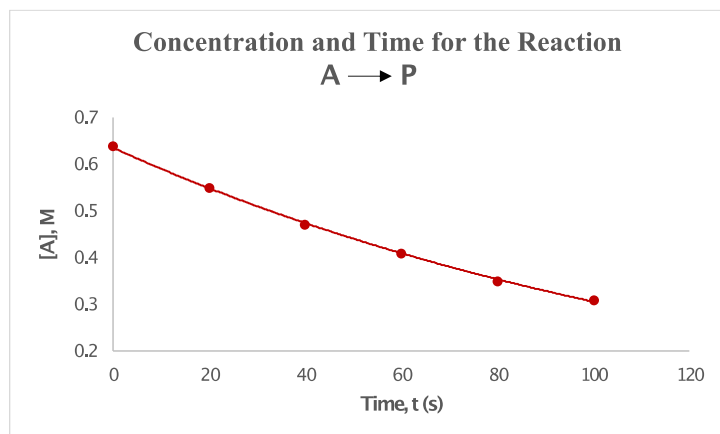


Reaction Rates

1. Consider the following plot.



Time, t (s)	[A], M
0	0.64
20	0.55
40	0.47
60	0.41
80	0.35
100	0.31

a) Calculate the rate of reaction from 20 to 80 seconds.

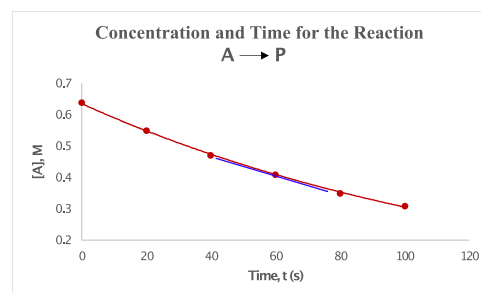
$$\frac{0.35 \text{ M} - 0.55 \text{ M}}{80 \text{ s} - 20 \text{ s}} = \mathbf{0.0033 \text{ M/s}}$$

b) Calculate the rate of reaction from 0 to 100 seconds.

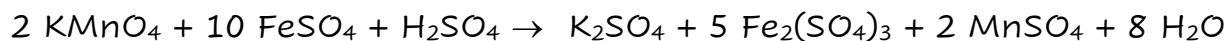
$$\frac{0.31 \text{ M} - 0.64 \text{ M}}{100 \text{ s} - 0 \text{ s}} = \mathbf{0.0033 \text{ M/s}}$$

c) What is the instantaneous rate at 60 seconds? Draw a tangent line at 60 s. The slope of this line is the rate.

$$m = \frac{0.4 \text{ M} - 0.48 \text{ M}}{60 \text{ s} - 40 \text{ s}} = \mathbf{0.004 \text{ M/s}}$$



2. Write the rate expression in terms of reactants and products for the following reaction. What is the rate of appearance of MnSO_4 if the rate of disappearance of FeSO_4 is 0.41 M/s ?



$$-\frac{\Delta[\text{KMnO}_4]}{2\Delta t} = -\frac{\Delta[\text{FeSO}_4]}{10\Delta t} = -\frac{\Delta[\text{H}_2\text{SO}_4]}{\Delta t} = \frac{\Delta[\text{K}_2\text{SO}_4]}{\Delta t} = \frac{\Delta[\text{Fe}_2(\text{SO}_4)_3]}{5\Delta t} = \frac{\Delta[\text{MnSO}_4]}{2\Delta t} = \frac{\Delta[\text{H}_2\text{O}]}{8\Delta t}$$

$$\frac{\Delta[\text{MnSO}_4]}{2\Delta t} = -\frac{\Delta[\text{FeSO}_4]}{10\Delta t}$$

$$\frac{\Delta[\text{MnSO}_4]}{\Delta t} = \frac{2 \times 0.41 \text{ M}}{10} = \mathbf{0.082 \text{ M/s}}$$