SC2 – O'Malley

SAT II-Review (Kinetics)

For 1 – 4:

a. Positive ΔH
b. Negative ΔH
c. Positive ΔG
d. Negative ΔG
e. Positive ΔS

1. Which describes an endothermic reaction?
2. Which describes a spontaneous reaction?
3. Which describes a nonspontaneous reaction?
4. Which is multiplied by temperature in the equation which calculates free energy?

For 1 – 4:

a. An increase in the reaction concentration
b. An increase in temperature
c. A decrease in pressure
d. catalysis
e. pH

5. Which increases effective collisions without increasing average kinetic energy?
6. Which decreases the activation energy?
7. Which increases average kinetic energy?

For 8 – 10:

a. Enthalpy change
b. Entropy change
c. Gibbs free energy change
d. Activation energy
e. specific heat capacity

8. Which is the amount of energy that must be added to raise the temperature of 1 gram of a substance 1 ^{o}C?
9. Which value indicates the spontaneity of a reaction?
10. Which value indicates whether a reaction is endothermic or exothermic?

For 11 – 13:

a. 0
b. 1
c. 2
d. 3
e. 4

Based on the following reaction and rate data:

A(g) + B(g) → products

Experiment	[A] mol/L	[B] mol/L	Initial rate (M/s)
1	0.060	0.010	0.040
2	0.030	0.010	0.040
3	0.030	0.020	0.080

11. What is the order of the reaction with respect to A?
12. What is the order of the reaction with respect to B?
13. What is the rate constant?

Q	Statement I	Because	Statement II
14.	An increase in entropy leads to a decrease in randomness	Because	The low energy state of ordered crystals has a high entropy
15.	In a second order reaction doubling [A] quadruples the rate	Because	The rate equation is $r=k[A]^2$ for such a reaction
16.	Catalysts decrease the rate of a chemical reaction	Because	Catalysts decrease activation energy
17.	An exothermic reaction has a positive ΔH value	Because	Heat must be added to the reaction for the reaction to occur
18.	The entropy of a solid decreases when it is dissolved	Because	It becomes less ordered
19.	If ΔH is positive and ΔS is positive, ΔG must be positive	Because	$\Delta G = \Delta H - T\Delta S$
20.	A catalyst increases the rate of reaction	Because	It raises the energy of the products
21.	Increasing the temperature increases the reaction rate	Because	At high temperatures, molecules or atoms tend to be further apart
22.	activation energy of a reaction is decreased by a catalyst	Because	It is not used up in the process
23.	The reaction of $BaCl_2$ and Na_2SO_4 doesn't go to completion	Because	The compound barium sulfate is formed
24.	Catalysts speed up or slow down a reaction	Because	Catalysts change the energy released from a reaction
25.	When salt dissolves in water, ΔS for the process is positive	Because	Aqueous ions have a greater entropy than ions in a solid
26.	The addition of a catalyst will decrease the ΔH for a reaction	Because	Catalysts provide alternate reaction paths with lower activation energy

27. For the reaction A + B → C, determine the order of the reaction with respect to B from the information given below:

$[A]_o$	$[B]_o$	Initial rate (M/s)
1.00	1.00	2.0
1.00	2.00	8.1
2.00	2.00	15.9

a. Zero order
b. First order
c. Second order
d. Third order
e. Fourth order

28. Which of the following is NOT a true statement about entropy?
a. Entropy is a measure of the randomness in a system
b. The entropy of an amorphous solid is greater than that of a crystalline solid
c. The entropy of a spontaneous reaction cannot decrease
d. The entropy of an isolated system will spontaneously increase or remain constant
e. The entropy of a liquid is greater than that of a solid

29. A catalyst
a. changes ΔG for an equation
b. acts by increasing the rate of the forward reaction more than the reverse reaction
c. raises the equilibrium constant of a system
d. may have molecular weight as low as 1 or higher than 200,000
e. does not react chemically during the course of a reaction

30. For which of the following is there an increase in entropy?
a. $Na(s) + H_2O(l) \rightarrow NaOH(aq) + H_2(g)$
b. $I_2(g) \rightarrow I_2(s)$
c. $H_2SO_4(aq) + Ba(OH)_2(aq) \rightarrow BaSO_4(s) + H_2O(l)$
d. $H_2(g) + ½\ O_2(g) \rightarrow H_2O(l)$
e. None of the above

31. Which of the following conditions guarantee a spontaneous reaction?
a. positive ΔH, positive ΔS
b. positive ΔH, negative ΔS
c. negative ΔH, negative ΔS
d. negative ΔH, positive ΔS
e. none of the above

32. A reaction that occurs only when heat is added is best described as
a. Exothermic
b. Endothermic
c. An equilibrium process
d. Spontaneous
e. Non-spontaneous

33. The important considerations in deciding if a reaction will be spontaneous are
a. stability & state of reactants
b. energy gained & heat evolved
c. exothermic energy & randomness of the products
d. endothermic energy & randomness of the products
e. endothermic energy & structure of the products

34. In a multistep chemical process, the rate-limiting step is the step in the reaction with the
a. Highest activation energy & fastest reaction rate
b. Highest activation energy & slowest reaction rate
c. Lowest activation energy & fastest reaction rate
d. Lowest activation energy & slowest reaction rate
e. Greatest concentration of the reactants and products

35. Which of the following reactions shows a decrease in entropy?
a. $C(s) + 2H_2(g) \rightarrow CH_4(g)$
b. $H_2O(g) \rightarrow H_2(g) + ½\ O_2(g)$
c. $2NI_3(s) \rightarrow N_2(g) + 3I_2(g)$
d. $2O_3(g) \rightarrow 3O_2(g)$
e. none of the above

answers:

1. A
2. D
3. C
4. E
5. A
6. D
7. B
8. E
9. C
10. A
11. A
12. B
13. E
14. F, F
15. T, T, CE
16. F, T
17. F, F
18. F, T
19. F, T
20. T, F
21. T, T
22. T, T
23. F, T
24. F, F
25. T, T
26. F, T
27. C
28. C
29. D
30. A
31. D
32. B
33. C
34. B
35. A