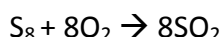


**Question One**

Sulfur ( $S_8$ ) is used in gun powder. It reacts with oxygen in an exothermic reaction.



- a) 11872 J is released when 1.28 g of sulfur ( $S_8$ ) is being burnt. Calculate the enthalpy (in  $\text{kJmol}^{-1}$ ) of the combustion reaction above.

molar mass for sulfur ( $S_8$ ) =  $256.8 \text{ gmol}^{-1}$

Amount of sulfur ( $S_8$ ) =  $1.28 \text{ g} \div 256.8 \text{ gmol}^{-1} = 0.004984 \text{ mol}$

$S_8$  : reaction = 1 : 1

Energy released 11.872 kJ

Energy change =  $11.872 \text{ kJ} \div 0.004984 \text{ mol} = 2381.82 \text{ kJmol}^{-1}$

Since energy is releasing, therefore the enthalpy is  $-2380 \text{ kJmol}^{-1}$  (3 s.f.)

- b) Using the answers above, calculate how much energy released when:

- a. 15 g of sulfur is burnt

$15 \text{ g} \div 256.8 \text{ gmol}^{-1} = 0.058411 \text{ mol}$

$S_8$  : reaction = 1 : 1 mole of reaction = 0.058411 mol

$0.058411 \text{ mol} \times 2380 \text{ kJmol}^{-1} = 139.125 \text{ kJ}$

Therefore 139 kJ is released when 15 g of sulfur is burnt

- b. 250 g of sulfur dioxide formed

$250 \text{ g} \div 64.1 \text{ gmol}^{-1} = 3.900156 \text{ mol}$

$SO_2$  : reaction = 8 : 1 mole of reaction =  $3.900156 \text{ mol} \div 8 = 0.48752 \text{ mol}$

Energy change =  $0.48752 \text{ mol} \times 2380 \text{ kJmol}^{-1} = 1160.296 \text{ kJ}$

Therefore 1160 kJ is released when 250 g of sulfur dioxide formed.

**Question Two**

Complete the table below. The first row is the example



Amount of $SO_2$	Mass of $SO_2$	Amount of $O_2$	Mass of $O_2$	Amount of $SO_3$	Mass of $SO_3$	Amount of equation	Energy released
2	128.2 g	1	32.0 g	2	160.2 g	1	1456 kJ
0.0877 mol	5.62g	0.0438 mol	1.41 g	0.0877 mol	7.02 g	0.0438 mol	63.8 kJ
3.98 mol	255 g	1.99 mol	63.7g	3.98 mol	319 g	1.99 mol	2898 kJ
0.00441 mol	0.283 g	0.00221 mol	0.0705 g	0.00441 mol	0.353 g	0.00221 mol	3.21 kJ