Determination of Molar Mass of a Volatile Liquid

Data Tables

Quantity	Symbol	Value	Units
Mass of empty flask	m_f		
Air temperature	T_{a0}		
Mass of water-filled flask	m_{fw}		

Run 1

Liquid: _____

Quantity	Symbol	Value	Units
Water bath temperature	T_{b1}		°C
			K
Room temperature	T_{a1}		°C
			K
Barometric pressure	P_{tot1}		hPa
			atm
Mass after cooling	m_1		g

Run 2

Liquid: _____

Quantity	Symbol	Value	Units
Water bath temperature	T_{b2}		°C
			K
Room temperature	T_{a2}		°C
			K
Barometric pressure	P_{tot2}		hPa
			atm
Mass after cooling	m_2		g

Run 3

Liquid: _____

Quantity	Symbol	Value	Units
Water bath temperature	T_{b3}		°C
			K
Room temperature	T_{a3}		°C
			K
Barometric pressure	P_{tot3}		hPa
			atm
Mass after cooling	m_3		g

Run 4

Liquid: _____

Quantity	Symbol	Value	Units
Water bath temperature	T_{b4}		°C
			K
Room temperature	T_{a4}		°C
			K
Barometric pressure	P_{tot4}		hPa
			atm
Mass after cooling	m_4		g

Calculation Tables

M_{air} = 0.78 (28.014 g) + 0.21 (31.998 g) + 0.01 (39.948 g) = 28.97 g/mol
ρ_w = 1000. g/L

Quantity	Symbol	Formula	Value with units
Mass of water filling flask	m_w	$m_{fw} - m_f$	
Volume inside flask	V	m_w/ρ_w	

Run 1

Quantity	Symbol	Formula	Value with units
Mass of liquid and vapor after flask cools	m_{vap1}	$m_1 - m_f$	
moles of sample	n_1	$P_{tot1}V/(RT_{b1})$	
Molar mass of liquid	M_1	m_{vap1}/n_1	

Run 2

Quantity	Symbol	Formula	Value with units
Mass of liquid and vapor after flask cools	m_{vap2}	$m_2 - m_f$	
moles of sample	n_2	$P_{tot2}V/(RT_{b2})$	
Molar mass of liquid	M_2	m_{vap2}/n_2	

Run 3

Quantity	Symbol	Formula	Value with units
Mass of liquid and vapor after flask cools	m_{vap3}	$m_3 - m_f$	
moles of sample	n_3	$P_{tot3}V/(RT_{b3})$	
Molar mass of liquid	M_3	m_{vap3}/n_3	

Run 4

Quantity	Symbol	Formula	Value with units
Mass of liquid and vapor after flask cools	m_{vap4}	$m_4 - m_f$	
moles of sample	n_4	$P_{tot4}V/(RT_{b4})$	
Molar mass of liquid	M_4	m_{vap4}/n_4	