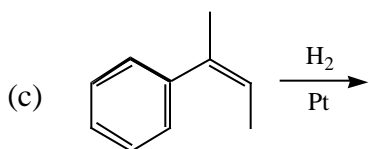
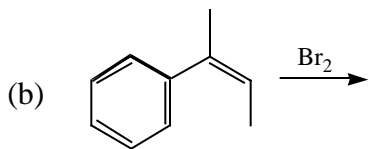
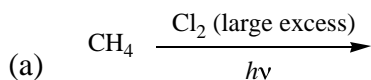


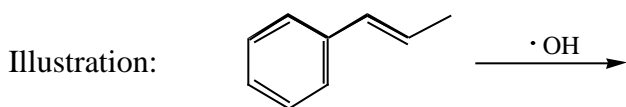
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1. (9 points) Suggest the organic product(s) for each reaction. Pay careful attention to stereochemistry. If more than one product is formed, indicate which product is major, if possible. If no reaction occurs write "NR." Do not include any mechanism details.

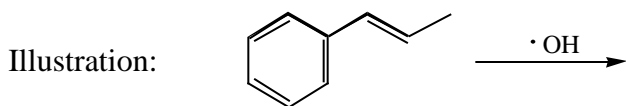


2. (9 points) In any reaction mechanism, a radical can only undergo three different mechanism fates. These fates were discussed in lecture. Name these three fates, and illustrate each using 1-phenylpropene and hydroxyl radical (shown below) as the only reactants in each case. If more than one product is possible for a given fate, show only the most likely product. Include curved arrows for each fate. *Hint: One of the fates is not initiation.*

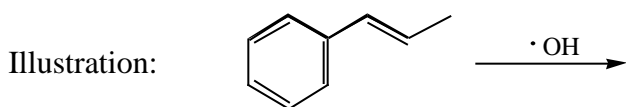
Name of radical mechanism fate #1: \_\_\_\_\_



Name of radical mechanism fate #2: \_\_\_\_\_



Name of radical mechanism fate #3: \_\_\_\_\_



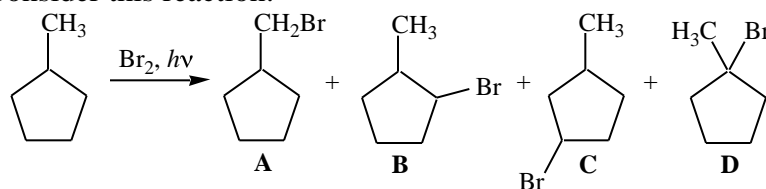
3. (5 points) Consider this radical:  $\text{H}_3\text{C}-\text{O}-\dot{\text{C}}\text{H}_2$

(a) Does this radical have resonance stabilization (circle one): Yes    No

(b) Very briefly explain with words or a clear drawing.

4. (3 points) Draw all significant resonance contributors of a secondary radical that has resonance stabilization due to interaction with an alkyne.

5. (13 points) Consider this reaction:



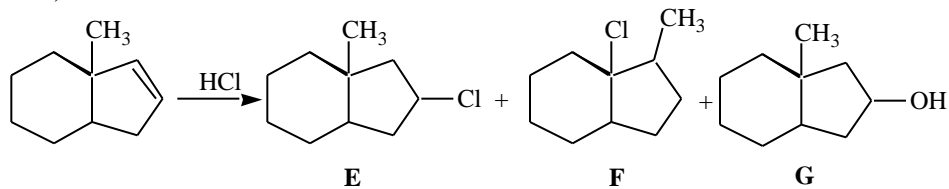
(a) The major product of this reaction is (circle one): **A**    **B**    **C**    **D**

(b) Provide a complete mechanism for the formation of the major product.

(c) Briefly explain your choice of major product.

(d) Draw the structure of a possible reaction product that is *not shown* above.

6. (18 points) Consider this reaction:

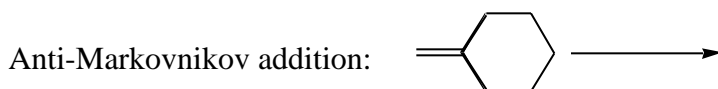


(a) Provide a mechanism for the formation of products **E** and **F**. Write “rds” above the reaction arrow for the rate-determining step.

(b) The major product(s) of this reaction are (circle one, or more than one if roughly equal amounts are formed): **E F G**

(c) Explain your choice of major product(s).

7. (4 points) Using the alkene shown below, give unambiguous examples of both Markovnikov and anti-Markovnikov addition of water. Include all reactants and products, but do not include any mechanism details.





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11. (8 points) Provide unambiguous examples that clearly illustrate each concept. If you write a reaction, include all reactants and products, but mechanisms are not necessary.

(a) A cycloaddition reaction.

(b) An anti addition reaction.

(c) An addition to a C-C bond that does not involve an electrophile.

(d) The "peroxide effect."

12. (7 points) By this point in your study of organic chemistry, you should have developed some sense of how reactions occur. Thus you should be able to suggest a logical mechanism for some reactions you have never seen before. Suggest a reasonable mechanism for this reaction, called the Friedel-Crafts alkylation. During World War II, reactions like this were used to produce alkylated arenes, critical components of airplane fuel.

