Predicting Redox Reactions

Pre-lesson assignment – Textbook p. 391-393

Make notes on predicting redox reactions

1. Explain the link between oxidation and reduction, and $E^{\ominus}$ in terms of the most positive and negative values.
2. Considering table 1:
    a. When A and B half cells are joined in a cell
        i. Which has the more positive value (and is therefore reduced)?
        ii. Which has the more negative value (and is therefore oxidised)?
        iii. Which of the following reaction combinations are possible?
            1. $Cr_{(s)} \rightarrow Cr^{3+}_{(aq)} + 3e^-$ and $Cu^{2+}_{(aq)} + 2e^- \rightarrow Cu_{(s)}$
            2. $Cr^{3+}_{(aq)} + 3e^- \rightarrow Cr_{(s)}$ and $Cu_{(s)} \rightarrow Cu^{2+}_{(aq)} + 2e^-$
        iv. Write an overall equation for A and B.
    b. When B and C half cells are joined in a cell
        i. Which has the more positive value (and is therefore reduced)?
        ii. Which has the less positive value (and is therefore oxidised)?
        iii. Which of the following reaction combinations are possible?
            1. $Ag_{(s)} \rightarrow Ag^{+}_{(aq)} + e^-$ and $Cu^{2+}_{(aq)} + 2e^- \rightarrow Cu_{(s)}$
            2. $Ag^{+}_{(aq)} + e^- \rightarrow Ag_{(s)}$ and $Cu_{(s)} \rightarrow Cu^{2+}_{(aq)} + 2e^-$
        iv. Write an overall equation for B and C.
    c. When A and C half cells are joined in a cell
        i. Which has the more positive value (and is therefore reduced)?
        ii. Which has the more negative value (and is therefore oxidised)?
        iii. Which of the following reaction combinations are possible?
            1. $Cr_{(s)} \rightarrow Cr^{3+}_{(aq)} + 3e^-$ and $Ag^{+}_{(aq)} + e^- \rightarrow Ag_{(s)}$
            2. $Cr^{3+}_{(aq)} + 3e^- \rightarrow Cr_{(s)}$ and $Ag_{(s)} \rightarrow Ag^{+}_{(aq)} + e^-$
        iv. Write an overall equation for A and B.
    d. Why can Cr^{3+} not be reduced by any combination of cells?
3. What are the limitations of predicting these reactions?
    note: $\Delta G = -nFE^{\ominus}$ where F is the faraday constant, but you don't need to know this. Basically, if you input a cell potential that is negative, you get $\Delta G > 0$. This means that these reactions will only work spontaneously in one direction.