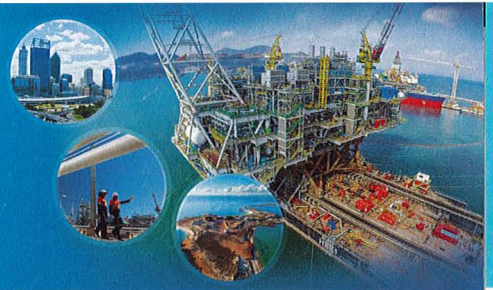

Q4

$Mg_{(s)} + Cl_{2(g)} \longrightarrow MgCl_{2(s)}$

20.0g 20.0g.

a) Determine Limiting Reagent.

Step 1 - Convert masses to moles

$n_{Mg} = \frac{m}{MM} = \frac{20.0}{24.3} = 0.823$ $\quad n_{Cl_2} = \frac{20.0}{71} = 0.282$

Step 2 - divide each by their coefficient

$Mg : \frac{0.823}{1} = 0.823$ $\quad Cl_2 : \frac{0.282}{1} = 0.282$

lowest value.

$Cl_2$ is L.R

b) Calculate mass of $MgCl_2$ formed (3 step STOICH Q)

Step 1 - Calculate moles of $Cl_2$ - done above = 0.282

Step 2 - Calculate moles of $MgCl_2$ from this

$n_{MgCl_2} = \frac{\text{Coeff}_{MgCl_2}}{\text{Coeff}_{Cl_2}} \times n_{Cl_2} = \frac{1}{1} \times 0.282$

$= 0.282$

Step 3 - Calculate mass of $MgCl_2$

$m = n \times MM = 0.282 \times (24.3 + 35.5 \times 2) = 26.8\,g$



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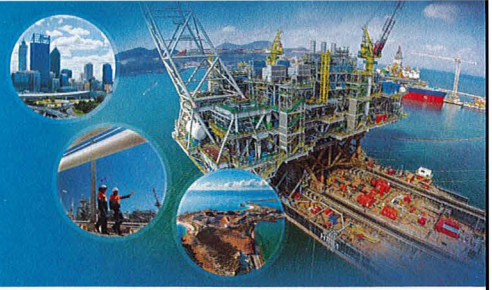

Q5

$N_2H_{4(l)} + O_{2(g)} \longrightarrow N_{2(g)} + 2H_2O_{(g)}$

2.29g 3.14g

(a) Determine Limiting Reagent

Step 1 : $n_{N_2H_4} = \frac{m}{MM} = \frac{2.29}{32} = 0.0716$ $\quad n_{O_2} = \frac{m}{MM} = \frac{3.14}{32} = 0.0981$

Step 2 : $N_2H_4 = \frac{0.0716}{\text{coeff}} = \frac{0.0716}{1} = 0.0716$ $\quad O_2 = \frac{0.0981}{\text{coeff}} = \frac{0.0981}{1} = 0.0981$

lowest value. $N_2H_4$ is L.R.

(b) Determine mass of $O_2$ not reacted (left over)

Solve by calculating the mass/moles of $O_2$ which does react with the hydrazine, then subtract it from how much you started with.

if 0.0716 moles of $N_2H_4$ reacts, this uses:

$n_{O_2} = \frac{\text{coeff}_{O_2}}{\text{coeff}_{N_2H_4}} \times n_{N_2H_4} = \frac{1}{1} \times 0.0716$

$= 0.0716$

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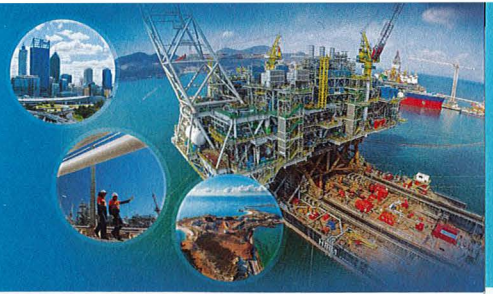

5b continued

if 0.0716 moles of $O_2$ reacts, what mass is this

$m_{O_2} = n_{O_2} \times MM = 0.0716 \times 32\,g$

$= 2.29\,g$ of $O_2$ will react.

$\therefore$ $O_2$ left over = starting mass − reacting mass

$= 3.14 - 2.29$

$= 0.85\,g$ of $O_2$ left over.

(c) Mass of Water produced. (3 step STOICH Q)

Step 1 – Calculate moles of L.R – done in part a

$n_{N_2H_4} = 0.0716$

Step 2 – Calculate moles of $H_2O$ which would form

$$n_{H_2O} = \frac{Coeff_{H_2O}}{Coeff_{N_2H_4}} \times n_{N_2H_4}$$

$$= \frac{2}{1} \times 0.0716$$

$$= 0.1432$$

Step 3 – Calculate mass of $H_2O$

$m_{H_2O} = n_{H_2O} \times MM = 0.1432 \times 18$

$= 2.58\,g$



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Q6 (No working for this Q)

a) 2.3 g of $Ag_2S$ would be produced

b) 1.71 g of $S_8$ would not react.

Q7 $N_2 + 3H_2 \longrightarrow 2NH_3$ (balanced)

0.001g 0.05g

a) Mass of Ammonia Produced

L. Reagent identified;

Step 1 $n_{N_2} = \frac{m}{MM} = \frac{0.001}{28} = 3.57 \times 10^{-5}$ $\quad n_{H_2} = \frac{0.05}{2} = 0.025$

Step 2 (÷ coeffs) $N_2 = \frac{3.57 \times 10^{-5}}{1} = 3.57 \times 10^{-5}$ $\quad H_2 = \frac{0.25}{3} = 8.33 \times 10^{-3}$

Smallest value.

$N_2$ is Limiting Reagent

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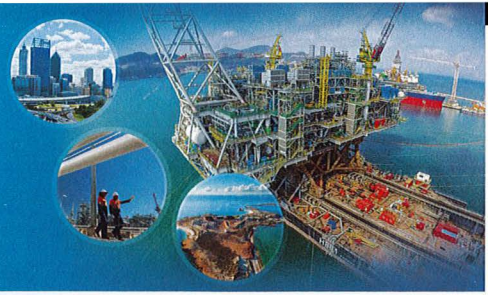

Q7 a) continued.

$N_2$ is L.R – Calculate mass of Ammonia made (3 step stoic)

step 1 – Calculate moles of $N_2$, done earlier = $3.57 \times 10^{-5}$

step 2 – Calculate moles of Ammonia $NH_3$

$$n_{NH_3} = \frac{\text{Coeff}_{NH_3}}{\text{Coeff}_{N_2}} \times n_{N_2} = \frac{2}{1} \times 3.57 \times 10^{-5}$$

$$= 7.14 \times 10^{-5}$$

step 3 – Calculate mass $NH_3$ produced

$$m_{NH_3} = n_{NH_3} \times MM = 7.14 \times 10^{-5} \times 17$$

$$= 1.21 \times 10^{-3}\ g.$$

(b) Mass of $H_2$ left unreacted (initially 0.05g)

Have to calculate mass of $H_2$ which did react and subtract it from starting mass.

$$n_{H_2} = \frac{\text{Coeff}_{H_2}}{\text{Coeff}_{N_2}} = \frac{3}{1} \times n_{N_2} = \frac{3}{1} \times 3.57 \times 10^{-5}$$

$$= 1.07 \times 10^{-4} \text{ moles}$$

$$m_{H_2} \text{ reacted} = n_{H_2} \times MM = 1.07 \times 10^{-4} \times 2$$

$$= 2.14 \times 10^{-4}\ g.$$

$\therefore$ Mass $H_2$ remaining = 0.05g (start) – $2.14 \times 10^{-4}$ (reacted)

$$= 0.0498\ g.$$