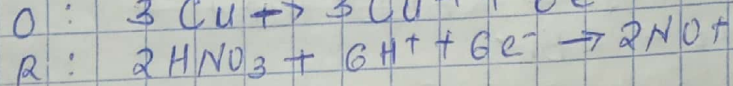
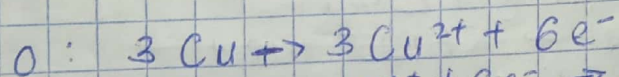
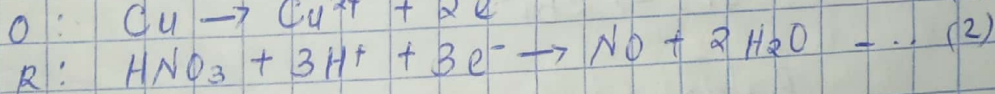
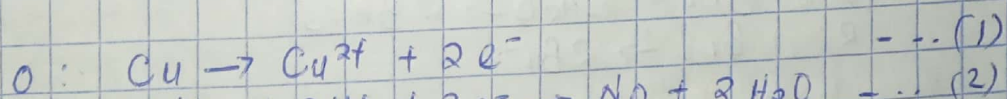
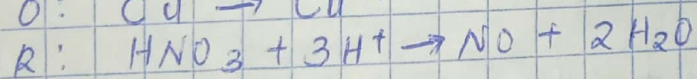
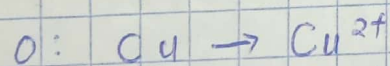
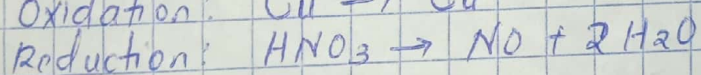
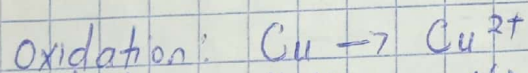
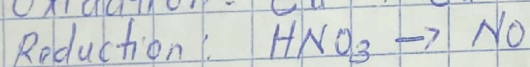
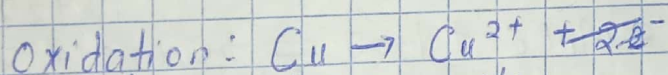
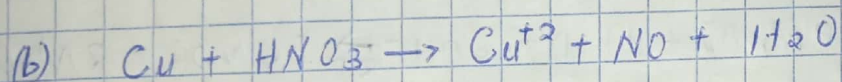
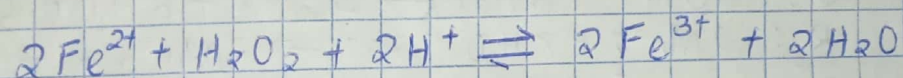
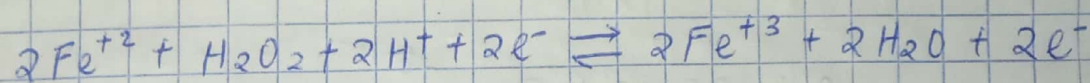
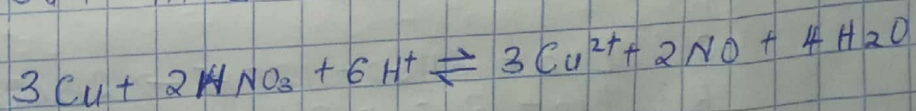
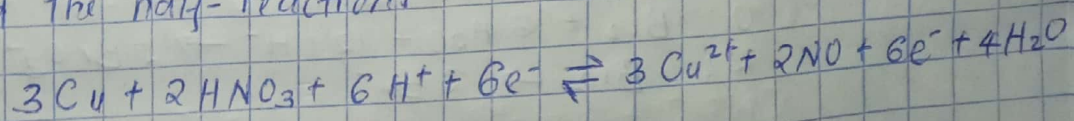
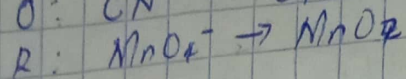
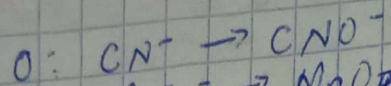
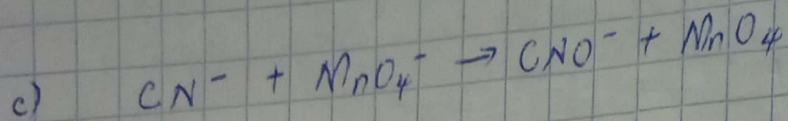
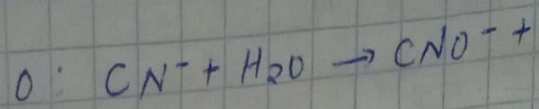
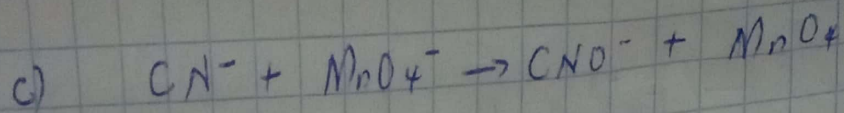


Add the half-reactions.

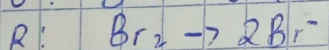
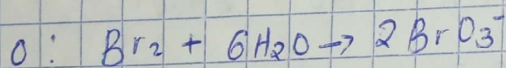
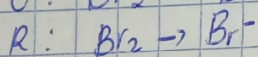
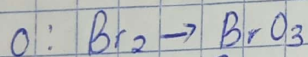
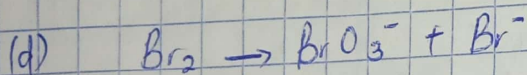
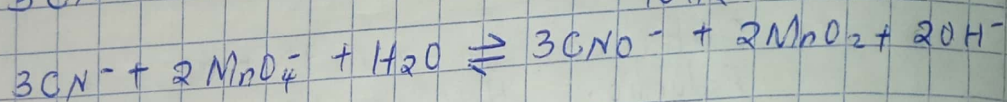
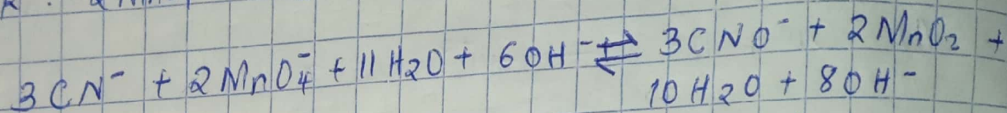
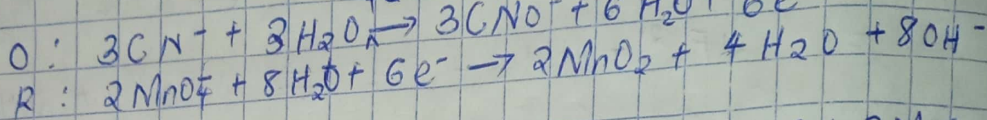
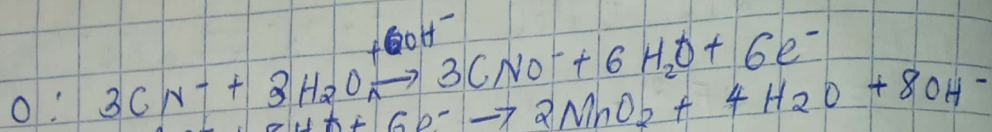
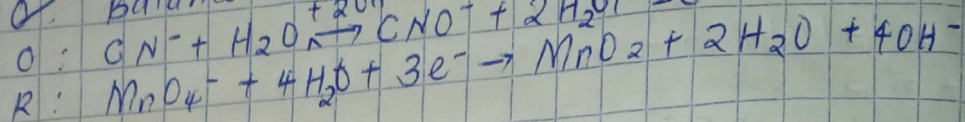
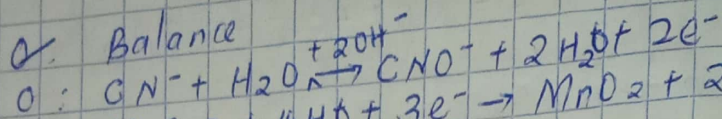


Add the half-reactions.

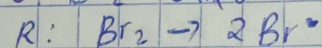
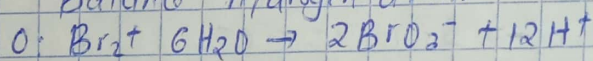




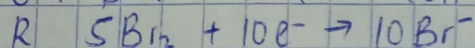
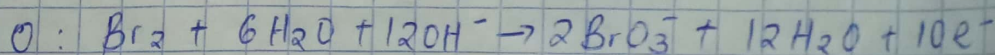
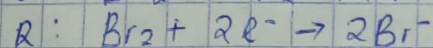
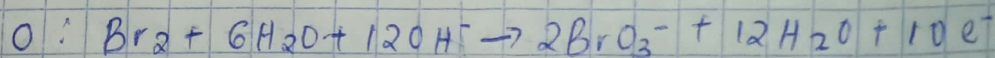
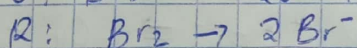
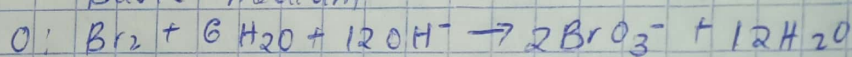
✓ Balance



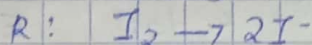
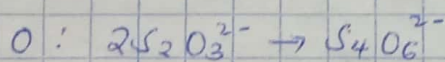
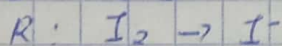
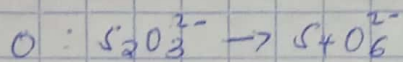
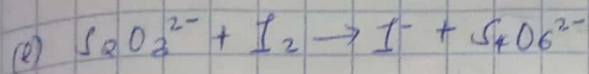
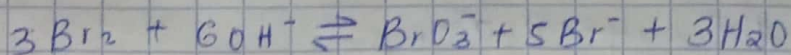
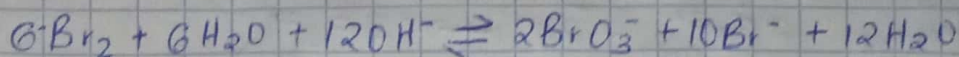
Balance hydrogen atoms



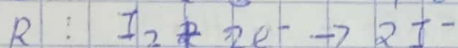
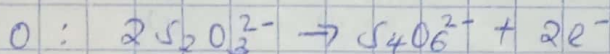
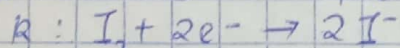
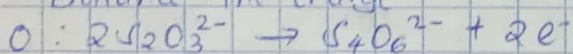
Basic medium



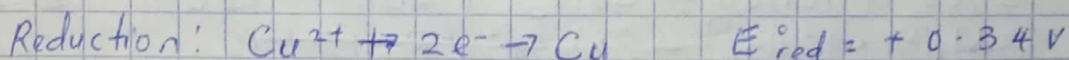
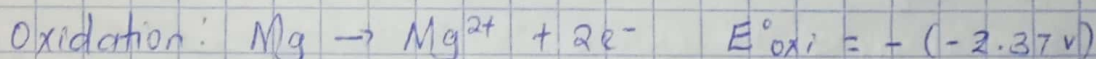
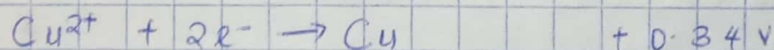
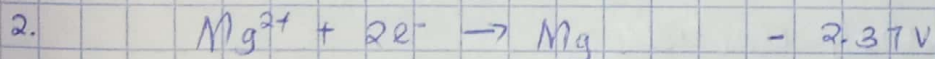
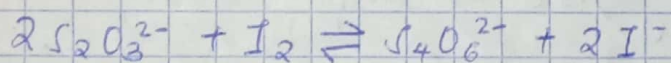
Add the half-reactions



Balance the charge



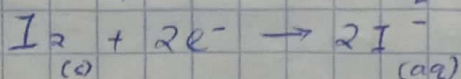
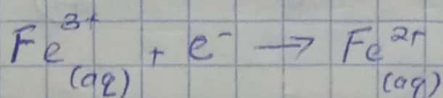
Add the half-reactions

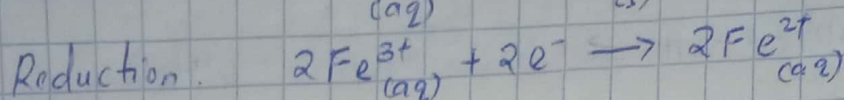
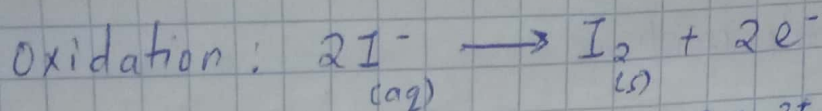


$$\begin{aligned} \text{EMF} &= E^\circ_{\text{oxi}} + E^\circ_{\text{red}} \\ &= -(2.37) + 0.34 \end{aligned}$$

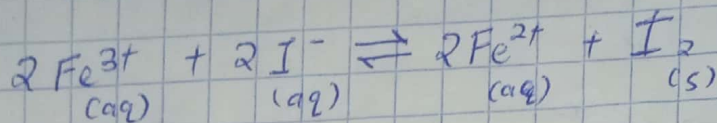
$$= +2.71\text{V}$$

3.

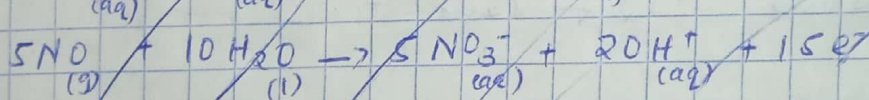
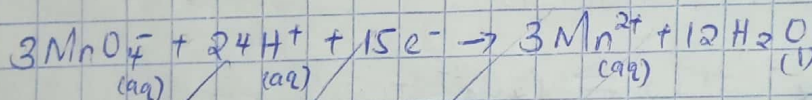
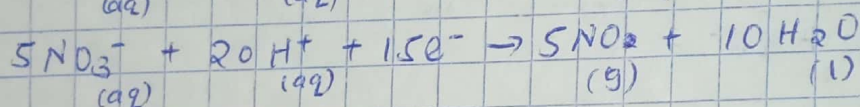
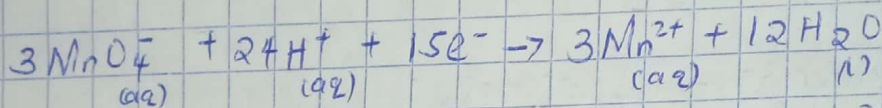
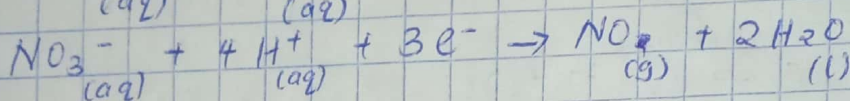
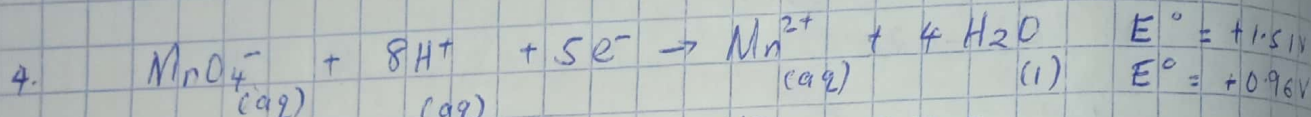




Add the half-reactions:



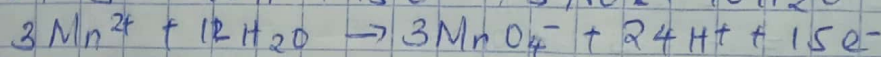
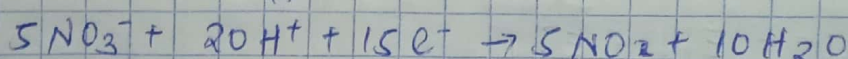
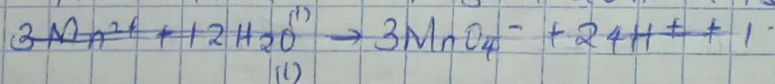
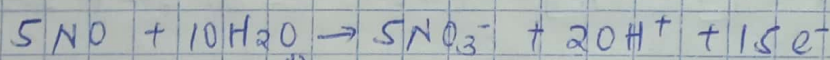
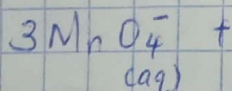
Fe^{3+} will oxidize I^- to I_2



$$E = +1.51\text{V}$$

$$E = -0.96\text{V}$$

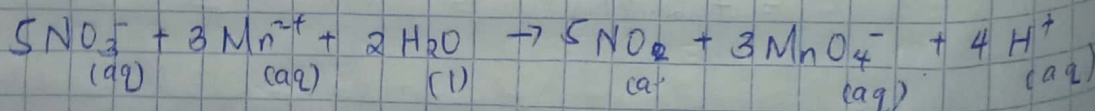
Add the half-reactions



$$E = 0.96\text{V}$$

$$E = 0.96\text{V}$$

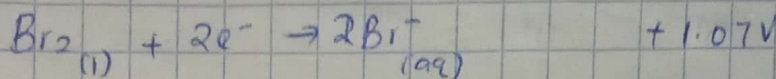
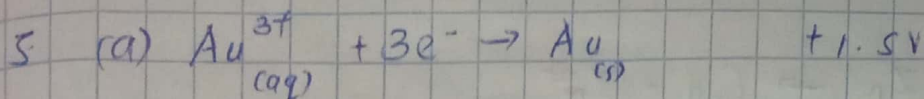
$$E = -1.51\text{V}$$



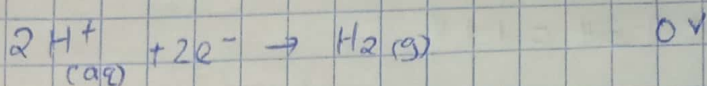
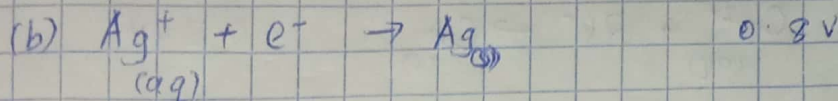
$$E = 0.96 - 1.51$$

$$= -0.55\text{V}$$

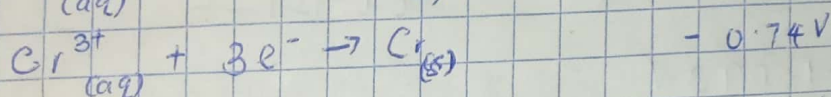
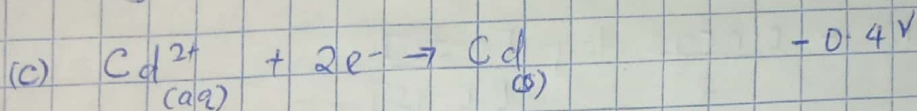
Negative E favours reverse reaction. Therefore, NO_3^- will not oxidize Mn^{2+} to MnO_4^-



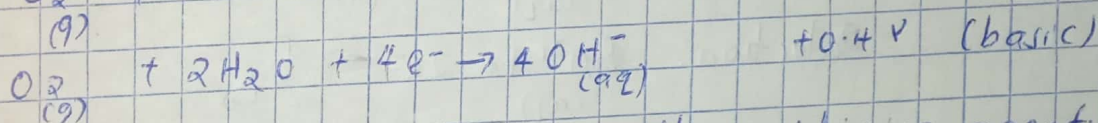
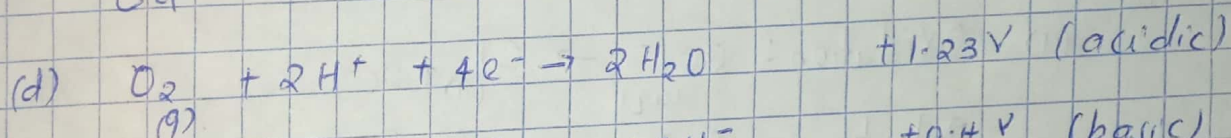
Au^{3+} is a better oxidizing agent than Br_2



Ag^{+} is a better oxidizing agent

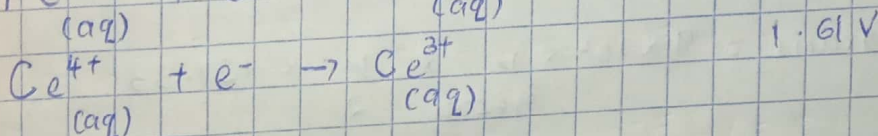
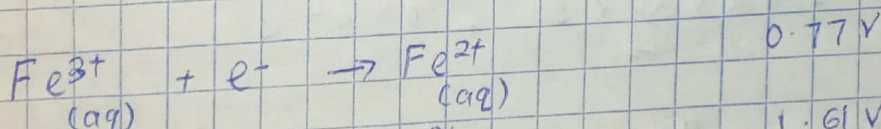


Cd^{2+} is a better oxidizing agent



O_2 in acidic media is a better oxidizing agent.

6.



$$E_{\text{cell}}^{\circ} = 1.61 - 0.77 = 0.84\text{V}$$

$$\Delta G^{\circ} = -nF E_{\text{cell}}^{\circ} = (-1)(96500)(0.84) = -81.06 \text{ kJ/mol}$$

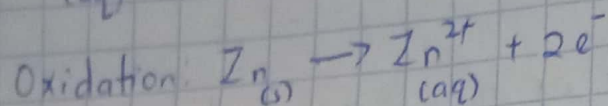
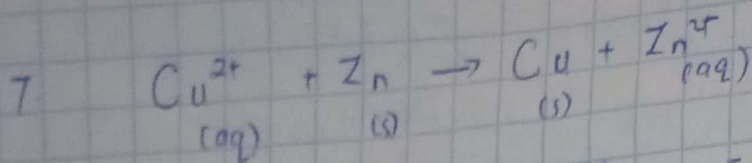
$$\Delta G^{\circ} = -RT \ln K$$

$$\ln K = \frac{-\Delta G^{\circ}}{RT}$$

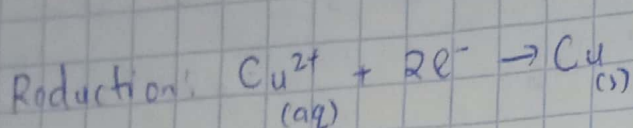
$$K = e^{-\left(\frac{\Delta G^{\circ}}{RT}\right)}$$

$$= e^{-\left(\frac{-81.06}{8.314 \times 298.15}\right)}$$

$$= 1.6 \times 10^{14}$$



$$0.76\text{V}$$



$$0.34\text{V}$$

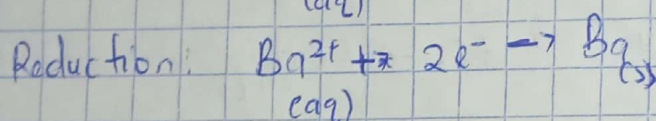
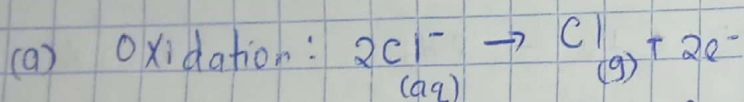
$$E^\circ = 0.76 + 0.34 = 1.1\text{V}$$

$$E = E^\circ - \frac{0.0592}{n} \log \frac{[\text{Zn}^{2+}]}{[\text{Cu}^{2+}]}$$

$$= 1.1 - \frac{0.0592}{2} \log \frac{[0.25]}{[0.15]}$$

$$= 1.093\text{V}$$

8



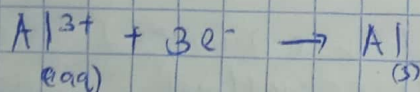
$$(b) \quad Q = \text{Current} \times \text{Time}$$

$$= 0.5 \times \frac{30}{60} \times 60 = 9 \times 10^2 \text{ C}$$

$$\text{Br, Grams} = 9 \times 10^2 \times \frac{1}{96500} \times \frac{1}{2} \times 137.33$$

$$= 0.64\text{g}$$

9.



$$Q = 60.2 \times \frac{1}{26.98} \times 3 \times 96500 = 6.46 \times 10^{-5} \text{ C}$$

$$\text{Time} = 6.46 \times 10^{-5} \times \frac{1}{0.352} \times \frac{1}{60} = 3.06 \times 10^4 \text{ min}$$