

Chapter 10: Alkyl Halides Part 2: Radical Reactions

Today Finish up Chapter 10

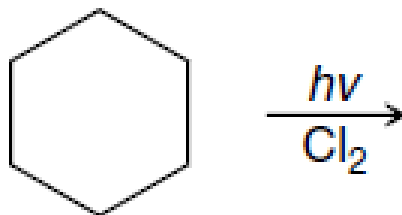
We will not cover 10.8 or 10.12 in class, but they are interesting applications.

Synthetic Utility of Halogenation

- Radical chlorination and bromination are both useful.
- Recall that bromination is more selective.



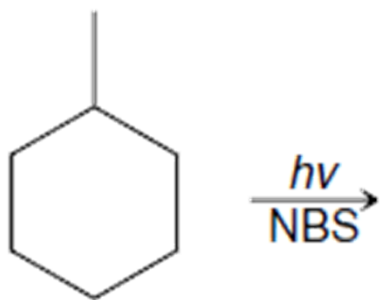
- ◆ Chlorination can be useful with highly symmetrical substrates.



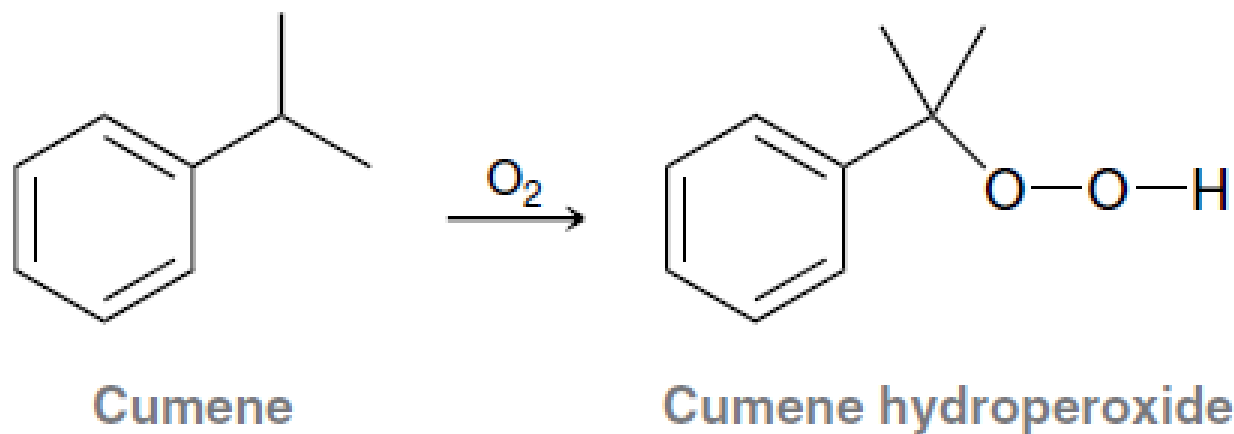
- ◆ The synthetic utility of halogenation is limited:

Synthetic Utility of Halogenation

- ◆ Synthesizing a target molecule from an alkane is challenging because of its limited reactivity.
- ◆ Often halogenation is the best option.



Autooxidation vs. Antioxidation – Autooxidation

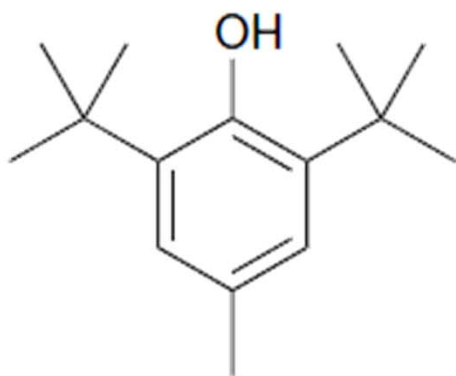


Autooxidation vs. Antioxidation – Autooxidation

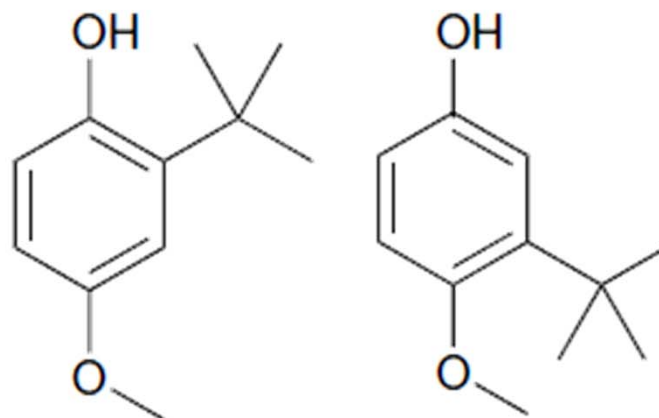
- ◆ Light accelerates the autooxidation process.
- ◆ Dark containers are often used to store many chemicals such as vitamins.
- ◆ In the absence of light, autooxidation is usually a slow process.
- ◆ Compounds that can form a relatively stable $C\bullet$ radical upon H abstraction are especially susceptible to autooxidation.



Autooxidation vs. Antioxidation – Antioxidants



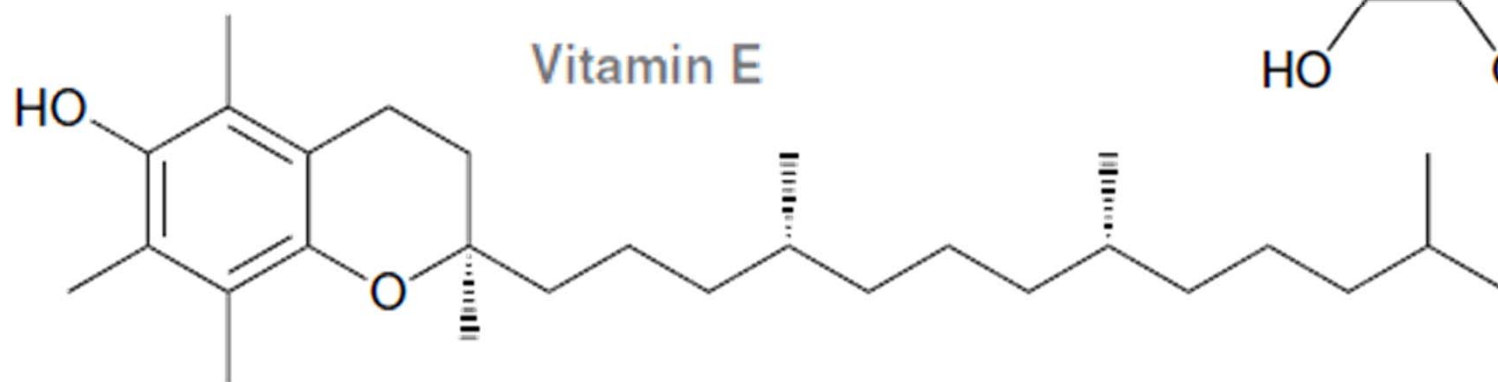
Butylated hydroxytoluene
(BHT)



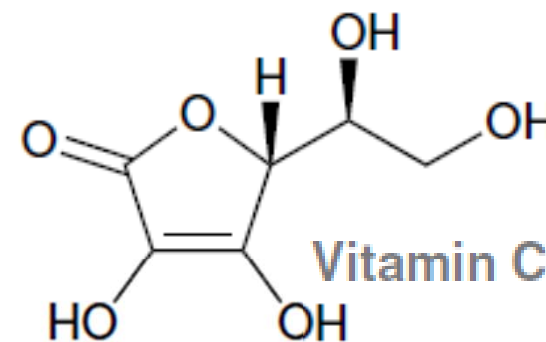
Butylated hydroxyanisole
(BHA)

Natural Antioxidants

- ◆ Vitamins C is hydrophilic.
- ◆ Vitamin E is hydrophobic.

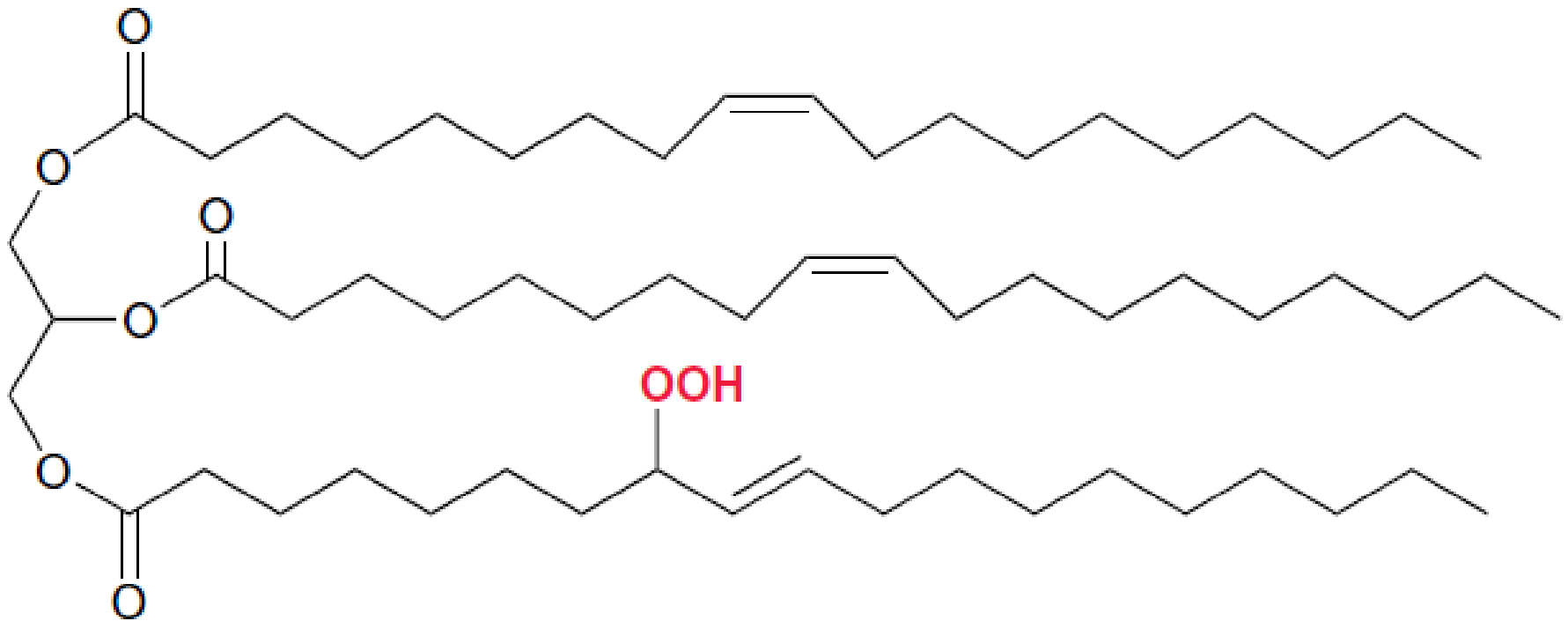


Vitamin E



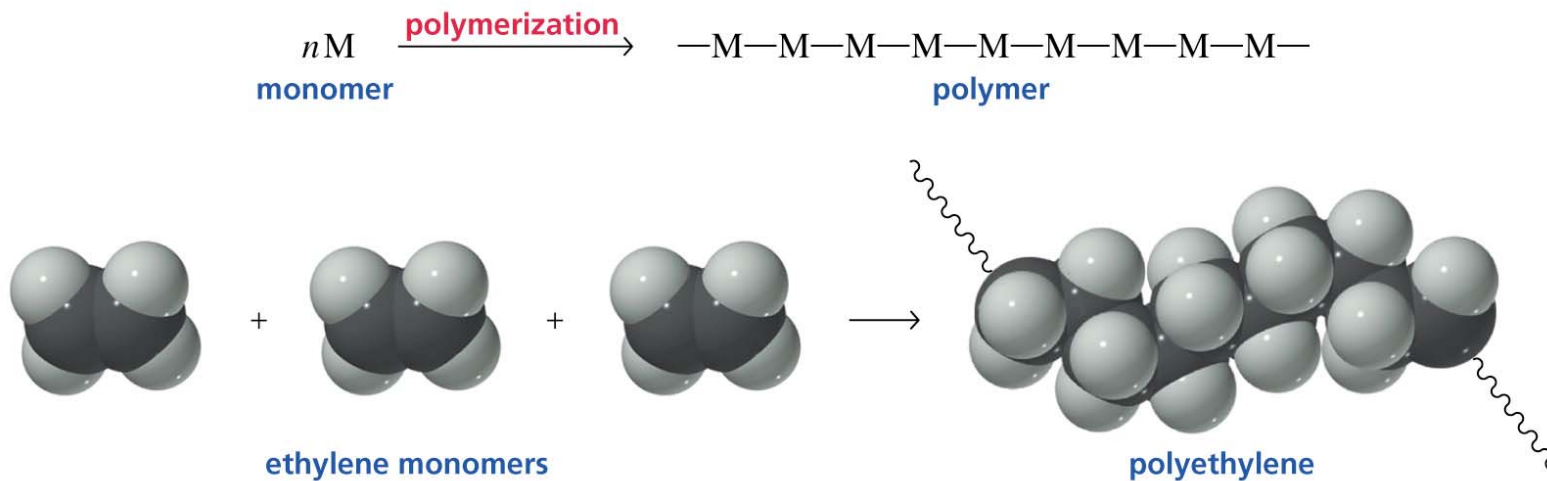
Vitamin C

Autooxidation vs. Antioxidation – Antioxidants



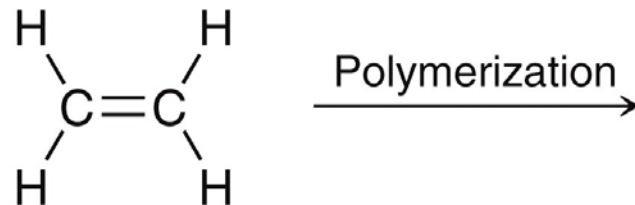
Radical Polymerization

- ◆ Free radical conditions can also be used to form polymers.



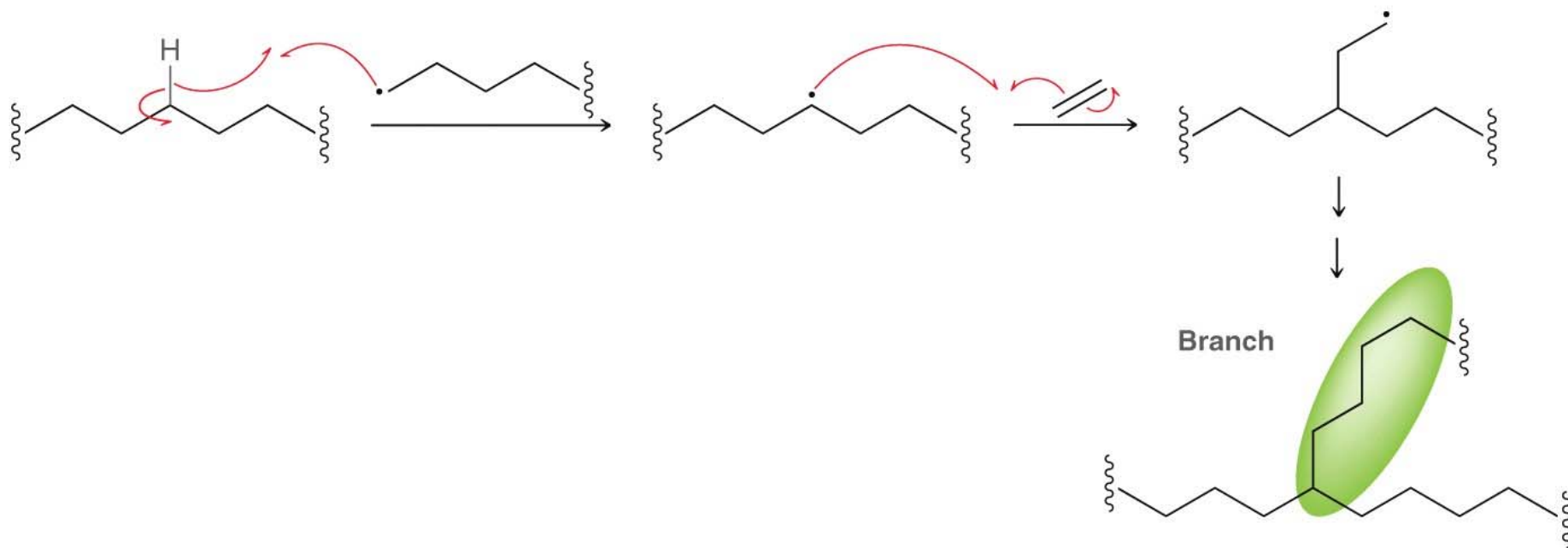
Radical Polymerization

- ◆ Free radical conditions are also frequently used to form polymers



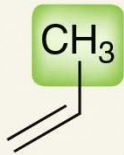
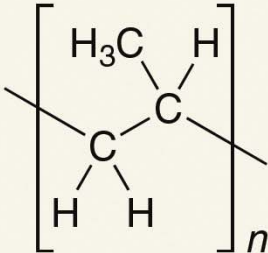
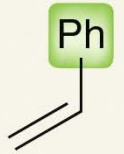
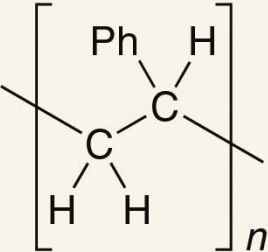
Ethylene
monomer

Radical Polymerization



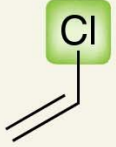
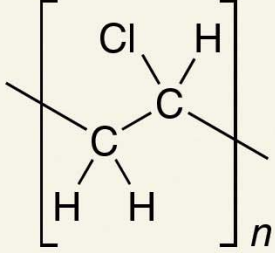
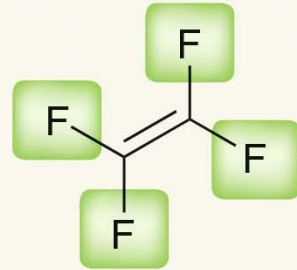
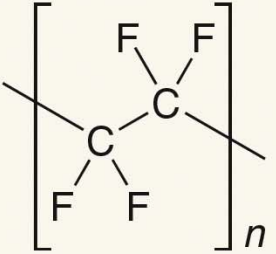
Radical Polymerization

- ◆ Polymers with varying properties are obtained by polymerizing substituted ethylene derivatives:

MONOMER	POLYMER	APPLICATION
 Propylene	 Polypropylene	Carpet fibers, appliances, car tires
 Styrene	 Polystyrene	Televisions, radios, Styrofoam

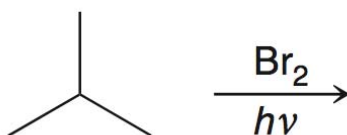
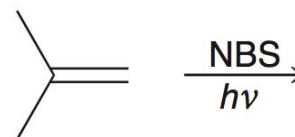
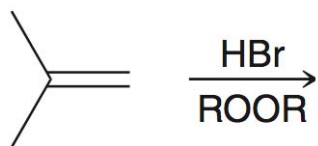
Radical Polymerization

- ◆ Polymers with varying properties are obtained by polymerizing substituted ethylene derivatives:

MONOMER	POLYMER	APPLICATION
 Vinyl chloride	 Poly(vinyl chloride)	PVC piping for plumbing, CDs, garden hoses, raincoats, shower curtains
 Tetrafluoroethylene	 Teflon	Nonstick coating for frying pans

Review of Chapter 10 Reactions

- ◆ Radical reactions are synthetically useful, and will be applied to multistep syntheses throughout this course:



For Next Time....

Suggested Homework Problems Chapter 9

1,7,9,13,18,20,32-37, 41,44,52,57

Suggested Homework Problems Chapter 10

1, 2, 12, 16, 23,24, 33, 42

Next Up Chapter 12!