Worksheet 7.1: Solutions
CO_2-producing reactions

No.	Answer
1	It changes straight from solid to gas without passing through the liquid phase.
2	It dissolves in water to produce a weak acid: $CO_2(g) + H_2O(l) \rightarrow H_2CO_3(aq)$
3	**a** $C_6H_{12}O_6(aq) + 6O_2(g) \rightarrow 6CO_2(g) + 6H_2O(l)$ **b** In the mitochondria of cells
4	$n(C_6H_{12}O_6) = \frac{m}{M} = \frac{500}{180.156} = 2.775$ $n(CO_2) = 6 \times n(C_6H_{12}O_6) = 6 \times 2.775 = 16.65$ mol $\therefore m(CO_2) = n \times M = 16.65 \times 44.01 = 732.8$ g $\therefore$ per week $= 7 \times 732.8 = 5.13 \times 10^3$ g
5	**a** $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$ **b** $CH_4(g) + 2H_2O(g) \rightarrow 4H_2(g) + CO_2(g)$
6	**a** $2HNO_3(aq) + Li_2CO_3(s) \rightarrow 2LiNO_3(aq) + CO_2(g) + H_2O(l)$ **b** $n(Li_2CO_3) = \frac{m}{M} = \frac{20.0}{73.892} = 0.2707$ $n(HNO_3) = 2 \times n(Li_2CO_3) = 2 \times 0.2707 = 0.5414$ mol $\therefore V(HNO_3) = \frac{n}{c} = \frac{0.5414}{0.304} = 1.78$ L
7	**a** $n(CO_2) = \frac{m}{M} = \frac{5.0 \times 10^3}{44.01} = 114$ $n(CH_4) = n(CO_2) = 114$ $\therefore m(CH_4) = n \times M = 114 \times 16.042 = 1.8 \times 10^3$ g $= 1.8$ kg **b** Combustion/redox
8	**a** $2C_4H_{10}(g) + 13O_2(g) \rightarrow 8CO_2(g) + 10H_2O(l)$ **b** $n(C_4H_{10})$ in 2 hours $= \frac{\text{m per sec}}{M} \times \text{time} = \frac{0.0050 \times 60 \times 60 \times 2}{58.12} = 0.619$ $n(O_2) = \frac{13}{2} \times n(C_4H_{10}) = 4.02$ $m(O_2) = n \times M = 4.02 \times 32.0 = 1.3 \times 10^2$ g
9	$H^+(aq) + HCO_3^-(aq) \rightarrow H_2O(l) + CO_2(g)$
10	**a** $C_6H_{12}O_6(aq) \rightarrow 2CH_3CH_2OH(aq) + 2CO_2(g)$ **b** Fermentation