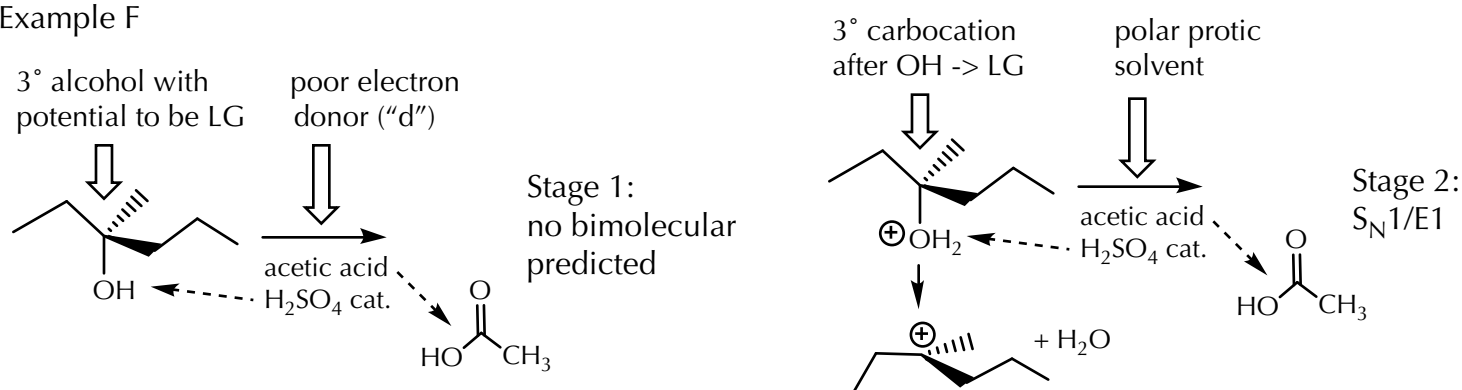


Example F



i. Is there (or is there the potential for) an sp³ carbon-leaving group?

| | | |
|-----|-----------------------|----|
| yes | yes, potential | no |
|-----|-----------------------|----|

ii. If so, what is the structural category for the carbon atom?

| | | | |
|---------|----|----------|------------------------|
| 1° | 2° | 3° | heteroatom-substituted |
| allylic | | benzylic | propargylic |

iii. If there is a Lewis base, what is its classification?

| | | | |
|---|---|---|---|
| anion, conj. acid pK _a < 15 uncharged sp ³ N, S, or P | anion, conj. acid pK _a 15-30 | conj. acid pK _a > 30, hindered base conj. acid pK _a > 10 | poor electron donor (not in the other categories) |
|---|---|---|---|

iv. Is a bimolecular reaction predicted? If so, which one?

| | | |
|------------------|----|----------------|
| S _N 2 | E2 | no bimolecular |
|------------------|----|----------------|

v. If no bimolecular, then is there:

| | |
|---------------------------|---------------|
| good carbocation possible | polar solvent |
|---------------------------|---------------|

vi. Is S_N1/E1 predicted?

| | |
|-----|----|
| yes | no |
|-----|----|

| | category a good e donor weak base | category b good e donor moderate base | category c good e donor strong base | category d poor e donor weak base |
|------------------------------------|---|--|--|--|
| sp ³ C-LG Lewis base | anion, c.a. pK _a < 15 uncharged sp ³ N/S/P | anion, c.a. pK _a ~15-30 | c.a. pK _a > 30 hindered: c.a. pK _a > 10 | |
| 1°C | S _N 2 | S _N 2 | E2 (no β-H: S _N 2) | no bimolecular predicted |
| 2°C | S _N 2 | E2 (no β-H: S _N 2) | E2 (β-H) | |
| 3°C | no S _N 2; no E2 | E2 (β-H) | E2 (β-H) | |

Example F:

- There is an sp³ C with the possibility of a leaving group attached to it because the hydroxyl group is in the presence of a strong acid (H₂SO₄), and that could give the protonated hydroxyl group; and there is a Lewis basic partner (acetic acid).
- The carbon atom with the leaving group on it is tertiary (3°).
- The Lewis base (acetic acid) is not an anion, and its conjugate acid has a pK_a value of about -5; this places **acetic acid** in the category of being a poor electron donor that is also a poor base for substitution and elimination reactions.