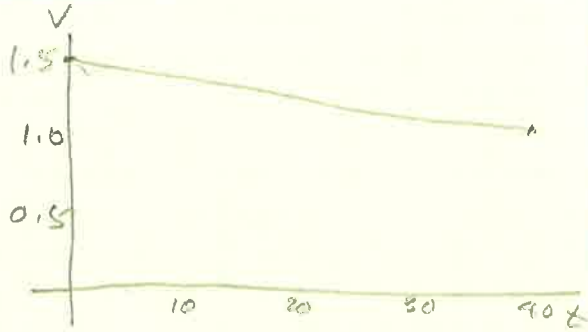
a 1.5V Battery will deliver 9mA for 40 hours. During that time the voltage drops from 1.5V to 1.0V linearly. How much energy does the Battery deliver in this 40 hour interval?



$$V = -\frac{0.5}{40h}t + 1.5$$

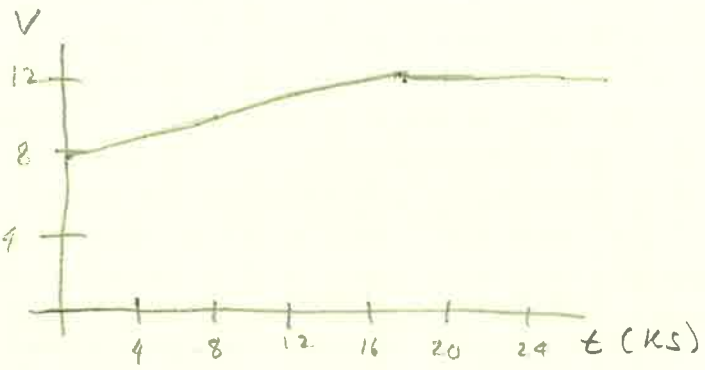
$$W = \int P\,dt = \int V I\,dt = \int_0^{40\text{ hours}} \left(-\frac{0.5}{40}t + 1.5\right)(9\text{mA})\,dt$$

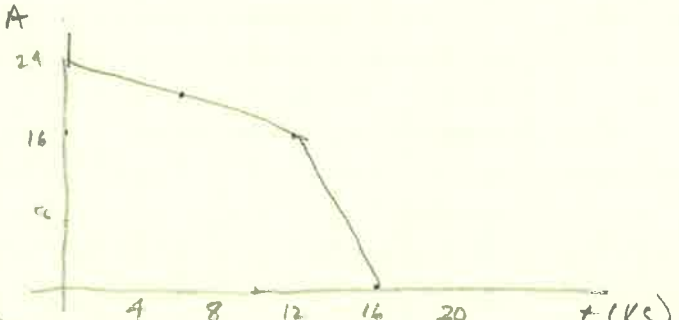
$$\boxed{W = 1620\text{ J}}$$

Voltage and current are shown Below

a) Find total charge transferred to battery

b) " " energy





a) $Q = \int i\,dt$

$= \int_0^{12K} \left(-\frac{8}{12}t + 24\right)dt + \int_{12K}^{16K} \left(-\frac{16}{4}t + 64\right)dt$

(area under the curve)

$= \frac{1}{2}(8)(12K) + 16(12) + \frac{1}{2}(4K)16$

$= 48K + 192K + 32K$

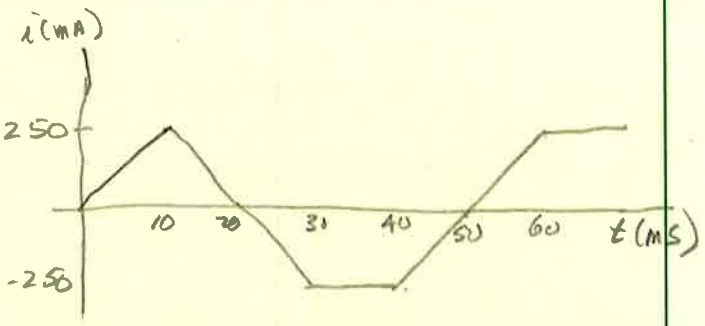
$\boxed{Q = 272K\ C}$

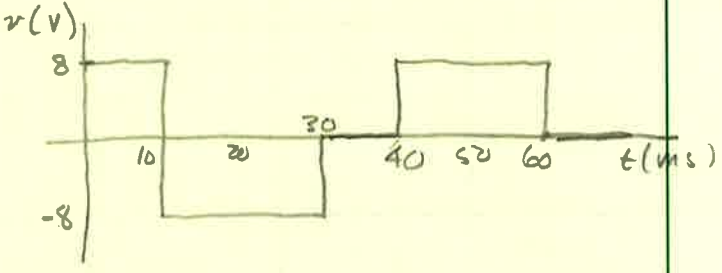
b) energy $= \int$ power $dt = \int VI\,dt$

$= \int_0^{12K} \left(\frac{3}{12}t + 8\right)\left(-\frac{8}{12}t + 24\right)dt + \int_{12K}^{16K} \left(\frac{3}{4}t + 8\right)\left(-\frac{16}{4}t + 64\right)dt$

$= \boxed{2618.7\ KJ}$

with V and I as shown:
a) sketch power vs. t
b) calculate energy delivered to the circuit element at t = 10, 30, and 80 ms.





a) Power = VI

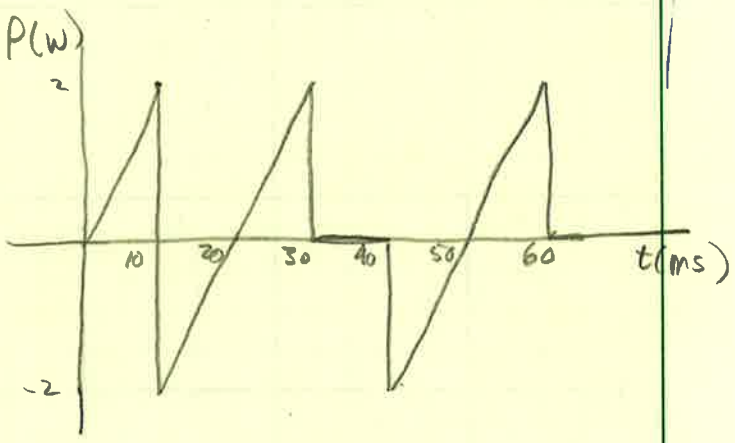
$0 < t \le 10 \quad p = 8\left(\frac{250}{10}t\right)$ mW

$10 \le t \le 30 \quad p = -8\left(-\frac{250}{10}t + 500\right)$ mW

$30 \le t \le 40 \quad p = 0$

$40 \le t \le 60 \quad p = 8\left(\frac{250}{10}t - 1250\right)$ mW

$t < 60 \quad p = 0$



b) energy = $\int$ power

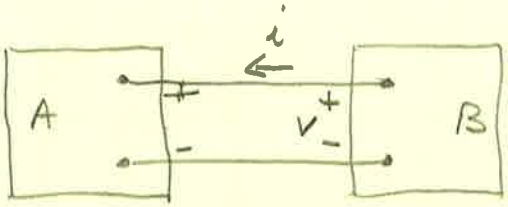
= area under curve

energy (0.01) = $\frac{1}{2}(10)(2) = \underline{10\text{ mJ}}$

(0.03) = $10 - \frac{1}{2}(2)(10) + \frac{1}{2}(2)(10) = \underline{\underline{10\text{ mJ}}}$

(0.80) = $10 - \frac{1}{2}(2)(10) + \frac{1}{2}(2)(10) = \underline{\underline{10\text{ mJ}}}$

Find the Power and state whether it is flowing from A-B or B-A



a) $i = 10A \quad V = 125V$

$P_A = iV = 1250\,W$

Power is Flowing from B-A

b) $i = 5A \quad V = -240V$

$P_A = -1200\,W$ from B-A or $1200\,W$ From A-B

c) $i = -12A \quad V = 480V$

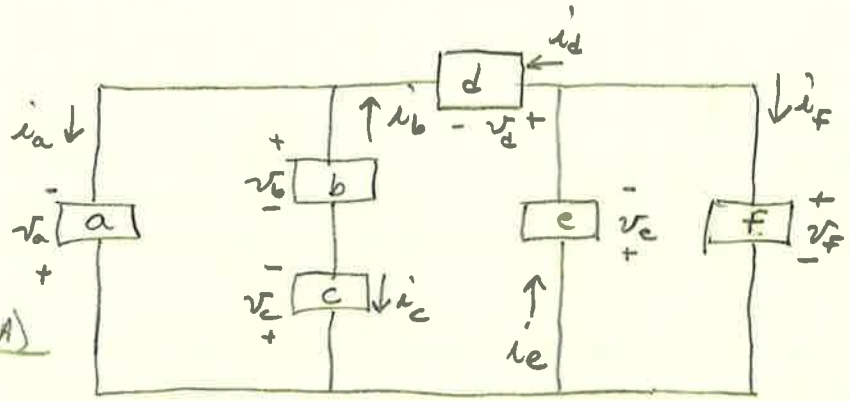
$P_A = (-12)(480) = -5760\,W$ From B-A or $5760\,W$ from A-B

d) $i = -25A \quad V = -660V$

$P = (-25)(-660) = 16,500\,W$ From B-A

Nilsson 10th eD.

Using the table below, does the circuit satisfy the power check?



Element	Volt (kV)	Curr (mA)
A	-3	-250
B	4	-400
C	1	400
D	1	150
E	-4	200
F	4	50

$P_a = -(i_a)(v_a) = -(-250)(-3) = -750\,mW$

$P_b = -(i_b)(v_b) = -(-400)(4) = 1600\,mW$

$P_c = -(i_c)(v_c) = -(400)(1) = -400\,mW$

$P_d = (i_d)(v_d) = (150)(1) = 150\,mW$

$P_e = (i_e)(v_e) = (200)(-4) = -800\,mW$

$P_f = (i_f)(v_f) = (50)(4) = 200\,mW$

$\Sigma P_{abs} = 1600 + 150 + 200 = 1950\,mW = 1.95\,W$ ✓

$\Sigma P_{del} = 750 + 400 + 800 = 1950\,mW = 1.95\,W$ ✓

Yes