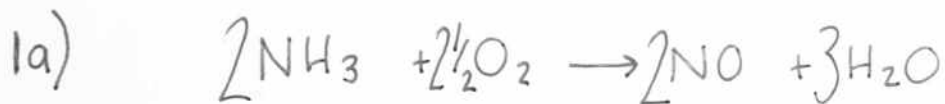


# Limiting Reagents - Answers



$$\frac{3.25}{17} = 0.19 \text{ moles of } \text{NH}_3$$

$$\frac{3.50}{32} = 0.11 \text{ moles of } \text{O}_2$$

So 0.19 moles of  $\text{NH}_3$  = 0.19 moles of  $\text{NO}$ .

$$0.11 \text{ moles of } \text{O}_2 = \frac{0.11}{2.5} \times 2 = 0.088 \text{ moles of } \text{NO}$$

∴  
limiting reagent.

b)  $0.088 \times 30 = \underline{\underline{2.64\text{g}}}$  of  $\text{NO}$ .

c)  $0.19 - 0.088 = 0.102$  moles of  $\text{NH}_3$  unused  $0.102 \times 17 = \underline{\underline{1.734\text{g}}}$



$$\frac{4.95\text{g}}{32} = 0.155 \text{ moles of } \text{C}_2\text{H}_4$$

$$\frac{3.25}{32} = 0.102 \text{ moles of } \text{O}_2$$

So 0.155 moles of  $\text{C}_2\text{H}_4 \times 2 = 0.31$  moles of  $\text{CO}_2$

$$0.102 \text{ moles of } \text{O}_2 = \frac{0.102}{3} \times 2 = 0.068 \text{ moles of } \text{CO}_2$$

∴  $\text{O}_2$  is limiting reagent.

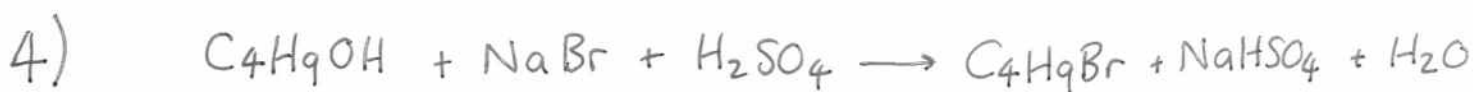
b)  $0.068 \times 44 = \underline{\underline{2.992\text{g}}}$  of  $\text{CO}_2$  formed



$$\frac{42.1g}{78} = 0.54 \text{ moles of } C_6H_6 \quad \frac{73.0g}{159.8} = 0.457 \text{ moles of } Br_2$$

0.46 moles of  $Br_2$  is limiting reagent.  $\therefore 0.46 \times 156.9 = 71.68g$  of  $C_6H_5Br$

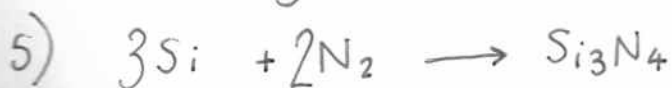
b)  $\frac{63.6}{71.68} \times 100 = \underline{\underline{88.7\%}}$



$$\frac{15.0g}{74} = 0.203 \text{ moles of } C_4H_9OH \quad \frac{22.4}{102.9} = 0.22 \text{ moles of } NaBr \quad \frac{32.7}{98.1} = 0.33 \text{ moles of } H_2SO_4$$

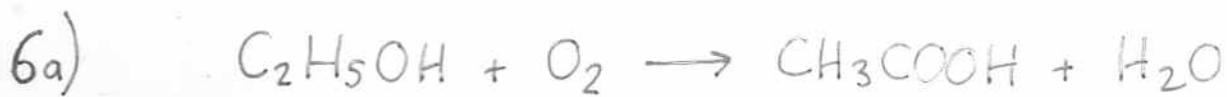
$\therefore$  0.203 moles of  $C_4H_9OH$  is the limiting reagent.  $0.203 \times 136.9 = 27.79g$  (theoretical yield)

$\frac{17.1g}{27.79g} \times 100 = \underline{\underline{61.5\%}}$



$$\frac{125}{95} \times 100 = 131.6g \text{ would be theoretical } 100\% \text{ yield.} \quad \frac{131.6g}{140.3} = 0.94 \text{ moles of } Si_3N_4 \times 3 = 2.82 \text{ moles of } Si.$$

$2.82 \times 28.1 = 79.2g$  of  $Si$  needed.



$$\frac{0.0274g}{60} = 0.456 \times 10^{-3} \text{ moles of ethanoic acid} \quad \text{also = moles of } O_2$$

$$0.456 \times 10^{-3} \times 32 = 0.0146g \text{ of } O_2 \text{ in } 1cm^3 \therefore \times 1000 = 14.6g \text{ in } 1dm^3$$

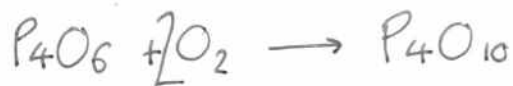
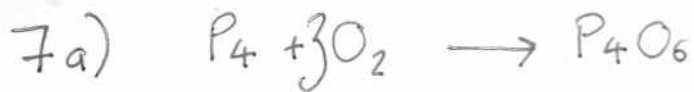
$$b) \quad \frac{1000}{100} \times 8.5 = 85cm^3 \text{ of ethanol} \quad \text{density} \times \text{vol} = \text{mass}$$

$$0.816 \times 85 = 69.36g \text{ of ethanol in } 1000cm^3 \quad \frac{69.36}{46} = 1.51 \text{ moles of ethanol}$$

$$\therefore 1.51 \text{ moles of ethanoic acid} \times 60 = 90.5g \text{ of ethanoic acid (theoretical)}$$

$$0.0274 \times 1000 = 27.4g \text{ in } 1000cm^3$$

$$\therefore \frac{27.4g}{90.5g} \times 100 = \underline{\underline{30.3\%}}$$



$$\frac{5.77\text{g}}{124} = 0.0465 \text{ moles of P}_4$$

$$\frac{5.77\text{g}}{32} = 0.18 \text{ moles of O}_2$$

if limiting:

$$0.0465 \text{ moles of P}_4 = 0.0465 \text{ moles of P}_4\text{O}_6 \leftarrow \text{first limiting}$$

$$\therefore 0.0465 \times 3 = 0.1395 \text{ moles of O}_2 \text{ needed}$$

$$0.18 \text{ moles of O}_2 = \frac{0.18}{3} = 0.0601 \text{ moles of P}_4\text{O}_6$$

$$\text{so: } 0.18 - 0.1395 = 0.0405 \text{ moles left over}$$

if limiting

$$0.0465 \text{ moles of P}_4\text{O}_6 = 0.0465 \text{ of P}_4\text{O}_{10}$$

$$0.0405 \text{ moles of O}_2 = \frac{0.0405}{2} = 0.02025 \text{ moles of O}_2 \leftarrow \text{limiting factor is O}_2$$

$$b) 0.02025 \times 284 = \underline{\underline{5.75\text{g}}}$$

$$c) 0.0465 - 0.02025 = 0.02625 \text{ moles of P}_4\text{O}_6 \text{ left over} \times 220 = \underline{\underline{5.775\text{g}}}$$