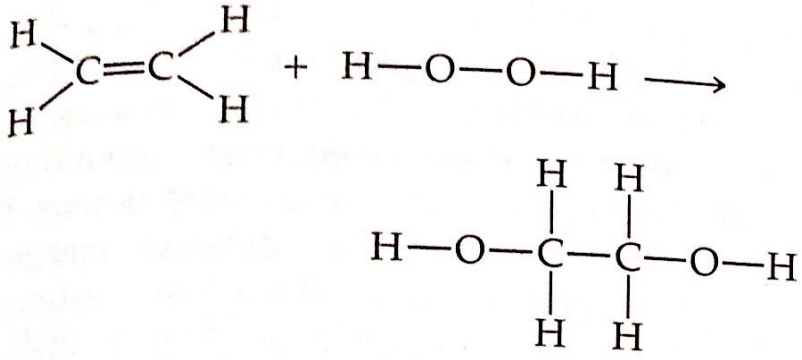
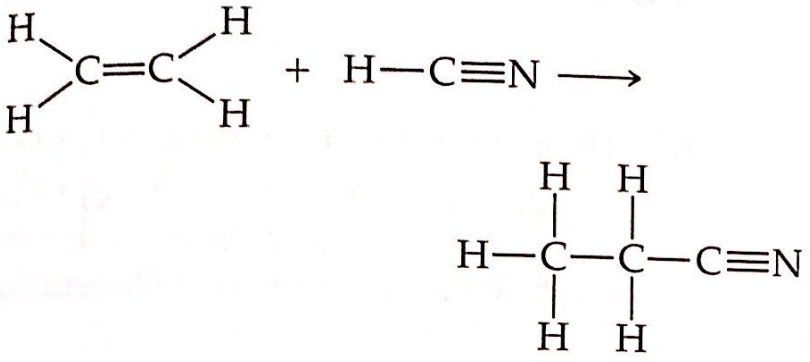
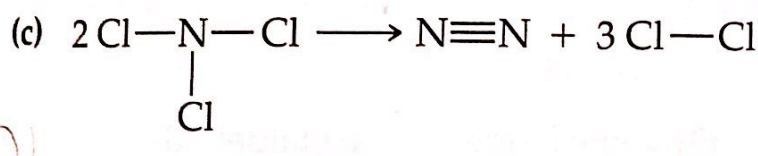
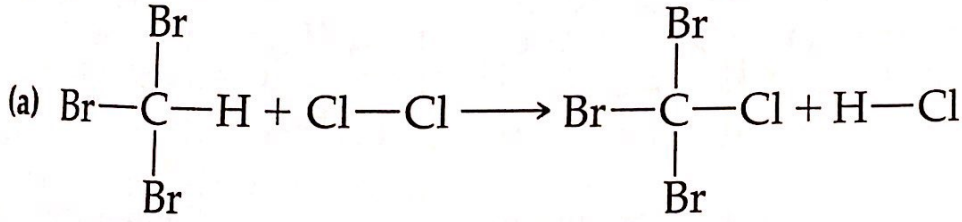
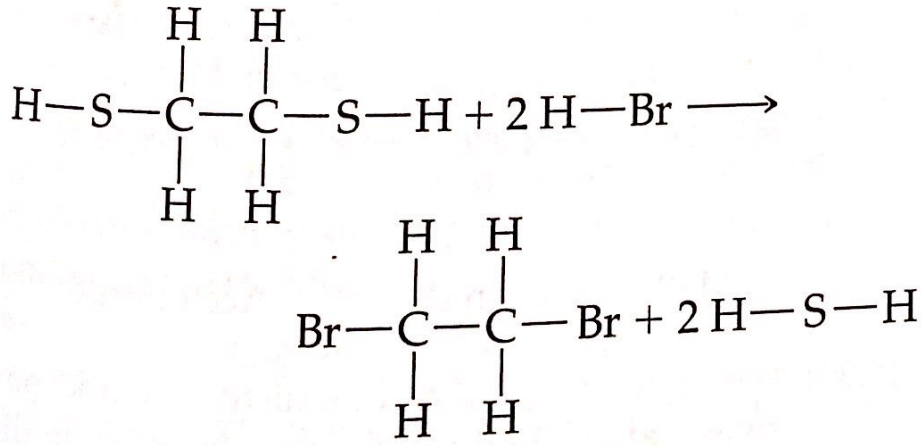
(a) 

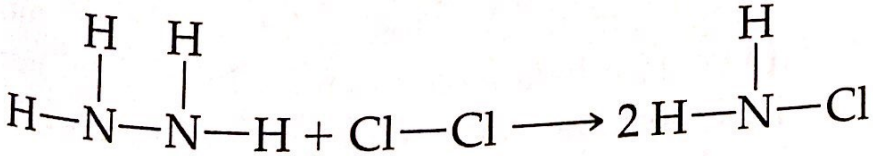
(b) 

(c) 

8.66 Using bond enthalpies (Table 8.4), estimate ΔH for the following gas-phase reactions:

(a) 

(b) 

(c) 

8.67 U...

(a) $2\,CH_4(g) + O_2(g) \longrightarrow 2\,CH_3OH(g)$

(b) $H_2(g) + Br_2(g) \longrightarrow 2\,HBr(g)$

(c) $2\,H_2O_2(g) \longrightarrow 2\,H_2O(g) + O_2(g)$

[8.68] Use bond enthalpies (Table 8.4) to estimate the enthalpy change for each of the following reactions:

(a) $3\,H_2C{=}CH_2(g) \longrightarrow C_6H_{12}(g)$ (the six carbon atoms from a six-membered ring with two hydrogen atoms on each carbon atom)

(b) $SiClH_3(g) + 3\,Cl_2(g) \longrightarrow SiCl_4(g) + 3\,HCl(g)$

(c) $8\,H_2S(g) \longrightarrow 8\,H_2(g) + S_8(s)$

(See Figure 7.28. Strictly speaking, the average bond enthalpy values apply to species in the gas phase. The heat of formation of $S_8(g)$ is 102.3 kJ/mol. Apply the needed correction in order to estimate the enthalpy change for the reaction as shown.)

8.69 Ammonia is produced directly from nitrogen and hydrogen by using the Haber process. The chemical reaction is

$$N_2(g) + 3\,H_2(g) \longrightarrow 2\,NH_3(g)$$

(a) Use bond enthalpies (Table 8.4) to estimate the enthalpy change for the reaction, and tell whether this reaction is exothermic or endothermic. **(b)** Compare the enthalpy change you calculate in (a) to the true enthalpy change as obtained using ΔH_f° values.

8.70 **(a)** Use bond enthalpies to estimate the enthalpy change for the reaction of hydrogen with ethene:

$$H_2(g) + C_2H_4(g) \longrightarrow C_2H_6(g)$$