2.10 Chemistry: Rate Equations and Equilibrium: 10-minute Pack

AQA 7405 · Calculator allowed · about 10 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 This question tests core definitions used throughout the study of chemical equilibrium.

(a) State what is meant by the equilibrium constant, Kc, for a reversible reaction. **(1)**

(b) State what is meant by dynamic equilibrium. **(1)**

(Total for Question 1 is 2 marks)

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2 A reversible reaction can be catalysed to speed up the rate at which it reaches equilibrium.

(a) State how a catalyst affects the rate of a reaction, and explain why, in terms of activation energy. **(2)**

(b) Explain why the addition of a catalyst does not change the value of Kc for a reversible reaction. **(2)**

(Total for Question 2 is 4 marks)

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Mark scheme · 2.10 Chemistry: Rate Equations and Equilibrium: 10-minute Pack

Question 1

(a) the ratio of the concentrations of products to reactants at equilibrium, each raised to the power of its balancing number, at a constant (fixed) temperature oe **B1**

(a) Answer: The ratio of product to reactant concentrations at equilibrium, each raised to its balancing number, at a fixed temperature.

(b) a state, in a closed system, in which the rate of the forward reaction equals the rate of the reverse reaction, so the concentrations of reactants and products remain constant, but both reactions continue to occur oe **B1**

(b) Answer: A state in a closed system where the forward and reverse reaction rates are equal, so concentrations remain constant even though both reactions continue.

Question 2

(a) a catalyst increases the rate of reaction by providing an alternative reaction pathway with a lower activation energy oe **B1**

(a) a greater proportion of particles now have energy greater than or equal to this lower activation energy, so more collisions are successful, increasing the rate constant, k, for both the forward and reverse reactions oe **B1**

(a) Answer: A catalyst provides an alternative pathway of lower activation energy, so more particles have sufficient energy to react, increasing k for both the forward and reverse reactions.

(b) a catalyst increases the rate constants of the forward and reverse reactions, kf and kr, by the same factor oe **B1**

(b) since Kc = kf/kr, this ratio is unchanged, so the value of Kc is unaffected; equilibrium is reached faster, but its position is unchanged oe **B1**

(b) Answer: Because the catalyst increases kf and kr by the same factor, the ratio Kc = kf/kr is unchanged; only the time taken to reach equilibrium is reduced.

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