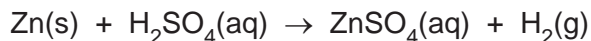# GCSE Chemistry A (Gateway Science)
J248/04 Chemistry A C4-C6 and C7 (Higher Tier)

Question Set 18

1 Zinc and dilute sulfuric acid react to make hydrogen.

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

A student measures the rate of this reaction by measuring the **loss in mass** of the reaction mixture.

She finds that the change in mass is very small and difficult to measure.

(a) Draw a labelled diagram to show a **better way** of measuring the rate of this reaction. **[3]**

(b) The reaction between zinc and dilute sulfuric acid is slow.

The student decides to try and find a catalyst for this reaction.

She tests four possible substances.

Each time she adds 0.5 g of the substance to 1.0 g of zinc and 25 cm³ of dilute sulfuric acid.

Look at her table of results.

Substance added	Colour of substance at start	Colour of substance at end	Relative rate of reaction
no substance			1
calcium sulfate powder	white	white	1
copper powder	pink	pink	10
copper(II) sulfate powder	blue	pink	30
manganese(IV) oxide powder	black	black	1

(i) It is important to do the reaction with **only** zinc and dilute sulfuric acid and no substance added.

Explain why. **[1]**

(ii) It is important to do all of the reactions with the same concentration of acid.

Explain why. **[1]**

(iii) Which of the substances could be a catalyst for the reaction between zinc and dilute sulfuric acid?

....

Explain your answer. **[2]**

(iv) There is **not** enough evidence to confirm which substance is a catalyst.

[1]

Suggest an extra piece of experimental evidence that could be collected to confirm which substance is a catalyst.

(v) The student does the experiment with copper, zinc and dilute sulfuric acid again.

This time she uses a lump of copper rather than copper powder.

Predict, with reasons, the relative rate of reaction. **[2]**

Total Marks for Question Set 18: 10

Resource Materials

The Periodic Table of the Elements

Key

atomic number
Symbol
name
relative atomic mass

(1)	(2)											(3)	(4)	(5)	(6)	(7)	(0)
1																	**18**
1 **H** hydrogen 1.0																	2 **He** helium 4.0
3 **Li** lithium 6.9	4 **Be** beryllium 9.0											5 **B** boron 10.8	6 **C** carbon 12.0	7 **N** nitrogen 14.0	8 **O** oxygen 16.0	9 **F** fluorine 19.0	10 **Ne** neon 20.2
11 **Na** sodium 23.0	12 **Mg** magnesium 24.3											13 **Al** aluminium 27.0	14 **Si** silicon 28.1	15 **P** phosphorus 31.0	16 **S** sulfur 32.1	17 **Cl** chlorine 35.5	18 **Ar** argon 39.9
19 **K** potassium 39.1	20 **Ca** calcium 40.1	21 **Sc** scandium 45.0	22 **Ti** titanium 47.9	23 **V** vanadium 50.9	24 **Cr** chromium 52.0	25 **Mn** manganese 54.9	26 **Fe** iron 55.8	27 **Co** cobalt 58.9	28 **Ni** nickel 58.7	29 **Cu** copper 63.5	30 **Zn** zinc 65.4	31 **Ga** gallium 69.7	32 **Ge** germanium 72.6	33 **As** arsenic 74.9	34 **Se** selenium 79.0	35 **Br** bromine 79.9	36 **Kr** krypton 83.8
37 **Rb** rubidium 85.5	38 **Sr** strontium 87.6	39 **Y** yttrium 88.9	40 **Zr** zirconium 91.2	41 **Nb** niobium 92.9	42 **Mo** molybdenum 95.9	43 **Tc** technetium	44 **Ru** ruthenium 101.1	45 **Rh** rhodium 102.9	46 **Pd** palladium 106.4	47 **Ag** silver 107.9	48 **Cd** cadmium 112.4	49 **In** indium 114.8	50 **Sn** tin 118.7	51 **Sb** antimony 121.8	52 **Te** tellurium 127.6	53 **I** iodine 126.9	54 **Xe** xenon 131.3
55 **Cs** caesium 132.9	56 **Ba** barium 137.3	57–71 lanthanoids	72 **Hf** hafnium 178.5	73 **Ta** tantalum 180.9	74 **W** tungsten 183.8	75 **Re** rhenium 186.2	76 **Os** osmium 190.2	77 **Ir** iridium 192.2	78 **Pt** platinum 195.1	79 **Au** gold 197.0	80 **Hg** mercury 200.6	81 **Tl** thallium 204.4	82 **Pb** lead 207.2	83 **Bi** bismuth 209.0	84 **Po** polonium	85 **At** astatine	86 **Rn** radon
87 **Fr** francium	88 **Ra** radium	89–103 actinoids	104 **Rf** rutherfordium	105 **Db** dubnium	106 **Sg** seaborgium	107 **Bh** bohrium	108 **Hs** hassium	109 **Mt** meitnerium	110 **Ds** darmstadtium	111 **Rg** roentgenium	112 **Cn** copernicium		114 **Fl** flerovium		116 **Lv** livermorium		