Name : _____ ( ) Class: _____ Date : _____

1 (a) $2H_2O_{2(l)} \rightarrow 2H_2O_{(l)} + O_{2(g)}$

(b) The decomposition occurs very slowly in the absence of manganese dioxide.
{A catalyst speeds of the rate of reaction, hence a reaction can still occur in the absence of a catalyst, but at a lower rate}

(c) (iii)

2 (a) (i) Lithium melts into a silvery ball, darts randomly at the water surface and reacts vigorously with water to a sizzling sound and bubbles of colourless gas (hydrogen) around itself.

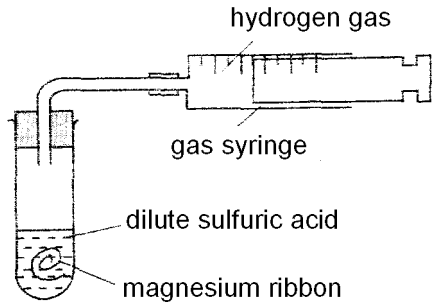
(ii) phenolphthalein indicator or universal indicator.

(b) (i) The initial rate of reaction was very fast with rapid production of hydrogen gas. The rate of reaction gradually slows down after 10 seconds and finally stops at 70 seconds.

(ii) The reaction stops because all the lithium has reacted.
{The water is present in excess}

(c) The volume of H_2 produced when half of the lithium has reacted = 340/2 = 170cm^3.
From the graph. the time taken to collect 170 cm^3 of hydrogen = **8 seconds**
{a common mistake is to take the total time and divide by 2. It is incorrect as the rate of reaction is NOT a CONSTANT.}

3 (a)



(b) (i) The relative molecular mass of Mg = 24
The number of moles of Mg = 0.1/24 = 4.1666 x10^{-3} mol = 4.17 x10^{-3} mol
The number of moles of H_2SO_4 = (25x2.0)/1000 = 5.00 x 10^{-2} mol

(ii) The reaction stops because all the magnesium has completely reacted.
The equation shows 1 mole of magnesium requires 1 mole of sulfuric acid. Since b(i) shows that 4.17 x 10^{-3} mole of magnesium was reacted with 5.00 x10^{-2} mole of H_2SO_4, therefore the sulfuric acid is present in excess.

(c) (i) The initial rate of formation of hydrogen is faster as the concentration of sulfuric acid used is increased to 3.0 mol/dm^3.

(ii) The total volume of hydrogen produced is the same because the same amount of magnesium has reacted. In both experiments, the sulfuric acid is present in excess.

(d) Heating the reaction mixture to increase temperature and using powdered magnesium to increase the surface area of reactant.

4 (a) (i) The initial rate of decomposition is slow as few reactant particles have gained sufficient energy to attain the minimum energy (activation energy) required to break bonds in the carbonate,

(ii) $CuCO_3$ (It has the steepest gradient or the rate of production of CO_2, per unit time is the greatest.

(iii) Since 1 mole of each carbonate decomposes to give 1 mole of carbon dioxide, the maximum volume of carbon dioxide produced by 0.01 mole of a carbonate at room temperature and pressure = 0.01 x 24 dm^3 = 0.240 dm^3 or 240 cm^3. Therefore, complete decomposition of the carbonates should give reaction curves that level off at a constant volume of 240 cm^3 carbon dioxide.

(iv) The same number of moles of carbonate is used so that a more accurate comparison of the rate of reaction using the volume of carbon dioxide liberated per unit time by each carbonate can be made. The same mass of each carbonate does not have the same number of moles as the relative molecular mass of each carbonate is different.
By using the same number of moles, the same number of molecules for each substance is used.

(b) Calcium carbonate is used in the extraction of iron in the blast furnace to remove silicon dioxide impurities. On heating, calcium carbonate decomposes into calcium oxide and carbon dioxide. The basic calcium oxide reacts and remove acidic silicon dioxide in the form of molten slag, calcium silicate.

(c) (i) Oxygen gas

(ii) $2Mg(NO_3)_{2(s)} \rightarrow 2MgO_{(s)} + 4NO_{2(g)} + O_{2(g)}$

5. (a) The calcium carbonate has reacted with dilute hydrochloric acid to liberate carbon dioxide, which diffuses through the cotton wool into the surrounding atmosphere. Since carbon dioxide is a relatively dense gas (M_r = 44), loss of carbon dioxide results in a measurable loss in the mass of the flask and its contents.

(b) The cotton plug allows carbon dioxide gas to diffuse through and at the same time prevent the loss of reactants when vigorous effervescence occurs during the reaction,which may cause the acids in the flask to spill.

(c) (i) Solution B gives a faster reaction than solution A as the decrease in the mass of its contents after 2 minutes is greater than the decrease in mass of solution A. The decrease in mass of solution B is 104.9 – 98.8 = 6.1g while the decrease in mass of solution A is 120.7 – 116.2 = 4.5g.

(ii) Solution B has a higher concentration since the rate of reaction is faster.

(d) Powdered calcium carbonate has a larger total surface area in contact with hydrochloric acid than lumps of calcium carbonate. The frequency of effective collisions between the reactant particles is greater resulting in a faster rate of reaction.

(e) The decomposition of hydrogen peroxide in the presence of rmanganese (IV) oxide catalyst to produce oxygen gas and water.

~ The End ~