11. A resistor of unknown resistance and a 15-Ω resistor are connected across a 20-V emf in such a way that a 2.0 A current is observed in the emf. What is the value of the unknown resistance?
   a. 75 Ω  
   b. 12 Ω  
   c. 7.5 Ω  
   d. 30 Ω  
   e. 5.0 Ω

\[
\text{Reg} = \frac{20V}{2.0A} = 10 \Omega < 15 \Omega \text{ so must be parallel}
\]
\[
\frac{1}{10\Omega} = \frac{1}{15\Omega} + \frac{1}{R_u} \quad R_u = 0.033 \frac{1}{\Omega}
\]
\[
R_u = 30 \Omega
\]

12. What is the current in the 15-Ω resistor when ε = 9.0 V?

\[
R_{eq} = \left(\frac{1}{15} + \frac{1}{30}\right) \Omega + 20 \Omega = 30 \Omega
\]
\[
I_b = \frac{\varepsilon}{R_{eq}} = 0.30 A
\]
\[
V_p = \varepsilon - I_b (20 \Omega) = 3.0 V
\]
\[
I_{15} = \frac{V_p}{15 \Omega} = 0.20 A
\]

13. What is the potential difference \(V_b - V_A\) when \(I = 0.50\) A in the circuit segment shown below?

\[\Delta V = (10\Omega) I + 15V + (16.5\Omega) I = 28V\]

14. A capacitor in a single-loop RC circuit is charged to 85% of its final potential difference in 2.4 s. What is the time constant for this circuit?

\[
C = \frac{V_0}{V_c (1 - e^{-t/RC})}
\]
\[
0.85 = 1 - e^{-t/RC} \quad e^{-t/RC} = 0.15
\]
\[
-\frac{t}{RC} = \ln(0.15) \quad RC = -\frac{2.45}{\ln(0.15)} = 1.35
\]

15. If 480 C pass through a 4.0-Ω resistor in 10 min, what is the potential difference across the resistor?

\[
I = \frac{\Delta Q}{\Delta t} = \frac{480C}{(10 \text{ min})(60 \text{ s/min})} = 0.80 A
\]
\[
V = IR = 3.2 V
\]