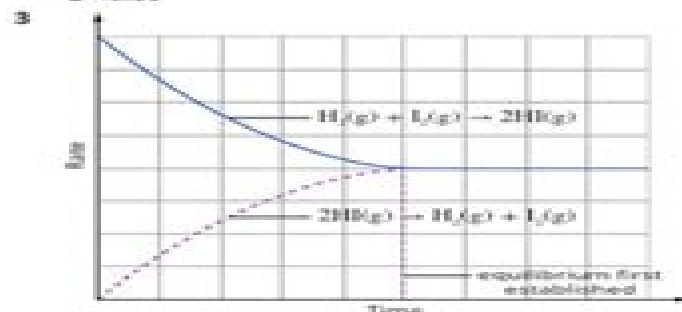


## Chapter 2 Chemical equilibrium

### 2.1 Dynamic equilibrium

#### 2.1 KEY QUESTIONS

1.
  - a An **open** system occurs when both matter and energy are exchanged between the system and the surroundings.
  - b Chemical equilibria can occur in **closed** systems.
  - c In some circumstances, a reversible reaction can form a **dynamic** equilibrium.
  - d The extent of reaction for chemical equilibria is **different** for different equilibria.
2.
  - a false
  - b false
  - c true
  - d false



4. closed, decreases, less, reverse, increases, equal
5.
  - a open; both energy and matter (carbon dioxide and water vapour) are exchanged with the surroundings
  - b closed; only energy can be exchanged with the surroundings. While the can is unopened, no matter is exchanged.
  - c open; both energy and matter are exchanged with the surroundings
6. B and F. Equilibrium can only occur in a closed system. At the molecular level, some of the sugar in the saturated sugar solution will continue to dissolve at the same rate as some is precipitated. In the unopened bottle of sparkling mineral water, the dissolved carbon dioxide will be in equilibrium with the gaseous carbon dioxide. In all of the other situations, the reverse reaction is not occurring at the same rate as the forward reaction, because the systems are open.
7.  $130 \text{ kJ mol}^{-1}$ . The activation energy is the difference between  $390 \text{ kJ mol}^{-1}$  and  $260 \text{ kJ mol}^{-1}$ , which is  $130 \text{ kJ mol}^{-1}$ .
8.
  - a Chemical equilibrium is 'dynamic' because both forward and reverse reactions occur at the same rate. An equilibrium develops between water vapour and water when wet clothes are in a sealed bag, with water evaporating as rapidly as water vapour condenses, so the clothes remain wet.
  - b When the bag is opened, water vapour escapes and the rate of evaporation exceeds the rate of condensation. The system is not in equilibrium and the clothes dry.
9.
  - a  $0.07 \text{ mol L}^{-1}$
  - b  $0 \text{ mol L}^{-1}$
  - c  $0.03 \text{ mol L}^{-1}$
  - d  $0.08 \text{ mol L}^{-1}$
  - e 0.04 moles
  - f The horizontal regions of the graph indicate that there is no change in concentration of  $\text{NO}_2$  or  $\text{N}_2\text{O}_4$ . This is when the system is at equilibrium and both the forward and reverse reactions are occurring at the same rate.
  - g 6 seconds
  - h As the reaction proceeds, the intensity of the brown colour will increase as the concentration of  $\text{NO}_2$  increases until equilibrium is reached. Once equilibrium is reached, the colour of the reaction mixture will remain constant.

# Reaction And Equilibrium Workbook Answers

**Roman Wölfel**



## Reaction And Equilibrium Workbook Answers:

General Chemistry Workbook Daniel C. Tofan, 2010-07-28 This workbook is a comprehensive collection of solved exercises and problems typical to AP introductory and general chemistry courses as well as blank worksheets containing further practice problems and questions It contains a total of 197 learning objectives grouped in 28 lessons and covering the vast majority of the types of problems that a student will encounter in a typical one year chemistry course It also contains a fully solved 50 question practice test which gives students a good idea of what they might expect on an actual final exam covering the entire material

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