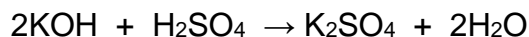


## IGCSE Moles questions – Solutions 3

The molar volume of a gas at room temperature and pressure is  $24 \text{ dm}^3$  or  $24\,000 \text{ cm}^3$

- 1 Which of the following are quantities for an exact reaction between potassium hydroxide and sulfuric acid?



(mark **any statements** that are correct with an x)

- A  $100.0 \text{ cm}^3$  of  $0.100 \text{ mol/dm}^3$  KOH and  $100 \text{ cm}^3$  of  $0.100 \text{ mol/dm}^3$   $\text{H}_2\text{SO}_4$
- B  $25.0 \text{ cm}^3$  of  $0.200 \text{ mol/dm}^3$  KOH and  $25.0 \text{ cm}^3$  of  $0.100 \text{ mol/dm}^3$   $\text{H}_2\text{SO}_4$
- C  $50.0 \text{ cm}^3$  of  $0.100 \text{ mol/dm}^3$  KOH and  $25.0 \text{ cm}^3$  of  $0.100 \text{ mol/dm}^3$   $\text{H}_2\text{SO}_4$
- D  $20.0 \text{ cm}^3$  of  $0.500 \text{ mol/dm}^3$  KOH and  $40.0 \text{ cm}^3$  of  $0.500 \text{ mol/dm}^3$   $\text{H}_2\text{SO}_4$
- 2 A student reacted  $50.0 \text{ cm}^3$  of  $0.100 \text{ mol/dm}^3$  sodium hydroxide with  $50.0 \text{ cm}^3$  of  $0.100 \text{ mol/dm}^3$  nitric acid. The concentration of the resulting sodium nitrate solution is:  
(put an x in the correct box)

- A  $0.100 \text{ mol/dm}^3$
- B  $0.0500 \text{ mol/dm}^3$
- C  $0.200 \text{ mol/dm}^3$
- D  $0.0250 \text{ mol/dm}^3$

- 3 Potassium iodate ( $\text{KIO}_3$ ) reacts with potassium iodide in acidic solution to form iodine:



$25.00 \text{ cm}^3$  of  $0.100 \text{ mol/dm}^3$  potassium iodate solution was reacted with excess potassium iodide and sulfuric acid. The iodine formed was then titrated against sodium thiosulfate solution.  $25.00 \text{ cm}^3$  of sodium thiosulfate solution was required for exact reaction:



The concentration of the sodium thiosulfate solution is (put an x in the correct box)

- A  $0.100 \text{ mol/dm}^3$
- B  $0.200 \text{ mol/dm}^3$
- C  $0.300 \text{ mol/dm}^3$
- D  $0.600 \text{ mol/dm}^3$
- 4 A student dissolved  $2.48 \text{ g}$  of sodium thiosulfate crystals ( $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ ) in water and Made the solution up to a total volume of  $200.0 \text{ cm}^3$ . They labelled this **solution A**.
- (a) Calculate the concentration of **solution A** in  $\text{mol/dm}^3$  [2]

- (b) The student measured out  $10.0 \text{ cm}^3$  of solution A using a pipette and added water to make it up to a total volume of  $100.0 \text{ cm}^3$ . He labelled this **solution B**. Calculate the concentration of **solution B** in  $\text{mol/dm}^3$  [2]

## IGCSE Moles questions – Solutions 3

- (c) Sodium thiosulfate solution reacts with hydrochloric acid to form a precipitate of sulfur.



In an experiment to investigate the rate of this reaction, a student added 10.0 cm<sup>3</sup> of 2.00 mol/dm<sup>3</sup> hydrochloric acid to 50.0 cm<sup>3</sup> of **solution A**.

- (i) Calculate the number of moles of sodium thiosulfate and hydrochloric acid and explain which one is in excess. [3]

Sodium thiosulfate	Hydrochloric acid

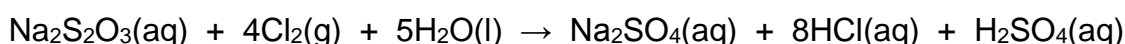
- (ii) Calculate the mass of sulfur formed in this experiment. [2]

- (d) In a separate experiment the student used **solution B** to determine the concentration of an iodine solution. The equation for the reaction is:



They measured out 25.00 cm<sup>3</sup> of an iodine solution and added **solution B** from a burette until all the iodine had reacted and the reaction mixture was colourless. 21.20 cm<sup>3</sup> of **solution B** was required for an exact reaction. Calculate the concentration of the iodine solution. [3]

- (e) Sodium thiosulfate solution also reacts with chlorine gas:



What volume of chlorine gas would react exactly with 100 cm<sup>3</sup> of **solution A**? [3]