The balanced chemical equation is $CaF_2 + H_2SO_4 \rightarrow 2HF + CaSO_4$.

b. How many kilograms of Calcium fluoride should be used to produce 1.32 kg of Hydrogen fluoride?

Step 1. We need to convert the given mass of Hydrogen fluoride to moles. We will also convert the given mass to grams since molar masses are given in grams. We will do this by inserting a conversion factor in our operation.

$$(1.32kg\ CaF_2)\left(\frac{1000g}{1kg}\right)\left(\frac{1mol\ HF}{20g\ HF}\right) = 66\ mol\ HF$$

Step 2. We determine the number of moles of CaF_2 needed to produce 66 mol of HF. From the balanced chemical equation, we can see that for 1 mole of CaF_2, 2 moles of HF can be produced.

$$(66\ mol\ HF)\left(\frac{1mol\ CaF_2}{2\ mol\ HF}\right) = 33\ mol\ CaF_2$$

Step 3. We need to convert the quantity to mass in kilograms.

$$(33\ mol\ CaF_2)\left(\frac{78g\ CaF_2}{1\ mol\ CaF_2}\right)\left(\frac{1kg}{1000g}\right) = 2.574kg\ CaF_2$$

The answer is **2.574 kg CaF_2**

c. What is the minimum amount, in grams, of sulfuric acid needed to completely consume 140g of Calcium fluoride?

Step 1. Convert the mass of CaF_2 to number of moles.

$$(140g\ CaF_2)\left(\frac{1mol\ CaF_2}{78g\ CaF_2}\right) = 1.795mol\ CaF_2$$

Step 2. Determine the number of moles of H_2SO_4 needed to completely consume 1.795 moles of CaF_2. The balanced chemical equation shows that it takes 1 mole of sulfuric acid to consume 1 mole of CaF_2 hence,

$$(1.795\ mol\ CaF_2)\left(\frac{1\ mol\ H_2SO_4}{1\ mol\ CaF_2}\right) = 1.795\ mol\ H_2SO_4$$

Step 3. The question asks for the amount in grams so we will use the molar mass of H_2SO_4 to calculate the mass.

$$(1.795\ mol\ H_2SO_4)\left(\frac{98g\ H_2SO_4}{1\ mol\ H_2SO_4}\right) = 175.91g\ H_2SO_4$$

Therefore, it takes **175.91g H_2SO_4** to completely consume 140g of CaF_2.