Task:

How many grams of zinc phosphate are formed when 10.0 grams of zinc react with excess phosphoric acid

Solution:

The chemical equation for this reaction is

$3Zn(s) + 2H_3PO_4(aq) = Zn_3(PO_4)_2(aq) + 3H_2(g)$

The molar weight of zinc phosphate is

$MW(Zn_3(PO_4)_2) = 3 \cdot MW(Zn) + 2 \cdot MW(P) + 8 \cdot MW(O)$

$MW(Zn_3(PO_4)_2) = 3 \cdot 65 + 2 \cdot 31 + 8 \cdot 16 = 385$ g/mol

The number of moles of Zn is

$n(Zn) = m(Zn) / MW(Zn) = 10.0 / 65 = 0.154$ mol

The number of moles of $Zn_3(PO_4)_2$ is

$n(Zn_3(PO_4)_2) = n(Zn) / 3 = 0.154 / 3 = 0.051$ mol

The mass of $Zn_3(PO_4)_2$ is

$m(Zn_3(PO_4)_2) = n(Zn_3(PO_4)_2)\ MW(Zn_3(PO_4)_2) = 0.051 \cdot 385 = 19.6$ g

Answer: $m(Zn_3(PO_4)_2) = 19.6$ g