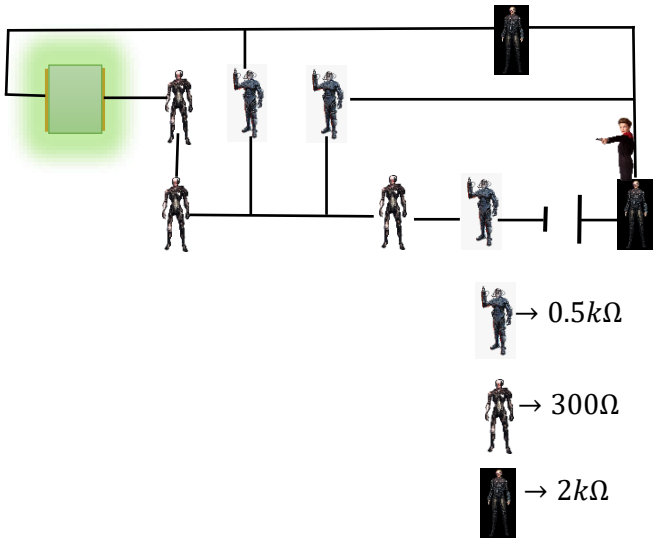
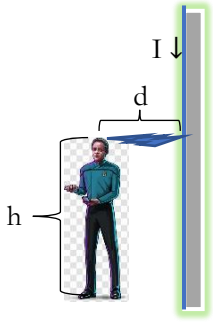
Discussion Week 6 Question 1

After arriving back from the Delta-Quadrant, Admiral Kathryn Janeway leads a covert mission to eliminate the Borg threat once and for all. After boarding a Borg cube, the team accouter a Borg regeneration alcove that is connected to the shield generator leading to the communication center of the cube. The configuration behaves like an electrical circuit with a 20MV battery with the regenerating Borgs and shield generator acting like resistors. Below is a schematic design by Lieutenant Harry Kim. What is the current running through the 80kΩ shield generator?



Discussion Week 6 Question 2

As Janeway's team inflitate the cube they get separated and the ship security turns on. One of her recent recurits recommended by Section 31, Dr. Julian Bashir, is walking near a wall that has a current of 3000A running along the surface (pictured below). When the sercuity of the cube activates, part of the current jumps a gap of distance d and travels through Dr. Bashir (an ample conductor compared to the air due to the salt water content of a humanoid body) which has a height of h. The ratio of d/h is 0.5, what is the current in Dr. Bashir's body (his resistance is negidible (or should I say futile?))?



Discussion Week 6 Question 3

The information storage array of the Cube is protected by a doorway that discharges a charge between the doorway with a time constant t. Lt. Tuvok deduces that the door is behaving like a capacitor in a RC Circuit. Engineer Torres disassembles part of the wall to reveal that the door is connected to a resistor of 25 MΩ with an electromotive force of $\mathscr{E}$=20V. If the capacitance of the doorway is 0.18F, what is the maximum charge that will build up on the doorway and how much time will it take to reach a 3rd of that charge?