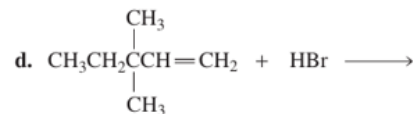
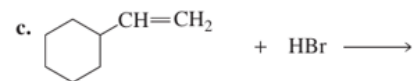
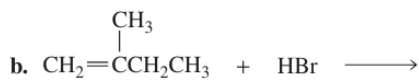
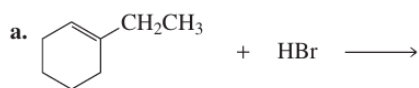


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1. What is the major product of each of the following reactions?



2. What is the major product of the reaction of 2-methyl-2-butene with each of the following reagents?

a. HBr

b. HI

c.  $\text{Cl}_2/\text{CH}_2\text{Cl}_2$

e.  $\text{H}_2/\text{Pd}$

f. MCPBA (a peroxyacid)

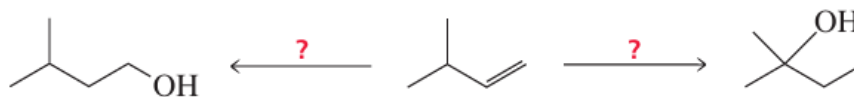
g.  $\text{H}_2\text{O} + \text{H}_2\text{SO}_4$

i.  $\text{Br}_2/\text{H}_2\text{O}$

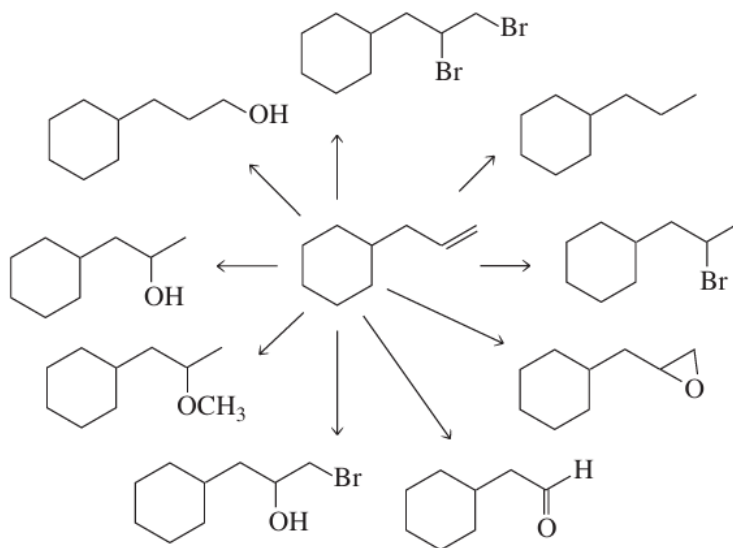
j.  $\text{Br}_2/\text{CH}_3\text{OH}$

k.  $\text{BH}_3/\text{THF}$ , followed by  $\text{H}_2\text{O}_2$ ,  $\text{HO}^-$ ,  $\text{H}_2\text{O}$

3. What reagents are needed to synthesize the following alcohols?



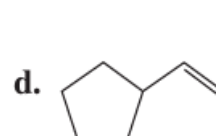
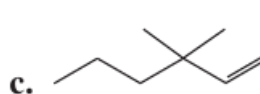
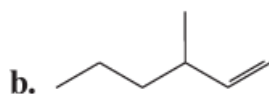
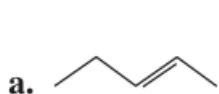
- 4.



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5. Which stereoisomer of 3-hexene forms (3*S*,4*S*)-4-bromo-3-hexanol and (3*R*,4*R*)-4-bromo-3-hexanol when it reacts with Br<sub>2</sub> and H<sub>2</sub>O?

6. What is the major product of the reaction of each of the following with HBr?

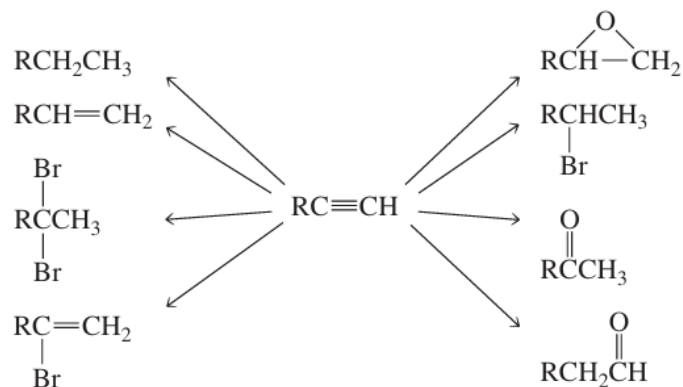


7. a) (*Z*)-2,3-dichloro-2-butene + H<sub>2</sub>, Pd/C

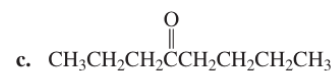
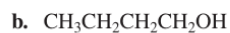
- b) (*E*)-2,3-dichloro-2-butene + H<sub>2</sub>, Pd/C

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8. What reagents should be used to carry out the following syntheses?



9. How can the following compounds be synthesized, starting with a hydrocarbon that has the same number of carbons as the desired product?

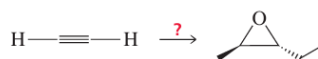


10. What stereoisomers are obtained when 2-butyne undergoes each of the following reaction sequences?
- a. 1.  $\text{H}_2$ /Lindlar catalyst 2.  $\text{Br}_2/\text{CH}_2\text{Cl}_2$       b. 1.  $\text{Na}/\text{NH}_3(\text{liq})$ ,  $-78^\circ\text{C}$  2.  $\text{Br}_2/\text{CH}_2\text{Cl}_2$       c. 1.  $\text{Cl}_2/\text{CH}_2\text{Cl}_2$  2.  $\text{Br}_2/\text{CH}_2\text{Cl}_2$

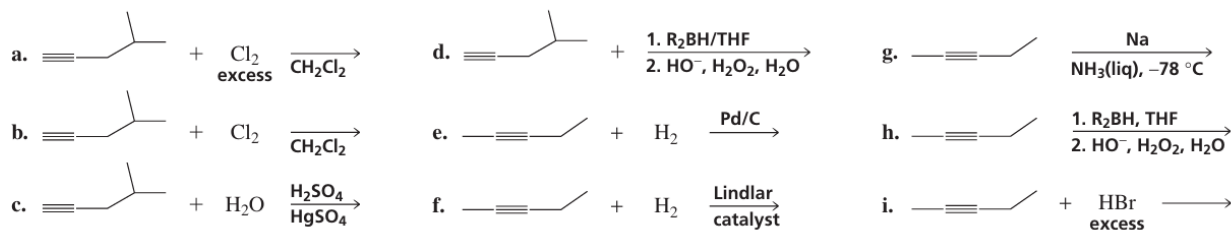
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11. Starting with ethyne, describe how the following compounds can be synthesized:
- (3*S*,4*R*)- 4-bromo-3-hexanol and (3*R*,4*S*)- 4-bromo-3-hexanol
  - (3*R*,4*R*)- 4-bromo-3-hexanol and (3*S*,4*S*)- 4-bromo-3-hexanol

12. Show how the following compound can be prepared from the given starting material. Draw the structure of the compound that is formed in each step of the synthesis.

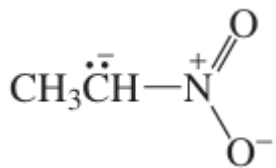


13. What are the products of the following reactions?

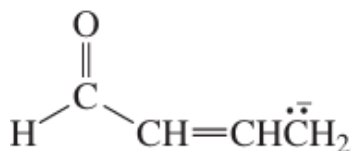


14. Draw resonance contributors for the following species. Do not include structures that are so unstable that their contributions to the resonance hybrid would be negligible. Indicate which are major contributors and which are minor contributors to the resonance hybrid.

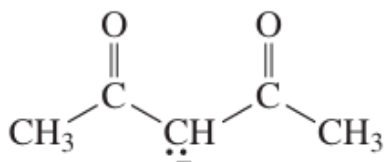
a.



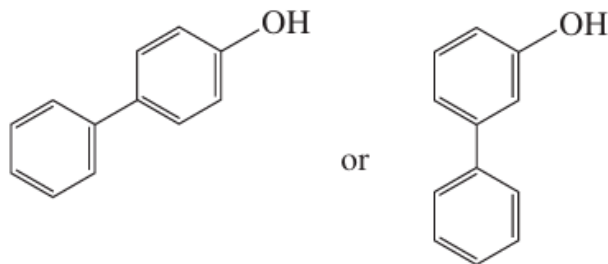
b.



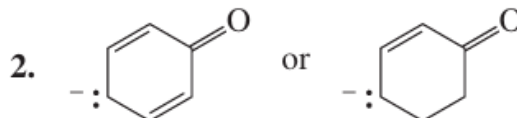
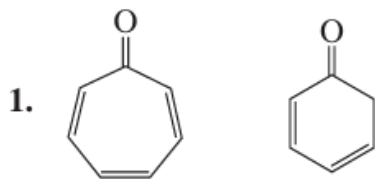
c.



15. a. Which is a stronger acid?



- b. Which is a stronger base?



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16. How could the following compounds be synthesized using a Diels–Alder reaction?

