IGCSE Moles questions – Solutions 2

The molar volume of a gas at room temperature and pressure is 24 dm^3 or 24 000 cm^3

1 Which of the following contains the greatest number of moles of sodium hydroxide?
(put a x in the correct box)

A	100.0 cm^3 of 0.100 mol/dm^3 NaOH	☐
B	25.0 cm^3 of 0.500 mol/dm^3 NaOH	☐
C	50.0 cm^3 of 0.200 mol/dm^3 NaOH	☐
D	1.00 cm^3 of 1.00 mol/dm^3 NaOH	☐

2 A student wants to make a 0.200 mol/dm^3 solution of copper(II) sulfate. They have been given copper(II) sulfate crystals, which have the formula $CuSO_4.5H_2O$. What mass of crystals do they have to weigh out if they want to make 100 cm^3 of solution?
(put a x in the correct box)

A	4.99 g	☐
B	3.19 g	☐
C	49.9 g	☐
D	31.9 g	☐

3 A student carries out a titration experiment. They measured out 25.0 cm^3 of sulfuric acid into a conical flask and put 0.120 mol/dm^3 sodium hydroxide in the burette. 27.60 cm^3 of sodium hydroxide was required for neutralisation. The equation for the reaction is:

$$2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$$

Which of following is correct? *(put a x in the correct box)*

A	The NaOH is more concentrated than the H_2SO_4	☐
B	The H_2SO_4 is more concentrated than the NaOH	☐
C	The NaOH and H_2SO_4 have the same concentration	☐

4 A teacher adds a piece of sodium of mass 0.100 g to 500 cm^3 of water.

(a) Write an equation (including state symbols) for the reaction that occurs [2]

……

(b) Calculate the volume of gas produced in this reaction. [3]

(c) Calculate the concentration of the resulting solution. [3]

5 Sodium carbonate reacts with hydrochloric acid:

$Na_2CO_3(s) + 2HCl(aq) \rightarrow 2NaCl(aq) + H_2O(l) + CO_2(g)$

A student added x cm^3 of 0.100 mol/dm^3 hydrochloric acid to solid sodium carbonate and collected 60.0 cm^3 of gas.

Calculate the mass of sodium carbonate and the volume of hydrochloric acid that reacted if the students used the exact quantities for the reaction and no gas escaped. [4]

Sodium carbonate……g

Hydrochloric acid ……cm^3

6 A student wanted to make a sample of zinc sulfate crystals. They were told to react excess zinc with 50.0 cm^3 of 0.100 mol/dm^3 sulfuric acid. The equation for the reaction between zinc and sulfuric acid is:

$Zn(s) + H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g)$

(a) Calculate the number of moles of sulfuric acid that the student used. [2]

(b) The teacher suggested that 0.500 g of zinc should be enough to add. Explain whether the teacher is correct or not. [2]

(c) Zinc sulfate crystals have the formula $ZnSO_4.7H_2O$. Calculate the maximum mass of zinc sulfate crystals that could be formed from adding excess zinc to 50.0 cm^3 of 0.100 mol/dm^3 sulfuric acid. [3]