Question Number	Acceptable Answers	Additional Guidance	Mark
9(a)(i)	$(K_c =) \dfrac{[HI(g)]^2}{[H_2(g)][I_2(g)]}$	Ignore missing state symbols or units Do not award round brackets	**(1)**

Question Number	Acceptable Answers	Additional Guidance	Mark
9(a)(ii)	$(K_c =) \dfrac{4y^2}{(a-y)^2}$ • Numerator term correct **(1)** • Denominator term correct **(1)**	Allow square brackets Allow $(2y)^2$ Allow $(a^2 - 2ay + y^2)$ or $(a-y)(a-y)$	**(2)**

Question Number	Acceptable Answers	Additional Guidance	Mark
9(b)(i)	• both values correct to 2 DP	1.13 2.93	**(1)**

Question Number	Acceptable Answers	Additional Guidance	Mark
9(b)(ii)	• All 7 points plotted correctly **(1)** • Appropriate straight line of best fit, drawn through the origin **(1)**	Allow TE for incorrect values from 9(b)(i) Do not allow all points above or below the line of best fit Allow line of best fit to intersect one square either side of the origin	**(2)**

Question Number	Acceptable Answers	Additional Guidance	Mark
9(b)(iii)	• co-ordinates correctly read off the line on graph **(1)** • gradient correctly calculated **(1)**	At least 1 line must be shown on the graph to indicate selection of co-ordinates Example of calculation $\dfrac{3.40 - 0.00}{4.50 - 0.00}$ = gradient of graph Gradient = 0.76 Ignore SF except 1SF Do not allow units for the gradient Allow a value from 0.71 to 0.81 inclusive	**(2)**

Question Number	Acceptable Answers	Additional Guidance	Mark
9(b)(iv)	• $\dfrac{\sqrt{K_c}}{2 + \sqrt{K_c}}$ = gradient / $\dfrac{y}{a}$ **(1)** • re-arrangement of expression and calculation of K_c **(1)**	Example of calculation $\dfrac{\sqrt{K_c}}{2 + \sqrt{K_c}}$ = 0.76 K_c = 40.1 /40 (no units) Allow TE on gradient from part (b)(iii) $K_c = [(2 \times grad)/(1-grad)]^2$ Correct answer with no working scores (2)	**(2)**

Question Number	Acceptable Answers	Additional Guidance	Mark
9(c)	• hydrogen is flammable / explosive	Allow iodine vapour damages eyes /toxic Allow hydrogen iodide is corrosive / acidic / irritant (if qualified) / lachrymator Ignore references to high pressure Ignore references to safety precautions	**(1)**

Question Number	Acceptable Answers	Additional Guidance	Mark
9(d)	• Faster rate of reaction / increased rate **(1)** • K_c unchanged **(1)**	Ignore references to shifting position of equilibrium	**(2)**

Question Number	Acceptable Answers	Additional Guidance	Mark
9(e)(i)	An explanation that makes reference to the following points: • (K_c is) smaller / decreases / gets less **(1)** • (forward) reaction is exothermic **(1)**	Allow reverse/backwards reaction is endothermic MP2 dependent on MP1	**(2)**

Question Number	Acceptable Answers	Additional Guidance	Mark
9(e)(ii)	• straight line drawn on the graph with a less steep gradient (and goes through the origin)	Do not allow if lines cross	**(1)**

(Total for Question 9 = 16 marks)

TOTAL FOR PAPER = 120 MARKS