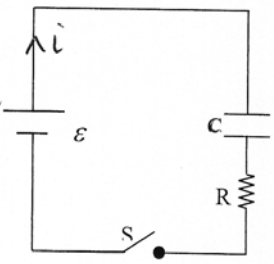
KING FAHD UNIVERSITY OF PERTOLEUM & MINERALS
PHYSICS DEPARTMENT
QUIZ #9- CHAPTER 27

NAME: Key ID# SECTION#

Consider a series RC circuit as shown in the figure, where $R = 1.0\,M\Omega$, $C = 5.0\,\mu F$ and $\varepsilon = 30$ V. If the switch is closed at $t = 0$,



(a) What is the current in resistance R at time 10 s after the switch is closed? What is its direction in the figure?

$$i = \frac{dq}{dt} = \frac{\varepsilon}{R} e^{-t/RC} = \frac{30}{1\times10^{6}} e^{-\frac{10}{5\times10^{-6}\times1\times10^{6}}}$$

$$i = 30\times10^{-6} e^{-2} =$$

$$\boxed{i = 4.1\times10^{-6}\ A}$$

(b) What is the charge on the capacitor plates at t = 10 s?

$$q = C\varepsilon\left(1 - e^{-t/RC}\right) = 5\times10^{-6}\times 30\left(1 - e^{-2}\right)$$

$$\boxed{q = 1.3\times10^{-4}\ C}$$

(c) What is the potential difference across the capacitor at t = 10 s?

$$V_c = \frac{q}{C} = \frac{1.3\times10^{-4}\ C}{5\times10^{-6}\ F} = \boxed{25.9\ V}$$

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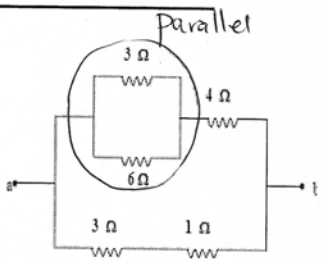
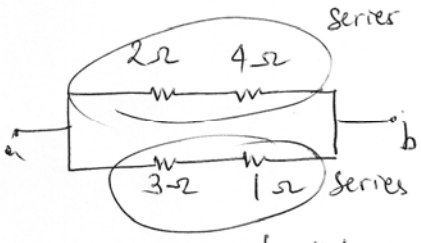
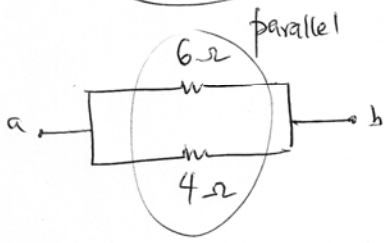
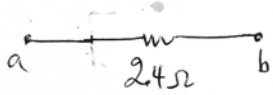
(a) Find the equivalent resistance between points a and b for the circuit shown in the figure.





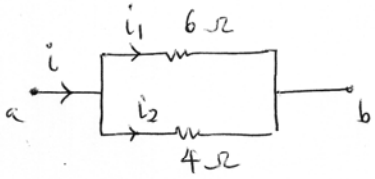




$R_{eq} = 2.4\,\Omega$

(b) If the potential difference Va-Vb = 10 V, what is the current in the 1 Ω resistor?

$i = \frac{10}{2.4} = 4.2\ A$



$V_a - V_b = i_2 \times 4 = i_1 \times 6$

$i_2 = \frac{10}{4} = 2.5\ A$

$i_1 = \frac{10}{6} = 1.7\ A$

Sum = 4.2 A

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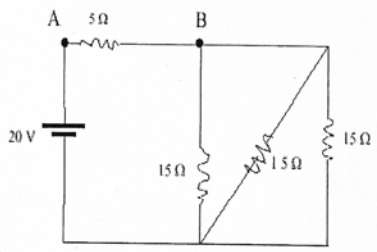
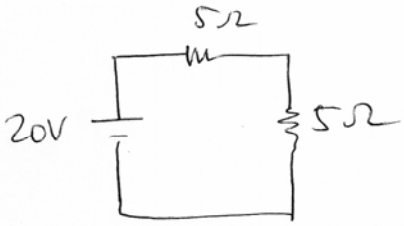
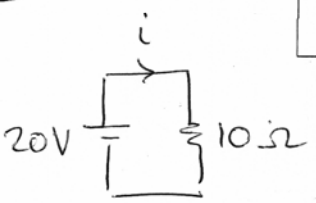
(a) Find the equivalent resistor of the circuit shown in the figure.

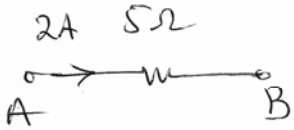




$i = 2A$



(b) Find the potential difference (VB-VA) between points B and A.



$$V_B - V_A = -\ 2 \times 5 = -10V$$

(c) What is the current in the 15 Ω resistors on the right?

$i_4 = \frac{2}{3}\ A$