

14. In each of the following pairs of substances, select the one which has greater entropy.

(a) $\text{H}_2\text{O}(\text{l})$ or $\text{H}_2\text{O}(\text{g})$

(b) $\text{Cl}_2(\text{g})$ or $2 \text{Cl}^-(\text{aq})$

(c) $\text{NH}_3(\text{l})$ or $\text{NH}_3(\text{aq})$

(d) $\text{CH}_3\text{COOH}(\text{aq})$ or $\text{CH}_3\text{COO}^-(\text{aq}) + \text{H}^+(\text{aq})$

15. In each of the following, decide

i) which side is favoured by the tendency to minimum enthalpy; that is, which side of the reaction the lower energy.

ii) which side is favoured by the tendency to maximum entropy; that is, which side of the reaction the more random species.

iii) whether the reaction will be

a spontaneous reaction which goes to completion ("GOES 100%"), or

a non-spontaneous reaction in which NO products are formed ("WON'T OCCUR"), or

a spontaneous equilibrium reaction in which the tendency to minimum enthalpy will be balanced by an opposing tendency to maximum entropy ("EQUILIBRIUM").

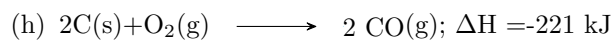
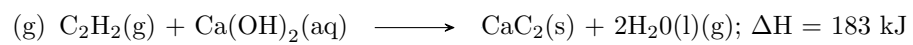
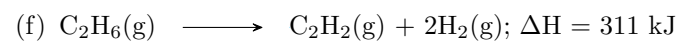
Note: in parts (a) to (d) all the species are GASES

(a) see graph

(b) see graph

(c) see graph

(d) see graph



16. What tendencies to minimum enthalpy and maximum entropy must exist in the following situations?

- (a) Liquid nitroglycerine explodes, forming an expanding cloud of gases.
- (b) Solid AgBr is almost insoluble in water; that is, very little $\text{Ag}^+(\text{aq})$ and $\text{Br}^-(\text{aq})$ are formed when AgBr(s) is mixed with water.
- (c) Water and alcohol mix completely in any proportions; that is, they are “miscible”.
- (d) The reaction: $3\text{N}_2(\text{g}) + \text{Pb}(\text{s}) \longrightarrow \text{Pb}(\text{N}_3)_2(\text{s})$ does not occur.
- (e) When $\text{N}_2\text{O}_4(\text{g})$ is put in a container, some of it decomposes into $2\text{NO}_2(\text{g})$.
- (f) Smoke, carbon dioxide and water vapour will not react to make wood and oxygen.