2.5 mol of $CH_4$ 4.8 mol of $O_2$

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

$$2.5 \text{ mol of } CH_4 \times \frac{2 \text{ mol } O_2}{1 \text{ mol } CH_4} = 5.0 \text{ mol of } O_2$$

$$4.8 \text{ mol of } O_2 \times \frac{1 \text{ mol } CH_4}{2 \text{ mol } O_2} = 2.4 \text{ mol of } CH_4$$

a)

| | $CH_4$ | $O_2$ |
|---|---|---|
| Have | 2.5 | 4.8 |
| Need | 2.4 | 5.0 |
| | ⊕ excess | ⊖ → L.R |

b) $$4.8 \text{ mol of } O_2 \times \frac{1 \text{ mol of } CO_2}{2 \text{ mol } O_2} = \boxed{2.4 \text{ mol of } CO_2}$$

~~2.4 mol of $CO_2$ × ——— mol~~

c) $2.5 - 2.4 = \boxed{0.1 \text{ mol of } CH_4 \text{ left}}$

3)

2.0 mol HCl 2.0 mol MgO

$$2HCl + MgO \rightarrow MgCl_2 + H_2O$$

a) $$2.0 \text{ mol HCl} \times \frac{1 \text{ MgO}}{2 \text{ HCl}} = 1.0 \text{ mol MgO}$$

$$2.0 \text{ mol of MgO} \times \frac{2 \text{ HCl}}{1 \text{ MgO}} = 4.0 \text{ mol HCl}$$

| | HCl | MgO |
|---|---|---|
| Have | 2.0 | 2.0 |
| Need | 4.0 | 1.0 |
| | ⊖ → L.R | ⊕ excess |

b) $2.0 - 1.0 = \boxed{1.0 \text{ mol of M left over}}$