Quiz 12.4 – Reaction Mechanisms and Catalysis

Name: _____

Question 1

Consider the decomposition of ozone: $2\,O_3(g) \longrightarrow 3\,O_2(g)$ $\quad \Delta H_{rxn} = -185.4\,\frac{kJ}{mol}$

With the following proposed mechanism:

$O_3(g) \rightleftharpoons O_2(g) + O(g)$ FAST

$O(g) + O_3(g) \longrightarrow 2\,O_2(g)$ SLOW

- Does this mechanism add up to the total overall reaction?
- Identify any catalysts or intermediates in this mechansm:
- Give the molecularity and the rate law for each elementary step (including the reverse reaction in step 1):
- Give the predicted overall rate law for this mechanism:
- Draw a plausible reaction coordinate diagram for this reaction

Question 2

Enzymes are biomolecules which catalyze the reaction of a substrate to form products: $S \longrightarrow P$

Enzymes often follow the *Michaelis-Menton* reaction mechanism:

$E + S \rightleftharpoons ES$ FAST

$ES \longrightarrow E + P$ SLOW

Answer the same questions above for the Michaelis-Menton mechanism

七步詩 (*The Quatrain of Seven Steps*)

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煮豆燃豆萁
漉菽以爲汁
萁在釜下燃
豆在釜中泣
本是同根生
相煎何太急

People burn the beanstalk to boil beans,
filtering them to extract juice.
The beanstalks were burnt under the cauldron,
and the beans in the cauldron wailed:
“We were originally grown from the same root;
Why should we hound each other to death with such impatience?”