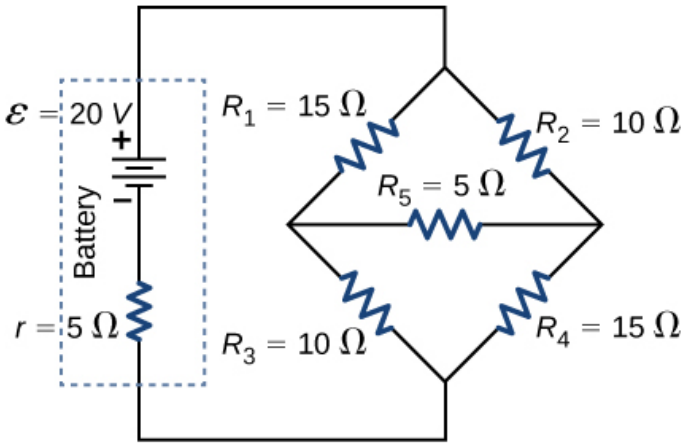
Name _____ PHY2049C, Practice Quiz 5

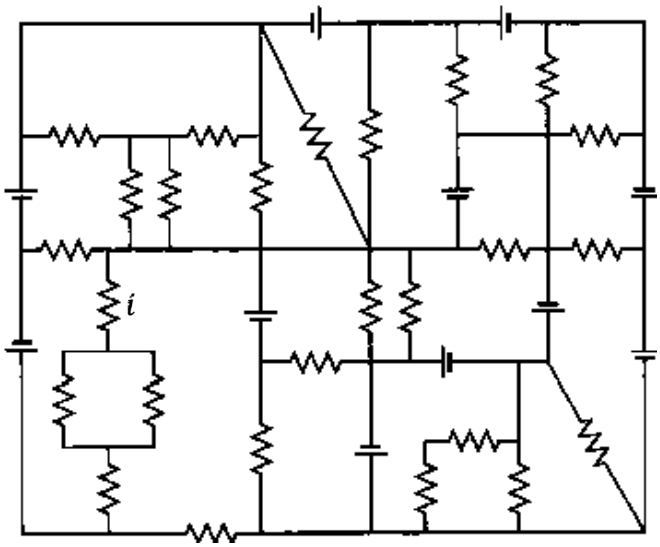
A- Read all the quiz once, or twice, before beginning to write. Make sure to comprehend all questions and start with those you feel most confident.
B – Be clear and concise. There are no extra points for being verbose or writing extra.
C –Only use the white pages that I will provide. You have 60 minutes to answer the quiz.

Problem 1 (OpenStax)

Consider the circuit shown below (to the left). (a) Find the current through each resistor. (b) Check the calculations by analyzing the power in the circuit.



Problem 1



Problem 2

Problem 2 (Halladay, Resnik)

What are the (a) size and (b) direction (up or down) of current i in the circuit above (to the right), where all resistances are 4.0 Ohms and all batteries are ideal and have an emf of 10 V?

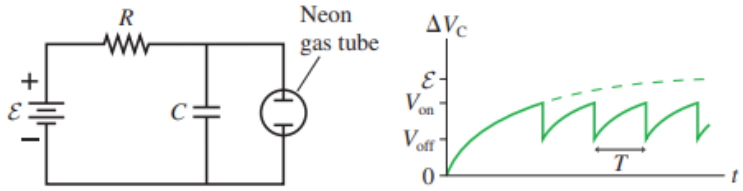
Problem 3

At first, the ratio of the number of teachers to the number of students in a school is 2 : 25. Then two teachers quit, and the ratio becomes 3:50. What was the initial number of students?

Problem 4

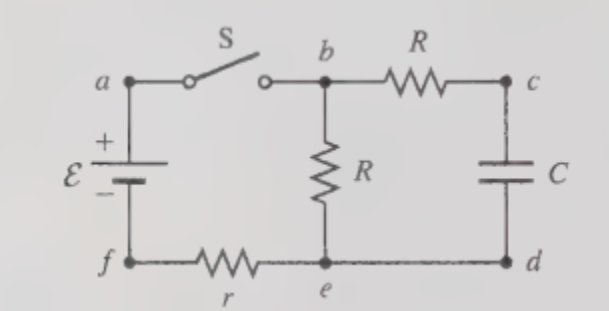
An oscillator circuit is important to many applications. A simple oscillator circuit can be built by adding a neon gas tube to an RC circuit, as shown in the figure. Gas is normally a good insulator, and the resistance of the gas tube is essentially infinite when the light is off. This allows the capacitor to charge. When the capacitor voltage reaches a value Von, the electric field inside the tube becomes strong enough to ionize the neon gas. Visually, the tube lights with an orange glow. Electrically, the ionization of the gas provides a very-low-resistance path through the tube. The capacitor very rapidly (we can think of it as instantaneously) discharges through the tube and the capacitor voltage drops. When the capacitor voltage has dropped to a value Voff, the electric field inside the tube becomes too weak to sustain the ionization and the neon light turns off. The capacitor then starts to charge again. The capacitor voltage oscillates between Voff, when it starts charging, and Von, when the light comes on to discharge it. Show that the oscillation period is :

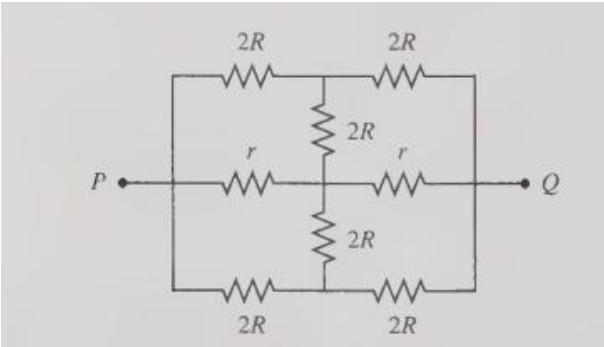
$$T = RC \ln\left(\frac{\mathcal{E} - V_{\text{off}}}{\mathcal{E} - V_{\text{on}}}\right)$$



Problem 5

A t=0 the switch is closed in the figure on the left; the capacitor discharged. Determine q at a time t





Problem 6

Calculate the equivalent (effective) resistance between points P and Q (figure on the right).