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CHM. 121.004
Inst. Mark Novak
Lab Report – Experiment 13
12/7/17

100

Experiment Objective

The objective of this experiment was to calculate the molar heat of vaporization of a liquid. By using CHEMPLOT we can graph vapor pressure and temperature to create an equation and calculate the molar heat of vaporization for a substance. Using that same calculated equation, you can also calculate the normal boiling point of a substance. This also is a demonstration of Dalton's law which states the total pressure of a mixture of gases equals the sum of the pressures that each would exert if it were present alone.

Conclusion

This was the first lab that could have been completed completely outside of class. The lab itself was very easy and most of it was pretty straight forward. The first question on the questions sheet was confusing at first because I thought we had to use the equation given to us on the sheet before it. However, from some help from the instructor, I learned that all you need to do was subtract the two gas pressures. The only other problem I had trouble on was the second to last problem (3a) because I used the wrong units. After I converted 101.3 kPa to 760 torr, I believe I got the right answer. The rest of the questions were pretty straight forward and self-explanatory. One of the questions asked us to calculate the molar heat of vaporization (2d) which I calculated as 33.62 KJ. After that I created the equation that it asks for in question (2e) and I used that equation to calculate the normal boiling point of benzine; I calculated this as being 352.68 K.

 Name George Pappas

QUESTIONS

1) When a few mL of liquid carbon tetrachloride are introduced at 40°C into a closed container in which the gas pressure is 742 mmHg, the pressure rises to 976 mmHg. The addition of more liquid carbon tetrachloride does not increase the pressure. What is the vapor pressure of CCl_4 at 40°C?
[Hint: Be sure to use scientific notation, proper units, and ink.]

1) 234 mm Hg ✓ 976-742

2a) Complete the table with this data:

VP (mmHg)	Log(VP)	Temp (°C)	Temp (K)	1/Temp (K^{-1})
27.00	1.4314	0.00	273 K	.003663
94.00	1.9731	25.00	298 K	.003356
388.00	2.5888	60.00	333 K	.003003

2b) Using the CHEMPLOT (or Excel) program, plot log(VP) versus 1/Temp.

2c) Write down the slope of the straight line your graph from CHEMPLOT (or Excel) gives you. (Make sure to use scientific notation and the correct units.)

Slope = −1756 ✓ y = −1756x + 7.8598

2d) Using the value you obtained for the slope, calculate the molar heat of vaporization, ΔH_{vap}.
(Make sure to use scientific notation and the correct units.)
[Hint: ΔH_{vap} = -(slope)x(2.303)x(R)] 33622.38135

ΔH_{vap} = 33.62 kJ ✓

2e) From the equation of your CHEMPLOT (or Excel) graph, change 'x' and 'y' to their proper symbols, but the correct units on the slope, then write the complete equation for that line.

Equation: Log (VP) = −1756/T + 7.8598 ✓

3a) Using the equation derived in (2e) above, find the temperature at which the vapor pressure of benzene equals 101.3 kPa.

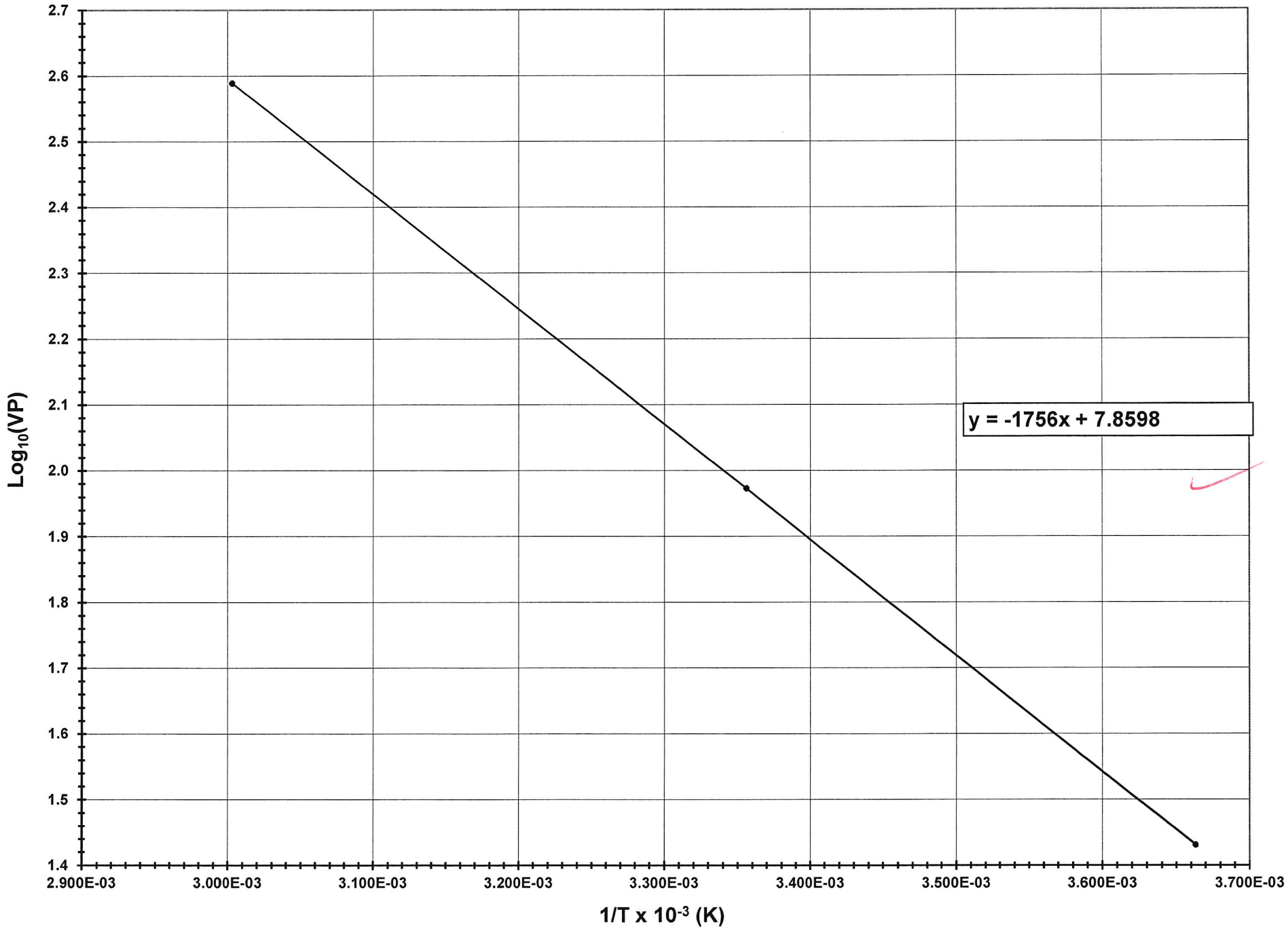
Temperature = 352.68 K ✓

3b) What is this temperature called?

The Normal Boiling Point ✓

Chem. 121 Exp. 13 - Vapor Pressure of Liquids

Name: George Pappas



Chem. 121 Exp. 13
Vapor Pressure of Liquid

Name: George Pappas

$1/T\ (K^{-1}) \times 10^{-3}$
3.663E-03
3.356E-03
3.003E-03

$Log_{10}(VP)$
1.4314
1.9731
2.5888

When entering 1/T data, follow the example below:
.003660 X 10-3 should be entered as 3.660E-03