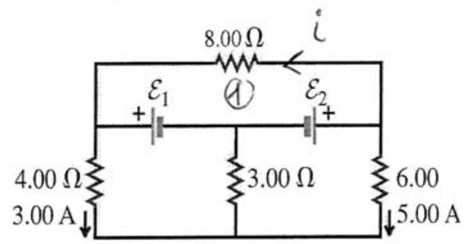
KING FAHD UNIVERSITY OF PERTOLEUM & MINERALS
PHYSICS DEPARTMENT
QUIZ #10- CHAPTER 27

NAME: Key ID# SECTION#

a. What is the value and direction of the current in the 8 Ω resistor?



T042-Fig. 5

Kirchhoff's for the big loop

$$-4\times 3 + 6\times 5 - 8i = 0$$

$$i = 2.25\,A$$

If Ɛ2 = 30 V, What is the value of Ɛ 1?

Kirchhoff's for loop 1

$$-\mathcal{E}_1 + \mathcal{E}_2 - 8\times 2.25 = 0$$

$$\mathcal{E}_1 = -18 + 30 = 12\,V$$

$$\mathcal{E}_1 = 12\,V$$

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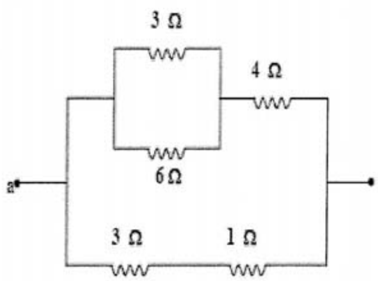
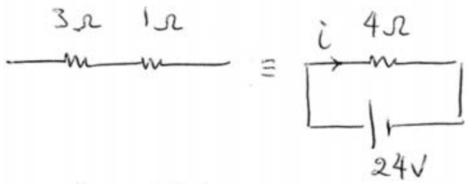
The potential difference between points Va-Vb = 24 V.



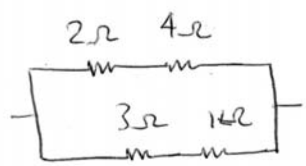
a. Calculate the current in the 1 Ω resistor.

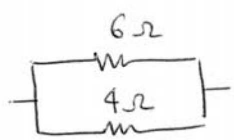


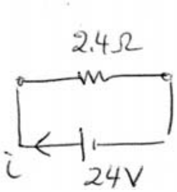
$i = \frac{24}{4} = 6\,A$

$\boxed{i = 6\,A}$

b. Calculate the power dissipated in the [redacted] resistors.







$i = \frac{24}{2.4} = 10\,A$

$P = i^2 R$

$= (10)^2 \times 2.4$

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

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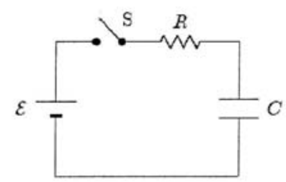
In the circuit shown in the figure, the capacitor is initially uncharged. At t = 0, switch S is closed.

$\mathcal{E}$ = 9 V, R = 15 Ω and C = 60 μF.

a. What is the **voltage** across the **resistor** 50 μs after the switch is closed?



$$V = iR = \frac{\mathcal{E}}{\cancel{R}} e^{-t/RC} \times \cancel{R}$$

$$= \mathcal{E} e^{-t/RC}$$

$$= 9 e^{-\frac{50\times10^{-6}}{15\times 60\times10^{-6}}} = 9 e^{-0.056} = 8.5V$$

$$\boxed{V = 8.5V}$$

b. At what time is the **charge** on the **capacitor** one-third its maximum value?

$$q = q_{max}\left(1 - e^{-t/RC}\right)$$

$$\frac{\cancel{q_{max}}}{3} = \cancel{q_{max}}\left(1 - e^{-t/RC}\right)$$

$$\frac{1}{3} = 1 - e^{-t/RC} \Rightarrow e^{-t/RC} = 0.666$$

$$-\frac{t}{RC} = -0.41$$

$$\boxed{t = 3.6 \times 10^{-4} s}$$