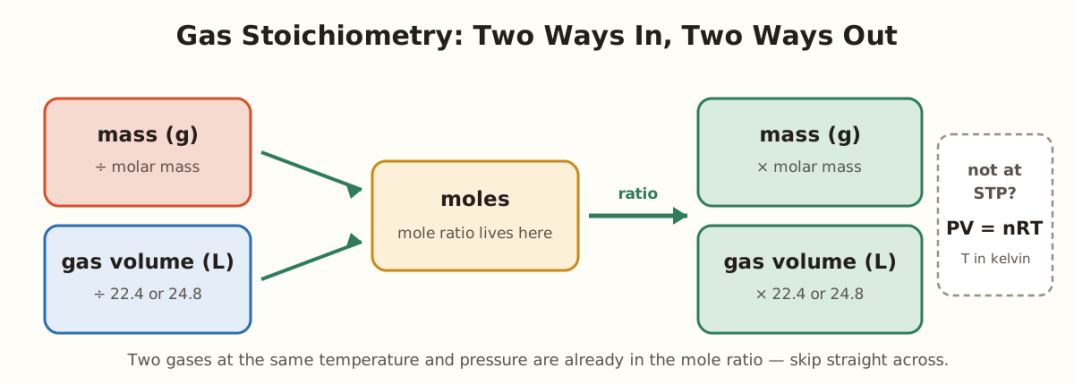
Gas Stoichiometry Worksheet

Grade 11 Chemistry · molar volume, mole ratio and PV = nRT

Name: _____ Date: _____ Score: / 16



Before you start: use 22.4 L/mol at STP and 24.8 L/mol at SATP. Each question says which. Part E is at neither, so use PV = nRT with R = 8.31 L·kPa/mol·K and temperature in kelvin. Three significant figures throughout.

Part A · the conditions matter

1. One mole of any gas occupies _____ L at STP and _____ L at SATP.
2. Two gases measured at the same temperature and pressure are in the same ratio by _____ as they are by _____.

Part B · mass in, gas volume out

#	Equation	Given	Find	Answer
1	$2KClO_3 \rightarrow 2KCl + 3O_2$	12.3 g $KClO_3$ at STP	L O_2	
2	$CaCO_3 \rightarrow CaO + CO_2$	25.0 g $CaCO_3$ at STP	L CO_2	
3	$2Al + 6HCl \rightarrow 2AlCl_3 + 3H_2$	5.40 g Al at SATP	L H_2	
4	$2H_2O_2 \rightarrow 2H_2O + O_2$	34.0 g H_2O_2 at SATP	L O_2	

Part C · gas volume in, mass out

#	Equation	Given	Find	Answer
5	$N_2 + 3H_2 \rightarrow 2NH_3$	67.2 L H_2 at STP	g NH_3	
6	$2Mg + O_2 \rightarrow 2MgO$	11.2 L O_2 at STP	g MgO	
7	$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$	49.6 L O_2 at SATP	g CO_2	
8	$2NaN_3 \rightarrow 2Na + 3N_2$	74.4 L N_2 at SATP	g Na	

Part D · gas to gas at the same conditions

#	Equation	Given	Find	Answer
9	$N_2 + 3H_2 \rightarrow 2NH_3$	30.0 L H_2, same T and P	L NH_3	
10	$2CO + O_2 \rightarrow 2CO_2$	48.0 L CO, same T and P	L CO_2	
11	$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$	15.0 L CH_4, same T and P	L O_2	
12	$2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$	10.0 L C_2H_6, same T and P	L CO_2	

Part E · not at STP or SATP

#	Equation	Given	Find	Answer
13	$CaCO_3 \rightarrow CaO + CO_2$	50.0 g $CaCO_3$ at 101 kPa, 25 °C	L CO_2	
14	$2KClO_3 \rightarrow 2KCl + 3O_2$	24.5 g $KClO_3$ at 95.0 kPa, 30 °C	L O_2	

Answer Key

Gas Stoichiometry · Grade 11 Chemistry

Part A

1. **22.4** L at STP; **24.8** L at SATP
2. **volume** as they are by **moles**

Parts B to E

#	Working	Answer
1	n = 12.3 / 122.55 = 0.100 mol → × 3/2 = 0.150 mol → × 22.4 L/mol	**3.36 L**
2	n = 25.0 / 100.09 = 0.250 mol → × 1/1 = 0.250 mol → × 22.4 L/mol	**5.60 L**
3	n = 5.40 / 26.98 = 0.200 mol → × 3/2 = 0.300 mol → × 24.8 L/mol	**7.44 L**
4	n = 34.0 / 34.02 = 0.999 mol → × 1/2 = 0.499 mol → × 24.8 L/mol	**12.4 L**
5	n = 67.2 / 22.4 = 3.00 mol → × 2/3 = 2.00 mol → × 17.04 g/mol	**34.1 g**
6	n = 11.2 / 22.4 = 0.500 mol → × 2/1 = 1.00 mol → × 40.31 g/mol	**40.3 g**
7	n = 49.6 / 24.8 = 2.00 mol → × 3/5 = 1.20 mol → × 44.01 g/mol	**52.8 g**
8	n = 74.4 / 24.8 = 3.00 mol → × 2/3 = 2.00 mol → × 22.99 g/mol	**46.0 g**
9	same T and P, so volumes follow the mole ratio: 30.0 × 2/3	**20.0 L**
10	same T and P, so volumes follow the mole ratio: 48.0 × 2/2	**48.0 L**
11	same T and P, so volumes follow the mole ratio: 15.0 × 2/1	**30.0 L**
12	same T and P, so volumes follow the mole ratio: 10.0 × 4/2	**20.0 L**
13	n = 50.0 / 100.09 = 0.500 mol → 0.500 mol CO_2; T = 25 + 273.15 = 298.10 K → V = nRT/P	**12.3 L**
14	n = 24.5 / 122.55 = 0.200 mol → 0.300 mol O_2; T = 30 + 273.15 = 303.10 K → V = nRT/P	**7.96 L**