

Intro to Organic Reactions

Name _____

1. Describe the key characteristics of a combustion reaction and give the two possible products of an incomplete combustion.

burn in presence of O_2 to form: $CO_2 + H_2O$ (complete)
 [Hydrocarbon is fuel] : $CO + H_2O + C$ (incom.)

2. Besides combustion, what is the only other type of reaction that an alkane can undergo? What conditions are necessary for this type of reaction to occur?

Halogenation: UV light, alkane, halogen molecules.
 formation of free radicals must occur w/ UV light

3. Define the terms:

- a. Free radical

Species w/ an unpaired electron

- b. Homolytic fission

equal splitting of electrons \rightarrow forms 2 free radicals

- c. Mechanism

sequence of steps a chemical reaction must undergo

- d. Nucleophile

negatively charged species w/ lone pair of e^- that is attracted to an electron-deficient C (positive charge)

- e. Monomer

single unit used as a unit to create polymers.

- f. Polymer

many single units joined into a long chain.
 (repeating)

- g. Reflux

boiling a liquid attached to a condenser so that the liquid runs back into original flask.

- h. Catalyst

substance that increases a rate of rxn by lowering activation energy. Not consumed in rxn.

4. Name and describe each of the three steps that are necessary in the mechanism of a substitution reaction in order for an alkane to be turned into a halogenoalkane.

Initiation: $Cl_2 \xrightarrow{UV\ light} Cl\cdot + Cl\cdot$

Propagation: $Cl\cdot + CH_4 \rightarrow CH_3\cdot + HCl$
 $CH_3\cdot + Cl_2 \rightarrow CH_3-Cl + Cl\cdot$

Termination: $Cl\cdot + Cl\cdot \rightarrow Cl_2$; $CH_3\cdot + Cl\cdot \rightarrow CH_3-Cl$; $CH_3\cdot + CH_3\cdot \rightarrow CH_3CH_3$

5. Write the substitution reaction that would occur between propane and bromine.

use steps for this (#4)

6. Identify the necessary reactants for a nucleophilic substitution reaction and identify the class of compound that would be formed by a hydroxide nucleophile.

halogens alkane, nucleophile (often w/ spectator ion) — alcohol

7. Each type of nucleophilic substitution involves two steps in its mechanism: nucleophilic attack and the halogen leaving. List the order of these two steps for S_N1 and S_N2 :

S_N1 Steps— 1. halogen leaving 2. nucleophilic attack

S_N2 Steps— 1. nucleophilic attack 2. halogen leaving

8. Explain what each symbol in the term S_N1 stands for.

Substitution
nucleophilic RXN
uni-molecular

9. For each of the following classes of compounds, identify whether it would undergo S_N1 or S_N2 . 1, 2, 3, bay!

Primary halogenoalkane

S_N2

Secondary halogenoalkane

S_N1 or S_N2

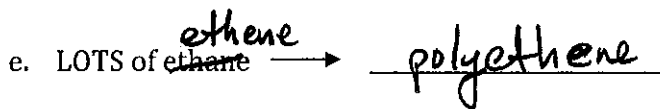
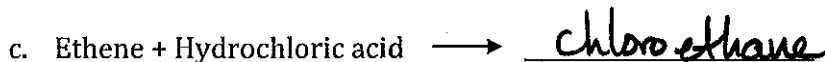
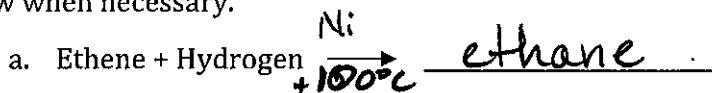
Tertiary halogenoalkane

S_N1

10. Why does an S_N1 mechanism occur faster than an S_N2 mechanism for most molecules?

halogen leaving is easier to occur than the transition state to form in S_N2 RXNs.

11. Complete the blanks below for the following addition reactions. Be sure to add catalysts over the arrow when necessary.



12. For each of the following classes of compounds, identify the product(s) (if any) of its oxidation.

Primary alcohol

\rightarrow aldehyde

\rightarrow carboxylic acid

Secondary alcohol

\rightarrow ketone

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Tertiary alcohol

\rightarrow NO RXN