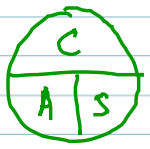
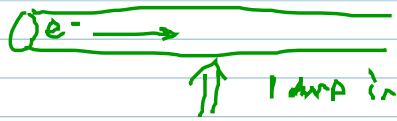
ELECTROLYSIS

The unit of electric current : ampere amps A

The unit of electric charge : coulomb C

$1\ C = 1\ A \cdot 1\ s$





1 mole e^- = 1 faraday

$1\ mole\ e^- = 9.65 \times 10^4\ C$

ELECTROPLATING $M^{2+} + 2e^- \rightarrow M$

electrolytic cell

(1) How many grams of Cu are deposited onto the cathode of an electrolytic cell if 5.0A of electricity runs through a $CuSO_4$ solution for 30 minutes?

$Cu^{2+} + 2e^- \rightarrow Cu$

$30\ min \times \frac{60\ sec}{1\ min} = 1800\ s$

$C = A \cdot s = (5.0A)(1800s) = 9000\ C$

$9000\ C \times \frac{1\ mole\ e^-}{9.65 \times 10^4\ C} \times \frac{1\ mol\ Cu}{2\ mole\ e^-} \times \frac{63.55\ g}{1\ mol\ Cu} = 2.96\ g\ Cu$

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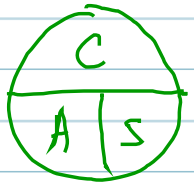

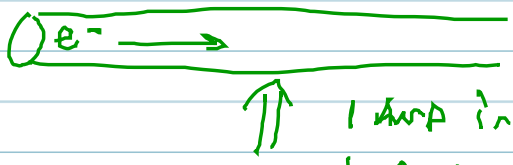

1 amp in 1 sec
1 C of charge

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How long (in minutes) would it take to plate out 1.5 g of Au onto a metal object using 3.0 A?

$$Au^{3+} + 3e^- \rightarrow Au$$

$s = \frac{C}{A}$

$$1.5\,g\,Au \times \frac{1\ mol\ Au}{196.97\,g} \times \frac{3\ mol\ e^-}{1\ mol\ Au} \times \frac{9.65\times10^4\,C}{1\ mol\ e^-}$$

$$= \frac{2204.65\,C}{3.0\,A} = 734.88\,s$$

$$\downarrow$$

$$12.25\,min$$

What current is needed to deposit 1.0 g of Ni from a solution of Ni^{2+} in 30 min?

$A = \frac{C}{s}$

$$Ni^{2+} + 2e^- \rightarrow Ni$$

$$\downarrow$$

$$1800\,s$$

$$1.0\,g\,Ni \times \frac{1\ mol}{58.69\,g} \times \frac{2\ mol\ e^-}{1\ mol\ Ni} \times \frac{9.65\times10^4\,C}{1\ mol\ e^-} = \frac{3288.46\,C}{1800\,s}$$

$$\downarrow$$

$$1.83\,A$$