

Name: KEY

Chemistry 121
 Fall 2005
 Test 4 -- FORM A

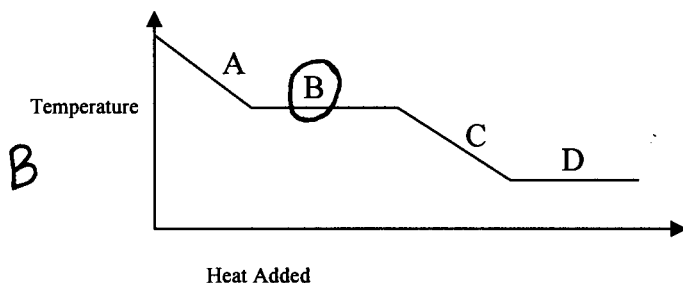
Instructions: You have 50 minutes to complete this 100-point exam. You may use a simple scientific calculator. No programmable calculators allowed.

I. Multiple Choice (10 pts) Carefully and clearly circle the best answer.

1. Which of the following molecules has the highest boiling point?

- a. C_2H_2 26.04 g/mol
 b. C_2H_6 30.07 g/mol
 D c. C_3H_8 44.09 g/mol
 (d) C_6H_6 78.11 g/mol

2. What region is correctly labeled as the boiling point on the cooling curve below?



3. Compounds with identical molecular formulas, but whose molecules have different structures are called:

- a. organic.
 b. inorganic.
 C (c) isomers.
 d. native.

4. Which of the following is a false statement about proteins?

- a. Some proteins extract energy.
 b. Some proteins act as transport molecules.
 C (c) All proteins hold genetic code.
 d. All proteins are composed of amino acids.

5. Which of the following gases will diffuse the quickest?

- A (a) NH_3 17.03 g/mol
 b. HCl 36.46 g/mol
 c. H_2SO_4 98.08 g/mol
 d. SCl_3 138.41 g/mol

II. Calculations, Functional Groups, Forces and Biochemicals Show all work. Partial credit will be given for correct work. If I cannot read the work, it will not be graded.

6. (5 pts) A gas collected over water had a total pressure of 725 torr. Calculate the partial pressure of the gas (in torr) if the temperature $10^\circ C$.

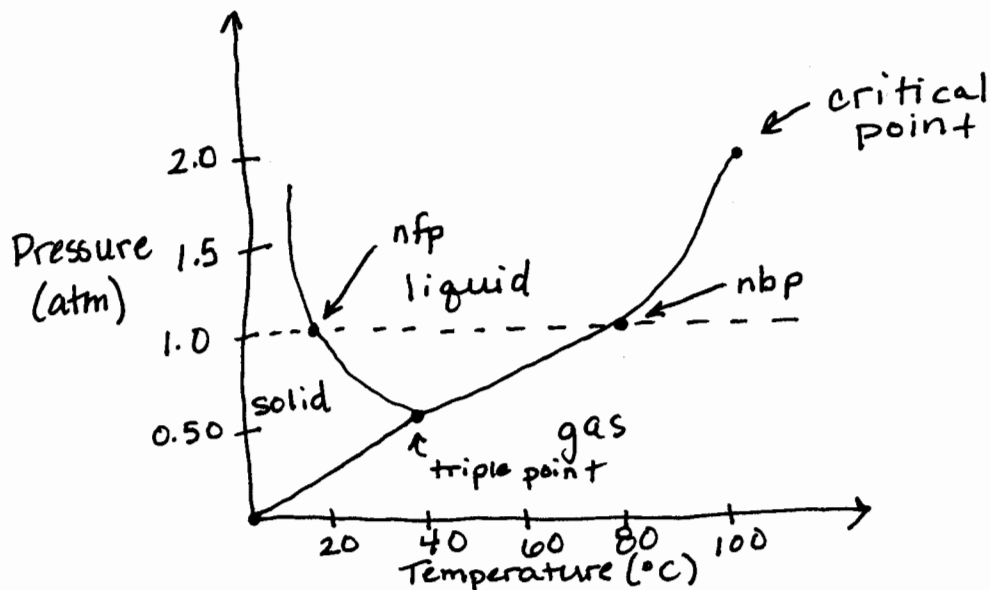
$$725 \text{ torr} - 9.209 \text{ torr} =$$

716 torr

Temperature ($^\circ C$)	Vapor Pressure (torr)
0	4.579
5	6.543
10	9.209
15	12.79
20	17.54
25	23.76

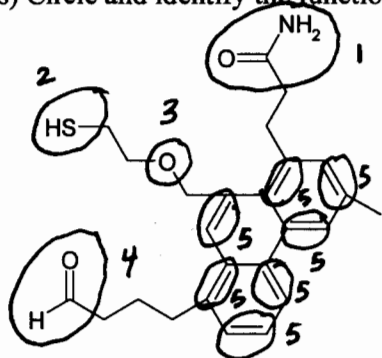
was

7. (20 pts) Draw the phase diagram for a substance that has a triple point at a pressure of 0.50 atm and a temperature of 40°C, a critical point of 2.0 atm and 100°C, a nfp of 20°C and a nbp of 80°C. Label the phases, the critical point and the triple point.



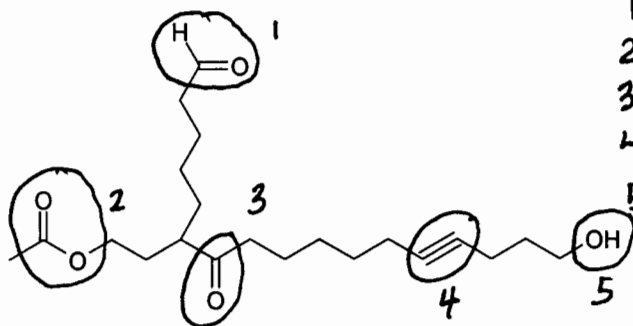
8. (20 pts) Circle and identify the functional groups in the two molecules below.

a.



1. amide
2. thiol
3. ether
4. aldehyde
5. alkene

b.



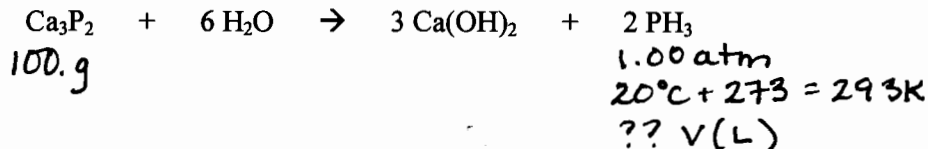
1. aldehyde
2. ester
3. ketone
4. alkyne
5. alcohol

9. (10 pts) Give the complimentary base pairing for the following nucleic acid sequences

a. AGGCCT
TCCGGA

b. UCAAAG
AGUUC

10. (15 pts) What volume (in L) of gaseous PH_3 at 1.00 atm and 20°C could be formed by the reaction of 100.g of calcium phosphide with excess water? (MM of $\text{Ca}_3\text{P}_2 = 182.18 \text{ g/mol}$)



$$100. \text{g Ca}_3\text{P}_2 \times \frac{1 \text{ mol Ca}_3\text{P}_2}{182.18 \text{ g Ca}_3\text{P}_2} \times \frac{2 \text{ mol PH}_3}{1 \text{ mol Ca}_3\text{P}_2} = 1.10 \text{ mol PH}_3$$

$$PV = nRT \quad V = \frac{nRT}{P} = \frac{(1.10 \text{ mol})(0.0821 \frac{\text{L}\cdot\text{atm}}{\text{mol}\cdot\text{K}})(293\text{K})}{1.00 \text{ atm}} = \boxed{26.5 \text{ L PH}_3}$$

11. (10 pts) A sample of He occupies 600. mL at 27°C and 570. mmHg. The volume is reduced to 450. mL and the sample cooled until the pressure is 380. mmHg. What is the final temperature in $^\circ\text{C}$?

$$\begin{array}{ll} V_1 = 600. \text{ mL} & V_2 = 450. \text{ mL} \\ T_1 = 27^\circ\text{C} + 273 = 300\text{K} & T_2 = ??^\circ\text{C} \\ P_1 = 570. \text{ mmHg} & P_2 = 380. \text{ mmHg} \end{array}$$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \quad \text{solve for } T_2$$

$$T_2 = \frac{P_2 V_2 T_1}{P_1 V_1} = \frac{(380. \text{ mmHg})(450. \text{ mL})(300\text{K})}{(570. \text{ mmHg})(600. \text{ mL})} = 150\text{K} - 273 = \boxed{123^\circ\text{C}}$$

12. (10 pts) What is the mole fraction of oxygen and mole percent of oxygen in a gaseous mixture if the partial pressure of oxygen is 545 mmHg and the total pressure of the mixture is 745 mmHg?

$$\chi_{\text{O}_2} = \frac{P_{\text{O}_2}}{P_{\text{total}}} = \frac{545 \text{ mmHg}}{745 \text{ mmHg}} = \boxed{0.732}$$

$$\text{mol}\% = \chi_{\text{O}_2} \cdot 100 = 0.732 \times 100 = \boxed{73.2\%}$$

13. (10 pts) Answer **one** of the following essay questions in **5 – 6 GRAMMATICALLY CORRECT SENTENCES**.

- Describe the general structure of glycerophospholipids, the polarity of the molecule and the function in the cellular membrane.
- Describe the 3 main intermolecular forces and their relative strengths.

see lecture notes

	IA																																VIII A
1	1															2																	
	H															He																	
	1.008															4.00																	
2	3	4															5	6	7	8	9	10											
	Li	Be															B	C	N	O	F	Ne											
	6.94	9.01															10.81	12.01	14.01	16.00	19.00	20.18											
3	11	12																13	14	15	16	17	18										
	Na	Mg	IIIB	IVB	VB	VIB	VII B	VIII B			IB	IIB	26.98	28.09	30.97	32.06	35.45	39.95															
	22.99	24.31															Al	Si	P	S	Cl	Ar											
4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36															
	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr															
	39.10	40.08	44.96	47.90	50.94	52.00	54.94	55.85	58.93	58.71	63.55	65.37	69.72	72.59	74.92	78.96	79.90	83.80															
5	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54															
	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe															
	85.47	87.62	88.91	91.22	92.91	95.94	[98]	101.1	102.9	106.4	107.9	112.40	114.8	118.7	121.8	127.60	126.90	131.30															
6	55	56	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86															
	Cs	Ba	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn															
	132.9	137.3	175	178.5	181	183.9	186.2	190.2	192.2	195.1	197	200.59	204.4	207.2	209	[209]	[210]	[222]															
7	87	88	103	104	105	106																											
	Fr	Ra	Lr	[261]	[262]	[263]																											
	[223]	[226]	[262]	[261]	[262]	[263]																											
57	58	59	60	61	62	63	64	65	66	67	68	69	70																				
La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb																				
138.9	140.1	140.9	144.2	[145]	150.4	152	157.3	158.9	162.5	164.93	167.3	168.9	173																				
89	90	91	92	93	94	95	96	97	98	99	100	101	102																				
Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No																				
[227]	232	[231]	238	[237]	[244]	[243]	[247]	[247]	[251]	[252]	[257]	[258]	[259]																				