Answer on the question #43061, Chemistry, Physical Chemistry

Question:

If 30 mL of an H2SO4 solution is neutralized by 60 mL of 1 M NaOH solution, then what is the molarity of the H2SO4?

a) 0.5 M
b) 1 M
c) 1.5 M
d) 2 M

Solution:

The equation of neutralization reaction is:

$$H_2SO_4 + 2NaOH = 2H_2O + Na_2SO_4$$

Thus, 1 mole of sulfuric acid reacts with 2 moles of sodium hydroxide:

$$\mathrm{n}(\mathrm{H_2SO_4}) = \frac{\mathrm{n}(\mathrm{NaOH})}{2}$$

According to the definition, the molarity is:

$$\mathrm{c} = \frac{\mathrm{n}}{\mathrm{V}}$$

Then, using the equation (1):

$$\mathrm{c}(\mathrm{H_2SO_4}) = \frac{\mathrm{n}(\mathrm{H_2SO_4})}{\mathrm{V}(\mathrm{H_2SO_4})} = \frac{\mathrm{n}(\mathrm{NaOH})}{2\mathrm{V}(\mathrm{H_2SO_4})} = \frac{\mathrm{c}(\mathrm{NaOH})\mathrm{V}(\mathrm{NaOH})}{2\mathrm{V}(\mathrm{H_2SO_4})} = \frac{60 * 1}{2 * 30} = 1\,\frac{\mathrm{mol}}{\mathrm{L}}$$

Answer: b).