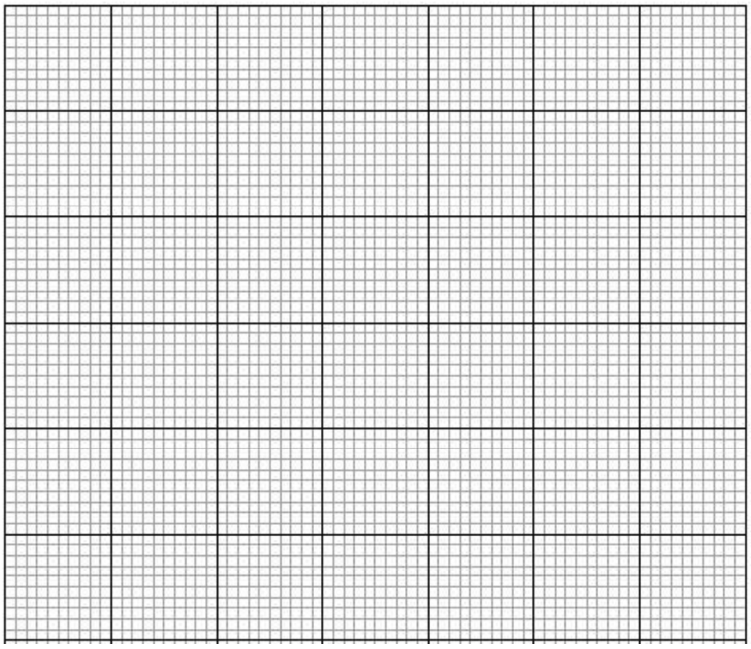
Chemical Equilibrium - A Graphing Activity

Name: _____ Slot: ____

A chemist was studying the decomposition of methanol, CH_3OH at a high temperature. She placed 1.0 mol of methanol into a 5.0-L flask and allowed it to decompose for 30 min at the high temperature. After 20 min, the concentration of CH_3OH had fallen to 0.050-M where it remained for the remainder of the experiment.

$$CH_3OH\ (g) \leftrightarrows CO\ (g) + 2\ H_2\ (g)$$

1. Sketch a **concentration vs time** graph that would accurately reflect the data from the experiment above. Show how the concentrations of all three species in the reaction would have changed over the 30 min interval.



2. Write the **equilibrium (Kc) expression** for the reaction.

3. Based on the information from your graph above, **calculate Kc** at the temperature for the experiment.

4. The same reaction has been **balanced in different ways below**. Write the Kc expression for each reaction and calculate its value using the information from the graph.

   a. $2\ CH_3OH\ (g) \leftrightarrows 2\ CO\ (g) + 4\ H_2\ (g)$

   When a chemical equation is **multiplied by a number**,

   b. $CO\ (g) + 2\ H_2\ (g) \leftrightarrows CH_3OH\ (g)$

   When a chemical equation is **reversed**, take the _____ of the Kc.

5. Is this an example of **homogeneous** equilibrium or **heterogeneous** equilibrium? Explain.

6. Roughly sketch a **<u>rate</u> vs time** graph showing the rates of the forward and reverse reactions over the 30-min interval.