

### Answer on Question #70800, Chemistry / General Chemistry :

Calcium dihydrogenphosphate can be represented by the formula  $\text{Ca}(\text{H}_2\text{PO}_4)_x$  where  $x$  is an integer. A 9.76 g sample of calcium dihydrogenphosphate contains 0.17 g of hydrogen, 2.59 g of phosphorus and 5.33 g of oxygen. Calculate the empirical formula and hence the value of  $x$ . Show your working.

#### Solution.

$$m(\text{Ca}(\text{H}_2\text{PO}_4)_x) = 9.76 \text{ g}$$

$$m(\text{H}) = 0.17 \text{ g}$$

$$m(\text{P}) = 2.59 \text{ g}$$

$$m(\text{O}) = 5.33 \text{ g}$$

$$x = ?$$

Solution weight Ca:

$$m(\text{Ca}) = m(\text{Ca}(\text{H}_2\text{PO}_4)_x) - m(\text{H}) - m(\text{P}) - m(\text{O})$$

$$m(\text{Ca}) = 9.76 \text{ g} - 0.17 \text{ g} - 2.59 \text{ g} - 5.33 \text{ g}$$

$$m(\text{Ca}) = 1.67 \text{ g}$$

Draw up a proportion:

$$n(\text{Ca}) : n(\text{H}) : n(\text{P}) : n(\text{O}) = \frac{m(\text{Ca})}{A(\text{Ca})} : \frac{m(\text{H})}{A(\text{H})} : \frac{m(\text{P})}{A(\text{P})} : \frac{m(\text{O})}{A(\text{O})}$$

And:

$$n(\text{Ca}) : n(\text{H}) : n(\text{P}) : n(\text{O}) = \frac{1.67}{40} : \frac{0.17}{1} : \frac{2.59}{31} : \frac{5.33}{16}$$

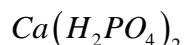
$$n(\text{Ca}) : n(\text{H}) : n(\text{P}) : n(\text{O}) = 0.04175 : 0.17 : 0.08355 : 0.3331$$

The empirical formula Calcium dihydrogenphosphate:

$$n(\text{Ca}) : n(\text{H}) : n(\text{P}) : n(\text{O}) = 0.04175 : 0.17 : 0.08355 : 0.3331$$

$$n(\text{Ca}) : n(\text{H}) : n(\text{P}) : n(\text{O}) = 1 : 4.07 : 2.001 : 7.98$$

$$n(\text{Ca}) : n(\text{H}) : n(\text{P}) : n(\text{O}) \approx 1 : 4 : 2 : 8$$



$$x = 2$$

**Answer:**  $\text{Ca}(\text{H}_2\text{PO}_4)_2$ ,  $x = 2$ .