

**Statistics:**

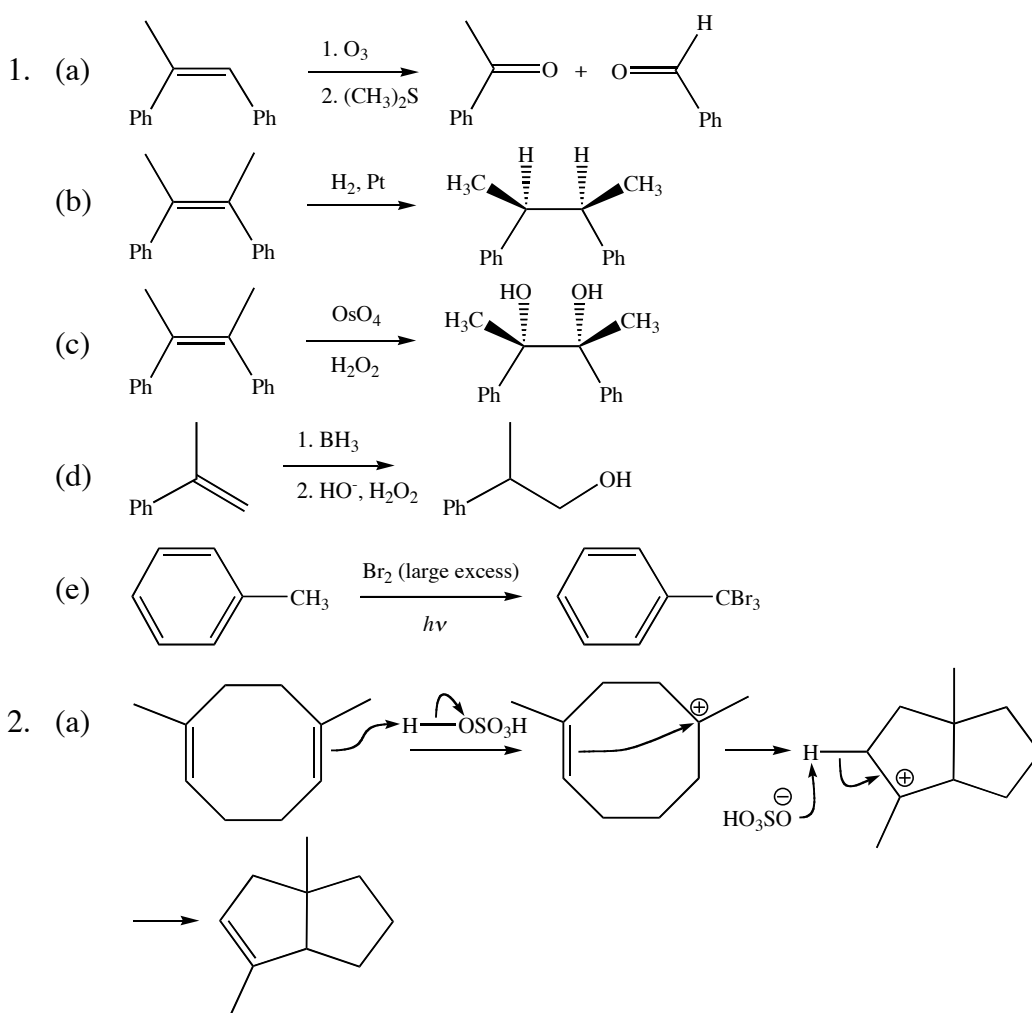
High score = 96 Average = 62.2 Low score = 06

Standard Deviation = Irrelevant as it does not control grade distribution in this class.

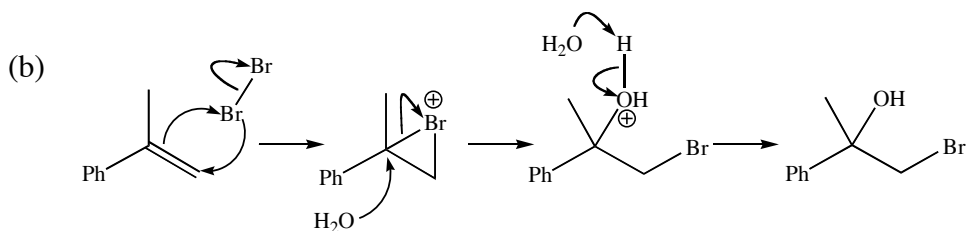
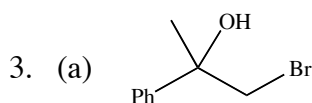
Final exams will be mailed back, or can be collected at Dr H's office, only after the average is posted here.

A note about exam keys: The answers presented here are usually significantly longer than expected from a student taking the exam. An exam key serves not only to reveal what was expected, but to instruct you as well.

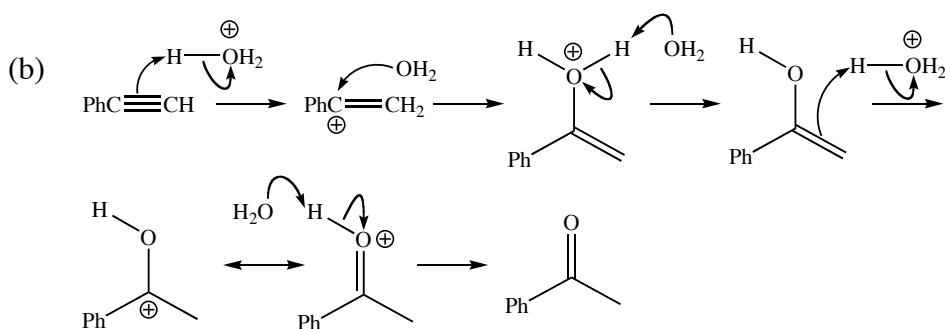
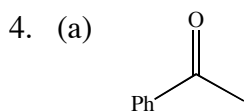
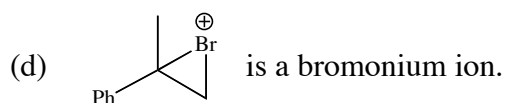
To see the final course grade cutoffs, consult the grading scale on the Chem 30A course web page.



(b) The reaction does not occur in pure water (not  $\text{H}_2\text{SO}_4$ ) because protonation of an alkene to form a carbocation requires a very strong acid such as  $\text{H}_2\text{SO}_4$  or  $\text{H}_3\text{O}^+$ .

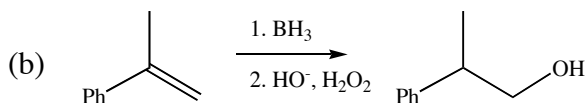
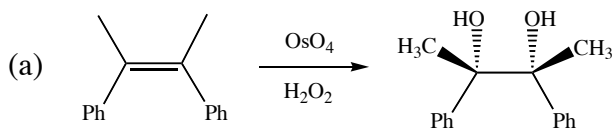


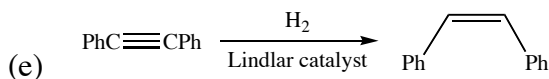
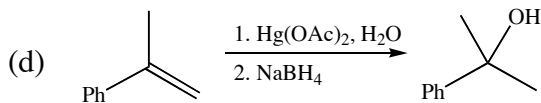
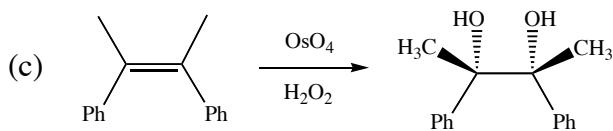
(c) This product is formed when water attacks the bromonium ion carbon that bears the greatest  $\delta^+$  charge.



(c) This is the major product because **its carbocation precursor (secondary vinylic with resonance) is more stable than the aldehyde's carbocation precursor (primary vinylic without resonance).**

5. Many answers are acceptable as long as they clearly illustrate the concept in question, and are complete and accurate.

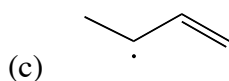




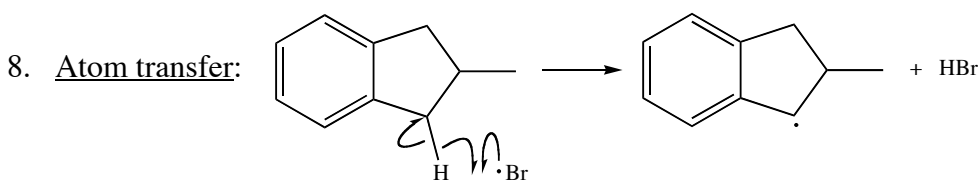
6.  $\text{BH}_3$  is electrophilic because **boron has an open octet**.

7. (a)  $sp^2$

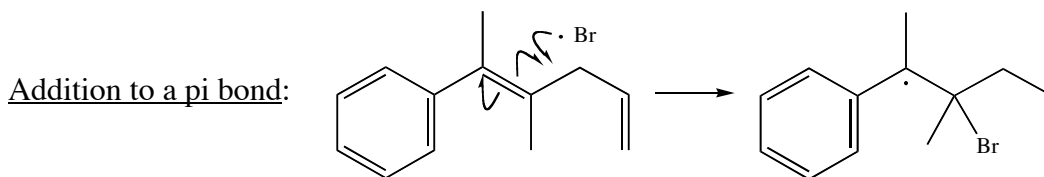
(b)  $(\text{CH}_3)_3\text{C} \cdot$



*Remember that radical do not get resonance stabilization from adjacent lone pairs!*



*The most stable radical (secondary with resonance) is formed.*



*The most stable radical (tertiary with resonance) is formed.*

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

9. There are many possible answers, as long as the differences and similarities are clear and significant. Here are some examples.

Difference: A radical is one electron short of a full octet whereas a carbocation is two electrons short.

Similarity: Both involve electron-deficient carbons.

Similarity: Both are stabilized by alkyl groups.

10. (a) The radical phenomenon that allows a small amount of a chlorofluorocarbon to convert many moles of ozone into dioxygen is **chain reactions**.

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

