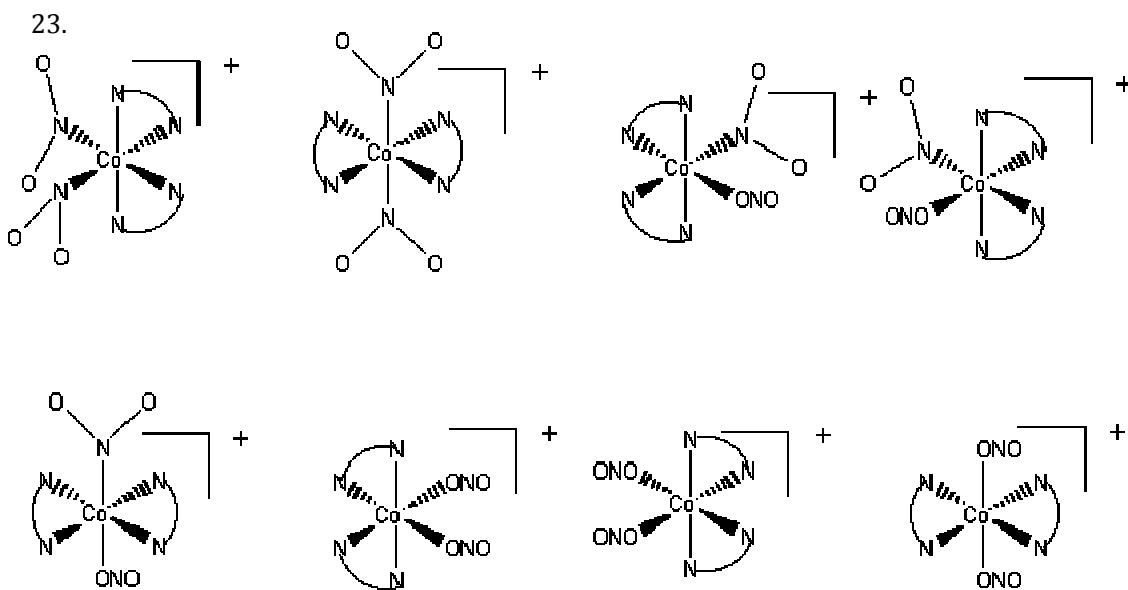


## Inorganic Chemistry Answers

1.
  - a.  $K^+ < Na^+ < Fe^{2+} < Cu^{2+} < Cu^+ < Ag^+ < F_2$
  - b.  $Ag^+$  and  $F_2$
2.
  - a. Mg
  - b. Mg, Al
  - c. Mg, Al, Zn
3.  $Zn_{(s)} + Cl_{2(g)} \rightarrow Zn^{2+}_{(aq)} + 2Cl^{-}_{(aq)}$ ,  $E^0 = 2.12$  V, yes.
4.
  - a.  $E^0 = 0.907$  V, spontaneous
  - b.  $E^0 = 0.036$  V, spontaneous
  - c.  $E^0 = -0.03$  V, not spontaneous
  - d.  $E^0 = 0.79$  V, spontaneous
5. 0.40 V
6.  $3 \times 10^{-8}$  M
7.  $H_2 \rightarrow 2H^+ + 2e^-$ ,  $O_2 + 4H^+ + 4e^- \rightarrow 2H_2O$ ,  $2H_2 + O_2 \rightarrow 2H_2O$ ,  $E^0 = 1.229$  V,  $E = 1.264$  V
8. -0.470 V
9.
  - a.  $2Hg \rightarrow Hg_2^{2+} + 2e^-$ ,  $Fe^{3+} + e^- \rightarrow Fe^{2+}$ ,  $2Hg + 2Fe^{3+} \rightarrow 2Fe^{2+} + Hg_2^{2+}$
  - b.  $Pt|Hg|Hg_2^{2+}||Fe^{2+}, Fe^{3+}|Pt$
  - c.  $E^0 = -0.017$  V, no.
  - d.  $E = 0.131$  V, more favourable
10.  $6 \times 10^{70}$
11. 2
12.  $5 \times 10^{-13}$
13.
  - a.  $Ag + Cl^- \rightarrow AgCl + e^-$ ,  $Cr_2O_7^{2-} + 14H^+ + 6e^- \rightarrow 2Cr^{3+} + 7H_2O$ ,  $6Ag + 6Cl^- + Cr_2O_7^{2-} + 14H^+ \rightarrow 2Cr^{3+} + 7H_2O + 6AgCl$
  - b.  $E^0 = 1.11$  V
  - c.  $E_{cell} = 1.10$  V
  - d. 10
14.
  - a. 0.358 V
  - b. 0.429 V
  - c. 0.518 V
  - d. 0 V
  - e.  $1 \times 10^{12}$
  - f.  $6 \times 10^3$  M
- 15.

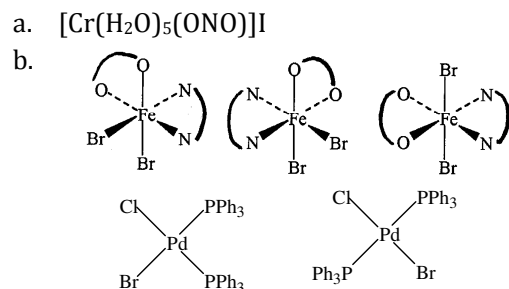
- a. +4
  - b. +4
  - c. 0
  - d. Mg
  - e. UF<sub>4</sub>
  - f. 20.5 A
  - g. 0.411 L
  - h. Yes
- 16.
- a. 1.53 V
  - b.  $24 \text{ H}^+ + 5 \text{ Fe} + 3 \text{ MnO}_4^- \rightarrow 5 \text{ Fe}^{3+} + 3 \text{ Mn}^{2+} + 12 \text{ H}_2\text{O}$
  - c. Fe|Fe<sup>3+</sup>||MnO<sub>4</sub><sup>-</sup>, Mn<sup>2+</sup> | Pt
  - d. 10<sup>388</sup>
  - e. 1.38 V
- 17.
- a. E<sup>0</sup> = 0.44 V, voltaic cell  
 $2 \text{ Cr}^{3+} + 3 \text{ Mn} \rightarrow 3 \text{ Mn}^{2+} + 2 \text{ Cr}$
  - b. E<sup>0</sup> = -0.4 V, electrolytic cell  
 $2 \text{ NO}_3^- + 8 \text{ H}^+ + 6 \text{ Cl}^- \rightarrow 3 \text{ Cl}_2 + 2 \text{ NO} + 4 \text{ H}_2\text{O}$
- 18.
- a. 0.78 V
  - b. 0.77 V
  - c. 0.75 V
- 19.
- a. NH<sub>3</sub>, NO<sub>2</sub><sup>-</sup>, 6, +3
  - b. NH<sub>3</sub>, Cl<sup>-</sup>, 6, +3
  - c. CN<sup>-</sup>, 6, +2
  - d. NH<sub>3</sub>, 4, +2
- 20.
- a. Potassium hexacyanomanganate(III)
  - b. Tetraamminepalladium (II) hydroxide
  - c. Dicyanoargentate (I) ion
  - d. Diamminesilver(I) ion
  - e. Potassium dioxalatoferrate (II) dehydrate
  - f. Potassium trioxalatocobaltate (III) hexahydrate
  - g. Tetraamminecopper (II) ion
  - h. Sodium diiodoargentate (I)
  - i. Sodium tetraiodoplatinate (II)
- 21.
- a. [Zn(NH<sub>3</sub>)<sub>2</sub>Cl<sub>2</sub>]
  - b. Sn[Fe(CN)<sub>6</sub>]
  - c. [Pt(CN)<sub>4</sub>]<sup>2-</sup>
  - d. K<sub>3</sub>[Cr(CN)<sub>6</sub>]
  - e. [Pt(NH<sub>3</sub>)<sub>4</sub>]<sup>2+</sup>
  - f. [Ni(NH<sub>3</sub>)<sub>6</sub>]Br<sub>2</sub>
  - g. [Cu(NH<sub>3</sub>)<sub>4</sub>]<sub>3</sub>[Fe(CN)<sub>5</sub>(OH)]<sub>2</sub>
22. Cr<sup>+2</sup>, Cr<sup>+3</sup>, Cr<sup>+6</sup>; Au<sup>+</sup>, Au<sup>+3</sup>; Ag<sup>+</sup>; Hg<sup>+2</sup>; Fe<sup>+2</sup>, Fe<sup>+3</sup>; Pt<sup>+</sup>, Pt<sup>+3</sup>



24.

- $[\text{Cr}(\text{NH}_3)_6]^{3+}$ , hexaamminechromium(III) ion. The oxidation state of Cr is 3+ so the electron configuration is  $d^3 (t_{2g}^3)$  so LFSE =  $-12Dq$
- $[\text{Cu}(\text{NH}_3)_4(\text{OH}_2)_2]^{2+}$ , *trans*-tetraamminediaquacopper(II) ion or *cis*-tetraamminediaquacopper(II) ion. The oxidation state of Cu is 2+ so the electron configuration is  $d^9 (t_{2g}^6 e_g^3)$  so LFSE =  $-6Dq$
- $[\text{Ti}(\text{OH}_2)_6]^{3+}$ , hexaaquatitanium(III) ion. The oxidation state of Ti is 3+ so the electron configuration is  $d^1 (t_{2g}^1)$  so LFSE =  $-4Dq$
- $[\text{Co}(\text{CN})_6]^{3-}$  (low spin), hexacyanocobaltate(III) ion. The oxidation state of Co is 3+ so the electron configuration is  $d^6 (t_{2g}^6)$  so LFSE =  $-24Dq + 2P$
- $[\text{Ni}(\text{NH}_3)_4\text{Cl}_2]$ , *cis*-tetraamminedichloronickel(II) or *trans*-tetraamminedichloronickel(II). The oxidation state of Ni is 2+ so the electron configuration is  $d^8 (t_{2g}^6 e_g^2)$  so LFSE =  $-12Dq$

25.



26.

- $[\text{Fe}(\text{CN})_6]^{3-}$
- $[\text{Co}(\text{o-phen})_3]^{3+}$