Model answers with grading scheme

• $MgSO_4 \cdot 12H_2O \longrightarrow MgSO_4 \cdot H_2O + 11 H_2O$

a) On wet basis per kg of the feed dodecahydrate

moles of $MgSO_4 \cdot 12H_2O = \dfrac{1000}{336.36} = 2.973 \longrightarrow$ ②
(Mwt of $MgSO_4 \cdot 12H_2O = 336.36$)

No. of moles of H_2O in product formed $= 32.703 \longrightarrow$ ①

mass of water removed (in kg) $= \dfrac{32.703 \times 18}{1000} = 0.5886 kg \longrightarrow$ ①

b) On wet basis per kg of product monohydrate

moles of $MgSO_4 \cdot H_2O = \dfrac{1000}{138.36} = 7.227 \longrightarrow$ ②
(Mwt of $MgSO_4 \cdot H_2O = 138.36$)

No. of moles of H_2O in product formed $= 79.5027 \longrightarrow$ ①

mass of water removed (in kg) $= 1.431 kg \longrightarrow$ ①

c) On dry basis per kg of feed dodecahydrate

$1000 g$ of $MgSO_4$, Mwt of $MgSO_4 = 120.36$

moles of $MgSO_4 = 8.308$
moles of $12 H_2O$ in $MgSO_4 = 8.308 \times 12 = 99.696$

total mass of $MgSO_4 \cdot 12H_2O = 2794.528 g$

Moles $= \dfrac{2794.528}{336.36} = 8.308 \longrightarrow$ ②

No. of moles of H_2O in product formed $= 91.389 \longrightarrow$ ①

mass of water removed (in kg) $= 1.645 kg \longrightarrow$ ①

d) On dry basis per kg of product monohydrate

$1000 g$ of $MgSO_4$, Mwt of $MgSO_4 = 120.36$

mass of H_2O in $MgSO_4 \cdot H_2O = 1149.55 g$

& moles $= \dfrac{1149.55}{138.36} = 8.308 \longrightarrow$ ②

mass of water removed (in kg) $= \dfrac{8.308 \times 11 \times 18}{1000} = 1.645 kg \longrightarrow$ ②