**Kinetics – Homework 2**

For Questions 1 – 3 use table below

|  |  |  |  |
| --- | --- | --- | --- |
| Summarised directions for recording responses to multiple completion questions | | | |
| **A** (i), (ii) and (iii) only | **B** (i) and (iii) only | **C** (ii) and (iv) only | **D** (iv) alone |

**1.**

The rate equation for a certain reaction is given below:

rate = k[X] [Y]2

Which of the following would make the initial rate of the reaction at least 8 times faster?

|  |  |  |
| --- | --- | --- |
|  | Change of concentration of X | Change in concentration of Y |
| (i) | doubled | no change |
| (ii) | doubled | doubled |
| (iii) | no change | doubled |
| (iv) | no change | trebled |

**2.** The reaction

2A + B  C + D

is second order with respect to A. When the concentrations of A and B are both doubled. the rateof reaction increases by a factor of four. Which statement(s) below is/are true?

(1) The overall reaction is third order.

(ii) The reactionis first order with respect to B.

(iii) The units of the rate constant are dmn mol–2s1

(iv) The units of the rate constant aredmt mol–1s–1

**3.** For the reaction

A(aq) + B(aq)  X(aq)

the rate equation is

*rate* = *k*[H+(aq)][B(aq)]2

Which of the following is/are true?

(i) H+ ions could catalyse this reaction.

(ii) The reaction is first order with respect to A.

(iii) The units of the rate constant are mol–2 dm6 s–1.

(iv) If the experiment is repeated under the same conditions but the concentration of B is tripled the initial rate will increase by a factor of six.

**4.** Iodine and propanone react in acid solution according to the equation

I2 + CH3COCH3  CH3COCH2I + HI

The rate equation for the reaction is found to be

rate = *k* [CH3COCH3][H+]

(a) Deduce the order of reaction with respect to iodine and the overall order of reaction.

*Order with respect to iodine* ...................................................................................

*Overall order* .........................................................................................................

(2)

(b) At the start of the experiment, the rate of reaction was found to be  
2.00 × 10–5 mol dm–3 s–1 when the concentrations of the reactants were as shown below.

|  |  |
| --- | --- |
| Reactant | Concentration / mol dm–3 |
| CH3COCH3 | 1.50 |
| I2 | 2.00 × 10–2 |
| H+ | 3.00 × 10–2 |

Use these data to calculate a value for the rate constant and deduce its units.

*Rate constant* .........................................................................................................

................................................................................................................................

................................................................................................................................

*Units* .......................................................................................................................

(3)

(c) How can you tell that H+ acts as a catalyst in this reaction?

................................................................................................................................

................................................................................................................................

................................................................................................................................

(2)

(Total 7 marks)

**5.** The initial rate of the reaction between the gases NO and H2 was measured in a series of experiments at a constant temperature and the following rate equation was determined.

rate = *k*[NO]2[H2]

(a) Complete the table of data below for the reaction between NO and H2

|  |  |  |  |
| --- | --- | --- | --- |
| Experiment | Initial [NO] / mol dm–3 | Initial [H2] / mol dm–3 | Initial rate / mol dm–3 s–1 |
| 1 | 3.0 × 10–3 | 1.0 × 10–3 | 1.8 × 10–5 |
| 2 | 3.0 × 10–3 |  | 7.2 × 10–5 |
| 3 | 1.5 × 10–3 | 1.0 × 10–3 |  |
| 4 |  | 0.50 × 10–3 | 8.1 × 10–5 |

(3)

(b) Using the data from experiment 1, calculate a value for the rate constant, *k*, and state its units.

.....................................................................................................................................

.....................................................................................................................................

.....................................................................................................................................

.....................................................................................................................................

.....................................................................................................................................

(3)

(Total 6 marks)

..................... Out of 16 (Grade )