Limit Reactant Practice

(#1) $2\ Na(s) + Cl_2(g) \rightarrow 2\ NaCl(s)$

(B) $6.0\ mol\ Na$ | $4.0\ mol\ Cl_2$ | $\emptyset$

(C) $-6.0\ mol\ Na$ | $-6.0\ mol\ Na\left(\frac{1\ mol\ Cl_2}{2\ mol\ Na}\right) + 6.0\ mol\ Na\left(\frac{2\ mol\ NaCl}{2\ mol\ Na}\right)$

$= -3.0\ mol\ Cl_2$

(A) $\emptyset\ mol\ Na$ | 1.0 mole Cl_2 left over | 6.0 mol NaCl made

a. 6.0 mole NaCl produced
b. Na is the limiting reactant
c. 1.0 mole of Cl_2 left over / in excess
(Cl_2 is the excess reactant)

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(#2)

	$C_2H_4(g)$	+	$3O_2(g)$	→	$2CO_2(g)$	+	$2H_2O(g)$
B:	2.7 mol C_2H_4		6.3 mol O_2		Ø		Ø ?
C:	$-2.7\text{ mol } C_2H_4 \left(\frac{3\text{ mol } O_2}{1\text{ mol } C_2H_4}\right)$						
	$= -8.1$ mol O_2 (not enough)						
C:	$-6.3\text{ mol } O_2 \left(\frac{1\text{ mol } C_2H_4}{3\text{ mol } O_2}\right)$		-6.3 mol O_2		$+6.3\text{ mol } O_2 \left(\frac{2\text{ mol } CO_2}{3\text{ mol } O_2}\right)$		$+6.3\text{ mol } H_2 \left(\frac{2\text{ mol } H_2O}{3\text{ mol } H_2}\right)$
	$= -2.1$ mol C_2H_4						
A:	0.6 mol C_2H_4 left over		Ø mol O_2		4.2 mol CO_2 produced		4.2 mol H_2O produced

a) 4.2 mol H_2O made

b) O_2 is the limiting reactant

c) C_2H_4 is the excess reactant w/ 0.6 mol left over

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(#3) * the values given in the question are not in moles
∴ must convert to moles before putting values in B-C-A table.

$$\frac{80.00\text{ g Cu} \mid 1\text{ mole Cu}}{63.55\text{ g Cu}} = 1.259\text{ mol Cu}$$

$$\frac{25.00\text{ g S} \mid 1\text{ mole S}}{32.07\text{ g S}} = 0.7795\text{ mol S}$$

	$2Cu(s)$	+ $S(s)$	→ $Cu_2S(s)$
B:	1.259 mol	0.7795 mol	Ø mol
C:	−1.259 mol	$-1.259\text{ mol}\left(\frac{1\text{ S}}{2\text{ Cu}}\right)$	$+1.259\text{ mol}\left(\frac{1\text{ Cu}_2\text{S}}{2\text{ Cu}}\right)$
		$= -0.6295\text{ mol S}$	
A:	Ø mole extra Cu	$= 0.1500$ mol S extra	0.6295 mol Cu_2S made

a) $\frac{0.6295\text{ mol } Cu_2S \mid 159.17\text{ g } Cu_2S}{1\text{ mol } Cu_2S} = \boxed{100.2\text{ g } Cu_2S}$

b) Cu is the limiting reactant

c) S is the excess reactant

d) $\frac{0.1500\text{ mol S} \mid 32.07\text{ g S}}{1\text{ mol}} = \boxed{4.811\text{ g S excess}}$

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#8

$$24.8\text{ g } CaCO_3 \left| \frac{1\text{ mole } CaCO_3}{100.09\text{ g } CaCO_3} \right. = 0.248\text{ mol } CaCO_3$$

	$CaCO_3(s)$	$\longrightarrow$	$CaO(s)$	+	$CO_2(g)$
B:	0.248 mol		ø		ø
C:	−0.248 mol		$+0.248\text{ mol}\left(\frac{1\ CaO}{1\ CaCO_3}\right)$		$0.248\text{ mol}\left(\frac{1\ CaO}{1\ CaCO_3}\right)$
A:	ø mol left		0.248 mol CaO made		0.248 mol CO_2 made

a) $$0.248\text{ mol } CaO \left| \frac{56.08\text{ g } CaO}{1\text{ mol } CaO} \right. = \boxed{13.9\text{ g } CaO}$$

b) $$0.248\text{ mol } CO_2 \left| \frac{22.4\text{ L } CO_2}{1\text{ mol } CO_2} \right. = \boxed{5.56\text{ L } CO_2}$$

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(#5) Step 1 Convert g to moles.

$$100.00\text{g } CaCO_3 \left| \frac{1\text{mole } CaCO_3}{100.09\text{g } CaCO_3} \right. = 0.99910\text{ mol } CaCO_3$$

$$45.00\text{g } FePO_4 \left| \frac{1\text{mol } FePO_4}{150.82\text{g } FePO_4} \right. = 0.2984\text{ mol } FePO_4$$

	$3CaCO_3$	+	$2FePO_4$	→	$Ca_3(PO_4)_2$	+	$Fe_2(CO_3)_3$
B:	0.99910 mol		0.2984 mol		∅		∅
C:	−0.99910 mol		$-0.99910\left(\frac{2\,FePO_4}{3\,CaCO_3}\right)$				
			−0.66607 not enough				
C:	$-0.2984\left(\frac{3}{2}\right)$		−0.2984		$+0.2984\left(\frac{1}{2}\right)$		$+0.2984\left(\frac{1}{2}\right)$
	$=-0.4476$						
A:	0.5515 mol $CaCO_3$ extra		∅		0.1492 mol $Ca_3(PO_4)_2$		0.1492 mol $Fe_2(CO_3)_3$

$$0.1492\text{ mol } Fe_2(CO_3)_3 \left| \frac{291.73\text{g } Fe_2(CO_3)_3}{1\text{mol } Fe_2(CO_3)_3} \right. = \boxed{43.53\text{ g } Fe_2(CO_3)_3}$$