3. Calculate the oxidation number of the atom in bold type.

(a) $H\mathbf{N}O_3$

(b) $\mathbf{N}O_2^-$

(c) $\mathbf{Cr}O_4^{2-}$

(d) $\mathbf{Cr}_2O_7^{2-}$

(e) $\mathbf{N}H_4^+$

(f) $\mathbf{N}_3^-$

(g) $\mathbf{C}_2H_6$

(h) $\mathbf{C}_3H_8$

(i) $\mathbf{Al}(OH)_4^-$

(j) $\mathbf{S}_2F_{10}$

(k) $\mathbf{N}_2O_3$

(l) $H\mathbf{Cl}O_4$

(m) $H\mathbf{Cl}O_3$

(n) $\mathbf{N}_2H_5^+$

(o) $\mathbf{N}H_2OH$

(p) $\mathbf{C}_2O_4^{2-}$

(q) $K_2\mathbf{U}O_4$

(r) $\mathbf{C}_3H_6O$

(s) $\mathbf{S}_8$

(t) $\mathbf{C}_4\mathrm{H}_6$

4. Assign oxidation numbers to the bold species in each of the following unbalanced reaction equations. Then determine which species undergoes oxidation in each reaction.

(a) $\mathbf{Cl}\mathrm{O}_2 + \mathbf{C} \longrightarrow \mathbf{Cl}\mathrm{O}_2^- + \mathbf{C}\mathrm{O}_3^{2-}$

(b) $\mathbf{Sn}^{2+} + \mathrm{Cl}^- + \mathbf{Br}\mathrm{O}_3^- \longrightarrow \mathbf{Sn}\mathrm{Cl}_6^{2-} + \mathbf{Br}^-$

(c) $\mathbf{Mn}\mathrm{O}_4^- + \mathbf{C}_2\mathrm{O}_4^{2-} \longrightarrow \mathbf{Mn}\mathrm{O}_2 + \mathbf{C}\mathrm{O}_2$

(d) $\mathbf{N}\mathrm{O}_3^- + \mathrm{H}_2\mathbf{Te} \longrightarrow \mathbf{N}\mathrm{O} + \mathbf{Te}\mathrm{O}_4^{2-}$

5. Which of the following are redox reactions?

(a) $l_2 + 5\ HOBr + H_2O \longrightarrow 2lO_3^- + 5\ Br^- + 7\ H^+$

(b) $4\ Ag^+ + Cr_2O_7^{2-} + H_2O \longrightarrow 2\ Ag_2CrO_4 + 2H^+$

(c) $KHCO_3 + Hl \longrightarrow Kl + CO_2 + H_2O$

(d) $2\ H_2O \longrightarrow 2H_2 + O_2$

(e) $H_2SO_4 + BaCl_2 \longrightarrow BaSO_4 + 2\ HCl$

(f) $Fe + H_2SO_4 \longrightarrow FeSO_4 + H_2$

6. (a) Which of Cl_2, ClO_4^-, Cl^-, ClO_3^-, and Cl_2O can be produced by reducing ClO_2^-?

(b) Which of NO_3^-, N_2, NO_2^-, N_2O and N_2O_3 can be produced by oxidizing NO?