Electrochemistry — Stoichiometry

There are two types of problems:
A: Current to Amount of Substance
B: Amount of Substance to Time and Current

The half–reaction is used to relate moles of electrons to moles of substance, (i.e. moles of electrons in an electrochemical reaction can be dealt with in the same way as the stoichiometric amounts of reactants and products). However, electrical current is measured, and not masses of electrons. Therefore some unit of conversions is required.
The quantity of electrical charge is equal to the current that has flowed multiplied by the time. In SI system, the coulomb, C is the unit of electrical charge, the ampere, A, is the unit of current, and time is expressed in seconds:

$$\text{quantity of charge, } Q = I\,t$$

Current is used as a conversion factor between time and coulombs, where 1 A = 1C/s, so a current of 1 A means 1 C of charge passes a point each second in an electrical circuit.
The charge on a single electron is very small, (1.6022×10^{-19} C), so it takes 6.24×10^{18}electrons to produce just one coulomb of charge.

$$\text{Current, I (amps)} = \frac{\text{electric charge (Coulombs, C)}}{\text{time (seconds, s)}}$$

Since the half-reaction equation expresses amount of electrons in moles and current expresses amount of electrons in coulombs, a factor to convert between the two is needed. This factor is Faraday's constant (F) where F = 9.6485×10^{4} C/mol e– or 1 mole electrons = 9.65×10^{4} C.
(1.6022×10^{-19} C/e^{-1} x 6.022×10^{23} e^{-1}/mol = 9.6485×10^{4} C/mol e^{-1})
(Note: the conversion expressed this way has three significant figures.)
Faraday, also known as the Faraday constant, F, is the quantity of electrical charge carried by one mole of electrons. Knowing the charge and using the Faraday constant as the conversion factor, the number of moles of electrons that passed through an electrical cell can be calculated.

A. Current to Amount of Substance
1. What mass of copper metal can be produced by the electrolysis of a copper (II) sulphate solution for 1.0 h at a steady current of 100 A? (Answer: 119 g)
2. How many grams of chromium metal can be made from chromium(III) ion with a current of 0.54 A for 1.00 hour? (Answer: 0.35 g)
3. What volume of hydrogen gas at STP can be produced from aqueous hydrochloric acid with a constant current of 5.30 A for 90.0 minutes? (Answer: 3.32 L)
4. What mass of zinc must be oxidized in a voltaic cell if the cell is to produce a direct current of 0.015 A for a period of 15 min? (Answer: 0.0049 g)

B. Amount of Substance to Time and Current
5. How long does it take to make 5.56 g nickel metal from Ni^{+2} with a constant current of 3.78 A? (Answer: 80.6 min)
6. How many minutes are required to make 1.0 g potassium metal from potassium ion at a current of 3.53 A? (Answer: 12 min)
7. What current is required to reduce 0.21 g of zinc ion to zinc metal in 30.0 minutes? (Answer: 0.34 A)
8. What time would be required to plate an iron platter with 50 g of silver using a solution containing the $[Ag(CN)_2]^{-1}$ ion and a current of 1.5 A