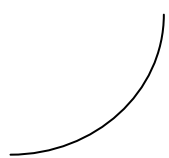




Answers to examination-style questions

Answers	Marks	Examiner's tips
1 a) i) 2	1	
ii) 1	1	
iii) 0	1	It is easier to calculate the order with respect to B first in this example.
b) $k = \frac{\text{rate}}{[\text{D}]^2[\text{E}]}$ or $\frac{8.36 \times 10^{-4}}{(0.84)^2(1.16)}$ $= 1.02 \times 10^{-3} \text{ mol}^{-2} \text{ dm}^6 \text{ s}^{-1}$	3	Make sure you can rearrange formulae. The units are worth a mark so do not leave them out. Answers from 1.02×10^{-3} to 1.05×10^{-3} are acceptable to take account of rounding up in the numbers during the calculation.
2 a) i) Expt 2 2.68×10^{-4} Expt 3 10.72×10^{-4} Expt 4 2.08×10^{-3}	3	Fewer than 2 dp here will be penalised. This gives 3 significant figs in answer. Accept 10.7×10^{-4}
ii) $k = \frac{\text{rate}}{[\text{X}]^2}$ or $\frac{2.68 \times 10^{-4}}{(1.20 \times 10^{-3})^2}$ $= 186 \text{ mol}^{-1} \text{ dm}^3 \text{ s}^{-1}$	3	Units are worth a mark so don't leave them out. In this case candidates often do part ii) to calculate k before part i).
b) increases exponentially, i.e. 	1	This is quite hard so a straight line like this was allowed:  but not a curve like this: 

Answers to examination-style questions

Answers	Marks	Examiner's tips
<p>3 a) i)</p> $k = \frac{0.65}{(0.15)(0.24)^2}$ $= 75.23 \text{ mol}^{-2} \text{ dm}^6 \text{ s}^{-1}$	3	Answers between 74 and 77 are allowed due to rounding up of numbers in the calculation.
<p>ii) $0.081 \text{ mol dm}^{-3} \text{ s}^{-1}$</p>	1 max.	There are no marks given for the units here.
<p>b) i) 2</p>	1	Use experiments 1 and 2 here.
<p>ii) 0</p>	1	Use experiments 1 and 3 here.
<p>4 a) order with respect to P is 2 order with respect to Q is 1</p>	2	Calculate Q first this time using experiments 2 and 3.
<p>b) i) $\text{rate} = k[\text{R}][\text{S}]^2$ $\text{rate} = 4.2 \times 10^{-4} \times 0.16 \times 0.84^2$ $= 4.7 \times 10^{-5} \text{ mol dm}^{-3} \text{ s}^{-1}$</p>	3	If the equation is wrong there are no marks allowed in this part of the question. One mark is given for the full correct equation, full marks for the correct answer.
<p>ii) $k = \frac{\text{rate}}{[\text{R}][\text{S}]^2} = \frac{8.1 \times 10^{-5}}{0.76 \times 0.98^2}$ $= 1.1 \times 10^{-4}$</p>	2	Another example of rearranging the formula before you can put the numbers in, one mark is given for the correct formula full marks for the correct answer.
<p>iii) T_1</p>	1	Hint: If you calculated a value for $k > 4.2 \times 10^{-4}$ then you will be allowed the answer to iii) as T_2 .
<p>5 a) i) 2 ii) 0</p>	2	
<p>b) i) $k = \frac{\text{rate}}{[\text{NO}]^2 [\text{O}_2]}$ $= \frac{6.5 \times 10^{-4}}{(5.012 \times 10^{-2})^2 (2.0 \times 10^{-2})} = 13$ Units = $\text{mol}^{-2} \text{ dm}^6 \text{ s}^{-1}$</p>	2	One mark is given for the correct formula full marks for the correct answer.
<p>ii) $\text{rate} = 13 (6.5 \times 10^{-2})^2 (3.4 \times 10^{-2})$ $= 1.9 \times 10^{-3} \text{ mol dm}^{-3} \text{ s}^{-1}$</p>	2	One mark will be given even if k is incorrect from question b) i). Units are needed for full marks to be gained.