Organic Chemistry
Jasperse

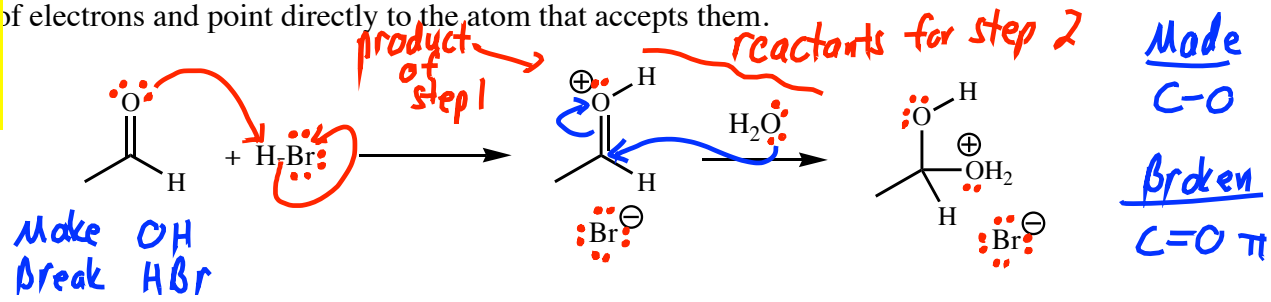
Mechanisms Practice. See Page 3 for a summary of mechanisms principles.

Arrow-Pushing Practice, Page 1:

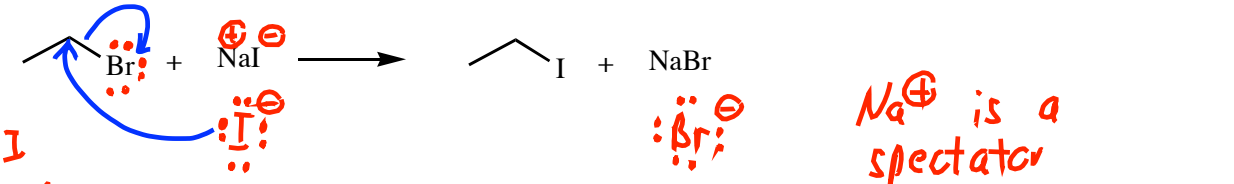
- Draw arrows for each of the steps in the following reactions.
- I won't require this on tests, but you may find it useful to include all lone-pairs on atoms that react.
- I won't require this on tests, but you may find it useful to draw in all hydrogens on atoms that react. (It is not useful to draw in all H's on atoms that don't react.)
- Remember that arrows track the movement of electrons, so an arrow should go from the source of electrons and point directly to the atom that accepts them.

Watch for:
Changes in:
1. Bonds
2. Lone Pairs
3. Formal Charge

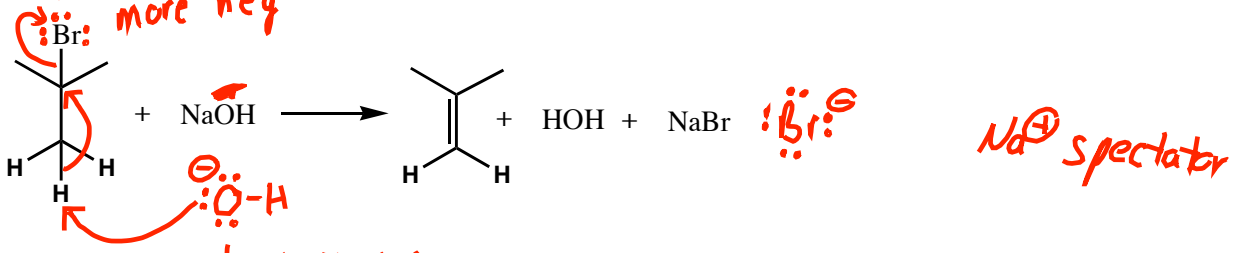
1.



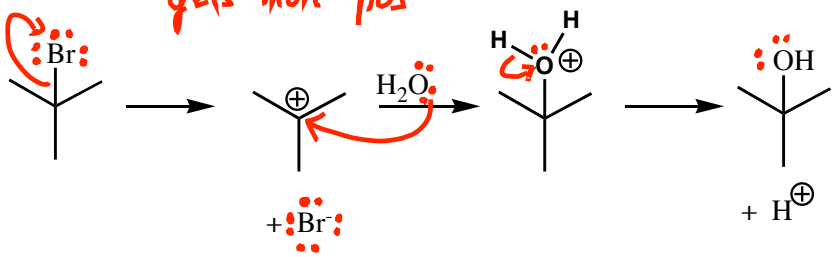
2. S_N2



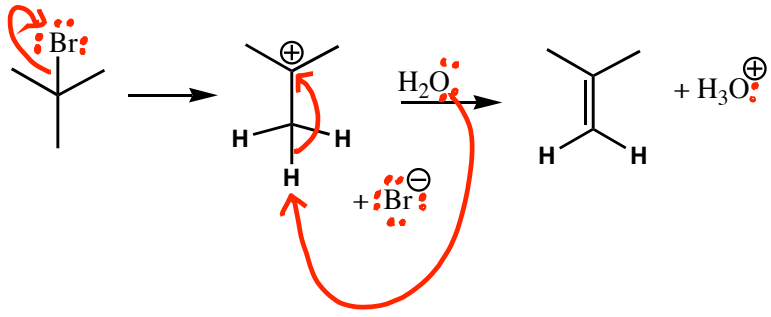
3. E2



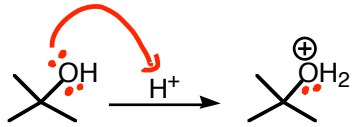
4. S_N1

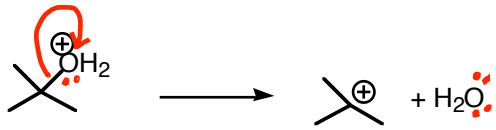


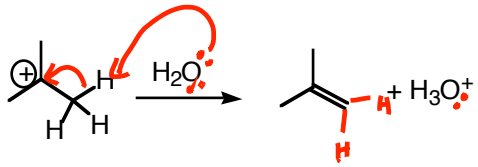
5. E1

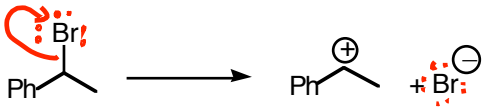


Page 2: Draw the arrow(s) for each of these steps.

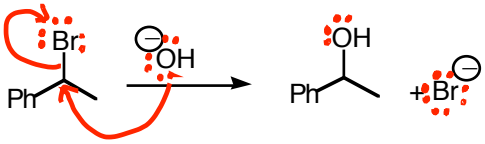
1. 

2. 

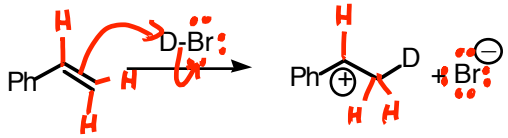
3. 

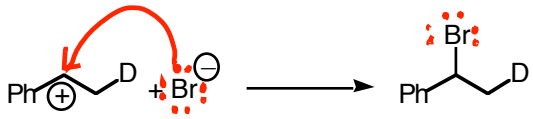
4. 

SN1/E1 Mech step (Test 2)

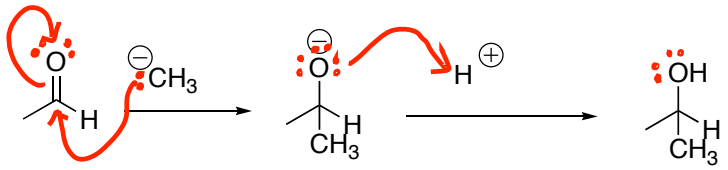
5. 

SN2 Mech (Test 2)

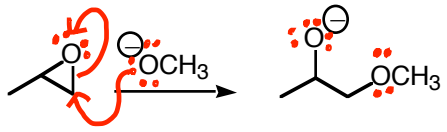
6. 

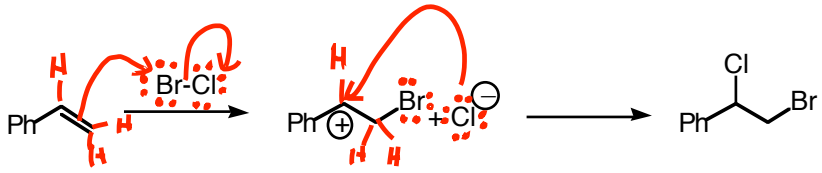
7. 

Test 3 HX addn to alkenes

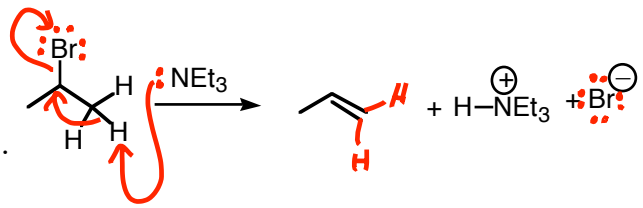
8. 

Organic 2 Test 1

9. 

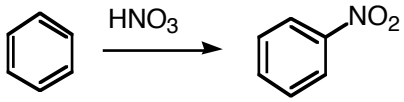
10. 

Test 3

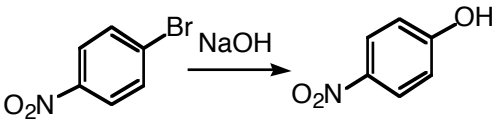
11. 

Test 3

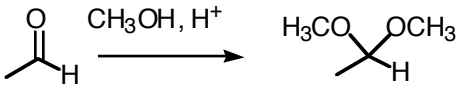
For each of the following reactions, write whether the mechanism would be radical, cationic, or anionic?

1. 

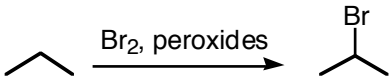
Cationic (The H+ is the active ion. Nitrate does nothing.)

2. 

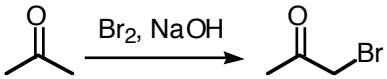
Anionic. The hydroxide is the active ion, sodium cation is spectator.

3. 

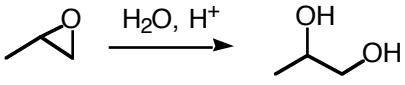
Cationic. H+

4. 

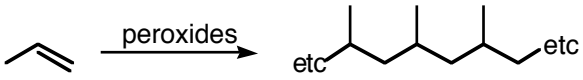
Radical. Peroxides or hv is clue.

5. 

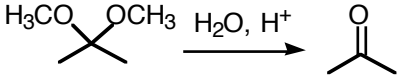
Anionic. The hydroxide is the active ion, sodium cation is spectator. Br2 without hv or peroxides does NOT by itself cause radical chemistry.

6. 

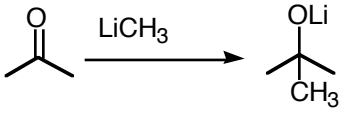
Cationic. H+

7. 

Radical. Peroxides is clue.

8. 

Cationic

9. 

Anionic. CH3 anion is active, highly unstable anion. Lithium cation is a metal cation, which serves as a do-nothing spectator.

Some Arrow-Pushing Guidelines

1. Arrows follow electron movement.

2. Some rules for the appearance of arrows
   - The arrow must begin from the electron source. There are two sources:
     a. An atom (which must have a lone pair to give)
     b. A bond pair (an old bond that breaks)
   - An arrow must always point directly to an atom, because when electrons move, they always go to some new atom.

3. Ignore any Spectator Atoms. Any metal atom is always a "spectator"
   - When you have a metal spectator atom, realize that the non-metal next to it must have negative charge

4. Draw all H's on any Atom Whose Bonding Changes

5. Draw all lone-pairs on any Atom whose bonding changes

6. **KEY ON BOND CHANGES**. Any two-electron bond that changes (either made or broken) must have an arrow to illustrate:
   - where it came from (new bond made) or
   - an arrow showing where it goes to (old bond broken)

7. **Watch for Formal Charges and Changes in Formal Charge**
   - If an atom's charge gets more positive ⇒ it's donating/losing an electron pair ⇒ arrow must emanate from that atom or one of it's associated bonds. There are two "more positive" transactions:
     - When an anion becomes neutral. In this case, an arrow will emanate from the atom. The atom has donated a lone pair which becomes a bond pair.
     - When a neutral atom becomes cationic. In this case, the atom will be losing a bond pair, so the arrow should emanate from the bond rather than from the atom.

   3 types
   ① more pos (source)

   - If an atom's charge gets more negative ⇒ it's accepting an electron pair ⇒ an arrow must point to that atom. Ordinarily the arrow will have started from a bond and will point to the atom.

   ② more neg (acceptor)

8. **When bonds change, but Formal Charge Doesn't Change, A "Substitution" is Involved**
   - Often an atom gives up an old bond and replaces it with a new bond. This is "substitution".
   - In this case, there will be an incoming arrow pointing directly at the atom (to illustrate formation of the new bond), and an outgoing arrow emanating from the old bond that breaks

   ③ subst.