ALKANES: REACTIONS WITH HALOGENS

1. a) You get an explosive reaction forming carbon and hydrogen fluoride.

   b) You get an explosive reaction forming carbon and either hydrogen chloride or hydrogen bromide.

   c) You get a substitution reaction in which hydrogen atoms in the methane are successively replaced by chlorine or bromine atoms. Hydrogen chloride or bromide are formed as well.

   d) No reaction.

   e) No reaction.

2. a)

chloromethane:	CH_3Cl
dichloromethane:	CH_2Cl_2
trichloromethane:	$CHCl_3$
tetrachloromethane:	CCl_4

   b) Substitution reactions. (If you have already done the mechanisms for these reactions, you will know them by their full name: free radical substitution reactions.)

   c) Hydrogen chloride

   d) $CH_4 + Br_2 \longrightarrow CH_3Br + HBr$

   e) $CH_3CH_2CH_2CH_2Cl$ and $CH_3\underset{\displaystyle Cl}{\underset{|}{C}}HCH_2CH_3$

   (You can just as well attach the chlorine to the third carbon in the chain as the second. That is the same molecule just flipped over. There are no other possibilities.)

3. $BrCH_2CH_2CH_2Br$. There is considerable ring strain in cyclopropane because the bond angles are only 60°. This leads to repulsion between the electrons in the various carbon-carbon bonds. Breaking the ring releases this strain and produces a more energetically stable compound.