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ANSWERS

1. (a) The carbon dioxide in the air above the pop will reach a concentration at which the carbon dioxide will react with water to produce carbonic acid at the same rate that the carbonic acid decomposes (figure 1).

$H_2CO_3(aq) \rightleftharpoons H_2O(l) + CO_2(g)$

(b) When the bottle is open, the carbon dioxide leaves the system and equilibrium is not achieved (equilibrium requires a closed system).

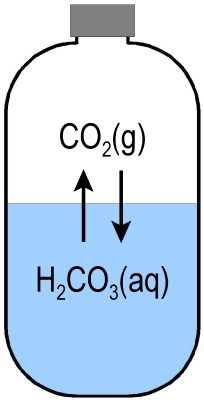

Figure 1

2. (a) At equilibrium, there is no visual change. The brown colour of the bromine will not become darker or lighter because the concentration of bromine at equilibrium is constant.

(b) At the molecular level the forward and reverse reactions continue at equilibrium (bromine is consumed by the forward reaction and produced by the reverse reaction). However, the rates of the forward and reverse reactions are equal. Bromine is consumed and produced at the same rate so the concentration of bromine does not change.

(c) The equilibrium is dynamic.