Equilibrium Practice Test

1. Explain what is meant by the term "chemical equilibrium". (3 marks)

2. Sketch two concentration-time graphs: one for an irreversible reaction and one for a reversible reaction. Explain why they are different. (3 marks)

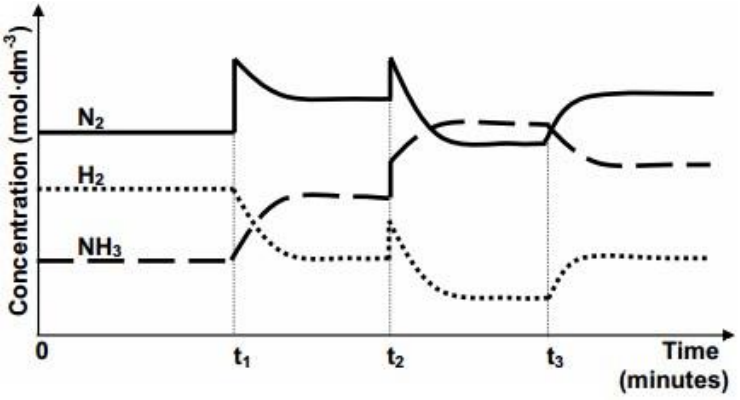
3. Explain why equilibrium cannot exist in an open system, using an example. (3 marks)

4. Determine which way the following reaction will shift. Write your response as "left" or "right". Show all work, if necessary. (5 marks)

$$A\ (s) + 2\ B\ (g) \rightleftharpoons C\ (g) + 2\ D\ (l) \qquad K_{eq} = 25.0;\ \Delta H = -85\ kJ$$

   a. The temperature is increased
   b. More of gas C is added to the system
   c. The pressure of the system is decreased
   d. An inert gas is added to the system, in a variable volume container.
   e. The system initially has 1.50 g of A, [B] = 0.24 M, [C] = 3.23 M and 1.17 L of D

5. Identify what stress is being put in the equilibrium system at t_1, t_2 and t_3, and how the system shifts to accommodate the stress. ($N_2\ (g) + 3\ H_2\ (g) \rightleftharpoons 2\ NH_3\ (g)$ + heat)



6. The following reaction is allowed to reach equilibrium in a closed vessel:

$$2\ X\ (g) + Y\ (g) \rightleftharpoons Z\ (g)$$

   A vessel initially contains 0.111 M of X and 0.325 M of Y.
   a. Write the equilibrium constant expression for this reaction. (2 marks)
   b. Create an ICE table for this reaction. (Do not solve!) (3 marks)

7. The following reaction is allowed to reach equilibrium in a closed vessel:

$$X\ (g) + 2\ Y\ (s) \rightleftharpoons Z\ (g) \qquad K_{eq} = 1.20$$

   A vessel is set up that originally contains 0.650 M of Z. What are the final concentrations of X and Z? (8 marks)

8. For the following reaction:

$$2NH_3\ (g) \leftrightharpoons N_2\ (g) + 3H_2\ (g),\ K_{eq} = 2.63 \times 10^{-9}$$

   Create an ICE table for the reaction given the initial concentrations: (7 marks)
   $[NH_3] = 2.78$ M $\qquad [N_2] = 1.24$ M $\qquad [H_2] = 0.179$ M
   Do not solve!