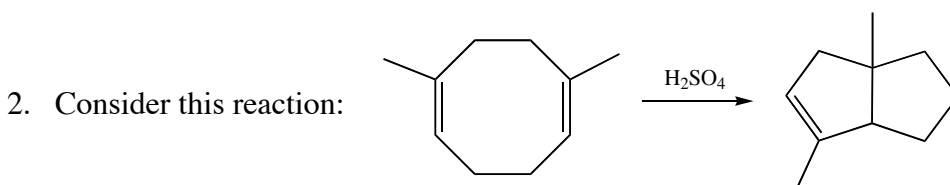
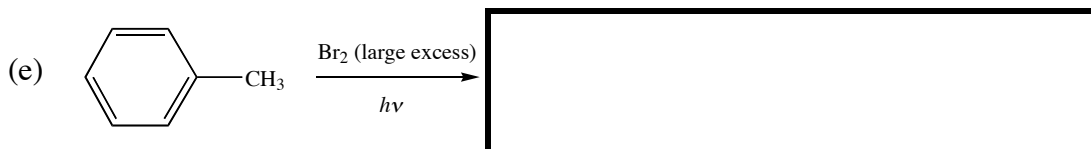
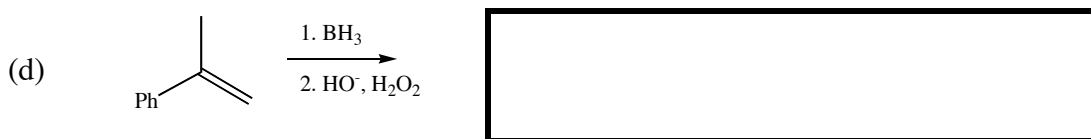
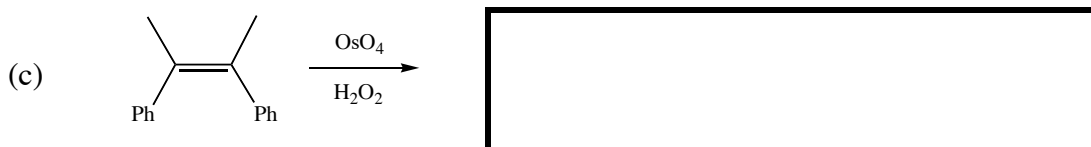
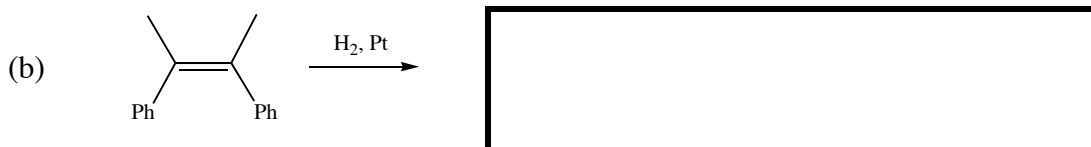
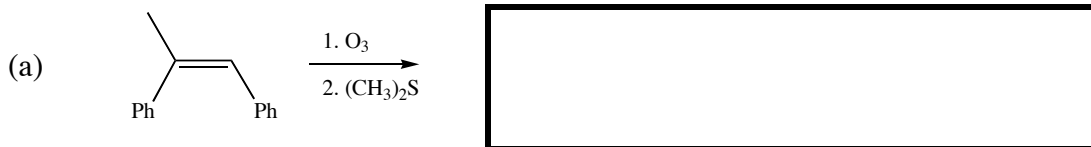
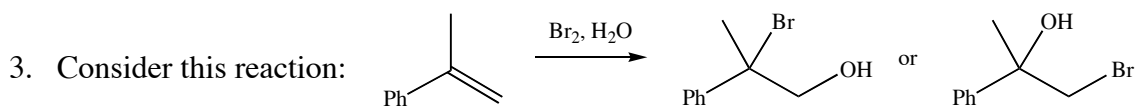


1. (15 points) Write the organic product(s) in the boxes. If more than one organic product is formed, indicate which product is major. Be sure to indicate stereochemistry if relevant. If no reaction occurs, write "NR." *Do not include any mechanism details.*



- (a) (6 points) Provide a mechanism for this reaction.

- (b) (3 points) Finish this statement in 20 words or less: This reaction does not occur in pure water (no H₂SO₄) because...

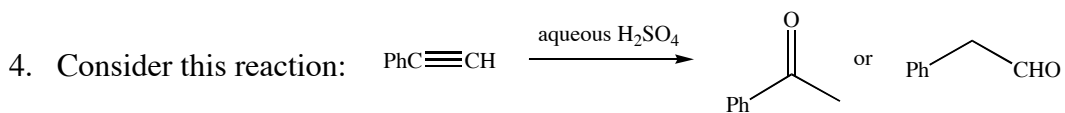


(a) (1 point) Circle the major product.

(b) (6 points) Provide a mechanism for the formation of the major product.

(c) (6 points) Briefly explain (2-3 sentences) your choice of major product.

(d) (1 point) The cation involved in this reaction mechanism that includes bromine in a ring is called a(n) _____.



(a) (1 point) Circle the major product.

(b) (10 points) Provide a mechanism for the formation of the major product.

(c) (3 points) Finish this statement in 20 words or less: This is the major product because...

5. (15 points) Write a reaction to clearly illustrate each concept. The reactions must include all reactants and products, but do not include any mechanism details.

(a) Syn addition.

(b) Anti-Markovnikov addition to form an alcohol.

(c) Oxidation of an alkene.

(d) Oxymercuration to form a tertiary alcohol.


(e) Reduction of an alkyne to give a *cis*-alkene.

6. (2 points) Finish this sentence in ten words or less: BH_3 is electrophilic because...

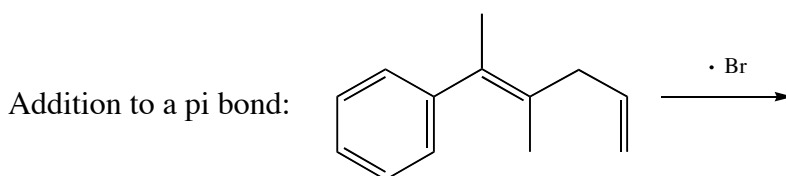
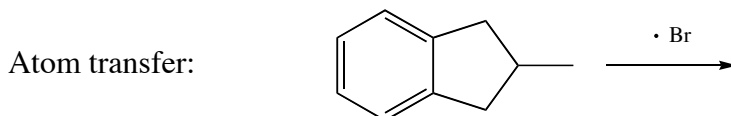
7. (6 points) Circle the appropriate response.

(a) Hybridization of carbon in a methyl radical: sp^3 sp^2 sp Not hybridized

(b) Most stable radical: $\dot{\text{C}}\text{H}_3$ $\dot{\text{C}}\text{H}_2\text{CH}_2\text{CH}_3$ $\dot{\text{C}}\text{H}_3\text{CHCH}_3$ $(\text{CH}_3)_3\dot{\text{C}}$

(c) Most stable radical:  $(\text{CH}_3)_2\text{N}-\dot{\text{C}}\text{H}-\text{N}(\text{CH}_3)_2$

8. (5 points) Like carbocations, radicals have a limited number of mechanism fates. Finish the radical fate illustrations given below with the appropriate curved arrows and mechanism step products. If the fate may be completed in more than one way select the most likely pathway. Each answer should not extend beyond a single mechanism step.



The name of the third common radical fate not given above is _____.

9. (6 points) List one *significant* difference and two *significant* similarities between carbocations and radicals. Avoid trivialities such as “both can have carbon.” Less significant answers may receive less credit.

Difference:

Similarity:

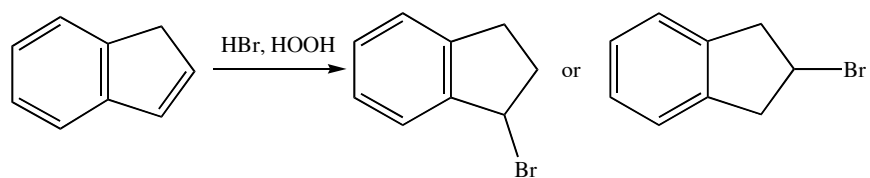
Similarity:

10. (4 points) Finish each statement in ten words or less.

(a) The radical phenomenon that allows a small amount of a chlorofluorocarbon to convert many moles of ozone into dioxygen (O_2) is

(b) In cells, antioxidants protect against damage from a molecule called....

11. Consider this reaction:



(a) (1 point) Circle the major product.

(b) (9 points) Write the best mechanism for the formation of the major product.