Kinetics and equilibrium

1. An aqueous solution containing 18.9g of an unknown molecular (nonelectrolyte) compound in 103.0g of water was found to have a freezing point of -1.7 ∘ C.Calculate the molar mass of the unknown compound.Express your answer using two significant figures and g/mol
2. What is the osmotic pressure of a solution made by dissolving 25.0g of glucose, C 6 H 12 O 6 , in enough water to form 325.0mL of solution at 34.0 ∘ C ?.
3. A solution of water (K f =1.86 ∘ C/m ) and glucose freezes at − 2.75 ∘ C . What is the molal concentration of glucose in this solution? Assume that the freezing point of pure water is 0.00 ∘ C Express your answer to three significant figures and include the appropriate units.
4. A solution of water (K b =0.512 ∘ C/m ) and glucose boils at 102.06 ∘ C . What is the molal concentration of glucose in this solution? Assume that the boiling point of pure water is 100.00 ∘ C .Express your answer to three significant figures and include the appropriate units.
5. At a certain temperature, the solubility of N 2 gas in water at 3.08atm is 72.5mg of N 2 gas/100 g water . Calculate the solubility of N 2 gas in water, at the same temperature, if the partial pressure of N 2 gas over the solution is increased from 3.08atm to 8.00atm .Express your answer numerically to three significant figures.
6. - Consider the following reaction:

 

 If the rate of change of [A] at a given point in time is -1.0 M/s, what is the rate of change of [C] at that same point in time? Choose from:

|  |
| --- |
| -1.0 M/s |
| +0.67 M/s |
| +1.0 M/s |
| +1.3 M/s |
| -1.3 M/s |

1. Consider the rate law: rate = k [A]2 What will the units of k be for this rate law? Choose from: 1/s, M/s, 1/M2\*s, 1/M\*s, s/M
2. Identify the intermediate(s) in the following reaction mechanism:


3. Consider the following reaction:



If the reaction is at equilibrium, and then the I2(g) present at that point in time is removed, what will happen to the concentrations of H2(g) and HI(g)? Choose from:

|  |
| --- |
| H2(g) will increase; HI(g) will increase |
| H2(g) will decrease; HI(g) will decrease |
| H2(g) will decrease; HI(g) will increase |
| H2(g) will increase; HI(g) will decrease |
| The concentrations of H2(g) and HI(g) will remain unchanged |

1. The rate law for the reaction:

A + 2 B → C

is:

rate = k[A][B]

If k = 0.318/M\*s , and initial concentrations of reactants are: [A] = 0.50 M and [B] = 0.35 M, what will be the initial rate of this reaction?
2. Consider the following reaction:



Which of the species in the reaction are included in the equilibrium constant expression for the reaction? Choose from:

|  |
| --- |
| PbBr2(s) only |
| Pb2+(aq) only |
| Br-(aq) only |
| Pb2+(aq) and Br-(aq)  |
| PbBr2(s), Pb2+(aq) and Br-(aq)  |

1. The following reaction:

CH3CHO → CH4 + CO

Is first order with k = 0.0693 / min

If the initial CH3CHO concentration is 0.435 M, what will be the CH3CHO concentration after 37.0 minutes?
2. Which of the following statements best describes chemical equilibrium? Choose from:

|  |
| --- |
| The forward and reverse reactions have stopped/ |
| The concentration of products is greater than the concentration of reactants. |
| The rate of the forward reaction is equal to the rate of the reverse reaction. |
| The forward reaction has stopped, and the reverse reaction has commenced. |
| The concentrations of reactants and products are equal. |

1. Consider the following equilibrium:

N2O4 (g) ⇋ 2 NO2(g) Kc = 4.63 x 10-3 at 25 °C

A reaction vessel contains 0.2 M NO2 and 0.25 M N2O4. Which of the following statements is true?

|  |
| --- |
| Q = 0.16 and [NO2] increases |
| Q = 0.16 and [N2O4] increases |
| The reaction is at equilibrium |
| Q = 0.80 and [NO2] increases |
| Q = 6.25 and [N2O4] increases |

1. The following reaction:

H2 (g) + I2 (g) ⇋ 2 HI (g)

Has an equilibrium constant of 30.5 under certain conditions. If initial concentrations of reactants and product are: [H2] = 0.100 M; [I2] = 0.100 M; and [HI] = 0.250 M, what will be the equilibrium concentration of HI? Choose from:

|  |
| --- |
| 0.100 M |
| 0.040 M |
| 0.330 M |
| 0.450 M |
| 0.244 M |