1. What is the maximum voltage that can be applied across a 300 Ω resistor without risking damage, if the resistor's maximum power rating is $\frac{1}{4}W$?

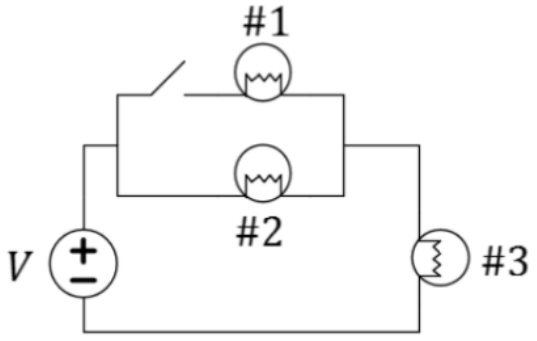
a. 5 V
b. $5\sqrt{3}$ V
c. 10 V
d. $10\sqrt{3}$ V
e. 25 V

2. Imagine we cook an egg by immersing it into water which is boiled by an ***electric heater***. The heater utilizes a current, I, at a voltage, V, for a time, T. If the change in energy of a newly cooked egg over its raw energy is given by ΔE_{egg}, the energy wasted in the cooking process is given by which equation below?

a. $E_{wasted} = IV$
b. $E_{wasted} = IV + \Delta E_{egg}$
c. $E_{wasted} = IV - \Delta E_{egg}$
d. $E_{wasted} = IVT + \Delta E_{egg}$
e. $E_{wasted} = IVT - \Delta E_{egg}$

3. What happens to the brightness of light bulbs #2 and #3 when the switch is closed, thus connecting light bulb #1 to the circuit, in parallel with light bulb #2, as shown below? You may assume that all of the bulbs have the same resistance and that brightness increases when current increases (and brightness decreases when current decreases).

a. #2 and #3 get dimmer
b. #2 and #3 get brighter
c. #2 and #3 are not affected
d. #2 gets dimmer, #3 gets brighter
e. #2 gets brighter, #3 gets dimmer



4. A 60 kg student runs up 20 m of stairs in 24 seconds. The best estimate of the average power produced by the student during this 24 second exercise?

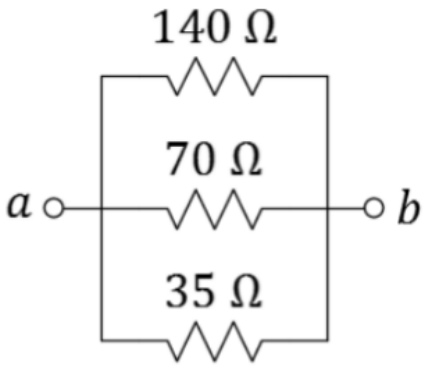
a. 50 W
b. 100 W
c. 500 W
d. 800 W
e. 1.5 kW

5. Consider a moving hybrid car that has 600 kJ of kinetic energy. If regenerative braking recovers 20% of this energy when the car stops, what is the total charge added to the car's 240 V battery?

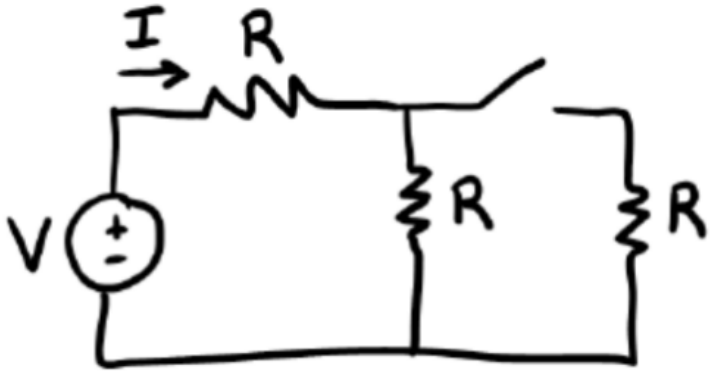
a. 250 C
b. 500 C
c. 1000 C
d. 2000 C
e. 2500 C

6. What is the value of resistance between ***a*** and ***b***?

a. R = 245 Ω
b. R = 81.7 Ω
c. R = 35 Ω
d. R = 23.3 Ω
e. R = 20 Ω

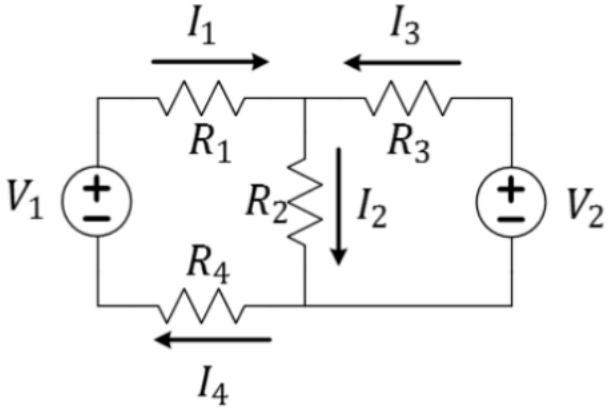


7. The current passing through the horizontal resistor when the switch is open has value I $Amps$. What happens to the current through the horizontal resistor when the third resistor is added to the circuit by closing the switch?



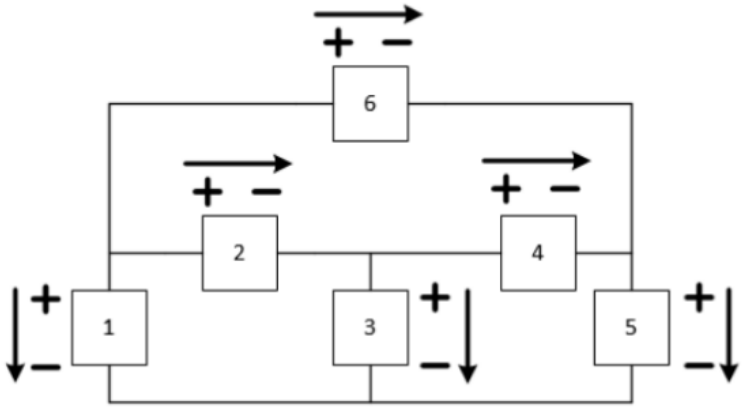
a. The current decreases to $I/2$ $Amps$.
b. The current decreases to $2I/3$ $Amps$.
c. The current stays the same.
d. The current increases to $4I/3$ $Amps$.
e. The current increases to $2I$ $Amps$.

8. Which of the following KCL and KVL equations is **incorrect** for this circuit?



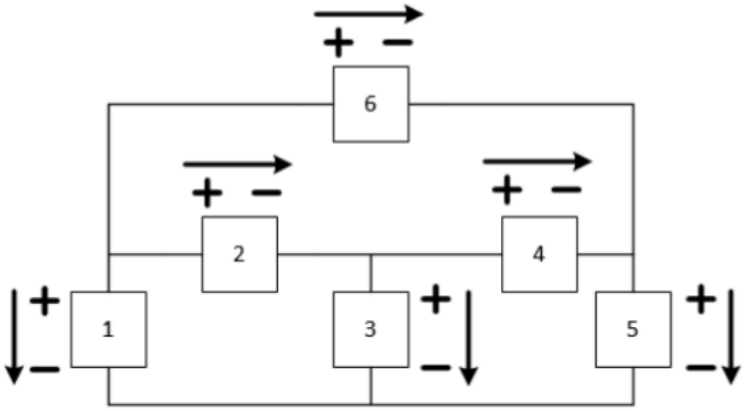
a. $I_1 = I_4$
b. $I_2 = I_3 + I_4$
c. $I_2R_2 + I_3R_3 - V_2 = 0$
d. $I_1R_1 + I_2R_2 + I_4R_4 = V_1$
e. $V_1 - I_1R_1 - I_3R_3 - V_2 - I_4R_4 = 0$

9. If v2 = 0.7 V, v4 = 0.3 V, v5 = 0.5 V in the circuit below, what is v1?



a. 0.1 V
b. 0.5 V
c. 0.8 V
d. 1.0 V
e. 1.5 V

10. If i1 = -10 mA, i3 = 5 mA, i6 = 2 mA in the circuit below, what is i4?



a. 2 mA
b. 3 mA
c. 5 mA
d. 7 mA
e. 13 mA