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ANSWERS

3. (a) 0 (element)
   (b) +6
   (c) –2
   (d) –1 (monatomic ion)
   (e) +2
   (f) –3
   (g) +3
   (h) +7
   (i) –2
   (j) +4

4. (a) $\overset{-4}{C}\overset{+1}{H_4}(g) + \overset{+1}{H_2}\overset{-2}{O}(g) \rightarrow \overset{+2}{C}\overset{-2}{O}(g) + 3\,\overset{0}{H_2}(g)$
   The carbon is oxidized and the hydrogen is reduced.

   (b) $8\,\overset{+1}{H^+}(aq) + \overset{+7}{Mn}\overset{-2}{O_4^-}(aq) + \overset{+2}{Fe^{2+}}(aq) \rightarrow \overset{+2}{Mn^{2+}}(aq) + \overset{+3}{Fe^{3+}}(aq) + 4\,\overset{+1}{H_2}\overset{-2}{O}(l)$
   The iron is oxidized and the manganese is reduced.

   (c) $\overset{0}{Cu}(s) + 2\,\overset{+1}{Ag}\overset{+5}{N}\overset{-2}{O_3}(aq) \rightarrow 2\,\overset{0}{Ag}(s) + \overset{+2}{Cu}(\overset{+5}{N}\overset{-2}{O_3})_2(aq)$
   The copper is oxidized and the silver is reduced.

6. (a) $\overset{+1}{H}\overset{-1}{Cl}(g) + \overset{-3}{N}\overset{+1}{H_3}(g) \rightarrow \overset{-3}{N}\overset{+1}{H_4}\overset{-1}{Cl}(s)$ (the chloride is a monatomic ion)
   This is NOT a redox reaction (no changes in oxidation numbers).

   (b) $\overset{+4}{Si}\overset{-1}{Cl_4}(l) + 2\,\overset{0}{Mg}(s) \rightarrow 2\,\overset{+2}{Mg}\overset{-1}{Cl_2}(s) + \overset{0}{Si}(s)$
   $SiCl_4$ is the oxidizing agent.
   Mg is the reducing agent.
   Magnesium is oxidized.
   Silicon is reduced.

   (c) $\overset{+2}{C}\overset{-2}{O}(g) + \overset{+1}{H_2}\overset{-2}{O}(g) \rightarrow \overset{+4}{C}\overset{-2}{O_2}(g) + \overset{0}{H_2}(g)$
   H_2O is the oxidizing agent.
   CO is the reducing agent.
   Carbon is oxidized.
   Hydrogen is reduced.