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Questions for Sanford, M. S.; Love, J. A.; Grubbs, R. H. *J. Am. Chem. Soc.* **2001**, *123*, 6543-6554 (doi: 10.1021/ja010624k).

1. Define olefin metathesis and the practical value of this process. Sketch a picture of the ruthenacyclobutane intermediate (you may want to access the images in Ref. 4a) and explain why this intermediate is important for olefin metathesis.
2. Determine the electron counts of the starting material and the intermediates A and B in Scheme 1. Predict the likely mechanism in Scheme 1, based solely on electron counts, ignoring the discussion in the paper.
3. Review metal-carbene bonding and define the  $=CHR^1$  ligands as either Fischer-like or Schrock-like carbenes. You can use outside sources. How did this affect your electron counting?
4. Discuss what techniques were used for this kinetic investigation. Why were they well-suited for this research?
5. The Authors studied the kinetics of phosphine exchange as a surrogate for the olefin metathesis reaction. Are the kinetics of phosphine exchange consistent with a  $I_a$  or  $I_d$  mechanism? Cite evidence from the paper.
6. The Authors indicate that a Dissociative mechanism is what happens in both phosphine exchange and olefin metathesis. What key pieces of kinetic evidence best support this mechanism?
7. Does the substitution of a  $PR_3$  ligand with an NHC ligand speed up or slow down phosphine exchange? Was this expected or not (refer back to the Introduction in which Ref. 6 is discussed)?
8. What factors affect the rate of olefin metathesis and how? Identify at least four possible factors. It's OK to speculate as long as you provide evidence cited in the paper.
9. What is the best olefin metathesis catalyst for ring-opening polymerization (ROMP) of cyclooctadiene of the ones discussed in this paper and why? What is the worst ROMP catalyst?