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CHEMISTRY

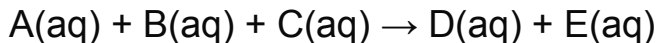
PHYSICAL CHEMISTRY II

Level & Board	AQA (A-LEVEL)
TOPIC:	RATE EQUATIONS
PAPER TYPE:	QUESTION PAPER - 4
TOTAL QUESTIONS	10
TOTAL MARKS	35

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Rate Equations - 4

1. A general equation for a reaction is shown.



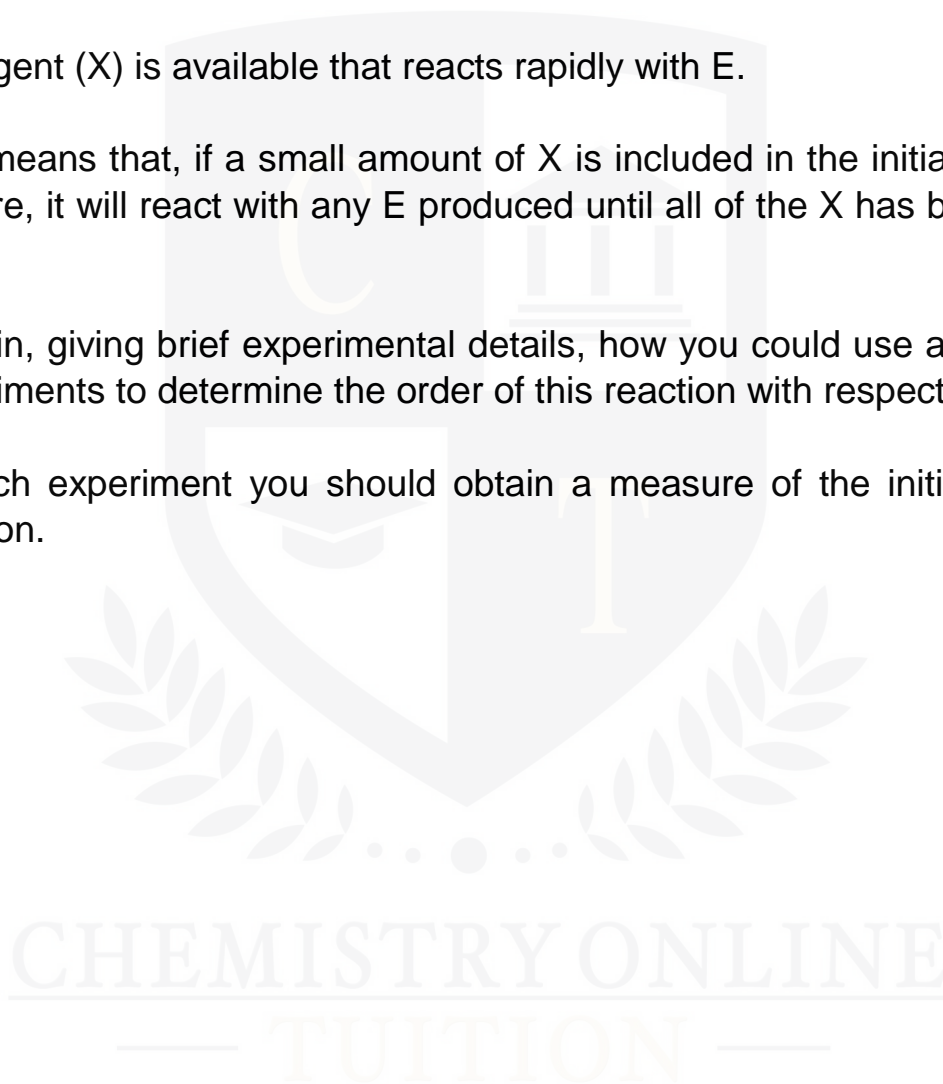
In aqueous solution, A, B, C and D are all colourless but E is dark blue.

A reagent (X) is available that reacts rapidly with E.

This means that, if a small amount of X is included in the initial reaction mixture, it will react with any E produced until all of the X has been used up.

Explain, giving brief experimental details, how you could use a series of experiments to determine the order of this reaction with respect to A.

In each experiment you should obtain a measure of the initial rate of reaction.



I am Sorry !!!!!

(6)

2. Draw a rate concentration graph for a zero , first and second order reactant.

(3)

3. State le Chatelier's principle.

(2)

4. The rate of the reaction between hydrogen and oxygen depends on the pressure as well as the temperature.



- (a) Describe and explain the effect of increasing the pressure on the rate of this reaction.

(2)

- (b) A sudden rapid increase in the rate of a reaction causes an explosion to occur.

Suggest why highly exothermic reactions such as this one are more likely to explode than other reactions.

(2)

5. State two characteristics of a dynamic equilibrium.

(2)

6. What effect does a catalyst have on the rate of a reaction, and how does it achieve this effect?

(4)

7. The following equation represents another equilibrium reaction.



Use le Chatelier's principle to describe and explain the colour change (if any) that might take place when

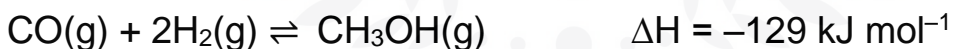
(a) A mixture of $\text{NO}_2(\text{g})$ and $\text{N}_2\text{O}_4(\text{g})$ is compressed at constant temperature.

(2)

(b) A mixture of $\text{NO}_2(\text{g})$ and $\text{N}_2\text{O}_4(\text{g})$ is heated at constant pressure.

(2)

- 8.** Methanol can be used as a fuel or as the feedstock for a variety of organic compounds.
It is manufactured from carbon monoxide and hydrogen.



(a) Describe and explain how the composition of the equilibrium mixture is affected by increasing the temperature and increasing the pressure in the reaction.

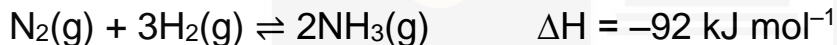
(4)

(b) Describe and explain the effect of increasing the pressure on the rate of reaction.

(2)

9. Ammonia, NH_3 , is made industrially by the Haber process.

This is an equilibrium reaction.



State the pressure and temperature that are used in the Haber process.

(2)

10. What is a catalyst?

(2)

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