

Careers in Chemistry: Farming

How much fertilizer will you need?

Conversion Factor: 1 acre corn = 6 kg phosphorous

$$x \text{ g P} = 340 \text{ acres} \times \frac{(6 \text{ kg P})}{(1 \text{ acre})} \times \frac{(1000 \text{ g P})}{(1 \text{ kg P})} = 2.04 \times 10^6 \text{ g P}$$

If a bag of fertilizer has the formula $\text{Ca}_3\text{P}_2\text{H}_{14}\text{S}_2\text{O}_{21}$,
The molar mass of it is 596 g/mol.

3 Ca @ 40g/mol	=	120 g	% P = $\frac{\text{Part}}{\text{Whole}}$	$\frac{62 \text{ g}}{596 \text{ g}}$
2 P @ 31 g/mol	=	62 g		
14 H @ 1 g/mol	=	14 g		
2 S @ 32 g/mol	=	64 g		
<u>21 O @ 16 g/mol</u>	=	<u>335 g</u>		
$\text{Ca}_3\text{P}_2\text{H}_{14}\text{S}_2\text{O}_{21}$	=	596 g	10.4 % Phosphorous	

In a bag of fertilizer you have 10.4 % (by mass) phosphorous.
A bag of fertilizer weighs 10,000 g (about 22 pounds).

$$10.4 \% \text{ of } 10,000 \text{ g} = 1040 \text{ g phosphorous / bag of fertilizer}$$

$$\frac{2.04 \times 10^6 \text{ g P}}{1040 \text{ g/bag}} = 1962 \text{ bags of fertilizer}$$

$$\text{Total Cost } (1962 \text{ bags of fertilizer})(\$54.73 / \text{bag}) = \$107,380$$