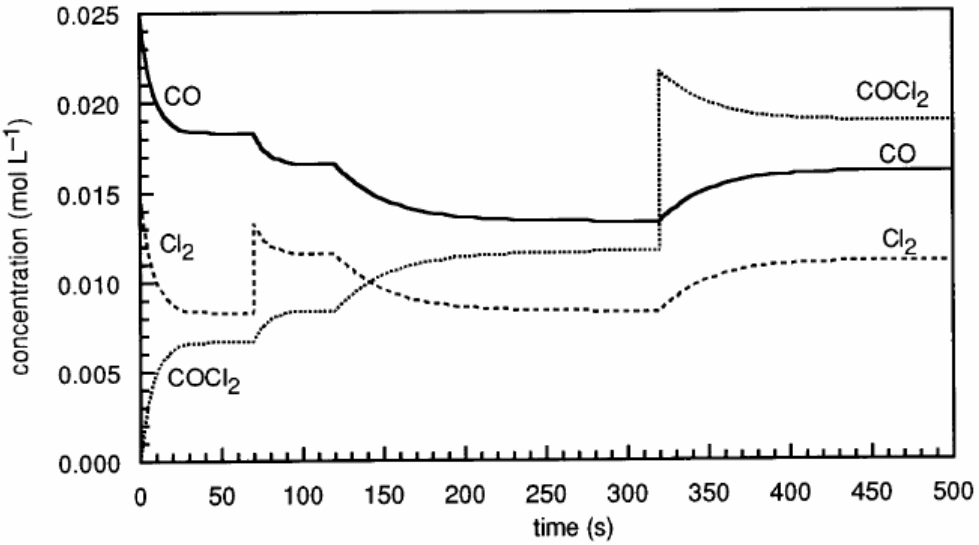
Appendix13: Grade 12 Chemistry (C12-4-08)



The above graph shows concentration versus time for a system containing carbon monoxide (CO) dichlorine (Cl_2) and phosgene ($COCl_2$). (Bodenstein and Plaut studied this system (*Z. physik. Chemie*, 1924, **110**, 399–416).)

1. Write a balanced equation to represent the reaction studied.
2. How much time was required for the system to reach equilibrium?
3. Calculate an approximate value for the equilibrium constant K_c using the concentrations at time t = 60 s.
4. Explain the changes 70 s after the initiation of the reaction.
5. What changes in conditions might have been imposed on the system 120 s after the initiation of the reaction?
6. Are any events taking place between the interval 50 s and 70 s? between 280 s and 300 s? Explain your answers.
7. What changes may have taken place at t = 320 s?
8. What differences would you have noticed if a catalyst had been present during the entire course of this reaction?
9. List the changes you might impose on this system if you wanted to produce a maximum amount of phosgene ($COCl_2$)?
10. How could you account for the differences in the value calculated for the equilibrium constant K_c from the concentrations at different time points on the graph?