

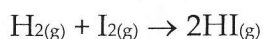
## Biophysical Chemistry

### Week 8 Problems

To be handed in by Wednesday 16<sup>th</sup> May 2012, 17:00

(either at my office 01/05 under the door or at the secretary's office 3<sup>rd</sup> floor)

1. The rate constant  $k$  of the (overall) second order reaction



varies with temperature as follows:

|   |                       |                       |      |
|---|-----------------------|-----------------------|------|
| $T \text{ (K)}$                                       | 556                   | 700                   | 781  |
| $k \text{ (mol}^{-1}\text{dm}^3\text{s}^{-1}\text{)}$ | $1.19 \times 10^{-4}$ | $1.72 \times 10^{-1}$ | 3.58 |

Calculate

(a) the activation energy of the reaction

(b) the rate constant at 629 K

(c) the rate constant for the reverse reaction at 629 K given that the equilibrium constant is 3.73 at this temperature (hint  $k_1/k_{-1} = K$ ).

2. The catalysed decomposition of hydrogen peroxide in aqueous solution was followed by titrating samples with potassium permanganate solution at various time intervals to determine the amount of remaining undecomposed hydrogen peroxide.

|                      |      |      |      |      |      |     |     |
|----------------------|------|------|------|------|------|-----|-----|
| $t \text{ in min}$   | 5    | 10   | 15   | 20   | 30   | 40  | 50  |
| $\text{vol in cm}^3$ | 37.1 | 29.8 | 24.3 | 19.6 | 12.3 | 8.3 | 5.0 |

Show graphically that the reaction is first order and determine the rate constant.