

CHEM 110 - GENERAL CHEMISTRY I - LABORATORY REPORT

Experiment 12. Colligative Properties

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Section _____ Date April 3rd, 2023 Instructor Dr. Ghatak

~~UNKNOWN NUMBER~~

- 1.a. Recorded mass of the solvent (p-dichlorobenzene) in grams 15.709 g
- 1.b. Mass of the solvent converted to kilograms 0.015709 kg
2. Mass of the unknown solute 1.570 g

Graphing the Data. Plot the data for Part I using the graph paper on page 97. Use the data for Part II to plot *two separate* graphs (one graph per trial) on pages 99 and 101. *Attach the three graphs (properly labelled) to this page.* From the graphs, determine the freezing point of the pure solvent (Part I) and the solution (Part II) as was explained on pages 92 and 93, and write the results below.

3. Freezing point of pure solvent (p-dichlorobenzene) from graph of data in Part I (page 97) 50.0 °C
4. Freezing point of solution from Part II:
- 4a. Freezing point from first trial (from graph on page 99) 45.0 °C
- 4b. Freezing point from second trial (from graph on page 101) . 45.0 °C
- 4c. Average freezing point of solution 45.0 °C
5. Average freezing point lowering (Δt_f) (line 3 – line 4c) 5.0 °C
6. Calculated molecular weight of the unknown solute 141.44 g/mol

(Show your calculation of the molecular weight on line 6 below. First write the formula you are using, then substitute in the numbers along with the appropriate units, and finally solve the equation, indicating the correct units in the answer.)

$$\Delta T_f = K_f \cdot m$$

$$50^\circ - 45^\circ = 7.1 \times m$$

$$m = \frac{S}{7.1} = 0.7042 = \frac{\text{moles of unknown solute}}{\text{kg of solvent}}$$

$$0.7042 = \frac{\text{moles}}{0.015709}$$

$$\text{moles} = 0.0111 \text{ moles of unknown solute} = \frac{\text{mass of solute}}{\text{m.w. of solute}}$$

$$0.0111 \text{ mol} = \frac{1.570 \text{ g}}{\text{m.w. of solute}}$$

$$\text{m.w. of solute} = 141.44 \text{ g/mol}$$

Data Sheet - Experiment 12 - Colligative Properties

Part I	
Time (min.)	Temp. (°C)
0.0	60.0
0.5	59.0
1.0	58.0
1.5	57.0
2.0	56.0
2.5	56.0
3.0	55.0
3.5	54.0
4.0	53.0
4.5	53.0
5.0	52.0
5.5	52.0
6.0	52.0
6.5	51.0
7.0	51.0
7.5	50.0
8.0	
8.5	
9.0	
9.5	
10.0	
10.5	
11.0	
11.5	
12.0	
12.5	
13.0	
13.5	
14.0	
14.5	
15.0	

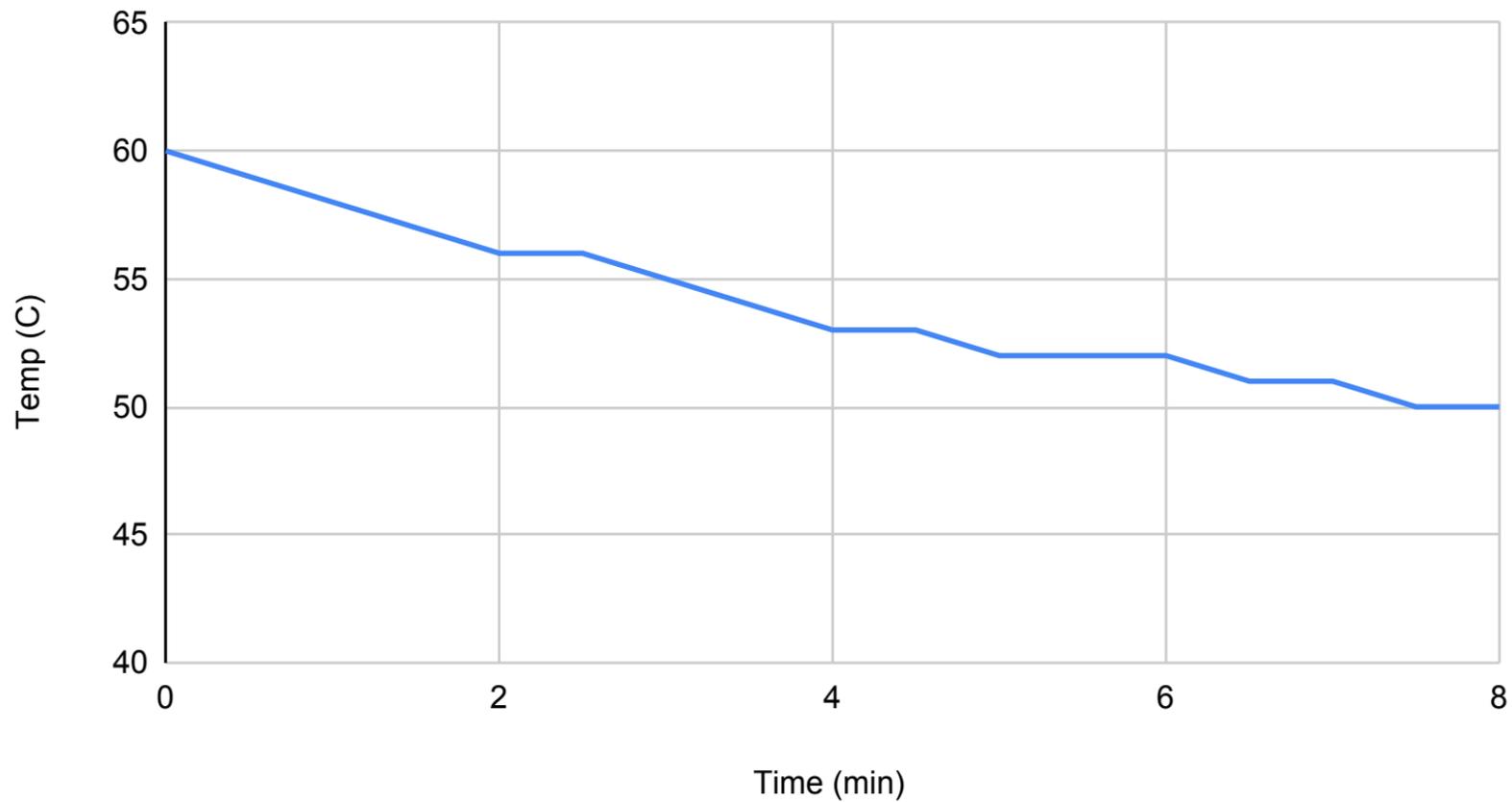
freezing point

Part II, Trial #1	
Time (min.)	Temp. (°C)
0.0	55.0
0.5	54.0
1.0	53.0
1.5	52.0
2.0	52.0
2.5	51.0
3.0	50.0
3.5	50.0
4.0	49.0
4.5	49.0
5.0	48.0
5.5	48.0
6.0	47.0
6.5	47.0
7.0	46.0
7.5	45.0
8.0	
8.5	
9.0	
9.5	
10.0	
10.5	
11.0	
11.5	
12.0	
12.5	
13.0	
13.5	
14.0	
14.5	
15.0	

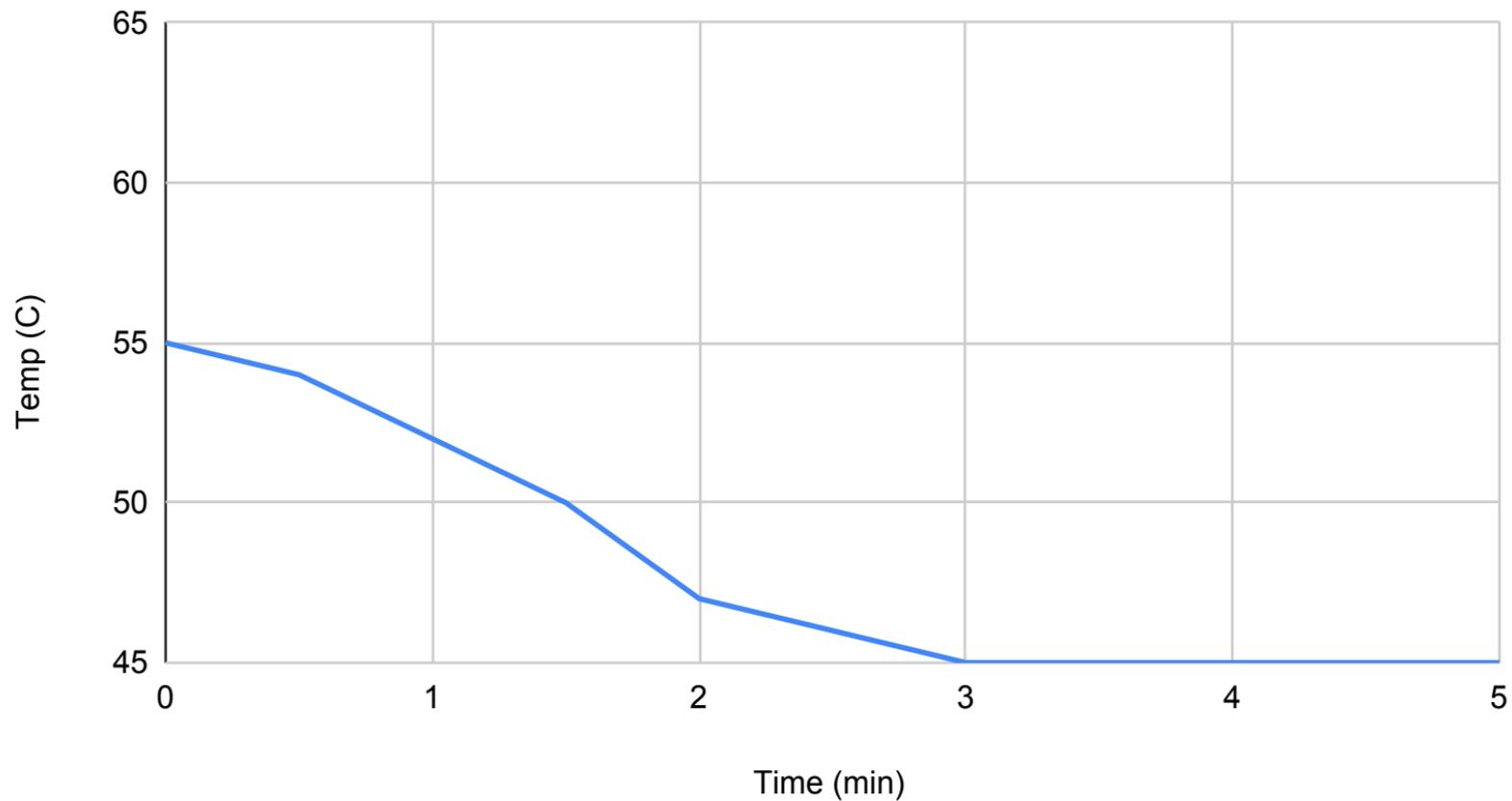
Part II, Trial #2	
Time (min.)	Temp. (°C)
0.0	55.0
0.5	54.0
1.0	52.0
1.5	50.0
2.0	47.0
2.5	46.0
3.0	45.0
3.5	
4.0	
4.5	
5.0	
5.5	
6.0	
6.5	
7.0	
7.5	
8.0	
8.5	
9.0	
9.5	
10.0	
10.5	
11.0	
11.5	
12.0	
12.5	
13.0	
13.5	
14.0	
14.5	
15.0	

If any boxes are not required in the above data sheet, just leave them blank.

Cooling Curve of the Pure Solvent



Cooling Curve of the Solution (Trial #2)



Cooling Curve of the Solution (Trial #1)

