H 5 **Calcium carbonate undergoes thermal decomposition to produce calcium oxide and carbon dioxide as shown in the equation below:**

$CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$

a **Calculate the mass of calcium oxide produced if 25 g of calcium carbonate decomposes.** (2 marks, ★★★)

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Carbon sequestration, storing carbon dioxide from the atmosphere in other forms, has been suggested as a way to reduce climate change caused by increased carbon dioxide in the atmosphere. Experiments have been conducted to find out whether calcium carbonate can be used in this way by reversing the thermal decomposition equation given above.

b **Calculate the mass of calcium carbonate that would be produced by sequestering 500 kg of carbon dioxide.** (2 marks, ★★★)

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H 6 **A pharmaceutical company produces tablets of the medicine paracetamol ($C_8H_9NO_2$), which contain 0.5 g of paracetamol.**

a **Calculate the number of moles of paracetamol in each tablet.** (2 marks, ★★★)

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b **The same company produces the medicine aspirin by the following reaction:**

$$C_7H_6O_3 + C_4H_6O_3 \rightarrow C_9H_8O_4 + CH_3COOH$$

salicylic acid + ethanoic anhydride → aspirin + ethanoic acid

(M_r = 137) **(M_r = 180)**

Calculate the number of moles of aspirin produced if 4 g of salicylic acid is used. (2 marks, ★★★★)

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c **Calculate the number of molecules of salicylic acid that produce 0.5 g of aspirin.** (2 marks, ★★★★)

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MATHS SKILLS

Use the formulae for your calculations:

$n = m/M_r$; $m = n \times M_r$; no. of particles = $n \times N_A$

Don't forget to put the units in your answer and use standard form (e.g. 6.5×10^{-5} instead of 0.000065) when appropriate.