

CHAPTER 4	Thought Lab 4.1: Molar Volumes of Gases Answer Key	BLM 4.1.7A
ANSWER KEY		

### Answers to Procedure Questions

#### Three Gases at 296 K and 98.7 kPa

Gas	Carbon dioxide	Oxygen	Methane
Volume of gas ( $V$ )	150 mL	150 mL	150 mL
Mass of empty syringe	25.08 g	25.08 g	25.08 g
Mass of gas + syringe	25.34 g	25.27 g	25.18 g
Mass of gas ( $m$ )	0.26 g	0.19 g	0.10 g
Molar mass of the gas ( $M$ )	44.01 g/mol	32.00 g/mol	16.05 g/mol
Number of moles of gas $\left(n = \frac{m}{M}\right)$	0.005 91 mol	0.005 94 mol	0.006 23 mol
Calculations for STP			
Volume of gas at STP (273.15 K and 101.325 kPa) $\left(\text{use } \frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}\right)$	135 mL	135 mL	135 mL
Molar Volume at STP $v = \frac{V}{n}$	22.8 L/mol	22.7 L/mol	21.6 L/mol
Calculations for SATP			
Volume of gas at SATP (298.15 K and 100 kPa) $\left(\text{use } \frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}\right)$	149 mL	149 mL	149 mL
Molar Volume at SATP $v = \frac{V}{n}$	25.3 L/mol	25.1 L/mol	23.9 L/mol

### Answers to Analysis Questions

1. The three molar volumes are almost equal to one another.
2. CO<sub>2</sub>, 2%; O<sub>2</sub>, 1%; CH<sub>4</sub>, 4%
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4. CO<sub>2</sub>, 2%; O<sub>2</sub>, 1%; CH<sub>4</sub>, 4%