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| **Sample problem 1**  CH4 burns in O2 , producing CO2+ H2O(g).  A 1.22 L CH4 cylinder, at 15°C, has a pressure of 328 kPa.   1. What volume of O2 at 100kPa and 298K will be required to react completely with all of the CH4? 2. How many grams of H2O(g) are produced? 3. What volume of CO2 (at STP) is produced if only 2.15 g of the CH4 was burned? | **Sample problem 1**  CH4 burns in O2 , producing CO2+ H2O(g).  A 1.22 L CH4 cylinder, at 15°C, has a pressure of 328 kPa.   1. What volume of O2 at 100kPa and 298K will be required to react completely with all of the CH4? 2. How many grams of H2O(g) are produced? 3. What volume of CO2 (at STP) is produced if only 2.15 g of the CH4 was burned? |
| **Sample problem 2**  Ammonia (NH3 ) gas can be synthesized from  nitrogen gas + hydrogen gas. What volume of ammonia at 450 kPa and 80°C can be obtained from the complete reaction of 7500 g hydrogen? | **Sample problem 2**  Ammonia (NH3 ) gas can be synthesized from  nitrogen gas + hydrogen gas. What volume of ammonia at 450 kPa and 80°C can be obtained from the complete reaction of 7500 g hydrogen? |
| **Sample problem 3**  Hydrogen gas (and NaOH) is produced when sodium metal is added to water. What mass of Na is needed to produce 20.0 L of H2 at STP? | **Sample problem 3**  Hydrogen gas (and NaOH) is produced when sodium metal is added to water. What mass of Na is needed to produce 20.0 L of H2 at STP? |
| **Extra Practice**   1. What volume of oxygen at STP is needed to completely burn 15 g of methanol (CH3OH) in a fondue burner?  (CO2 + H2O are products) 2. When sodium chloride is heated to 800°C it can be electrolytically decomposed into Na metal & chlorine  (Cl2 ) gas. What volume of chlorine gas is produced (at 800°C and 100 kPa) if 105 g of Na is also produced? 3. What mass of propane (C3H8 ) can be burned using 100 L of air at SATP? Note: 1) air is 20% O2 , so 100 L of air holds 20 L O2 , 2) CO2 and H2O are the products of this reaction. 4. A 5.0 L tank holds 13 atm of propane (C3H8 ) at 10°C. What volume of O2 at 10°C & 103 kPa will be required to react with all of the propane? 5. Nitroglycerin explodes according to:  4 C3H5 (NO3) 3 → 12 CO2 (g) + 6 N2 (g) + 10 H2O(g) + O2 (g) 6. Calculate the volume, at STP, of each product formed by the reaction of 100 g of C3H5 (NO3)3 7. 200 g of C3H5 (NO3)3 is ignited (and completely decomposes) in an otherwise empty 50 L gas cylinder. 8. What will the pressure in the cylinder be if the temperature stabilizes at 220°C? | **Extra Practice**   1. What volume of oxygen at STP is needed to completely burn 15 g of methanol (CH3OH) in a fondue burner?  (CO2 + H2O are products) 2. When sodium chloride is heated to 800°C it can be electrolytically decomposed into Na metal & chlorine  (Cl2 ) gas. What volume of chlorine gas is produced (at 800°C and 100 kPa) if 105 g of Na is also produced? 3. What mass of propane (C3H8 ) can be burned using 100 L of air at SATP? Note: 1) air is 20% O2 , so 100 L of air holds 20 L O2 , 2) CO2 and H2O are the products of this reaction. 4. A 5.0 L tank holds 13 atm of propane (C3H8 ) at 10°C. What volume of O2 at 10°C & 103 kPa will be required to react with all of the propane? 5. Nitroglycerin explodes according to:  4 C3H5 (NO3) 3 → 12 CO2 (g) + 6 N2 (g) + 10 H2O(g) + O2 (g) 6. Calculate the volume, at STP, of each product formed by the reaction of 100 g of C3H5 (NO3)3 7. 200 g of C3H5 (NO3)3 is ignited (and completely decomposes) in an otherwise empty 50 L gas cylinder. 8. What will the pressure in the cylinder be if the temperature stabilizes at 220°C? |

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