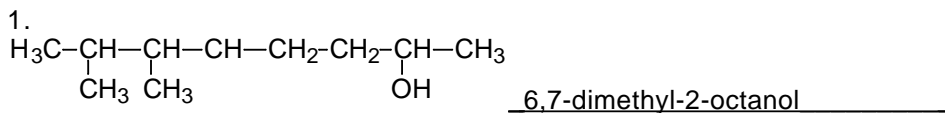
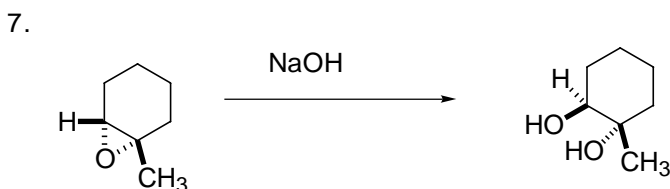
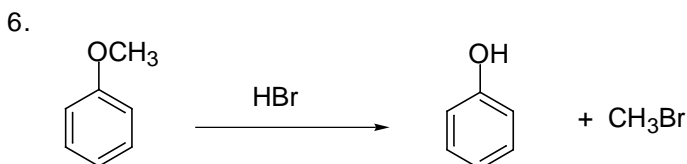
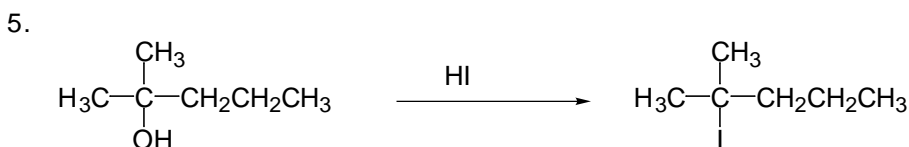
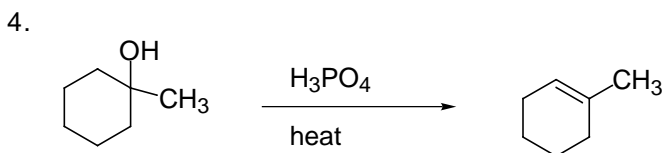
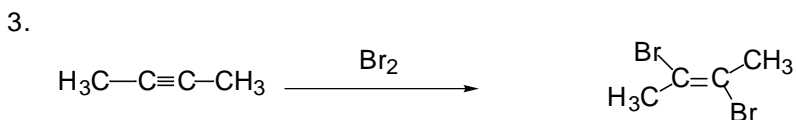


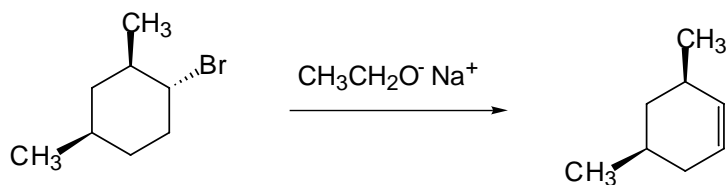
- I. Nomenclature (3 points each) Give the IUPAC name for the following compounds: Indicate R, S, cis, trans, E, or Z where appropriate.



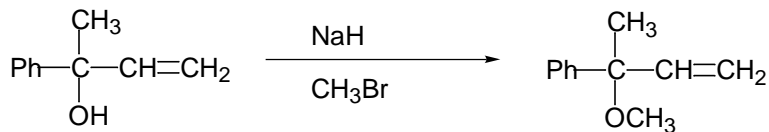
- II. Reactions: Predict the major organic product of the following reactions. If more than one product is formed give both and indicate the **major** product. Indicate stereochemistry where necessary. (4 points each)



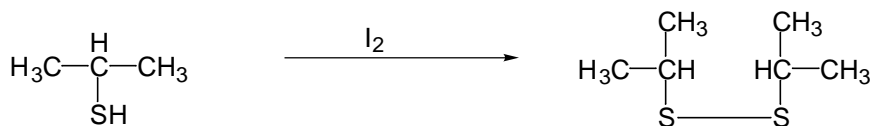
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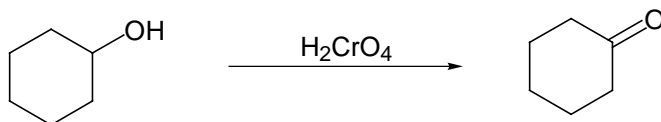
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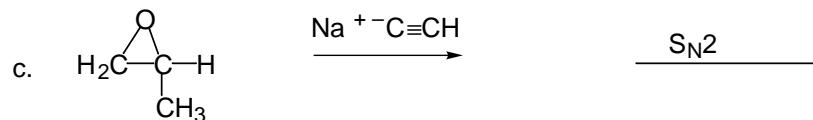
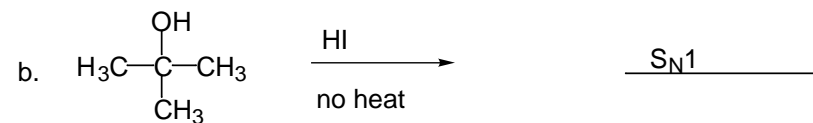
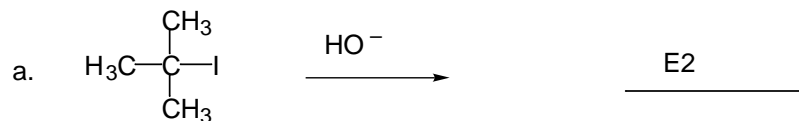
10.



11.



12. Indicate whether the following reactions are more likely to proceed by an E1, E2, SN1 or SN2 mechanism. (2 points each)



II. Multiple Choice: Place the letter in the blank and Circle the best answer (**only one**). (3 points each)

D 13. What functional group would be associated with an IR stretch at 1735 cm^{-1} .

- a. hydroxyl
- b. amine
- c. hydrocarbon
- d. carbonyl group

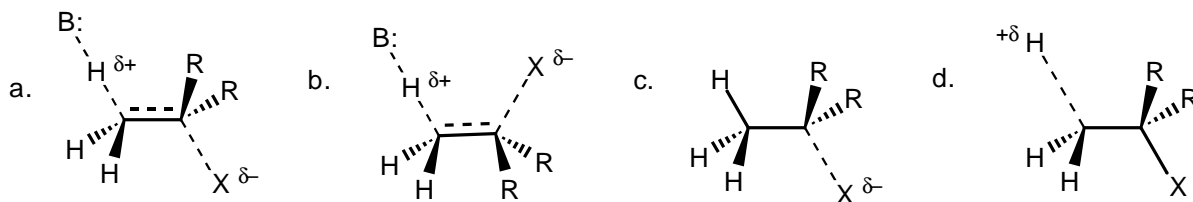
_C_14. Absorbption of infrared light results in

- a. spin inversion of a hydrogen nucleus
- b. promotion of an electron to a higher energy orbital
- c. increased stretching or bending vibrations.
- d. expulsion of a high energy photon

_B_15. The rate limiting step for a dehydration reaction is

- a. protonation of the alcohol by a strong acid
- b. loss of water from the protonated alcohol to form a carbocation
- c. removal of a proton from the carbocation to form the alkene
- d. simultaneous abstraction of a β -hydrogen by base and loss of hydroxide ion

_A_16. Which of the following best represents the transition state for the rate limiting step of an E2 elimination?



_D_17. Crown ethers

- a. are cyclic polyethers
- b. complex (chelate) metal cations
- c. have a "crown-like" shape
- d. all of the above.

_D_18. Which of the following would undergo dehydration the slowest?

- a. 2,2-dimethylpropanol
- b. 2-butanol
- c. 1-methylcyclohexanol
- d. ethanol

_C_19. The hybridization of the oxygen in CH_3OCH_3 is

- a. sp
- b. sp^2
- c. sp^3
- d. p

_B_20. The pi bonds of acetylene are

- a. Lewis acidic
- b. perpendicular
- c. non-equivalent
- d. highly hindered

_D_21. An epoxide is

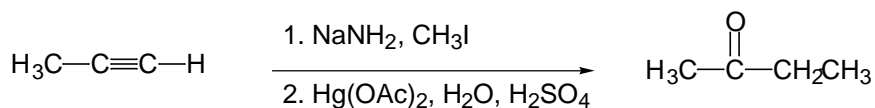
- a. any cyclic ether
- b. less reactive than an ordinary ether
- c. a good nucleophile
- d. reactive because of bond angle strain

_A_22. Which of the following is **not** capable of hydrogen bonding to another of molecule of the same compound?

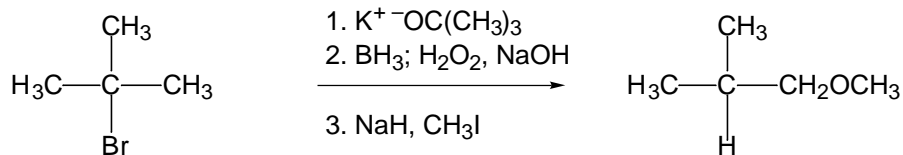
- a. diethyl ether
- b. 2-butanol
- c. water
- d. acetic acid

Syntheses. Give reagents to show how to synthesize the compounds on the right from the compounds on the left. They may require more than one step. (4 pts each)

23.

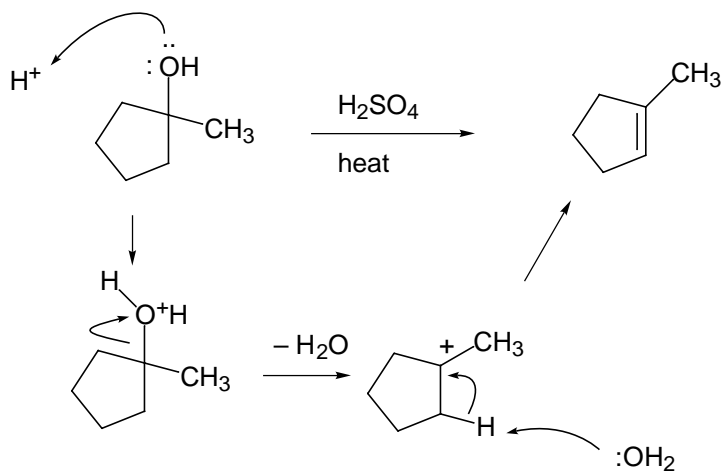


24.

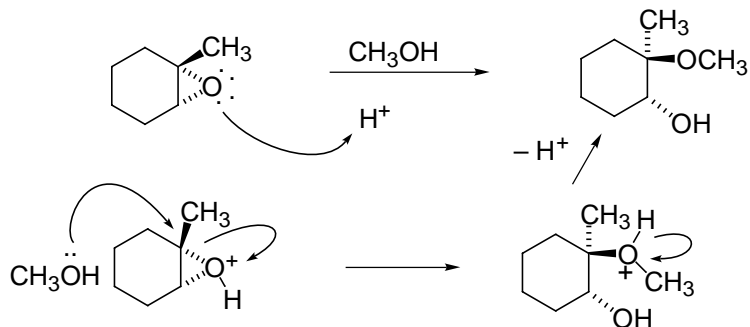


V. Mechanisms. Give a stepwise, detailed mechanism with arrows and intermediates for the following reactions. (5 points each)

25.



26.



27.

