

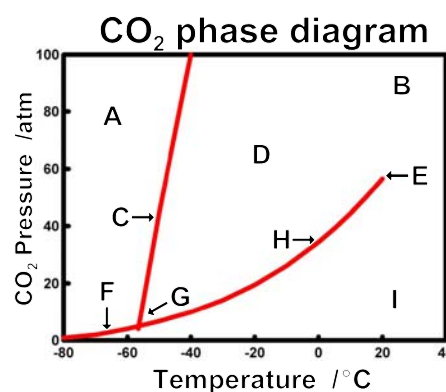
NAME \_\_\_\_\_

Answer the following questions on the answer sheet. Supply the appropriate units where required.

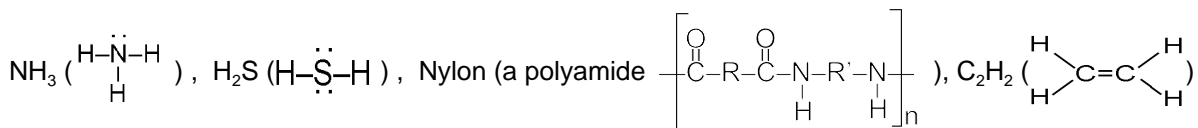
$$\ln\left(\frac{P_1}{P_2}\right) = \frac{\Delta H_v}{R} \left(\frac{1}{T_2} - \frac{1}{T_1}\right) \quad R = 0.08206 \text{ L atm K}^{-1} \text{ mol}^{-1}$$

$$R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$$

- 1.- 3. Give the van't Hoff factor for each of the compounds on your answer sheet. (3 credits)
4. The  $\Delta H_v$  for ethanol is  $45.17 \text{ kJ mol}^{-1}$  and the boiling point is  $78.3^\circ\text{C}$ . What is the vapor pressure of ethanol at  $30^\circ\text{C}$ ?
5. The temperature for the boiling point for acetic acid is  $118.1^\circ\text{C}$ . What is the vapor pressure of acetic acid at this temperature?
6. Give the product(s) for the following reaction:  $\text{Na} + \text{Cl}_2 \rightarrow ?$
7. Give the product(s) for the following reaction:  $\text{Li} + \text{H}_2 \rightarrow ?$
8. Give the product(s) for the following reaction:  $\text{P}_8 + \text{Cl}_2 \rightarrow ?$
9. Give the product for the following reaction in dry conditions:  $\text{Na} + \text{O}_2 \rightarrow ?$
10. In the phase diagram to the right what does the letter **C** indicate?
11. In the phase diagram to the right what equilibrium does the letter **H** indicate?
12. - 13. What is the strongest force responsible for the making the solid phase possible for the following compounds? (2 credits)

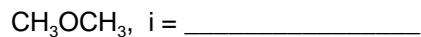
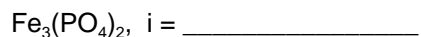
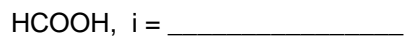
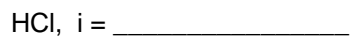
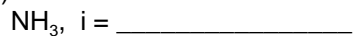
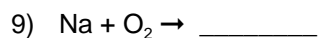
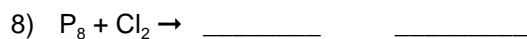
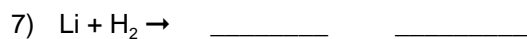
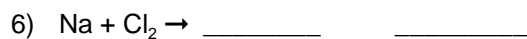


14. Calculate the **total** molality for a solution that has 10.0 g of  $\text{CH}_3\text{COOH}$  dissolved in 150 g of water. (Give 3 sig figs.)
15. Calculate the **total** molality for a solution that has 15.0 g of  $\text{SrCl}_2$  dissolved in 20.0 g of water.
16. What is the freezing point depression for a solution that has 0.530 mol of ethanol ( $\text{C}_2\text{H}_5\text{OH}$ ) dissolved in 500 g of  $\text{CH}_3\text{COOH}$ ? ( $K_f(\text{CH}_3\text{COOH}) = 3.90^\circ\text{C kg mol}^{-1}$ )
17. Calculate the **total** mole fraction of water for a solution that has 35.0 g of  $\text{LiCl}$  dissolved in 350 g of water.
18. The vapor pressure of acetone at  $39.5^\circ\text{C}$  is 400 torr. If 0.50 mole of methanol ( $\text{CH}_3\text{OH}$ ) is dissolved in 4.00 mole of acetone at  $39.5^\circ\text{C}$  what would the vapor pressure be?
19. What is the osmotic pressure of a solution consisting of 45.0 g of  $\text{NaCl}$  dissolved in 550 mL of water solution at  $25^\circ\text{C}$ ?
20. At  $25^\circ\text{C}$  what is the osmotic pressure of a toluene ( $\text{C}_6\text{H}_5\text{CH}_3$ ) solution if 1.55 g of a protein with a molar mass of  $5.50 \times 10^4 \text{ g mol}^{-1}$  is dissolved in 25.00 mL of solution?

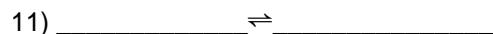


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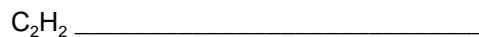
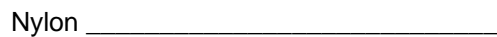
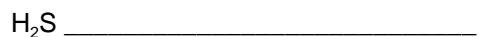
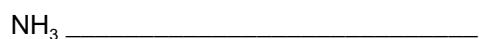
1-3)

4) \_\_\_\_\_  
the unit(s)!5) \_\_\_\_\_  
the unit(s)!

10) \_\_\_\_\_



12 + 13)

14) \_\_\_\_\_  
the unit(s)!15) \_\_\_\_\_  
the unit(s)!16) \_\_\_\_\_  
the unit(s)!17) \_\_\_\_\_  
the unit(s)!18) \_\_\_\_\_  
the unit(s)!19) \_\_\_\_\_  
the unit(s)!20) \_\_\_\_\_  
the unit(s)!

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1-3)

NH<sub>3</sub>,  $i =$  \_\_\_1\_\_\_\_\_HCl,  $i =$  \_\_\_2\_\_\_\_\_HCOOH,  $i =$  \_\_\_1\_\_\_\_\_Fe<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>,  $i =$  \_\_\_5\_\_\_\_\_CH<sub>3</sub>OCH<sub>3</sub>,  $i =$  \_\_\_1\_\_\_\_\_HF,  $i =$  \_\_\_1\_\_\_\_\_

4) \_\_\_0.0852\_\_\_ (64.7) \_\_\_\_\_ atm (torr) \_\_\_\_\_

the unit(s)!

5) \_\_\_1.00\_\_\_ (760) \_\_\_\_\_ atm (torr) \_\_\_\_\_

the unit(s)!

6) Na + Cl<sub>2</sub> → \_\_\_NaCl\_7) Li + H<sub>2</sub> → \_\_\_LiH\_ \_\_\_\_\_8) P<sub>8</sub> + Cl<sub>2</sub> → \_\_\_PCl<sub>3</sub>\_\_\_ \_\_\_PCl<sub>5</sub>\_\_\_9) Na + O<sub>2</sub> → \_\_\_Na<sub>2</sub>O<sub>2</sub>\_\_\_

10) \_\_\_solid-liquid phase boundary\_

11) \_\_\_CO<sub>2</sub>(l) \_\_\_ ⇌ \_\_\_CO<sub>2</sub>(g) \_\_\_

12 + 13)

NH<sub>3</sub> \_\_\_hydrogen bonding\_\_\_H<sub>2</sub>S \_\_\_Dipole-dipole attractions\_\_\_

Nylon \_\_\_Covalent bond\_\_\_

C<sub>2</sub>H<sub>2</sub> \_\_\_London Forces\_\_\_14) \_\_\_1.11\_\_\_\_\_ mol kg<sup>-1</sup> \_\_\_\_\_

the unit(s)!

15) \_\_\_1.42\_\_\_\_\_ mol kg<sup>-1</sup> \_\_\_\_\_

the unit(s)!

16) \_\_\_4.13\_\_\_\_\_ °C (or K) \_\_\_\_\_

the unit(s)!

17) \_\_\_9.23\_\_\_\_\_ - \_\_\_\_\_

the unit(s)!

18) \_\_\_356\_\_\_ (0.468) \_\_\_\_\_ torr (atm) \_\_\_\_\_

the unit(s)!

19) \_\_\_68.5\_\_\_ (5.21 × 10<sup>4</sup>) \_\_\_\_\_ atm (torr) \_\_\_\_\_

the unit(s)!

20) \_\_\_0.0276\_\_\_ (21.0) \_\_\_\_\_ atm (torr) \_\_\_\_\_

the unit(s)!