CHEMISTRY 101 **SPRING 2005** NAME

FINAL S 501-511

Form A Signature

PART 2

Please read and sign: "On my honor, as an Aggie, I have neither given nor received unauthorized aid on this exam."

(7 pts) **53.** Write a balanced net ionic equation to represent the oxidation of iodide ion (I^-) by permanganate ion (MnO_4^-) in basic solution to yield molecular iodine (I_2) and manganese(IV) dioxide (MnO_2). Use smallest whole number coefficients.

7

$$6\,\overset{-1}{I}^- + 2\,\overset{+7}{Mn}\overset{-2}{O_4}^- \longrightarrow 3\,\overset{0}{I_2} + 2\,\overset{+4}{Mn}\overset{-2}{O_2}$$

$$3\left(2\,I^{-1} \longrightarrow I_2^{\,0}\right) \uparrow 2$$

$$2\left(Mn^{+7} \longrightarrow Mn^{+4}\right) \downarrow 3$$

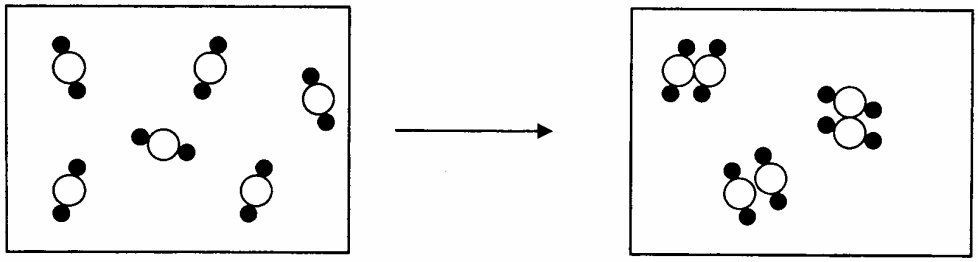
$$4H_2O + 6\,I^- + 2\,MnO_4^- \longrightarrow 3\,I_2 + 2\,MnO_2 + 8\,OH^-$$

$-6 - 2 = -8$ $\qquad -8$

OVER ⇒

(5 pts) **54.** Here is a molecular representation of a reaction occurring in the gas phase at 300 K and 1 atm pressure. If the initial volume is 1.00 L, determine the final volume if the temperature and pressure don't change and explain briefly how you arrived at your answer.

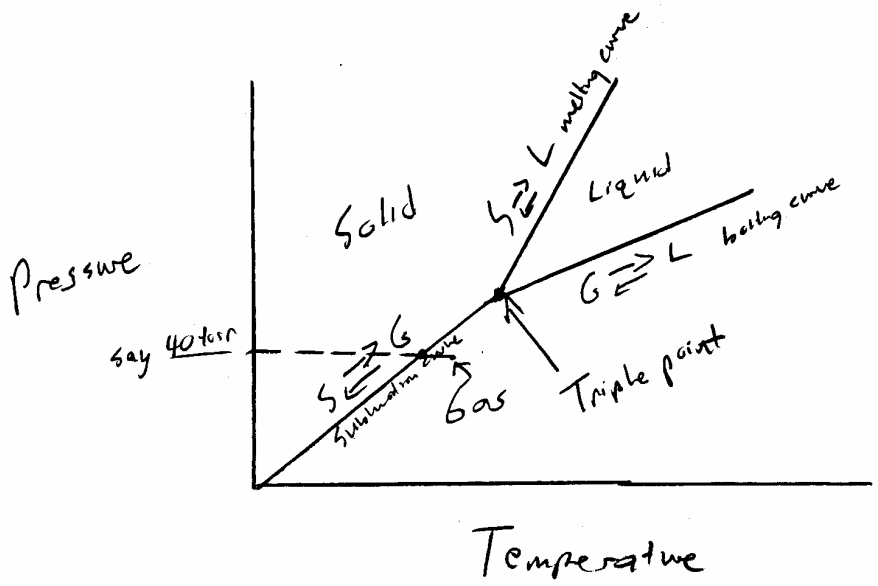
5



The final volume would be 0.500 liters, if the pressure & temperature are constant then the volume would be reduced by half because the number of molecules was reduced by half ✓

(6 pts) **55.** Draw a typical phase diagram. Label the axes and the areas where solids, liquids and gases can be found. Draw a line segment representing the phase change of a solid to a gas at constant pressure.

6



only exceptions are $Ca(OH)_2$, $Sr(OH)_2$, & $Mg(OH)_2$ I think

(6 pts) **56.** Determine the **complete** net ionic equation for the reaction between nitric acid and copper(II) hydroxide.

6 formula unit

aq Back So No ins-l

$$2HNO_3 + Cu(OH)_2 \rightarrow Cu(NO_3)_2 + 2H_2O$$

Total Ionic

$$2H^+(aq) + 2NO_3^-(aq) + Cu(OH)_2(s) \rightarrow Cu^{2+}(aq) + 2NO_3^-(aq) + 2H_2O(l)$$

Net Ionic

$$2H^+(aq) + Cu(OH)_2(s) \rightarrow Cu^{2+}(aq) + 2H_2O(l)$$

(6 pts) **57.** Given the following data:

5 6

Specific Heat of ice:	2.09 J/g°C
Heat of fusion of ice at 0°C	334 J/g
Specific Heat of liquid H_2O	4.18 J/g°C
Heat of vaporization of liquid water at 100°C	2.26×10^3 J/g
Specific Heat of steam	2.03 J/g°C

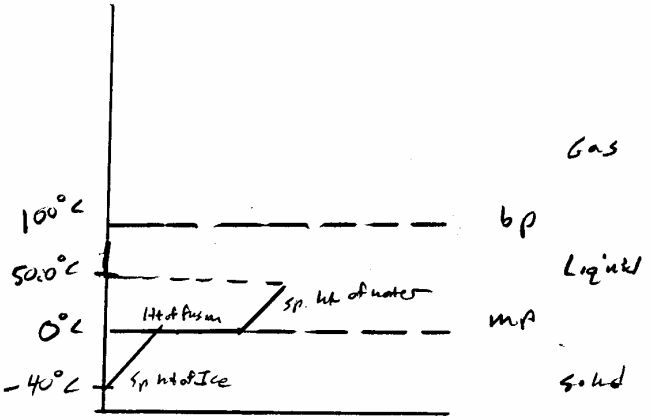
Calculate the amount of heat (in kB) required to convert 20.0 g of ice at -40°C to liquid water at 50.0°C.

$ht = (20.0 grms)(2.09)(40) = 1672$

$ht = (20.0 grms)(334) = 6680$

$ht = (20.0 grms)(4.18)(50) = 4180$

12,532 J



$22.99 \times 3 = 68.97$
$30.9 \times 1 = 30.9$
$16 \times 4 = 64$

mw = 163.87

$(Na_3PO_4)^{3-} = i = 4$

(6 pts) **58.** What is the initial boiling point of a solution prepared by dissolving 35.0 g of sodium phosphate in 100.0 g of water? The boiling point of water is 100.00°C and K_b for water is 0.512 °C/m).

6

mw = grams / moles

$\Delta T_b = i K_b m$

$\Delta T_b = (4)(.512)(2.1358) = 4.37$

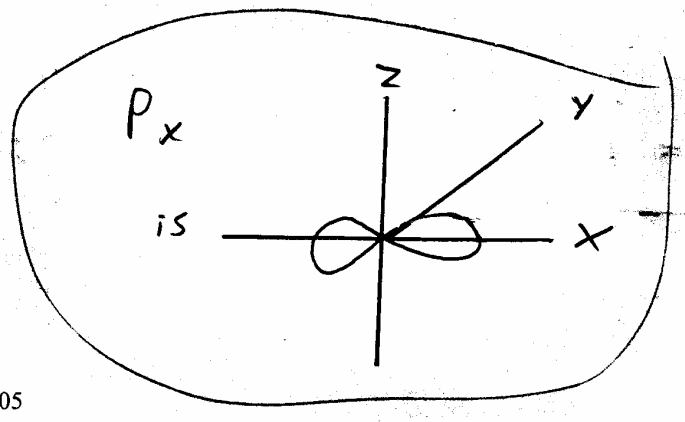
$m = \frac{\text{moles solute}}{1\text{kg solvent}} \frac{(.21358)}{(.1)} = 2.1358$

So new boiling point should be around 104.37°C

(4 pts) **59.** Draw a picture of the p_x orbital and label the axis.

4

p_x p_y p_z



40 excellent