

# MEASUREMENT OF VAPOR PRESSURE SMART WORKSHEET

## BEFORE YOU BEGIN

- $R = 8.31446 \text{ J mol}^{-1} \text{ K}^{-1}$
- Remember all calculations must be done with temperatures in Kelvin
- $P_{\text{total}}$  = pressure measured inside flask
- $P_{\text{air}}$  = partial pressure of air inside flask
- $P_{\text{vap}}$  = partial pressure of vapor inside flask
- $T(\text{K}) = T(^{\circ}\text{C}) + 273.15$

## PART A. PRESSURE OF AIR AT ROOM TEMPERATURE

RUN 1

Part A "run 1" pressure and temperature data		
$P_{\text{air, room temp}}$ (kPa)	<div><div></div><div>103.93</div><div></div></div>	
$T_{\text{room temp}}$ (°C)	<div><div></div><div>23.6</div><div></div></div>	
1. $T_{\text{room temp}}$ (K) (Unrounded)	<div><div></div><div>296.75</div><div></div></div>	
2. $T_{\text{room temp}}$ (K) (Rounded)	<div><div></div><div>296.8</div><div></div></div>	

YOUR PROGRESS ON THE PRESSURE OF IR AT ROOM TEMPERATURE SECTION

CORRECT	2 / 2	POINTS AWARDED 10 / 10	AUTOSOLVED	0 / 2	NOT FINISHED	0 / 4
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## PART B. PRESSURE OF VOLATILE LIQUID MEASURED AT DIFFERENT TEMPERATURES

ID of volatile liquid:	<div><div></div><div>A</div><div></div></div>
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### TEMPERATURE CALCULATIONS

Part B temperature data and calculations					
$T_2$ range ( $^{\circ}\text{C}$ )	$T_2(^{\circ}\text{C})$	3-10. $T_2(\text{K})$		11-18. $1/T_2(\text{K}^{-1})$	
		Unrounded	Rounded	Unrounded	Rounded
23-27	<div><div>23.6</div><div></div></div>	<div><div>296.75</div><div></div></div>	<div><div>296.8</div><div></div></div>	<div><div>0.00336984</div><div></div></div>	<div><div>0.003370</div><div></div></div>
15-20	<div><div>16.9</div><div></div></div>	<div><div>290.05</div><div></div></div>	<div><div>290.1</div><div></div></div>	<div><div>0.00344768</div><div></div></div>	<div><div>0.003448</div><div></div></div>
29-31	<div><div>29.7</div><div></div></div>	<div><div>302.85</div><div></div></div>	<div><div>302.9</div><div></div></div>	<div><div>0.00330196</div><div></div></div>	<div><div>0.003302</div><div></div></div>
35-38	<div><div>37.5</div><div></div></div>	<div><div>310.65</div><div></div></div>	<div><div>310.7</div><div></div></div>	<div><div>0.00321906</div><div></div></div>	<div><div>0.003219</div><div></div></div>

PRESSURE CALCULATIONS

To determine significant figures of a logarithmic value, count only digits after the decimal point.

Part B total pressure data and partial pressure of air calculations						
Run temperature ( ° C)	$P_{total}(\text{kPa})$			19-27. $P_{air}(\text{kPa})$		
				Unrounded		Rounded
23.6	<div><div></div><div>106.89</div><div>✓</div></div>			<div><div></div><div>103.930</div><div>✓</div></div>		<div><div></div><div>103.9</div><div>✓</div></div>
16.9	<div><div></div><div>104.02</div><div>✓</div></div>			<div><div></div><div>101.583</div><div>✓</div></div>		<div><div></div><div>101.6</div><div>✓</div></div>
29.7	<div><div></div><div>110.70</div><div>✓</div></div>			<div><div></div><div>106.066</div><div>✓</div></div>		<div><div></div><div>106.1</div><div>✓</div></div>
37.5	<div><div></div><div>116.61</div><div>✓</div></div>			<div><div></div><div>108.798</div><div>✓</div></div>		<div><div></div><div>108.8</div><div>✓</div></div>

Part B partial pressure of vapor calculations						
Run temperature ( ° C)	28-35. $P_{vap}(\text{kPa})$			36-43. $\ln(P_{vap})$		
	Unrounded		Rounded	Unrounded		Rounded
23.6	<div><div></div><div>2.9600</div><div>✓</div></div>		<div><div></div><div>3.0</div><div>✓</div></div>	<div><div></div><div>1.0852</div><div>✓</div></div>		<div><div></div><div>1.09</div><div>✓</div></div>
16.9	<div><div></div><div>2.4365</div><div>✓</div></div>		<div><div></div><div>2.4</div><div>✓</div></div>	<div><div></div><div>0.8906</div><div>✓</div></div>		<div><div></div><div>0.89</div><div>✓</div></div>
29.7	<div><div></div><div>4.6336</div><div>✓</div></div>		<div><div></div><div>4.6</div><div>✓</div></div>	<div><div></div><div>1.5333</div><div>✓</div></div>		<div><div></div><div>1.53</div><div>✓</div></div>
37.5	<div><div></div><div>7.8118</div><div>✓</div></div>		<div><div></div><div>7.8</div><div>✓</div></div>	<div><div></div><div>2.0556</div><div>✓</div></div>		<div><div></div><div>2.06</div><div>✓</div></div>

GRAPH DATA

Part B slope calculation (calculated in external spreadsheet)

	Unrounded		Rounded		Unit	
44-45. Slope from graph	<div><div></div><div>-5231.43</div><div>✓</div></div>		<div><div></div><div><math>-5.2 \times 10^3</math></div><div>✓</div></div>		<div><div></div><div>K</div><div>✓</div></div>	

CALCULATING THE ENTHALPY OF VAPORIZATION

The gas constant is  $8.31446 \text{ J mol}^{-1} \text{ K}^{-1}$

Part B enthalpy of vaporization calculation

	Unrounded		Rounded	
46-47. $\Delta H_{vap}(\text{kJ mol}^{-1})$	<div><div></div><div>43.4967</div><div>✓</div></div>		<div><div></div><div>43</div><div>✓</div></div>	

Part B quality of data check for your calculated change in enthalpy of vaporization

Quality of Data	
Percent error	Within 10% of true enthalpy 3
Correct sign	Well done, your change in enthalpy of vaporization has the correct sign (positive) 1

The enthalpy of vaporization of unknown ID A is  $44.8 \text{ kJ mol}^{-1}$

YOUR PROGRESS ON THE PRESSURE OF VOLATILE LIQUID SECTION