

5.03 L O₂

$$(2)(c) \frac{16.7 \text{ g Fe}}{55.8 \text{ g}} \times \frac{1 \text{ mol}}{1 \text{ mol}} \times \frac{3 \text{ mol O}_2}{4 \text{ mol Fe}} \times \frac{22.4 \text{ L}}{1 \text{ mol}} = 10.1 \text{ L O}_2$$

~~10.1 L O₂~~

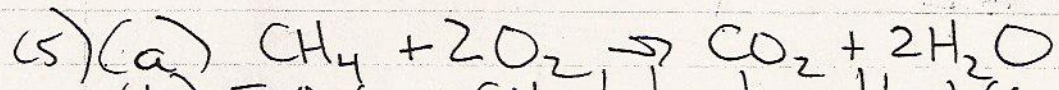
$$(3) \frac{71.0 \text{ g P}_4\text{O}_{10}}{284 \text{ g P}_4\text{O}_{10}} \times \frac{1 \text{ mol}}{1 \text{ mol}} \times \frac{4 \text{ mol H}_3\text{PO}_4}{1 \text{ mol P}_4\text{O}_{10}} = 1.00 \text{ mol H}_3\text{PO}_4$$

1.00 mol H₃PO₄

$$(4) \frac{0.98 \text{ L HCl}}{22.4 \text{ L HCl}} \times \frac{1 \text{ mol}}{4 \text{ mol HCl}} \times \frac{2 \text{ mol Cl}_2}{1 \text{ mol Cl}_2} \times \frac{22.4 \text{ L}}{1 \text{ mol}} = 0.49 \text{ L Cl}_2$$

0.49 L Cl₂

(NOTE: Since the volumes cancel out, it's OK to just use a mole ratio here.)



$$(b) \frac{50.6 \text{ g CH}_4}{16 \text{ g CH}_4} \times \frac{1 \text{ mol}}{1 \text{ mol}} \times \frac{1 \text{ mol CO}_2}{1 \text{ mol CH}_4} \times \frac{22.4 \text{ L}}{1 \text{ mol}} = 70.9 \text{ L CO}_2$$

70.9 L CO₂

$$(c) \frac{50.6 \text{ g CH}_4}{16 \text{ g CH}_4} \times \frac{1 \text{ mol}}{1 \text{ mol}} \times \frac{2 \text{ mol H}_2\text{O}}{1 \text{ mol CH}_4} \times \frac{18.0 \text{ g}}{1 \text{ mol}} = 114 \text{ g H}_2\text{O}$$

114 g H₂O

(6)(a) $\frac{12 \text{ mol CO}}{3 \text{ mol CO}} \times \frac{1 \text{ mol Fe}_2\text{O}_3}{1 \text{ mol Fe}_2\text{O}_3} = 4 \text{ mol Fe}_2\text{O}_3$
 (we have 12 mol)
 Fe₂O₃ is left over, so CO is limiting.

$$(b) \frac{12 \text{ mol CO}}{3 \text{ mol CO}} \times \frac{2 \text{ mol Fe}}{1 \text{ mol Fe}} = 8 \text{ mol Fe}$$

$$(7) \frac{54.0 \text{ g Al}}{27 \text{ g}} = 2 \text{ mol Al} \quad \frac{319 \text{ g CuSO}_4}{159.6 \text{ g}} = 2 \text{ mol CuSO}_4$$

$$\frac{2 \text{ mol Al}}{2 \text{ mol Al}} \times \frac{3 \text{ mol CuSO}_4}{3 \text{ mol CuSO}_4} = 3 \text{ mol CuSO}_4 \text{ required}$$

(we have 2 mol)

CuSO₄ runs out first, so it is limiting.

$$\frac{2 \text{ mol CuSO}_4}{3 \text{ mol CuSO}_4} \times \frac{3 \text{ mol Cu}}{1 \text{ mol Cu}} \times \frac{63.5 \text{ g}}{1 \text{ mol}} = 127 \text{ g Cu}$$