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| **Question 1**http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/delta.gif*P*(C6H14)/http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/delta.gif*t* was found to be –6.2 x 10–3 atm/s for the following reaction:C6H14(*g*) http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/arrow_rt.gifC6H6(*g*) + 4H2(*g*) Determine http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/delta.gif*P*(H2)/http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/delta.gif*t* for this reaction at the same time.1. 6.2 x 10–3 atm/s
2. 1.6 x 10–3 atm/s
3. 2.5 x 10–2 atm/s
4. –1.6 x 10–3 atm/s
5. –2.5 x 10–2 atm/s

**Question 2**The reaction A + 2B http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/arrow_rt.gifproducts was found to have the rate law: rate = *k*[A][B]2. While holding the concentration of A constant, the concentration of B was increased from *x* to 3*x*. Predict by what factor the rate of reaction will increase.1. 3
2. 6
3. 9
4. 27
5. 30

**Question 3**Nitric oxide gas (NO) reacts with chlorine gas according to the equationNO + ½Cl2 http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/arrow_rt.gifNOCl. The following initial rates of reaction have been measured for the given reagent concentrations.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Expt. no. |   | Rate (*M*/hr) |   | NO (*M*) |   | Cl2 (*M*) |
| 1 |   | 1.19 |   | 0.50 |   | 0.50 |
| 2 |   | 4.79 |   | 1.00 |   | 0.50 |
| 3 |   | 9.59 |   | 1.00 |   | 1.00 |

Which of the following is the rate law (rate equation) for this reaction?1. rate = *k*[NO]
2. rate = *k*[NO][Cl2]1/2
3. rate = *k*[NO][Cl2]
4. rate = *k*[NO]2[Cl2]
5. rate = *k*[NO]2[Cl2]2

**Question 4**A first-order reaction has a rate constant of 3.0 x 10–3/s. The time required for the reaction to be 75 percent complete is \_\_\_\_\_\_\_\_.1. 95.8 s
2. 201 s
3. 231 s
4. 462 s
5. 41.7 s

**Question 5**The units for a second-order rate constant are \_\_\_\_\_\_\_\_.1. *M*/s
2. 1 / *M* http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/middot.gifs
3. 1/s
4. 1 / *M*2 http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/middot.gifs

**Question 6**The isomerization of cyclopropane to form propene http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/image_13-25.gifhttp://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/arrow_rt.gifCH3 — CH http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/2line-h.gifCH2CH2 is a first-order reaction. At 760 K, 15 percent of a sample of cyclopropane changes to propene in 6.8 minutes. What is the half-life of cyclopropane at 760 K?1. 3.4 x 10–2 min
2. 2.5 min
3. 23 min
4. 29 min
5. 230 min

**Question 7**For the chemical reaction system described by the diagram below, which statement is true?http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Previews/image13-53.gif1. The forward reaction is endothermic.
2. The activation energy for the forward reaction is greater than the activation energy for the reverse reaction.
3. At equilibrium, the activation energy for the forward reaction is equal to the activation energy for the reverse reaction.
4. The activation energy for the reverse reaction is greater than the activation energy for the forward reaction.
5. The reverse reaction is exothermic.

**Question 8**When the concentrations of reactant molecules are increased, the rate of reaction increases. The best explanation is: As the reactant concentration increases, the \_\_\_\_\_\_\_\_.1. average kinetic energy of molecules increases
2. frequency of molecular collisions increases
3. rate constant increases
4. activation energy increases
5. order of reaction increases

**Question 9**Which is the correct equilibrium constant expression for the following reaction?Fe2O3(*s*) + 3H2(*g*) http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/eqarrows.gif2Fe(*s*) + 3H2O(*g*)1. *K*c = [Fe2O3] [H2]3 / [Fe]2[H2O]3
2. *K*c = [H2] / [H2O]
3. *K*c = [H2O]3 / [H2]3
4. *K*c = [Fe]2[H2O]3 / [Fe2O3] [H2]3
5. *K*c = [Fe] [H2O] / [Fe2O3] [H2]

**Question 10**Consider the two gaseous equilibria (*K*1 and *K*2):SO2(*g*) + ½O2(*g*) http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/eqarrows.gifSO3(*g*)       *K*12SO3(*g*) http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/eqarrows.gif2SO2(*g*) + O2(*g*)       *K*2The values of the equilibrium constants *K*1 and *K*2 are related by \_\_\_\_\_\_\_\_.1. *K*2 = (*K*1)2
2. (*K*2)2 = *K*1
3. *K*2 = 1/(*K*1)2
4. *K*2 = 1/*K*2
5. None of the above

**Question 11**The following reactions occur at 500 K. Arrange them in order of increasing tendency to proceed to completion (i.e., least completion http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/arrow_rt.gifgreatest completion).1. 2NOCl http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/eqarrows.gif2NO + Cl2        *KP* = 1.7 x 10–2
2. N2O4 http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/eqarrows.gif2NO2                 *KP* = 1.5 x 103
3. 2SO3 http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/eqarrows.gif2SO2 + O2         *KP* = 1.3 x 10–5
4. 2NO2 http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/eqarrows.gif2NO + O2          *KP* = 5.9 x 10–5
5. 2 < 1 < 3 < 4
6. 3 < 1 < 4 < 2
7. 3 < 4 < 1 < 2
8. 4 < 3 < 2 < 1
9. 4 < 3 < 1 < 2

**Question 12**When the following reaction is at equilibrium, which choice is always true?2NOCl(*g*) http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/eqarrows.gif2NO(*g*) + Cl2(*g*)1. [NO] [Cl2] = [NOCl]
2. [NO]2 [Cl2] = [NOCl]2
3. [NOCl] = [NO]
4. 2[NO] = [Cl2]
5. [NO]2 [Cl2] = *K*c[NOCl]2

**Question 13**On analysis, an equilibrium mixture for the reaction2H2S(*g*) http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/eqarrows.gif2H2(*g*) + S2(*g*)was found to contain 1.0 mol H2S, 4.0 mol H2, and 0.80 mol S2 in a 4.0 L vessel. Calculate the equilibrium constant for this reaction.1. 1.6
2. 3.2
3. 12.8
4. 0.64
5. 0.8

**Question 14**2.50 mol NOCl was placed in a 2.50 L reaction vessel at 400oC. After equilibrium was established, it was found that 28 percent of the NOCl had dissociated according to the equation:2NOCl(*g*) http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/eqarrows.gif2NO(*g*) + Cl2(*g*)Calculate the equilibrium constant, *K*c, for the reaction.1. 0.021
2. 0.039
3. 0.169
4. 26
5. 47

**Question 15**At 35oC, the equilibrium constant for the following reaction is *K*c = 1.6 x 10–5.2NOCl(*g*) http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/eqarrows.gif2NO(*g*) + Cl2(*g*)An equilibrium mixture was found to have the following concentrations of Cl2 and NOCl:[Cl2] = 1.2 x 10–2 *M*; [NOCl] = 2.8 x 10–1 *M*. Calculate the concentration of NO(*g*) at equilibrium.1. 1.0 x 10–4 *M*
2. 1.0 x 10–2 *M*
3. 2.8 x 10–1 *M*
4. 2.4 x 10–2 *M*
5. 1.6 x 10–3 *M*

**Question 16**Consider the reactionN2(*g*) + O2(*g*) http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/eqarrows.gif2NO(*g*)*K*c = 0.10 at 2000oC. Starting with initial concentrations of 0.040 *M* of N2 and 0.040 *M* of O2, calculate the equilibrium concentration of NO.1. 5.4 x 10–3 *M*
2. 0.0096 *M*
3. 0.011 *M*
4. 0.080 *M*
5. 0.10 *M*

**Question 17**For the following reactions the equilibrium constants are defined.A + 2B http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/eqarrows.gifC       *K*1C http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/eqarrows.gifD + E         *K*2Then for the reactionA + 2B http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/eqarrows.gifD + E       *K*cthe equilibrium constant must be equal to \_\_\_\_\_\_\_\_.1. *K*c = *K*1 + *K*2
2. *K*c = *K*1/*K*2
3. *K*c = *K*1 – *K*2
4. *K*c = (*K*1)(*K*2)
5. *K*c = *K*2/*K*1

**Question 18**At 700 K, the reaction2SO2(*g*) + O2(*g*) http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/eqarrows.gif2SO3(*g*)has an equilibrium constant *K*c = 4.3 x 106, and the following concentrations are present:[SO2] = 0.10 *M*[SO3] = 10 *M*[O2] = 0.10 *M*Is the mixture at equilibrium? If not at equilibrium, in which direction—**left to right** or **right to left**— will the reaction occur to reach equilibrium?1. Yes, the mixture is at equilibrium.
2. No, left to right
3. No, right to left
4. There is not enough information to tell.

**Question 19**For the following reaction at equilibrium, which choice gives a change that will shift the position of equilibrium to favor formation of more products?2NOBr(*g*) http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/eqarrows.gif2NO(*g*) + Br2(*g*)       http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/delta.gif*H*orxn = 30 kJ1. Increase the total pressure by decreasing the volume.
2. Add more NO.
3. Remove Br2.
4. Lower the temperature.
5. Remove NOBr selectively.

**Question 20**The following reaction is endothermic:2SO3(*g*) http://myedison.tesc.edu/tescdocs/Web_Courses/CHE-112-OL/Rewrite_0203/images/eqarrows.gif2SO2(*g*) + O2(*g*)What will happen if the temperature is increased?1. More SO3 will be produced.
2. *K*c will decrease.
3. No change will occur in *K*c.
4. *K*c will increase.
5. The pressure will decrease.
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