FREE RADICAL SUBSTITUTION 3

1) For the conversion of ethane to 1,1-dibromoethane.

a) Give the overall equation.

$CH_3-CH_3 + 2Br_2 \rightarrow CHBr_2-CH_3 + 2HBr$

b) Give the pair of propagation steps to form bromoethane from ethane.

$CH_3-CH_3 + \dot{B}r \rightarrow CH_3-\dot{C}H_2 + HBr$

$CH_3-\dot{C}H_2 + Br_2 \rightarrow CH_3-CH_2Br + \dot{B}r$

c) Give the pair of propagation steps to form 1,1-dibromoethane from bromoethane.

$CH_3-CH_2Br + \dot{B}r \rightarrow CH_3-\dot{C}HBr + HBr$

$CH_3-\dot{C}HBr + Br_2 \rightarrow CH_3-CHBr_2 + \dot{B}r$

d) Give the termination step that forms butane.

$2\ CH_3-\dot{C}H_2 \rightarrow CH_3-CH_2-CH_2-CH_3$

2) For the conversion of methane to tetrachloromethane.

a) Give the overall equation.

$CH_4 + 4Cl_2 \rightarrow CCl_4 + 4HCl$

b) Give the pair of propagation steps to form chloromethane from methane.

$CH_4 + \dot{C}l \rightarrow \dot{C}H_3 + HCl$

$\dot{C}H_3 + Cl_2 \rightarrow CH_3Cl + \dot{C}l$

c) Give the pair of propagation steps to form tetrachloromethane from trichloromethane.

$CHCl_3 + \dot{C}l \rightarrow \dot{C}Cl_3 + HCl$

$\dot{C}Cl_3 + Cl_2 \rightarrow CCl_4 + \dot{C}l$

d) Give the termination step that forms a substance with the empirical formula CCl_3.

$2\ \dot{C}Cl_3 \rightarrow CCl_3-CCl_3$

3) For the conversion of 2-iodopropane to 1,2-diiodopropane.

a) Give the overall equation.

$CH_3-CHI-CH_3 + I_2 \rightarrow CH_2I-CHI-CH_3 + HI$

b) Give the pair of propagation steps to form 1,2-diiodopropane from 2-iodopropane.

$CH_3-CHI-CH_3 + \dot{I} \rightarrow \dot{C}H_2-CHI-CH_3 + HI$

$\dot{C}H_2-CHI-CH_3 + I_2 \rightarrow CH_2I-CHI-CH_3 + \dot{I}$

c) Give the termination step that forms a substance with empirical formula C_3H_6I.

$2\ \dot{C}H_2-CHI-CH_3 \rightarrow CH_3-CHI-CH_2-CH_2-CHI-CH_3$

4) For the conversion of 1,1,1-tribromoethane to 1,1,1-tribromo-2,2,2-trichloroethane.

a) Give the overall equation.

$CBr_3-CH_3 + 3\,Cl_2 \rightarrow CBr_3CCl_3 + 3HCl$

b) Give the pair of propagation steps to form 1,1,1-tribromo-2-chloroethane from 1,1,1-tribromoethane.

$CBr_3-CH_3 + \dot{C}l \rightarrow CBr_3-\dot{C}H_2 + HCl$

$CBr_3-\dot{C}H_2 + Cl_2 \rightarrow CBr_3-CH_2Cl + \dot{C}l$

c) Give the pair of propagation steps to form 1,1,1-tribromo-2,2,2-trichloroethane from 1,1,1-tribromo-2,2-diichloroethane.

$CBr_3-CHCl_2 + \dot{C}l \rightarrow CBr_3-\dot{C}Cl_2 + HCl$

$CBr_3-\dot{C}Cl_2 + Cl_2 \rightarrow CBr_3-CCl_3 + \dot{C}l$

d) Give the termination step that forms a bromoalkane.

$2\ CBr_3-\dot{C}H_2 \rightarrow CBr_3-CH_2-CH_2-CBr_3$