

Answer on Question 76941 in General Chemistry

$$.m_1 (\text{sample})=27.129 \text{ g}$$

$$.m(\text{CO}_2)=48.328 \text{ g}$$

$$.m (\text{H}_2\text{O})=19.783 \text{ g}$$

$$.m_2(\text{sample})=34.687 \text{ g}$$

$$.m(\text{SO}_2)=14.992 \text{ g}$$

Formula=?

Find the amount of substance of CO_2

$$.n(\text{CO}_2)=\frac{m(\text{CO}_2)}{Mr(\text{CO}_2)}=\frac{48.328}{44}=1.1 \text{ mol}$$

$$Mr(\text{CO}_2)=Ar(\text{C}) + 2 Ar(\text{O})=12 + 2 \times 16=44$$

$$.n(\text{C})=n(\text{CO}_2)=1.1 \text{ mol}$$

$$.m(\text{C})=n \times Ar(\text{C})=1.1 \times 12=13.2 \text{ g}$$

Find the amount of substance of H_2O

$$.n(\text{H}_2\text{O})=\frac{m(\text{H}_2\text{O})}{Mr(\text{H}_2\text{O})}=\frac{19.783}{18}=1.1 \text{ mol}$$

$$Mr(\text{H}_2\text{O})=2Ar(\text{H})+Ar(\text{O})=2+16=18$$

$$.n(\text{H})=2n(\text{H}_2\text{O})=2.2 \text{ mol}$$

$$.m(\text{H})=n(\text{H}) \times Ar(\text{H})=2.2 \times 1=2.2 \text{ g}$$

By the proportion we find the mass of SO_2 which is formed during combustion of 27.127 g of substance

34.687 g of substance gives 14.992 g of SO_2

27.129 g of substance gives x g of SO_2

$$.x=m(\text{SO}_2)=\frac{27.129 \times 14.992}{34.687}=11.725 \text{ g}$$

Find the amount of substance of SO_2

$$.n=\frac{m(\text{SO}_2)}{Mr}=\frac{11.725}{64}=0.18 \text{ mol}$$

$$M_r(SO_2) = A_r(S) + 2A_r(O) = 32 + 2 \times 16 = 64$$

$$n(S) = n(SO_2) = 0.18 \text{ mol}$$

$$m(S) = n \times A_r = 32 \times 0.18 = 5.76 \text{ g}$$

Find the mass of oxygen

$$m(O) = m(\text{substance}) - m(C) - m(H) - m(S) = 27.129 - 13.2 - 2.2 - 5.76 = 5.969 \text{ g}$$

Find the amount of substance of O

$$n = \frac{m(O)}{A_r(O)} = \frac{5.969}{16} = 0.37 \text{ mol}$$

$$n(C) : n(H) : n(S) : n(O) = 1.1 : 2.2 : 0.18 : 0.37 = 6 : 12 : 1 : 2$$

The formula is $C_6H_{12}SO_2$

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