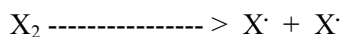
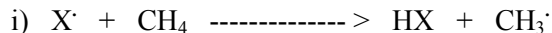


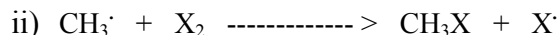
Consider the free radical halogenation (X_2) of **methane** with both **fluorine (F_2)** and **bromine (Br_2)**. Use the information below and the data table provided to answer the following questions.
 $CH_4 + X_2 \rightarrow CH_3X + HX$



X = F Br



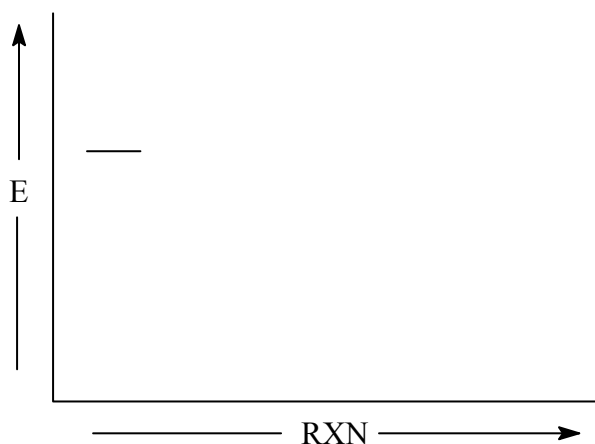
ΔH_i _____



ΔH_{ii} _____

ΔH_{rxn} _____

- a) Using the two propagation steps shown above (i and ii), calculate ΔH_i and ΔH_{ii} and ΔH_{rxn} for the reaction with both F_2 and Br_2 (see BDE values below).
- b) Are the reactions endo- or exothermic overall? _____
- c) Which step is the rate determining step in the **bromination** reaction?
- d) Which reaction is likely *not* a safe reaction to carry out in the lab? Why?
- e) On the axes below, construct a reaction profile for the **bromination** propagation steps. Keep your profile roughly to scale. With vertical arrows, **Label ΔH°** for step i, ii, and for the overall reaction.



Bond	Bond Dissociation Energy (KJ/mol)
CH ₃ -H	438
CH ₃ -Br	293
CH ₃ -F	456
H-Br	366
H-F	569
Br-Br	193
F-F	157