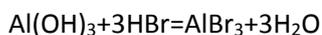20mL of $Al(OH)_3$ reacts completely with 50mL of 1mol of HBr. What is the concentration of $Al(OH)_3$?

Solution:

We write the equation for the reaction:

$Al(OH)_3 + 3HBr = AlBr_3 + 3H_2O$

$$M(Al(OH)_3) = \frac{n(Al(OH)_3)}{v(Al(OH)_3)} = \frac{mole}{l}$$

$$M - concentration\ of\ the\ substance$$

Convert your mL solutions to L in order to plug them into formula.

$$v\big((Al(OH)_3)\big) = 20ml * \frac{1l}{1000ml} = 0,020l$$

$$v(HBr) = 50ml * \frac{1l}{1000ml} = 0,050l$$

Find the amount of the substance HBr, which came in response:

$$n(HBr) = V(HBr) * M(HBr)$$

$$n(HBr) = 1 * 0.050 = 0.05\ mole$$

According to the reaction equation we find the amount of the substance $Al(OH)_3$:

$$\frac{n(Al(OH)_3)}{n(HBr)} = \frac{1}{3}$$

$$n(Al(OH)_3) = \frac{n(HBr)}{3} = \frac{0.05}{3} = 0.017\ mole$$

Find the concentration of $Al(OH)_3$:

$$M(Al(OH)_3) = \frac{0.017\ mole}{0.020\ l} = 0.85$$

Answer: 0.85 M ($Al(OH)_3$)