Question	Part	Answer	Marks
		Data plotted correctly/axes labelled with units/appropriate scale/lines of best fit	1+1+1+1
	(d)	Powdered calcium carbonate contains smaller particles with greater surface area; More collisions occur per unit of time between reacting particles; More carbon dioxide is produced per unit of time resulting in a more rapid decrease in mass when powdered calcium carbonate was used.	1 1 1
49	(a)	Initially, the colour of the solution is purple as the solution is alkaline (pH = 13). The colour changes from purple to red (pH = 2) as more sulfuric acid is produced in the reaction.	1 1
	(b)	Acts as a catalyst; Increases the rate of formation of sulfuric acid which causes the rapid colour change.	1 1
50	(a)	Low proportion of collisions are successful. Reactants collide with insufficient (activation) energy or the incorrect orientation for a reaction to occur.	1 1
	(b)	Act as catalysts/increase the rate of chemical reactions.	1
	(c)	$CO_{2\,(g)} + H_2O_{(l)} \rightleftharpoons H_2CO_{3(aq)}$	2
	(d)	Hydrogencarbonate must be converted into carbon dioxide rapidly inside the blood as it flows into the lungs; There is very little time for carbon dioxide to move from the blood to the lungs to be exhaled (blood is flowing rapidly); Carbonic anhydrase ensures the rapid conversion of hydrogencarbonate to carbon dioxide to prevent a build-up of carbon dioxide and subsequent acidosis.	1 1 1
51	(a)	$K_c = \frac{[HI]^2}{[H_2].[I_2]}$	2

51 (b)

	HI	H_2	I_2
Initial concentration (mol.L^{-1})	1.00/2.00 = 0.500	0	0
Change in concentration (mol.L^{-1})	−0.125	+0.125/2 = +0.0625	+0.125/2= +0.0625
Equilibrium concentration(mol.L^{-1})	0.750/2.00 = 0.375	+0.0625	+0.0625

Question	Part	Answer	Marks
51	(b)	Calculate the initial concentration of HI Calculate determine the final concentration of HI Calculate determine the change in concentration of HI Calculate determine the changes in the concentrations of H_2 and I_2 using the stoichiometric ratio (if HI decreases by 0.25 mol then both H_2 and I_2 increase by 0.25 mol/2 as the ratio is 2:1). Determine the equilibrium concentrations of H_2 and I_2	1 1 1 1 1
	(c)	$K_c = \frac{[H_2].[I_2]}{[HI]^2}$ $K_c = \frac{[0.0625].[0.0625]}{[0.375]^2}$ $K_c = 0.028$	 1 1
	(d)	Left K_c is less than 1.	1 1
	(e)	$\frac{[HI]^2}{[H_2].[I_2]} = \frac{[0.375]^2}{[0.0625].[0.0625]} = 36$ Alternatively: $\frac{1}{0.028} = 36$	2