

Questions from the “PAL Prüfungsbuch”
Reaction Kinetics, Thermodynamics, Chemical Equilibrium

416: Which statement about the topic „catalysis“ is *wrong*?

- 1) In heterogeneous catalysis reactants and catalyst form different phases
- 2) In Friedel-Crafts reactions often AlCl_3 is used as catalyst
- 3) An example for homogeneous catalysis is the usage of sulphuric acid as catalyst in an esterification
- 4) The usage of catalysts increases the yield
- 5) Catalysts increase the reaction rate in chemical reactions

417: In the reaction of ethanoic acid with ethanol sulphuric acid is used as catalyst. In which way does the catalyst participate in the reaction?

- 1) It shifts the reaction equilibrium to the product side
- 2) It raises the reaction enthalpy
- 3) It protonates the ethanoic acid and facilitates the split off of the hydroxyl group
- 4) It dissociates the ethanol
- 5) It does not participate in the reaction

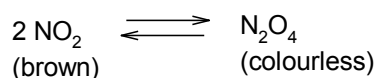
418: In chemical engineering what is understood by catalyst poison?

- 1) Catalysts that have a toxic effect on human organisms
- 2) Substances that do not lose their toxic effect after catalytic treatment
- 3) Substances that catalytically work towards the starting substance side of the equilibrium
- 4) Substances that cause a deceleration of the reaction speed by reducing the concentration of the reaction partners
- 5) Substances that are preferentially adsorbed by the catalyst and thereby block its surface

419: Which of the following catalytic reactions is a homogeneous catalysis?

- 1)
$$\text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{C}_2\text{H}_5 + \text{H}_2\text{O} \xrightarrow{\text{H}^+} \text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{H} + \text{H}_3\text{C}-\text{CH}_2-\text{OH}$$
- 2)
$$\text{H}_3\text{C}-(\text{CH}_2)_7-\text{CH}=\text{CH}-(\text{CH}_2)_7-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH} + \text{H}_2 \xrightarrow{\text{Ni}} \text{H}_3\text{C}-(\text{CH}_2)_{16}-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH}$$
- 3)
$$2 \text{SO}_2 + \text{O}_2 \xrightarrow{\text{V}_2\text{O}_5} 2 \text{SO}_3$$
- 4)
$$4 \text{NH}_3 + 5 \text{O}_2 \xrightarrow{\text{Pt}} 4 \text{NO} + 6 \text{H}_2\text{O}$$
- 5)
$$\text{N}_2 + 3 \text{H}_2 \longrightarrow 2 \text{NH}_3$$

420: The system



is in an equilibrium. Pressure is be increased. Which statement is correct?

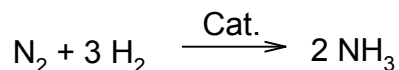
- 1) The equilibrium position does not change
- 2) Increasingly brown vapours are formed
- 3) The equilibrium position will shift to the right side
- 4) It applies: $K = \frac{c(\text{N}_2\text{O}_4)}{c(2 \text{NO}_2)}$
- 5) The use of the catalyst V_2O_5 shifts the equilibrium position to the left side

423: Which statement about the following reaction is correct?



- 1) It requires a catalyst
- 2) It is an exothermic reaction
- 3) It is an acid-base-reaction
- 4) It is a double transformation
- 5) It is an equilibrium reaction

428: Which of the following measures does *not* shift the equilibrium of the reaction?



- 1) Removing the ammonia from the equilibrium
- 2) Increase only the nitrogen fraction of the educts
- 3) Increase only the hydrogen fraction of the educts
- 4) Increase of pressure
- 5) Change of catalyst

429: Which influence does a equal ionic additive have on the **saturated** solution of an electrolyte?

- 1) The dissociation constant changes
- 2) The solution turns neutral
- 3) Parts of the electrolyte precipitate
- 4) The solution turns alkaline
- 5) The solution turns acidic

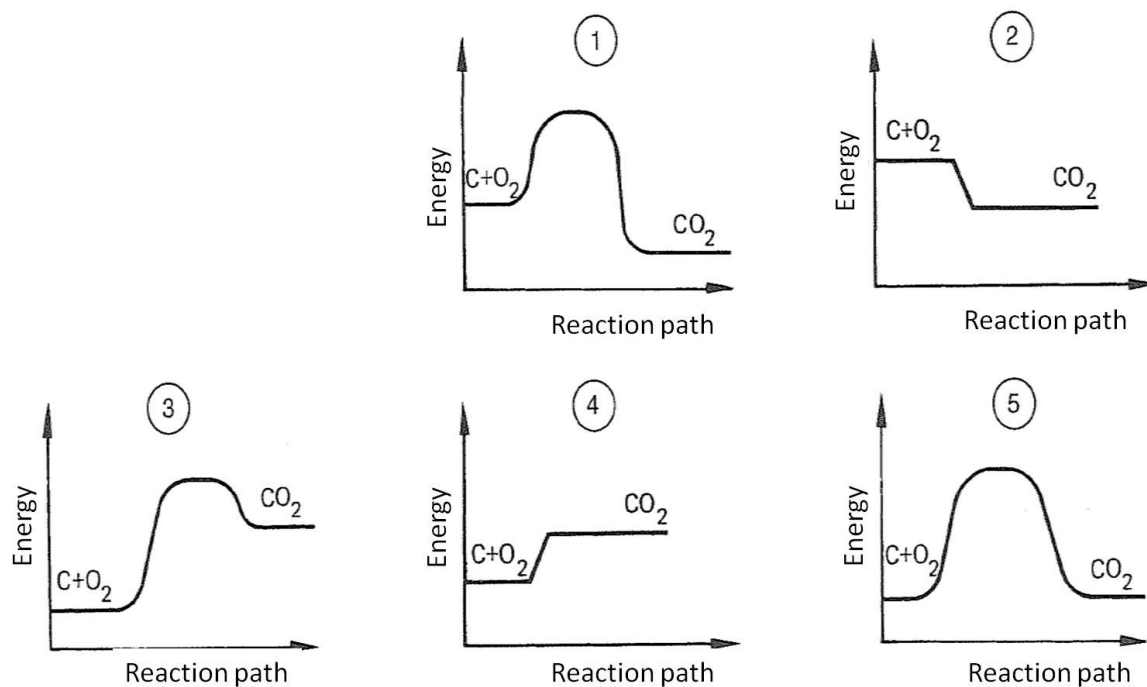
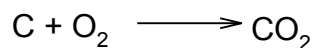
430: How can the reaction rate of a chemical reaction be accelerated?

- 1) By usage of stabilizers
- 2) By removal of a product
- 3) By usage of a catalyst
- 4) By changing the quantity of starting material
- 5) By adding seed crystals

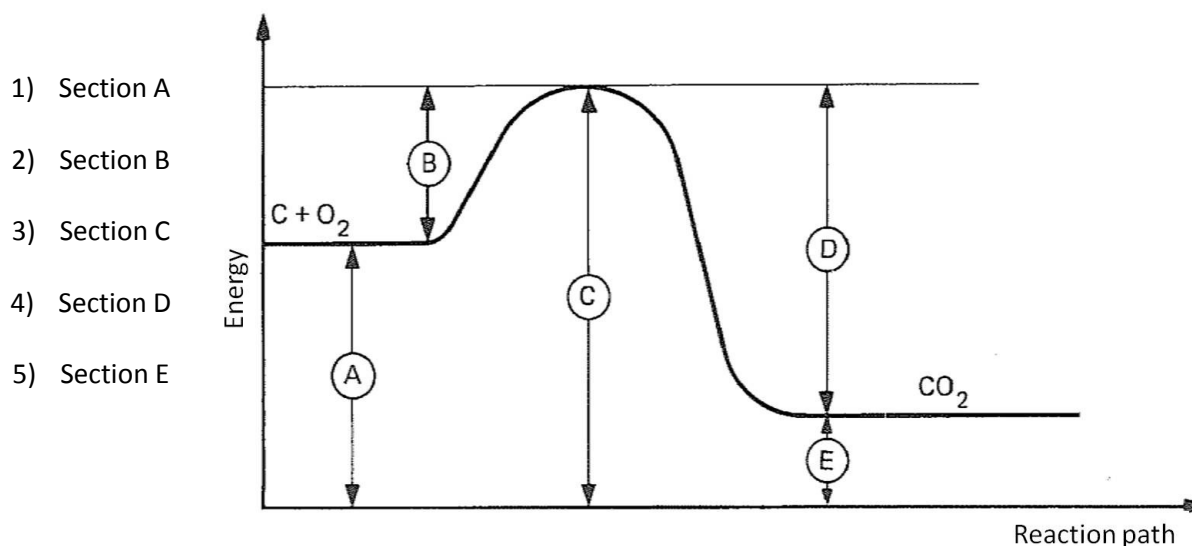
436: Which statement does apply for an exothermic reaction?

- 1) ΔH is positive
- 2) Exothermic reactions require constant energy input
- 3) Exothermic reactions have a negative activation energy
- 4) In an exothermic reaction the products are of lower energy than the educts
- 5) In the course of exothermic reactions always explosions occur

440: What is the correct energy diagram for the following reaction?



446: Which section in this diagram about carbon combustion shows the activation energy?



447: This scheme shows the phase diagram of water with the triple point. Which transition is called sublimation?

- 1) From A to C
- 2) From A to B
- 3) From B to C
- 4) From B to A
- 5) From C to B

