Oxidation and Reduction

Set 24: Oxidation Number

1. Determine the oxidation number of the element in **bold** type in each of the following:

(a) $\mathbf{S}O_2$
(b) $H_2\mathbf{S}$
(c) $H_2\mathbf{S}O_4$
(d) $Na_2\mathbf{S}_2O_3$
(e) $\mathbf{S}F_6$
(f) $\mathbf{P}_2O_5$
(g) $\mathbf{P}H_3$
(h) $[\mathbf{Cu}(NH_3)_4]_{2+}$
(i) $H_3\mathbf{P}O_4$
(j) $Mg_2\mathbf{P}_2O_7$
(k) $\mathbf{C}H_4$
(l) $\mathbf{C}O_2$
(m) $\mathbf{C}H_3OH$
(n) HCHO
(o) HCOOH
(p) $\mathbf{N}O_2$
(q) $\mathbf{N}_2O$
(r) $\mathbf{N}H_4C\ell$
(s) $NaNO_3$
(t) $\mathbf{N}_2H_4$
(u) $\mathbf{Sn}C\ell_4$
(v) **Sn**O
(w) $\mathbf{Cu}_2O$
(x) **Cu**S
(y) $\mathbf{Fe}C\ell_2$
(z) $\mathbf{Fe}_2O_3$

2. For each of the following reactions determine whether any elements have undergone a change in oxidation number and note whether they have been oxidised or reduced.

(a) $Mg + O_2 \rightarrow 2MgO$
(b) $2Na + 2H_2O \rightarrow 2NaOH + H_2$
(c) $Cl_2 + 2I^- \rightarrow I_2 + 2Cl^-$
(d) $3H_2S + 2HNO_3 \rightarrow 3S + 2NO + 4H_2O$
(e) $2MnO_4^- + 5H_2S + 6H^+ \rightarrow 2Mn^{2+} + 5S + 8H_2O$
(f) $2SnCl_2 + 4HCl + O_2 \rightarrow 2SnCl_4 + 2H_2O$
(g) $H_2SO_4 + 2HBr \rightarrow SO_2 + Br_2 + 2H_2O$
(h) $Cr_2O_7^{2-} + 6Fe^{2+} + 14H^+ \rightarrow 2Cr^{3+} + 6Fe^{3+} + 7H_2O$
(i) $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$
(j) $NH_4NO_2 \rightarrow N_2 + 2H_2O$
(k) $Ba^{2+} + SO_4^{2-} \rightarrow BaSO_4$
(l) $Na_2CO_3 + 2HCl \rightarrow 2NaCl + CO_2 + H_2O$
(m) $HCl + NaOH \rightarrow NaCl + H_2O$
(n) $H_2S + CuCl_2 \rightarrow CuS + 2HCl$

Answers

1.
(a) +4 (b) -2
(c) +6 (d) +2
(e) +6 (f) +5
(g) -3 (h) +2
(i) +5 (j) +5
(k) -4 (l) +4
(m) -2 (n) 0
(o) +2 (p) +4
(q) +1 (r) -3
(s) +5 (t) -2
(u) +4 (v) +2
(w) +1 (x) +2
(y) +2 (z) +3

2.
(a) Mg (0 +2) O (0 -2)
(b) Na (0 +1) H (+1 0)
(c) I (-1 0) C (0 -1)
(d) S (-2 0) N (+5 +2)
(e) S (-2 0) Mn (+7 +2)
(f) Sn (+2 +4) O (0 -2)
(g) Br (-1 0) S (+6 +4)
(h) Fe (+2 +3) Cr (+6 +3)
(i) None (this is an acid/base reaction)
(j) N (-3 0) N (+3 0)
(k) None (this is a precipitation reaction)
(I) None (this is an acid/carbonate equation)
(m) None (this is an acid/base neutralisation equation)
(n) None (this is a precipitation reaction)