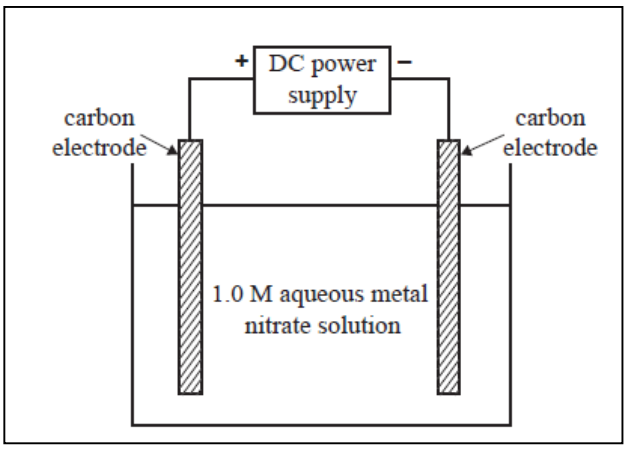
Friday Worksheet **Name: …….**

Electrolytic cells worksheet 7

1) A current of 0.85 Amps was passed through the electrolytic cell shown on the right for 57.0 minutes . This was done three times and each time a different solution was used.
The first time a 1.0 M $Cr(NO_3)_3$ solution was used. The second time a 1.0 M $Cu(NO_3)_2$ solution was used and the third time a 1.0 M $AgNO_3$ solution was used.
Calculate the mass of each metal that was deposited on each separate occasion.

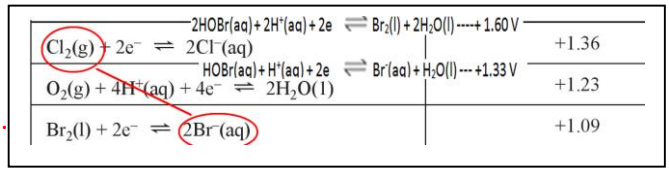


Step 1 Calculate the amount of charge delivered in Quolombs
=> Charge = 0.85 X 57.0 X 60
=> Charge = 2907 C
Step 2 calculate the mol of electrons delivered
=> 2907 / 96500 = 0.0301
Step 3 Calculate the mol of each metal deposited.
=> $Cr^{3+}(aq) + 3e$ => Cr (s) => 0.0301 /3 mol of Cr => mass = 52.0 X 0.0301/3 = 0.53 grams
=> $Cu^{2+}(aq) + 2e$ => Cu(s) => 0.0301 /2 mol of Cu => mass = 63.5 X 0.0301/2 = 0.96 grams
=> $Ag^{+}(aq) + e$ => Ag (s) => 0.0301 mol of Ag => mass = 108 X 0.0301 = 3.3 grams

2) An ornament was coated with a layer of metal M by electrolysis of the metal ion M^{y+}. A current of 1.85 amperes was applied for 20.00 minutes. What was the value of "y" if an amount of 5.75 X 10^{-3} mol of metal M was deposited?

Step 1 Calculate the amount of charge delivered in Quolombs
=> Charge = 1.85 X 20.0 X 60
=> Charge = 2220 C
Step 2 calculate the mol of electrons delivered
=> 2220 / 96500 = 0.0230
Step 3 Find the ratio of mol of M to electrons
=> 5.75 X 10^{-3} mol of M : 0.0230 mol of electrons.
=> 1 : 4
=> So for every mol of M, 4 mol of electrons are needed. Hence y = 4

3) Given the following standard electrode potentials in volts
$HOBr(aq) + H^+(aq) + 2e \rightleftharpoons Br^-(aq) + H_2O(l)$ --- +1.33 V
$2HOBr(aq) + 2H^+(aq) + 2e \rightleftharpoons Br_2(l) + 2H_2O(l)$ ----+ 1.60 V
Explain why a reaction between chlorine gas and bromine ions is expected to produce no significant amount of HOBr product.



Using the Data booklet we can see that
the strongest reductant present is Br^-
The reaction will occur as indicated on the right.
The products will therefore be Br_2 and
Cl^- according to the reaction $2Br^-(aq) + Cl_2(g) \Rightarrow 2Cl^-(aq) + Br_2(l)$
Students should try and use the data provided before assuming slow rate of reaction.