. 17°C
2. 51°C
3. 22°C
4. 28°C
5. 13°C
6. 25°C
7. 39°C
8. 30°C
9. 45°C
10. 34°C

002 (part 1 of 3) 5.0 points

Refer to the following phase diagram for this question and the next two questions.



What is the normal boiling point of this sub-

stance?

1. 308°C
2. 240°C
3. 130°C
4. -90°C
5. -60°C
6. 200°C
7. 278°C

003 (part 2 of 3) 5.0 points

Refer to the phase diagram in part 1. What is the critical temperature for this substance?

1. 308°C
2. -90°C
3. -60°C
4. 200°C
5. 278°C
6. 130°C
7. 240°C

004 (part 3 of 3) 5.0 points

Refer once again to the phase diagram in part 1. Which phase has the lowest free energy for this substance at 0.01 atm and 60°C ?

1. liquid
2. all have equal free energy
3. gas
4. solid

005 5.0 points

Hummingbird food is a sugar solution, made

as follows: 1 cup water plus 1/4 cup sugar (sucrose, 342.3 g/mol). What is the molality of sugar in hummingbird food? Here are some useful conversion factors:

1 cup = 0.2366 L ; 1 cup sugar = 200 g sugar

1. 0.146 *m*
2. 0.617 *m*
3. 0.0118 *m*
4. 0.000619 *m*
5. 0.0691 *m*

006 5.0 points

The lattice energy for MX is 455 kJ/mol and it's heat of hydration is -345 kJ/mol. What is the heat of solution for MX?

1. 110 kJ/mol
2. 800 kJ/mol
3. -800 kJ/mol
4. 151 kJ/mol
5. 133 kJ/mol
6. -110 kJ/mol
7. 89 kJ/mol

007 5.0 points

Which of the following substances would you predict might evaporate the fastest?

1. $C_{10}H_{22}$
2. C_6H_{14}
3. C_8H_{18}
4. $C_{12}H_{24}$

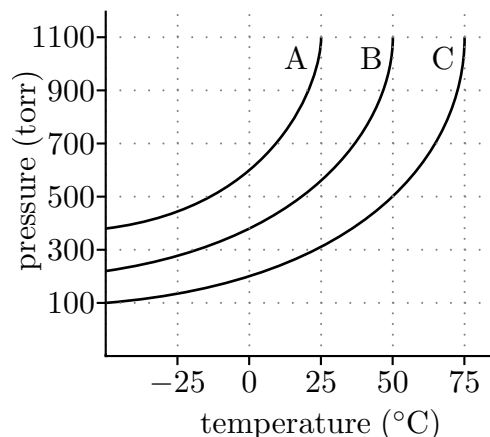
008 5.0 points

The vapor pressure of all liquids

1. is the same at their freezing points.
2. decreases with the increasing volume of the container.
3. increases with temperature.
4. is the same at 100°C .
5. increases with volume of liquid present.

009 (part 1 of 2) 5.0 points

The following is the plot of vapor pressure vs temperature for three substances, A, B, and C.



Which, if any, of these substances would be a gas at SATP?

1. A
2. A and C
3. A and B
4. B
5. none
6. B and C
7. all 3 are gases
8. C

010 (part 2 of 2) 5.0 points

Which ones are gases at STP?

1. A
2. C
3. A and B
4. B and C
5. A and C
6. B
7. none
8. all 3 are gases

011 5.0 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. $142 \text{ kJ}\cdot\text{mol}^{-1}$
2. $33.1 \text{ kJ}\cdot\text{mol}^{-1}$
3. $48.6 \text{ kJ}\cdot\text{mol}^{-1}$
4. $3.98 \text{ kJ}\cdot\text{mol}^{-1}$
5. $486 \text{ J}\cdot\text{mol}^{-1}$

012 5.0 points

The vapor pressure of a pure liquid depends on which of the following

- I. the volume of the liquid
- II. the volume of the gas
- III. the surface area of the liquid
- IV. the temperature

1. only III
2. I and II
3. only II

4. only I
5. III and IV
6. all of them
7. only IV

013 5.0 points

Consider an ideal gas dissolving into a liquid. Which of the following is/are true?

- I) ΔS is negative for this process.
- II) $\Delta H_{\text{solution}}$ is positive for this process.
- III) This process only occurs at high enough temperatures.
- IV) $\Delta H_{\text{lattice}}$ is equal to zero for the gas.

1. I only
2. I, II, and IV only
3. I and III only
4. I and II only
5. I, III, and IV only
6. I, II, III, and IV
7. I and IV only

014 5.0 points

As the temperature of water sample is decreased, we expect to see a(n) (decrease/increase) in the solubility of (all/some) dissolved gases.

1. increase, all
2. increase, some
3. decrease, some
4. decrease, all

015 5.0 points

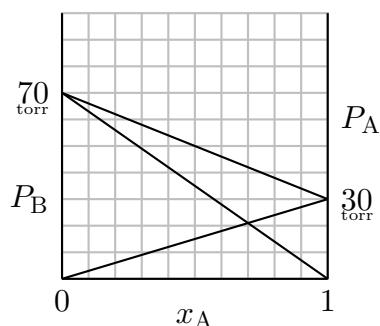
Which of the following statements about col-

ligative properties of aqueous solutions is FALSE?

1. Osmosis is a colligative property.
2. Colligative properties only depend on the number of solute particles present in solution.
3. The higher the concentration of solute in the solution, the higher the vapor pressure of the solvent.
4. For a given solution, the freezing point will be lowered more than the boiling point will be raised.

016 5.0 points

Consider the following vapor pressure diagram for a binary liquid containing solvents A and B.



If 3 moles of A and 2 moles of B are mixed, what is the vapor pressure of the solution?

1. 46 torr
2. 28 torr
3. 50 torr
4. 62 torr
5. 54 torr
6. 38 torr

017 5.0 points

What is the boiling point elevation of a solution of Na_2SO_4 (142.1 g/mol, complete disso-

ciation) made by dissolving 10.0 g of Na_2SO_4 into 250 g water ($K_b = 0.512^\circ\text{C}/m$)?

1. 0.288°C
2. 0.108°C
3. 0.144°C
4. 0.576°C
5. 0.363°C
6. 0.432°C

018 5.0 points

When 20.0 grams of an unknown compound are dissolved in 500 grams of benzene, the freezing point of the resulting solution is 3.77°C . The freezing point of pure benzene is 5.48°C , and its freezing point depression constant is $K_f = 5.12^\circ\text{C}/\text{molality}$. What is the molecular weight of the unknown compound?

1. 120 grams/mole
2. 100 grams/mole
3. 80.0 grams/mole
4. 140 grams/mole
5. 160 grams/mole

019 5.0 points

What is the osmotic pressure of a solution that contains 4.56×10^{-3} moles of lactose in 100 mL of solution at 25°C ?

1. 1053 torr
2. 71 torr
3. 848 torr
4. 536 torr
5. 113 torr

020 5.0 points

Which of the following solutes is likely to be most soluble in water?

1. ethanol ($\text{CH}_3\text{CH}_2\text{OH}$)
2. carbon tetrachloride (CCl_4)
3. Br_2
4. CS_2