Quiz 1: Chemical Kinetics

"If it wasn't for activation energy, things would move a lot faster around here!"

SCH4UE 2004-2005 Name: _____

1. Consider the reaction:

$$N_{2\,(g)} + 3\,H_{2\,(g)} \longrightarrow 2\,NH_{3(g)}$$

Suppose that at a particular moment during the reaction molecular hydrogen is reacting at the rate of 0.074 mol dm^{-3}.

a. At what rate is ammonia being formed? 2

b. At what rate is molecular nitrogen reacting? 2

2. In aqueous solutions, molecular bromine reacts with methanoic acid, HCOOH, as follows:

$$Br_{2(aq)} + HCOOH_{(aq)} \longrightarrow 2\,Br^{-1}_{(aq)} + 2H^{+1}_{(aq)} + CO_{2(g)}$$

The rate of this reaction was investigated by some ardent chemists at 25 ^{O}C. We have taken the following figures from their results:

Time (s)	$[Br_2]$ (mol dm^{-3})
0.0	0.0120
50.0	0.0101
100.0	0.00846
150.0	0.00710
200.0	0.00596
250.0	0.00500
300.0	0.00420
350.0	0.00353
400.0	0.00296

a. Suggest two ways by which the rate of this reaction may be measured experimentally. 2

b. Plot a graph of concentration of bromine as a function of time on a well constructed graph. 5

c. When is the rate of the reaction greatest and when is it least? 1

d. Suggest one reason why the rate of reaction is changing? 2

e. Determine the instantaneous rate of decrease of concentration of bromine at:
(i) 125 s (ii) 225 s 4

f. What is the average rate of reaction for the first 100 s time interval. 2

g. Write an expression to express the rate at which the bromine concentration changes with time. 2

h. How does the reaction rate change with time? Explain. 2