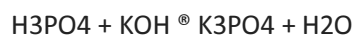


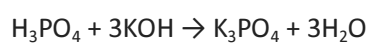
Question #61194, Chemistry / Other |

A train is carrying three cars of concentrated phosphoric acid (assume that it is 85% by weight) to deliver it in a manufacturing plant. The train got into an accident and all of the acid were spilled due to derailment. If 150,000 lbs of potassium hydroxide was used to neutralize the acid, what is the amount (in kg) of concentrated phosphoric acid that was spilled due to derailment?



Answer:

150000 lbs of KOH equals 68038.8555 kg or 68.03886×10^6 g. The amount of moles of KOH is in 3 times less than H_3PO_4 according to the equation:



$$v(\text{H}_3\text{PO}_4) = v(\text{KOH})/3 = m(\text{KOH})/3M_r(\text{KOH}) = 68.03886 \times 10^6 \text{ g}/(3 \times 56 \text{ g mol}^{-1}) = 0.40499 \times 10^6 \text{ mol}$$

Thus, the mass of the acid is:

$$m(\text{H}_3\text{PO}_4) = v(\text{H}_3\text{PO}_4) \times M(\text{H}_3\text{PO}_4) = 0.40499 \times 10^6 \text{ mol} \times 98 \text{ g/mol} = 39.68934 \times 10^6 \text{ g} = 39689.34 \text{ kg}$$

Taking into account that concentrated phosphoric acid has 85% of the acid the mass of spilled solution equals:

$$m = m(\text{H}_3\text{PO}_4)/0.85 = 39689.34 \text{ kg}/0.85 = 46693.34 \text{ kg}$$