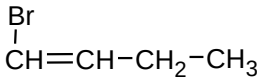
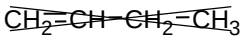
Organic Synthesis

How can we form this?

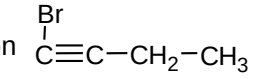


Substitution?

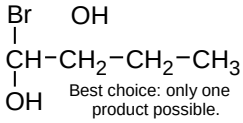
No; the pi bond will break before Br contributes to a substitution reaction



We could use hydrogenation of 1-bromo-1-butyne (provided only one of the pi bonds break)



Performing an elimination on 1-bromo-2-butanol or **1-bromo-1-butanol** would work best.



Best choice: only one product possible.

How do we choose between reactions?

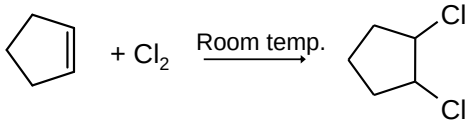
- Notice that their may be more than one way to form a particular compound
- The handout is an oversimplification …
- There are thousands of reaction mechanisms, many of which are very specific
- Considerations when choosing include …
  - Yield (how much product forms)
  - Potential for multiple products
  - Ease of separating contaminating structures
  - Type of isomer desired
  - Economics: e.g. cost of starting materials

Answers: 1, 2

1) An addition reaction involves breaking a double bond and adding two parts of a molecule across the bond
   - Examples: 1) halogenation, 2) hydrogenation, 3) hydrolysis, 4) addition polymerization
   - The 'opposite' of breaking the bond is forming a double bond - i.e. elimination
2) Condensation is a reaction that involves the production of water.
   - Examples: 1) elimination, 2) esterification, 3) condensation polymerization
   - oxidation is not an example – the H_2O comes from H_2SO_4, not from an organic molecule

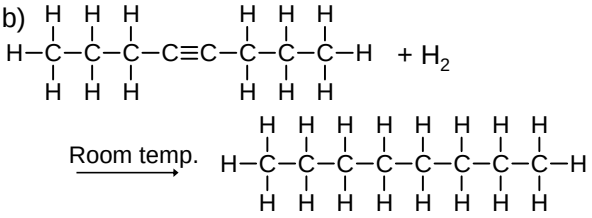
Answers: 3

a) **1,2-dichlorocyclopentane** is best formed via halogenation of cyclopentene. Substitution using Cl_2 would work, but would not be efficient because many other products would form (e.g. 1,2,4-trichlorocyclopentane, etc.)

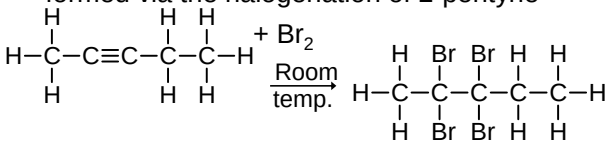


b) The only way to prepare **octane** from 4-octyne is via hydrogenation of both pi bonds. (see top of next page for diagram)

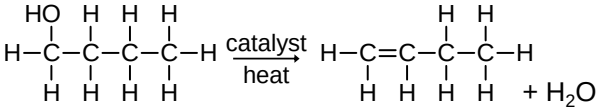
b)



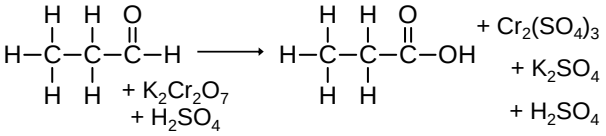
c) **2,2,3,3-tetrabromopentane** *can* be formed via substitution using Br_2. It is more efficiently formed via the halogenation of 2-pentyne



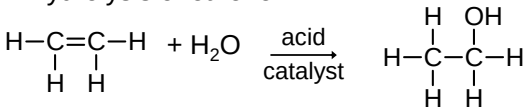
d) **1-butene** can be formed from the elimination reaction involving 1-butanol. Using 2-butanol could result in either 1-butene or 2-butene and therefore is a less desirable choice.



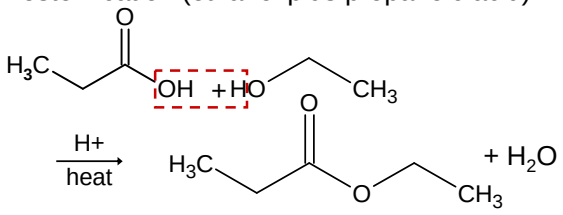
e) **Propanoic acid** is best formed from the oxidation of propanal



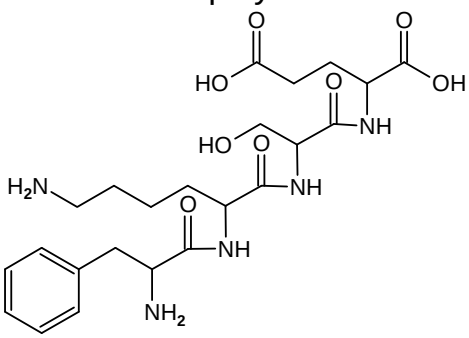
f) Ethanol is most easily formed from the hydrolysis of ethene.



g) Ethyl propanoate is an ester, formed via esterification (ethanol plus propanoic acid)



Formation of a polyamide



A polyamide "backbone" forms with R groups coming off. This protein is built with amino acids.