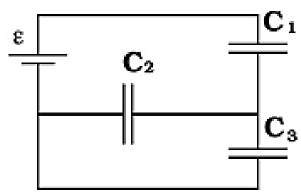
The next four questions pertain to the situation described below.

In the circuit below, consisting of a battery and several capacitors, some quantities are known and some are not. The capacitors were completely uncharged before the battery was attached and we are considering the static situation. (Be sure to keep at least 3 sig. figs. in your answer for all parts of this problem.)



Known Quantities:

- Q_1= 8.3 x 10^{-6} C
- C_1= 5.6 x 10^{-6} F
- C_2= 1.4 x 10^{-6} F
- Energy stored on C_2 is W_2= 4.3 x 10^{-6} J

1) What is the potential difference across $\mathbf{C_1}$**?**
V_1 =

[ ] V

2) What is the potential difference across $\mathbf{C_2}$?
V_2 =

[ ] V

3) What is the potential difference across $\mathbf{C_3}$?
V_3 =

[ ] V

4) What is the charge $\mathbf{Q_3}$ on capacitor $\mathbf{C_3}$?
Q_3 =

[ ] x 10^{-6} C

The next eight questions pertain to the situation described below.

5) If you have five capacitors with capacitances 0.7 x 10^{-6} F, 1.9 x 10^{-6} F, 3.8 x 10^{-6} F, and two 6.4 x 10^{-6} F in **series**. What is the equivalent capacitance of all five?
C =

x 10^{-6} F

6) Initially the capacitors are uncharged. Now a 7 V battery is attached to the system. How much charge is on the positive plate of the 3.8 x 10^{-6} F capacitor?
Q =

x 10^{-6} C

7) What is the potential difference between the plates of the 3.8 x 10^{-6} F capacitor?
V =

V

8) How much energy is stored in the entire capacitor system?
PE =

x 10^{-6} J

9) If you have five capacitors with capacitances 0.7 x 10^{-6} F, 1.9 x 10^{-6} F , 3.8 x 10^{-6} F, and two 6.4 x 10^{-6} F in **parallel**. What is the equivalent capacitance of all five?
C =

x 10^{-6} F

10) If one attaches a 7 V battery to the system, how much charge is on the positive plate of the 3.8 x 10^{-6} F capacitor?
Q =

x 10^{-6} C

11) What is the potential difference between the plates of the 4.0 x 10^{-6} F capacitor?
V =

V

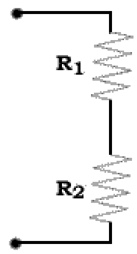
12) How much energy is stored in the entire capacitor system?
PE =

[ ] x 10^{-6} J

The next seven questions pertain to the situation described below.

Find the equivalent resistance for each of the networks shown below. All resistances are in ohms.

13)

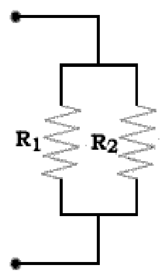


$\mathbf{R_1 = 7}\ \Omega\ \mathbf{R_2 = 11.4}\ \Omega$

R =

Ω

14)

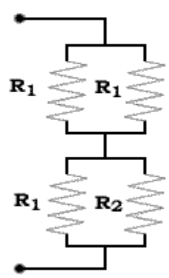


$\mathbf{R_1 = 7}\ \Omega\ \mathbf{R_2 = 11.4}\ \Omega$

R =

Ω

15)

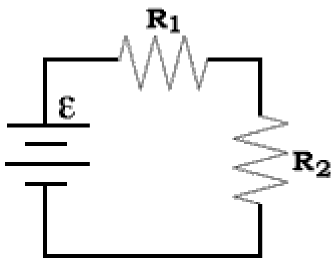


$\mathbf{R_1 = 7}\ \Omega\ \mathbf{R_2 = 11.4}\ \Omega$

R =

Ω

16) Find the current flowing in the circuit below.



$R_1 = 7\ \Omega$ $R_2 = 11.4\ \Omega$ $V = 4.6$ V

I =

A

17) How much power does the battery deliver?
P_{BATT} =

W

18) How much power does each resistor dissipate?
P_{R1} =

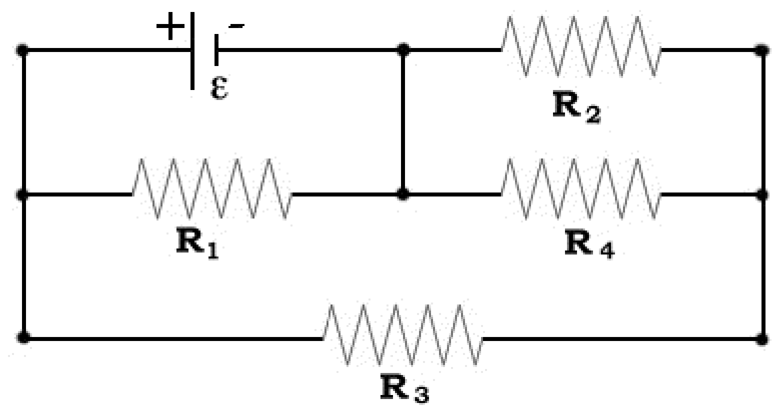
W

19) **P_{R2}** =

W

The next four questions pertain to the situation described below.

Be careful to keep a lot of significant figures for all of your answers!



R_1 = 2 Ω **R_2 = 6 Ω** **R_3 = 12 Ω** **R_4 = 8 Ω** **V = 4 V**

20) What is the current through the resistor, **R_1** in the above circuit?

I =

A

21) What single, equivalent resistor could replace all of the resistors in this circuit?

R_{tot} =

Ω

22) What is the current supplied by the battery?

I =

A

23) What is the current through the resistor, **R_2** ?

I =

A

The next four questions pertain to the situation described below.

We normally give \"brightest\" of a house-hold light bulb by giving the amount of power that light bulb uses. A house-hold bulb that discipates 100W of electrical power puts out more light that one that discipates 60 Watts of electrical power. A standard light bulb operates on a potential drop of around 92 V.

24) For a 75 watt light bulb, what is the current through the bulb?
$i =$

[ ] A

25) What is the resistance of this bulb?
$R =$

[ ] Ω

26) Now assume you have a light bulb that has half the resistance of the one in part (2) and the same potential drop. What is the is the power rating of this bulb?
$P=$

[ ] W

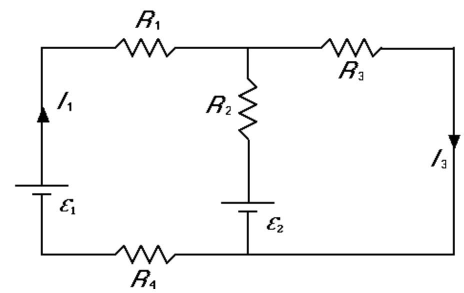
27) Based on your answer to part (3), how is the resistance of a light bulb and it's power rating related?

- (1) The higher the power, the lower the resistance
- (2) The higher the power, the higher the resistance

[ ] Type in the number that corresponds to your answer

The next two questions pertain to the situation described below.

The circuit in the figure is composed of two batteries (e_1 = 8 V and e_2 = 5 V) and four resistors (R_1 = 110 Ω, R_2 = 40 Ω, R_3 = 40 Ω, and R_4 = 50 Ω, as shown.



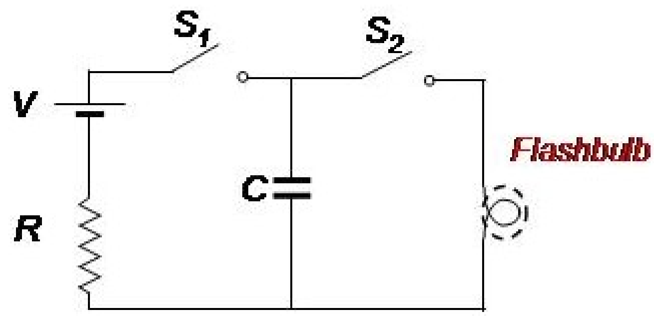
28) What is the current I_1 which flows through R_1?
$I_1 =$

A

29) What is the current I_3 that flows through R_3?
$I_3 =$

A

The next five questions pertain to the situation described below.



The above shows a simplified circuit for a photographer's flash unit. The circuit consists of a $V = 9$ V battery, connected to a $R = 55$ kΩ resistor, a $C = 135$ μF capcitor and two switches. Initially, the capcitor is uncharged and the two switches are open. To charge the unit, switch S_1 is closed. To fire the flash, S_2 (which is connected to the camera's shutter) is also closed.

30) How long after S_1 is closed does it take to charge the capacitor to 5V?

$T_1 =$

sec

31) Assume that S_1 has been closed for a very long time. What is the electrical potential difference between the two plates of the capcitor?

$V_c =$

V

32) Assume that S_1 has been closed for a very long time. What is the charge on each of the two plates of the capcitor?

$Q_c =$

A

33) Assume that S_1 has been closed for a very long time. What is the energy stored in the capcitor?

$E_c =$

J

34) Assume that capacitor discharges itself in 3.2 µsec. What average power put out by the flashbulb during this time?

$P_b =$

[ ] W