CHAPTER 6 SUMMARY

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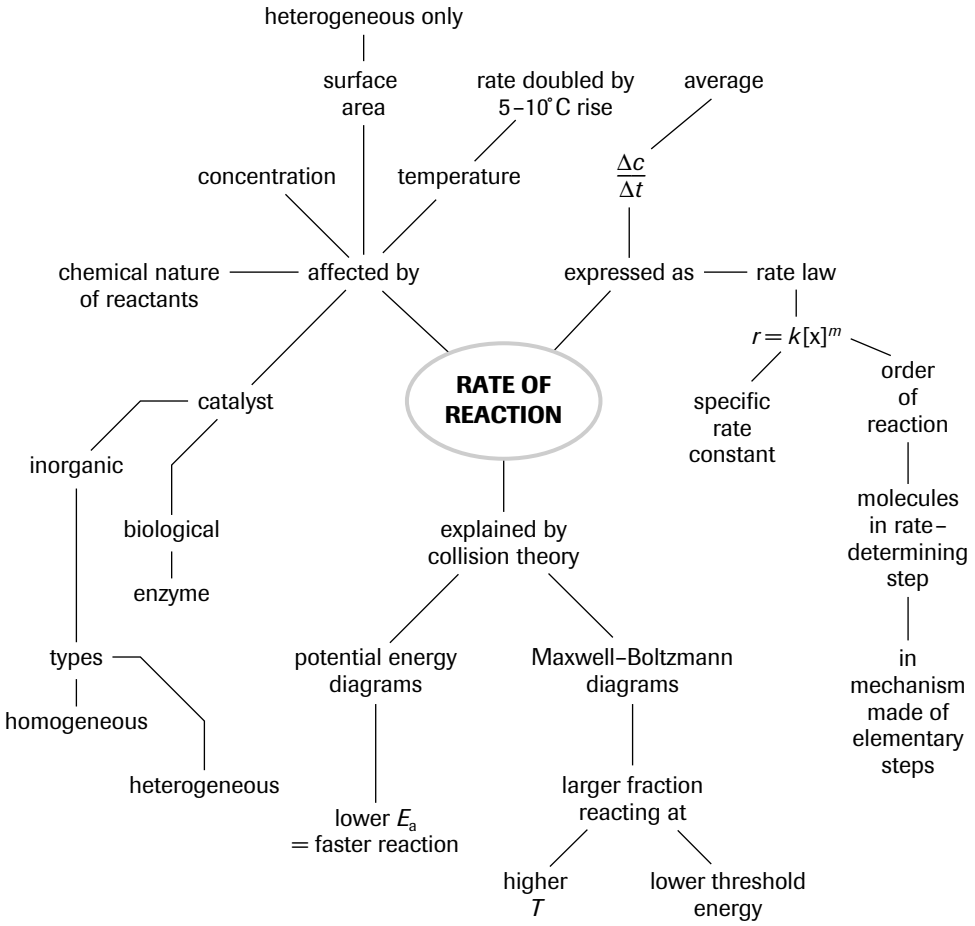
MAKE A SUMMARY



CHAPTER 6 SELF-QUIZ

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1. False: The molecular species that exists at a maximum of potential energy is called the *activated complex*.
2. True
3. False: Elementary steps in reaction mechanisms generally involve *one* or *two* molecule collisions.
4. True
5. True
6. False: The enthalpy change is *the same* for a catalyzed chemical reaction.
7. True
8. True
9. False: The rate-determining step in a mechanism is the *slowest* step.
10. False: A homogeneous catalyst is one in which the catalyst and the reactants are in *the same* phase.
11. (b)
12. (e)
13. (d)

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14. (c)
15. (a)
16. (b)
17. (d)
18. (b)

CHAPTER 6 REVIEW

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Understanding Concepts

1. pressure or volume, conductivity, absorbency of light
2. concentration, temperature, catalysis, chemical nature of reactants
3. Additional surface area $= 18 \times 1\ cm^2$

   Total surface area $= 24\ cm^2$

   Proportional change in surface area $= \dfrac{24\ cm^2}{6\ cm^2} = 4$

   The rate would be multiplied by a factor proportional to the surface area change:

   $r = 4 \times 20$ mL/s

   $r = 80$ mL/s
4. (a) rate increases
   (b) rate decreases
   (c) rate increases
   (d) rate increases
5. (a) $r = \dfrac{\Delta V}{\Delta t}$

   $= \dfrac{44.2\ mL}{30.0\ s}$

   $r = 1.47$ mL/s

   (b) (i) With a 5ºC increase in temperature, the rate could be doubled and the time halved.
   (ii) Without the catalyst, the reaction might be imperceptibly slow.
6. (a) $r = k\,[ClO_{2(aq)}]^2[OH^-_{(aq)}]$

   (b) This is a third-order reaction.
   (c) The rate would quadruple.
   (d) The rate would double.
7. (a) When we compare Trials 1 and 2, we see that as $[Cl_2]$ is doubled, rate is multiplied by 2; therefore, rate depends on $[Cl_2]^1$.
   When we compare Trials 2 and 3, we see that as [NO] is doubled, rate is multiplied by 4; therefore, rate depends on $[NO]^2$.
   Overall, $r = k\,[Cl_2]^1[NO]^2$.

   (b) The rate-determining step is most likely to be
   $2\ NO_{(g)} + Cl_{2(g)} \rightarrow$ product or intermediate

   (c) $k = \dfrac{r}{[NO]^2\,[Cl_2]}$

   $= \dfrac{1.8 \times 10^{-2}\ mol/(L \cdot s)}{(0.10\ mol/L)^2 \times 0.10\ mol/L}$

   $k = 18\ L^2/(mol^2 \cdot s)$

   (d) $r = k\,[NO]^2\,[Cl_2]$

   $= 18\ L^2/(mol^2 \cdot s)\,(0.30\ mol/L)^2 \times 0.40\ mol/L$

   $r = 0.65\ mol/(L \cdot s)$

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