Instantaneous Rate

the chemical rxn rate at a given time

rate = slope of the line tangent to the curve at the given time

Calculate the instantaneous rate for the reactant at 100 s.

$$-\frac{0.0026\ M}{110\ s} = -2.4 \times 10^{-5}\ M/s$$

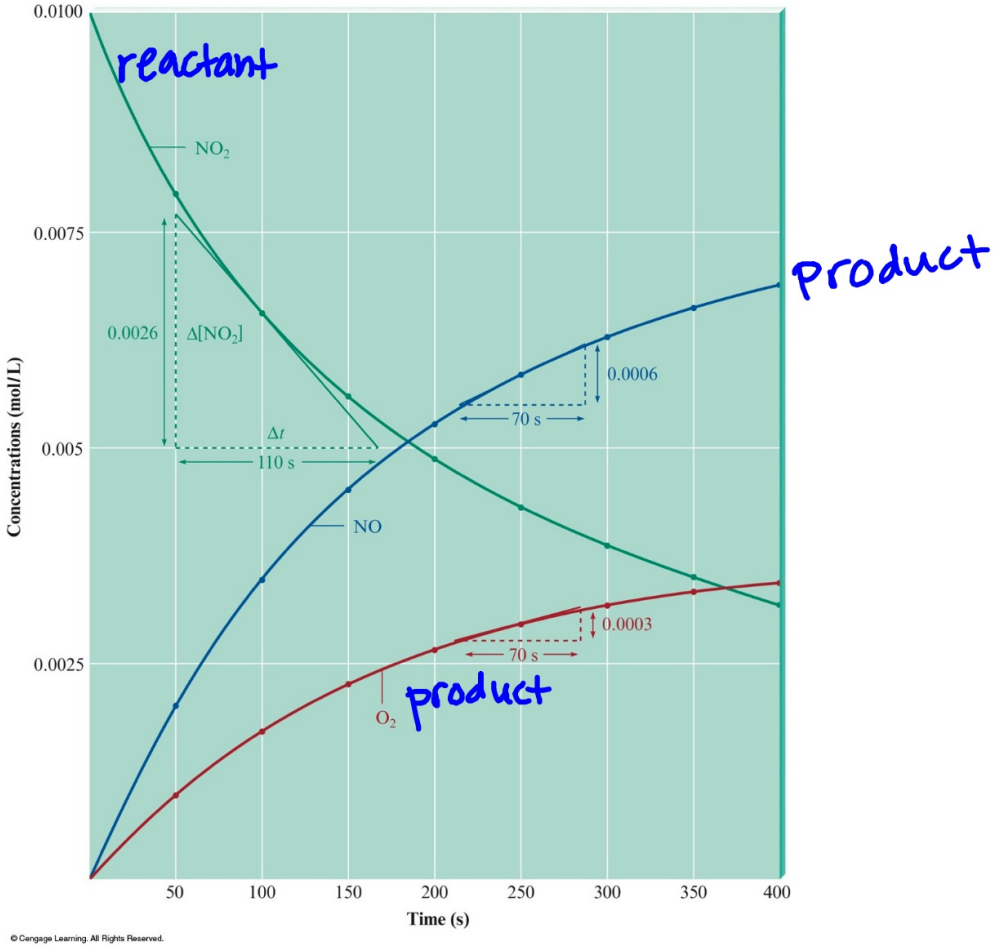
negative slope

Calculate the instantaneous rate of formation of NO at 250 s.

$$\frac{0.0006\ M}{70\ s} = 9 \times 10^{-6}\ M/s$$

Calculate the instantaneous rate of formation of O_2 at 250 s.

$$\frac{0.0003\ M}{70\ s} = 4 \times 10^{-6}\ M/s$$



Relative Rates (Stoichiometric Relationship)

put "1" over the coefficient for each species.
put a negative sign for all reactants
put a positive sign for all products.

Write the relative rates of change in concentration of the reactants and products of each reaction below.

a) $2\ NO_2(g) \rightarrow O_2(g) + 2\ NO(g)$

$$-\frac{1}{2}\frac{\Delta[NO_2]}{\Delta t} = +\frac{1}{1}\frac{\Delta[O_2]}{\Delta t} = +\frac{1}{2}\frac{\Delta[NO]}{\Delta t}$$

b) $4\ PH_3(g) \rightarrow P_4(g) + 6\ H_2(g)$

$$-\frac{1}{4}\frac{\Delta[PH_3]}{\Delta t} = +\frac{1}{1}\frac{\Delta[P_4]}{\Delta t} = +\frac{1}{6}\frac{\Delta[H_2]}{\Delta t}$$

c) $2\ NOCl(g) \rightarrow 2\ NO(g) + Cl_2(g)$

$$-\frac{1}{2}\frac{\Delta[NOCl]}{\Delta t} = +\frac{1}{2}\frac{\Delta[NO]}{\Delta t} = +\frac{1}{1}\frac{\Delta[Cl_2]}{\Delta t}$$