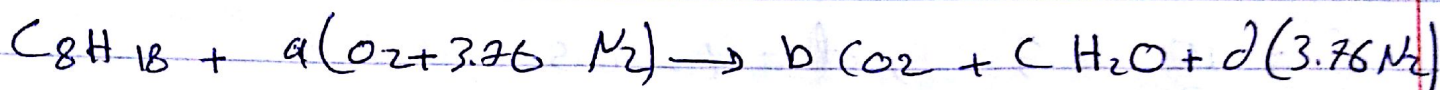


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HW # 2

ICE
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$$C: b = 8$$

$$O: 2a = 2b + c \rightarrow a = 12.5$$

$$H: c = 9$$

$$d \rightarrow a = 12.5$$



$$\text{by mass} \rightarrow (A/F) = \frac{(12.5) \times 32 + (47 \times 28)}{(12 \times 8 + 18)} = 15.05$$

$$\dot{m}_f = 2 \text{ g/s}$$

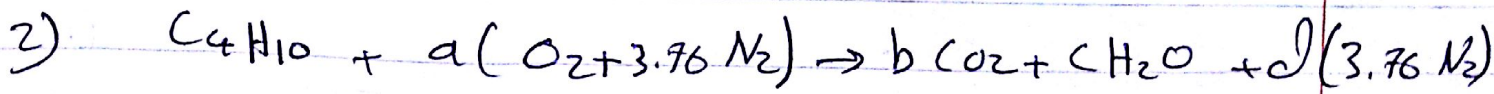
$$A/F = \frac{\dot{m}_a}{\dot{m}_f} \rightarrow \dot{m}_a = \cancel{A/F} \dot{m}_f (A/F) \dot{m}_f$$

$$= 30.1 \text{ g/s}$$

$$\dot{m}_f = 2 \times 60 \times \frac{1}{1500} \times \frac{1}{4} \times 2 = 0.04 \text{ g/cycle}$$

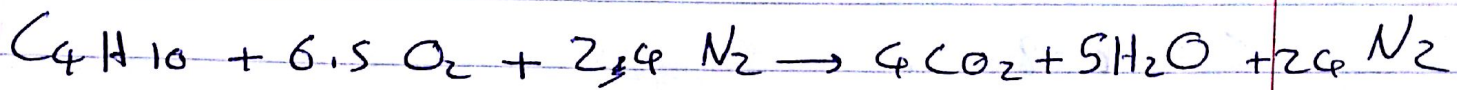
$$\dot{m}_a = \dot{m}_f (A/F) = (0.04)(15.05) = 0.602 \text{ g/cycle}$$

$$M_v = \frac{2 (30.1 \times 10^3) (60)}{(1.16) (2.4 \times 10^3) (1500)} = 86.5 \%$$



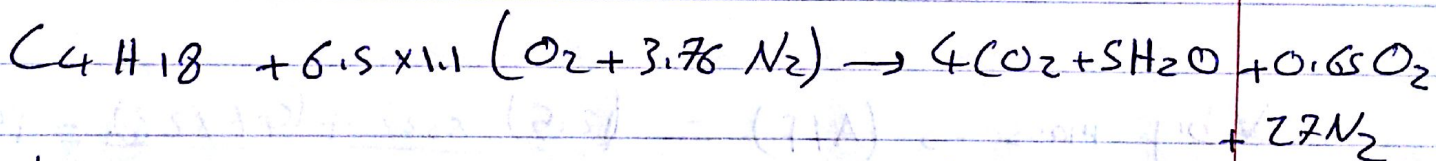
$$b = 4, \quad 2a = 2b + c \rightarrow a = 6.5$$

$$c = \frac{10}{2} = 5, \quad d = a = 6.5$$



$$\text{by mass } (A/F)_{st} = \frac{(6.5 \times 32) + (24.4 \times 28)}{(12 \times 4) + 10} = 15.4$$

$$(A/F) = (A/F)_{st} / \phi = \frac{15.4}{0.9} = 17.2$$



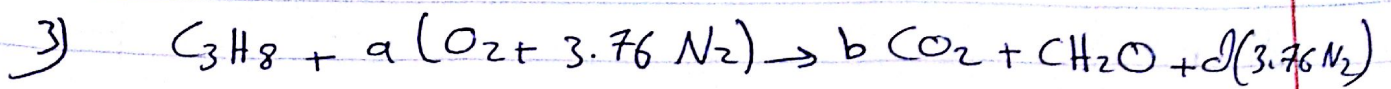
$$m_{total} = 9 + 5 + 0.65 + 27 = 36.65$$

$$\% CO_2 = \frac{9}{36.65} \times 100 = 10.9$$

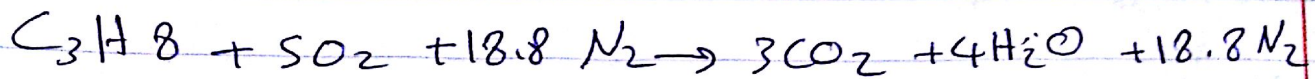
$$\% H_2O = \frac{5}{36.65} \times 100\% = 13.7\%$$

$$\% O_2 = \frac{0.65}{36.65} \times 100\% = 1.78\%$$

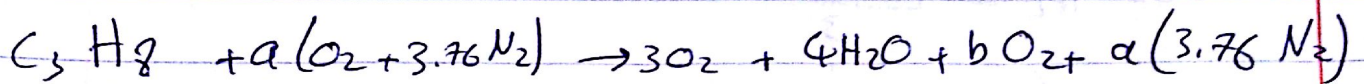
$$\% N_2 = \frac{27}{36.65} \times 100\% = 74\%$$



$$b=3, \quad c=4, \quad a = \frac{2b+c}{2}, \quad d=a=5$$

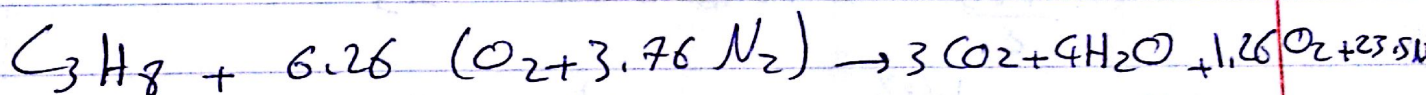


$$(A/F)_{st} = \frac{5 \times 32 + 18.8 \times 28}{12 \times 3 + 8} = 15.5$$



$$\%CO_2 = 10.8\%, \quad \%O_2 = 4.5\%, \quad \%N_2 = 84.7\%$$

$$b = 1.27, \quad a = 5 + 1.27 = 6.27$$



$$(A/F)_{st} = \frac{6.26 \times 32 + 23.5 \times 28}{12 \times 3 + 8} = 19.52$$

$$\phi = \frac{(A/F)_{st}}{(A/F)_{ot}} = \frac{15.5}{19.52} = 0.79$$

4) 1

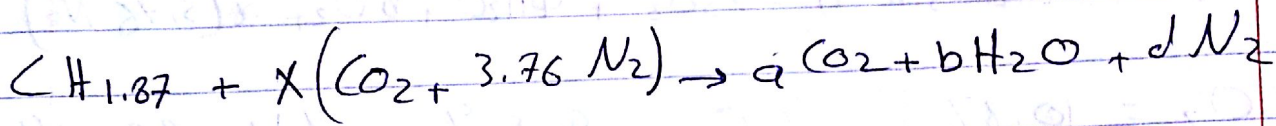
$$\dot{m}_g = 0.4 \text{ g/s} \quad , \dot{m}_a = 5.6 \text{ g/s} \quad -$$

$$(A/F)_{st} = 14$$

$$\% \text{ CO}_2 = 13.0\%$$

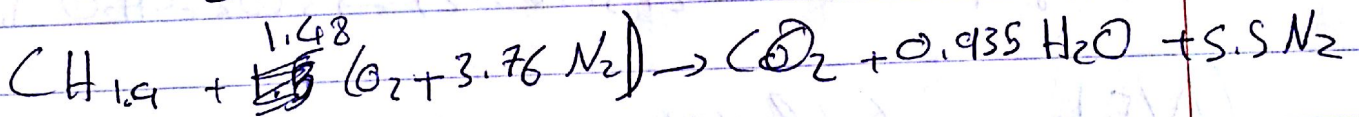
$$H/C = 1.97 \rightarrow CH_{1.9}$$

$$\text{moles H}_2 = \frac{\text{moles CO}}{3}$$



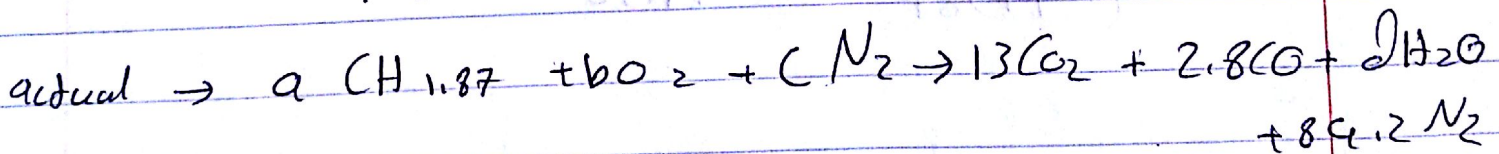
$$a = 1 \quad , \quad b = \frac{1.87}{2} = 0.935$$

$$X = \frac{2a + b}{2} = \frac{2 + 0.935}{2} = 1.4675 \quad , \quad d = 5.5$$



$$(A/F)_{st} = \frac{(1.97 \times 32) + (5.5 \times 28)}{12 + 1.87} = 14.56$$

$$\phi = \frac{14.56}{14} = 1.09$$



$$a = 15.8 \quad , \quad d = 14.77 \quad , \quad b = 21.78$$

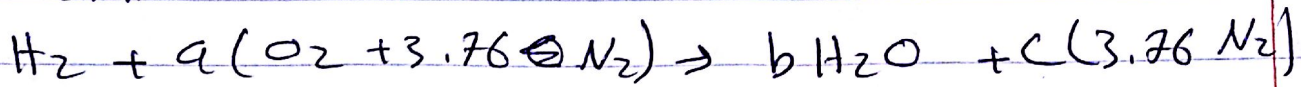
$$(A/F)_{act} = \frac{(21.78 \times 32) + (84.2 \times 28)}{(15.8 \times 12) + (15.8 \times 1.87)} = 13.94$$

$$6) \% \text{H}_2\text{O} = 22.3\%$$

$$\% \text{O}_2 = 7.44\%$$

$$\% \text{N}_2 = 70.2\%$$

stch



$$b=1, a=1/2, c=1/2$$

$$(A/F)_{st} = \frac{0.5 \times 32 + 0.5 \times 3.76 \times 28}{2}$$

$$= 34.34$$

act



$$a = 22.3, b = 18.62$$

$$\text{mass} \rightarrow (A/F)_{act} = \frac{(18.62 \times 32) + (70.2 \times 28)}{22.3 \times 2}$$

$$= 57.43$$

$$\phi = \frac{34.34}{57.43} = 0.6$$