7. Electrochemical Cell – Applications (V, 10)

a) Factors Affecting Electrochemical Cells

i) Concentration

- a change means not 1 M (so the "°" is removed from the E° cell)
- apply Le Chatelier's principle:

eg/ $Ag^+ + e^- \rightleftharpoons Ag_{(s)}$ E° cell = +0.80 V if $[Ag^+] = 1$ M

a "+" E cell means the forward reaction (reduction) is favored

eg/ $Ag^+ + e^- \rightleftharpoons Ag_{(s)}$ E cell = **less than** +0.80 V if $[Ag^+] = 0.5$ M

lower $[Ag^+]$ means a shift left, reduction favored less, so lower E cell value.

eg/ $Ag^+ + e^- \rightleftharpoons Ag_{(s)}$ E cell = **more than** +0.80 V if $[Ag^+] = 1.5$ M

higher $[Ag^+]$ means a shift right, so reduction favored more, so higher E cell

ii) Surface Area

- what if we use a larger electrode?
- will the E°cell be larger, smaller, the same?

① the electrode is a solid.
② changing the amount of solid will not affect its concentration
③ if concentration is not affected, neither is the ox/red equilibrium

- therefore, the E°cell will be the same!

(Note: the ***rate*** at which the cell works (reaction proceeds) will change!)

iii) Multiple Electrodes

- what if we have multiple anodes and multiple cathodes?
- at which electrode will the reactions proceed?

- choose the cathode – anode pair that will give the largest E°cell
  (the half reactions farthest from each other of the table!)
- the other electrodes will be spectators!

→ Example

Do Questions: #39, 42-45 page 225-226; #47-48 page 228