Question #82699

Calculate the change in heat energy, in kJ, when 50cm3 of 2.50mol/dm3 sodium hydroxide solution is added to excess nitric acid

Solution:

The chemical reaction between sodium hydroxide and nitric acid is well-known as neutralization reaction [1]. According to the definition [2], the heat released during a neutralization reaction is:

$$Q = -\Delta H * n$$

As sodium hydroxide is a strong base and nitric acid is a strong acid, the molar heat of neutralization for this chemical reaction is always the same (-55.9 kJ/mol) [3]. Therefore, the change in heat energy is:

$$n = C_M * V = 2.5 * 0.05 = 0.125 \; mol$$

$$Q = -\Delta H_{neutralization} * n = -(-55.9) * 0.125 = 6.99 \approx 7 \; kJ$$

Answer:

The change in heat energy in the reaction between sodium hydroxide and nitric acid is 7 kJ.

References:

[1]   https://en.wikipedia.org/wiki/Neutralization_(chemistry)

[2]   https://en.wikipedia.org/wiki/Enthalpy_of_neutralization

[3]   https://www.ausetute.com.au/heatneutral.html

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