total: 30 points

Homework 10.3

Exercises: 30, ~~31~~, 32, 33, ~~37~~, 38, 40, ~~41~~, 42
Problems: 19, 23, 24, 25, 26, 28, 29, 30, ~~31~~, ~~32~~

(2) **E.30 The electrons run from the power sources (battery) through the wire, through the animal, into the ground, back to the battery (which has one end connected to the ground).**

X **E.31 (This is a tricky problem). The potential difference (voltage) in the wire between the left and the right leg of the bird is very small; the wire has a much lower resistance than the bird, so very little current is running through the bird. (If the bird would touch ground (potential V =0), the potential difference between the wire and ground is huge, so a huge amount of current would run through the bird (would die).**

(2) **E.32 The circuit would not be complete, so no current can flow.**

(2) **E.33** Current arrives through one wire and leaves through the other.

X ~~E.37 The socket's central pin has the higher voltage. (it is more protected).~~

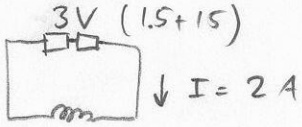
(2) **E.38** The end through which the current enters has the higher voltage. This is because there is a voltage drop, as the current runs through the strip.

(2) **E.40 The currents runs from one battery terminal through your tongue to the other terminal. Electrical energy from the charges is converted into heat and chemical energy (in your nerves and muscles).**

X ~~E.41 The power deposited in a metal is proportional to its electric resistance, so high-resistance metals heat more. So much that they melt in a tiny spot.~~

(2) **E.42** Most of the energy conversion (electrical energy to thermal energy and light) should happen in the filament (and not in the wire). The part of the circuit with the highest resistance has the highest power loss. You want this to happen in the filament.

P.19



energy of two batteries:

$2 \times 40{,}000\,J = 80{,}000\,J$

(4)

power: $P = V \cdot I = 3V \cdot 2A = 6W$

power: $P = \frac{E}{t} \rightarrow t = \frac{E}{P}$

$t = \frac{80{,}000\,J}{6\,W}$

$t = 13{,}333\,s$

$t = 3.7$ hours

P. 23 $R = 0.04\ \Omega$, $I = 15\ A$

$V_{drop} = I \cdot R$

(2) $= 15\ A \cdot 0.04\ \Omega$

$\underline{V_{drop} = 0.6\ V}$

P. 24 $P = I \cdot V$

(2) $= 15\ A \cdot 0.6\ V$

$\underline{P = 9\ W}$

P. 25 $P = V \cdot I$

(2) $= 400{,}000\ V \cdot 600\ A$

$P = 240{,}000{,}000\ W$

$\underline{P = 240\ MW}$

P. 26 $P = V \cdot I$ (power remains the same)

$I = P/V$

(2) $I = \dfrac{240{,}000{,}000\ W}{120\ V}$

$I = 2{,}000{,}000\ A$ (through all houses combined, not each house)

P. 28 $V = I \cdot R$

$I = V/R$

(2) $I = \dfrac{100\ V}{2{,}500\ \Omega}$

$\underline{I = 0.04\ A}$

P. 29 $V = I \cdot R$

$R = V/I$

(2) $R = \frac{1V}{10A}$

$R = 0.1\ \Omega$

P. 30 $R = V/I$

(2) $R = \frac{2V}{2A}$

$R = 1\ \Omega$