

Name _____

Slayter Box _____

Hour Examination 1

January 29, 2003

General Chemistry (CHEM 122-01)

Intermolecular Forces, Phase Transitions, Solution Properties

Dr. Bennett

Please do not open until instructed

*Intermolecular Forces, Phase Transitions, Solution Properties*Notes:

* This exam consists of **5 questions on 6 pages** (including this cover page). Please check to make sure that you have a complete copy of the exam.

* *Please do not simply give me answers. Give me well-supported answers. Numerical answers that are not backed by supporting calculations will receive minimal credit.*

* Please write clearly; if I can't read your answer, I can't give you credit for your answer.

* Please note that different questions are worth different numbers of points. Plan your time accordingly.

* Remember to include units and significant figures where appropriate.

* No books or notes are to be used on this exam.

* Please do NOT share calculators; if you need a calculator but do not have one, please let me know!

* *If you feel that you would be better able to answer **any** question if you had additional information, please do not hesitate to ask for it. I will happily provide any information that I feel will help you answer the question without compromising the efficacy and fairness of the test.*

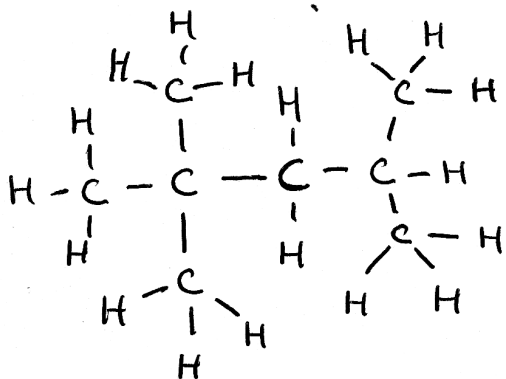
Question	Possible	Score
1	15	
2	20	
3	8	
4	15	
5	12	
TOTAL	70	
	percent:	

I have not provided any constants or formulas on this test because I did not feel that there were any that would be needed for the test. However, I may have overlooked something. If you were expecting to have some quantity given to you that I have failed to provide, please let me know!

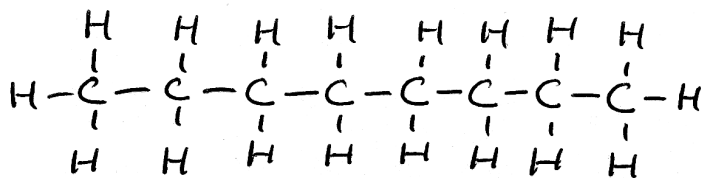
2. Some questions about vaporization.

(a) Why does the boiling point of a liquid vary with atmospheric pressure?

(b) Suggest a reason why the boiling point of isooctane is lower than the boiling point of octane.



isooctane (C₈H₁₈)



octane (C₈H₁₈)

(c) Take a moment to study the diagram shown below. It is an adaptation of the mercury barometer used to measure atmospheric pressure. Three tubes are inverted in a pool of mercury. The left hand one was filled with mercury before being inverted in the pool. Its level of mercury relative to the pool represents the atmospheric (or barometric) pressure.

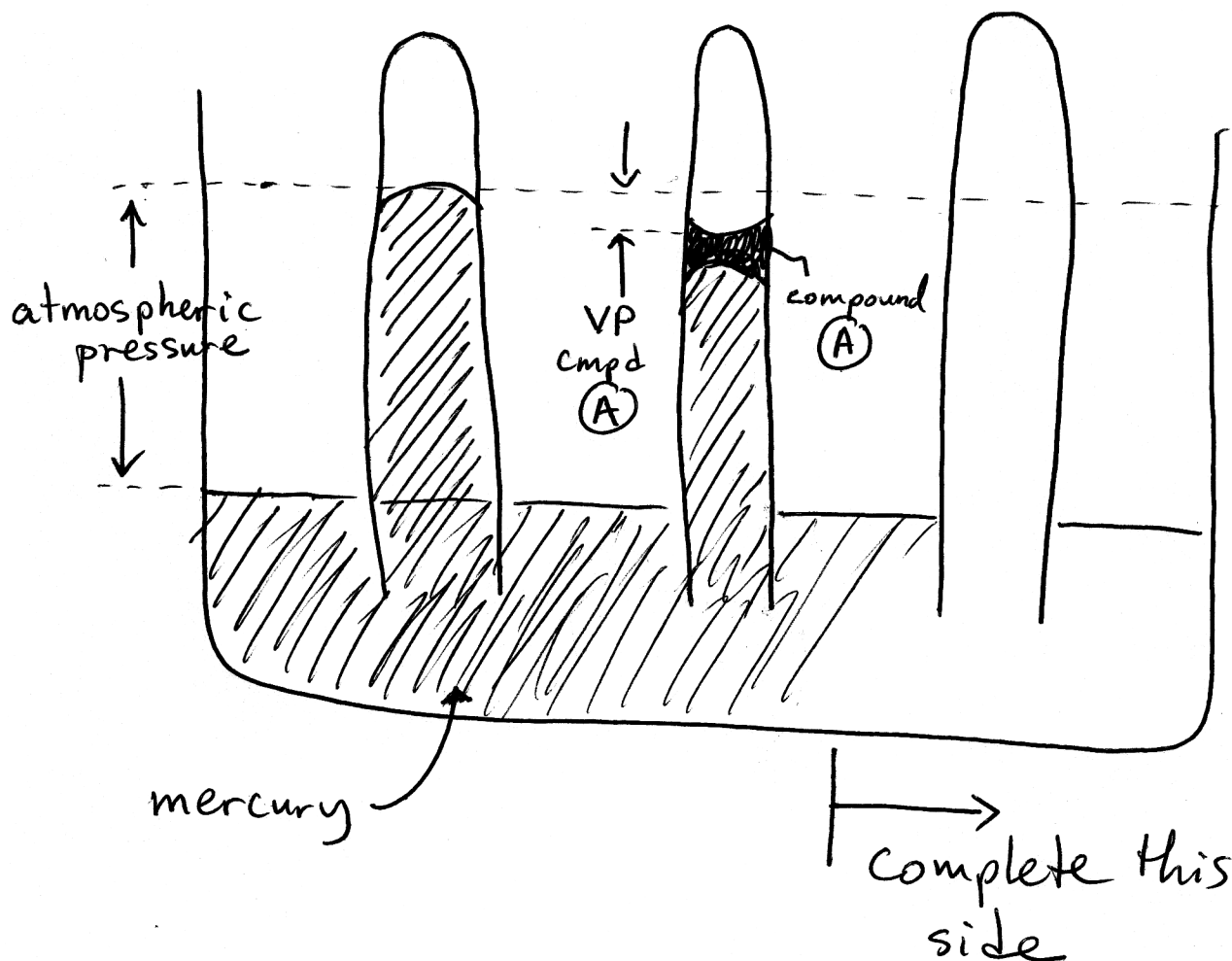
For the second (middle) tube, the same thing was done, except that afterwards, a sample of compound "A" was introduced by means of a syringe, a flexible tube, and a patient experimentalist. The column of mercury moved down as some of compound "A" vaporized. The difference in levels of the liquid columns in these two tubes represents the vapor pressure of compound "A".

An enterprising student did the same thing with compound "B" in the right-hand tube. After they completed the work they were in a huge hurry to get out of lab and they forgot to draw a picture of what they had observed!

The identity of the compounds was checked:

A	1-propanol ($\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$)
B	methanol (CH_3OH)

Given this information, please complete the diagram as the student would have observed it.



3. What is polarizability? Explain how the polarizability of krypton compares with the polarizability of neon. How is polarizability related to strength of intermolecular attractions?

4. Consider the following pairs of chemicals. For each pair, please decide which compound would be more soluble in water and *briefly* explain your choice.

methane (CH_4) or ammonia (NH_3)

butanol ($\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$) or butane ($\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$)

MgCl_2 or CH_2Cl_2

5. Short answer questions (*explanations not required*):

(a) Which of the following molecules contains the most polar **bond**: CH_4 , CCl_4 , CH_2IBr , CH_3NH_2 , or CH_3OH ? (Please ask me if you need help figuring out what these molecules look like.)

(b) Which of the following **molecules** is the most polar: CH_4 , CF_4 , CH_2IBr , NH_3 , or NH_4^+ ? (Please ask me if you need help figuring out what these molecules look like.)

(c) Please list two **fundamental molecular-scale differences** between the liquid and solid states.

(d) **True or False**: breaking some "high-energy" bonds releases large amounts of energy. (Please only consider the process of breaking the bond, not any subsequent process.)