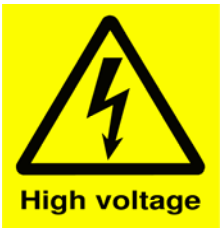
Name_____

DC CIRCUITS

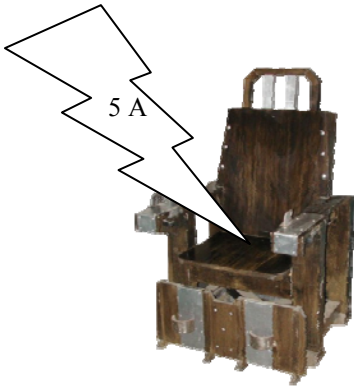


Skin conditions and household voltage:

Dry Conditions: Current = Volts/Ohms = 120/100,000 = 0.001 A a barely perceptible level of current

Wet conditions: Current = Volts/Ohms = 120/1,000 = 0.120 A sufficient current to cause ventricular fibrillation

Current	Effects
0.001 A	Perception level. Slight tingling sensation. Still dangerous under certain conditions.
0.005 A	Slight shock felt; not painful but disturbing. Average individual can let go. However, *strong involuntary reactions to shocks in this range may lead to injuries.*
0.006-0.30 A	Painful shock, *muscular control is lost*. This is called the freezing current or "let-go" range.
0.05-0.150 A	Extreme pain, respiratory arrest, severe muscular contractions. Individual cannot let go.
1 – 4.3 A	Ventricular fibrillation (the rhythmic pumping action of the heart ceases.) Muscular contraction and nerve damage occur. Death is most likely.
10 A	Cardiac arrest, severe burns and probable death.



After some final testing, the 13-foot-high fence at Calipatria State Prison will be activated with a deadly load of 4,000 volts and 500 amperes, enough to electrocute instantly any inmate desperate or foolhardy enough to try to escape.

"You touch the fence and you die," Chief Deputy Warden Bobbie Lynn Reed said.

Ohm's Law and Power

1. A person sticks their tongue on a 9.0V battery and feels a shock. If the resistance of a wet tongue (same as skin) is 1500 Ω, what current will flow through a person's tongue?

[0.006 A or 6.0 mA]

2. A laptop operates under a voltage of 20.0 V and it draw a current of 2.00 A. What is the resistance of this laptop?

[10.0 Ω]

3. A current of 0.020 A flowing through the body will render the victim unable to release the conductor. If the resistance of the skin is 500. Ω, what is the minimum voltage required to produce this effect?

[10.0 V]

4. A battery when short-circuited generates a current of 25.0 A and it has an internal resistance of 0.0624 Ω. What is its voltage?

[1.56 V]

5. Complete the following table:

V	I	R	P
12 V	20 A		
220 V		300 Ω	
	1.5 A	0.75 Ω	
9 V		0.0045 Ω	
	6.5 A	1800 Ω	
120 V	2.2 A		
180 V		35 Ω	926 W

6. A 1500. W space heater is connected to a voltage 120. V. How much current will it draw? What is its resistance?

[12.5 A]
[9.6 Ω]

7. Alarm clocks have a typical power consumption of 4 watts when connected to a 120 V line. What is the resistance of the alarm clock?

[3600 Ω]

8. A typical vacuum cleaner draws 13 amps of current when operating on household voltage of 120 V.
   A. What is the power consumption of the vacuum?
   B. What is the resistance of the vacuum?

A. [1560 W]
B. [9.23 Ω]

9. While charging an Ipad consumes 10 W of power and uses a current of 2.1 A. What is the resistance of an Ipad?

[2.3 Ω]

10. What is the total (equivalent) resistance of a 5.0 Ω, 2.5 Ω, and a 7.0 Ω that are connected in series? In parallel?

[14.5 Ω]
[1.35 Ω]

11. Three resistors, $R_1 = 9\ \Omega$, $R_2 = 12\ \Omega$ and $R_3 = 36\ \Omega$, are connected in parallel. Find the equivalent resistance.

[4.50 Ω]

12. Two resistors 20.0 Ω, and 60.0 Ω are connected in parallel to a 90.0 V battery.
    A. The total resistance of the circuit
    B. The total current of the circuit
    C. The current through each resistor

A. [15 Ω]
B. [6.0 A]
C. [4.5 A :20Ω, 1.5 A:60Ω]

13. What is the total current in the circuit if 3 resistors of 2.0, 5.0, and 8.0 ohms are connected to a 9.0 V battery in series? In parallel?

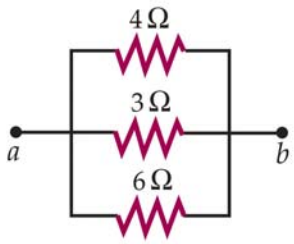
[0.60 A series]
[7.4 A parallel]

14. What are the possible total resistances that can be achieved using a 3.0 Ω, 15 Ω, and a 10 Ω resistor?

[28 Ω, 2 Ω, 12.5 Ω, 9 Ω, 17.3 Ω, 6.96 Ω, 2.68 Ω, 6.4 Ω]

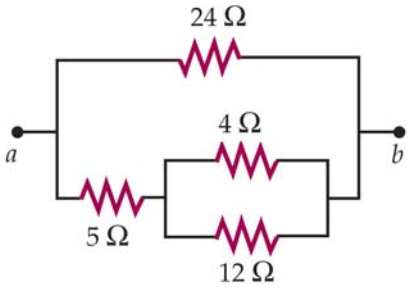
Find the total resistance of the following:

15.



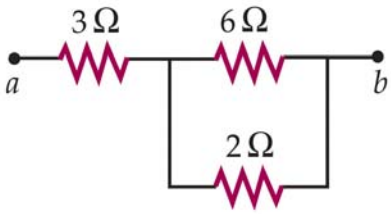
[1.3 Ω]

16.



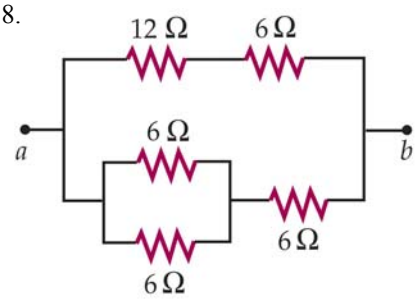
[6 Ω]

17.



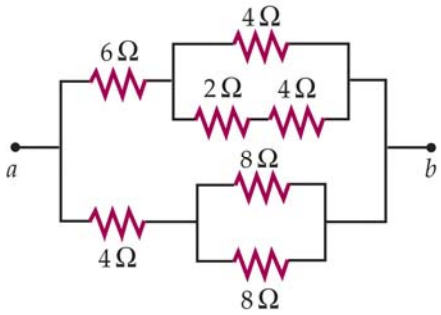
[4.5 Ω]

18.



[6 Ω]

19.

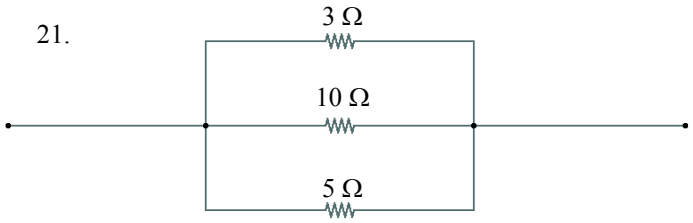


[4.1 Ω]

20.

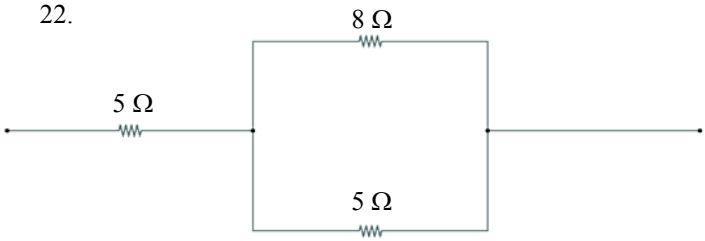
[32 Ω]

21.



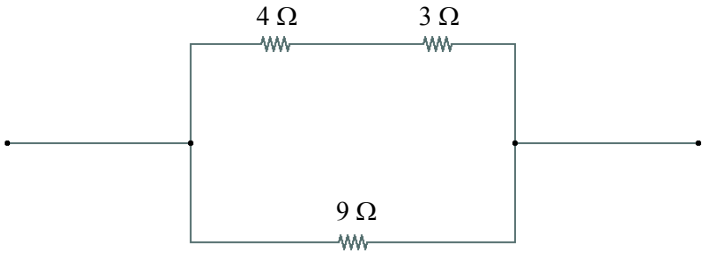
[1.8 Ω]

22.



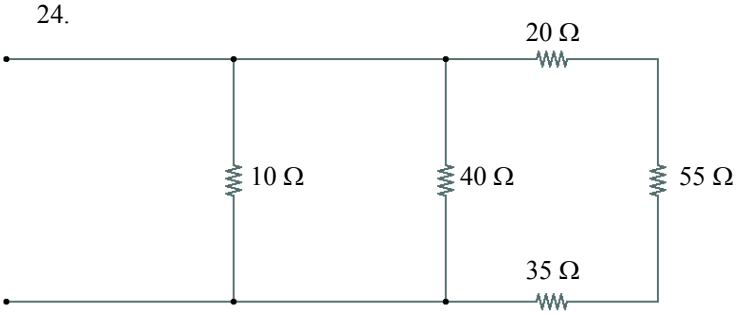
[7.5 Ω]

23.



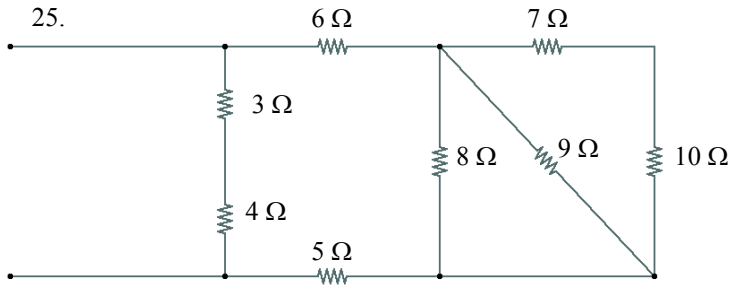
[3.94 Ω]

24.



[7.46 Ω]

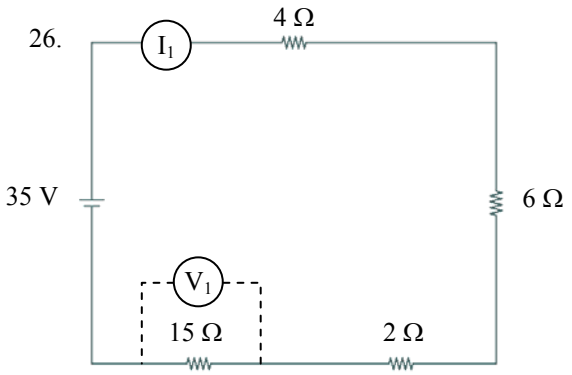
25.



[4.7 Ω]

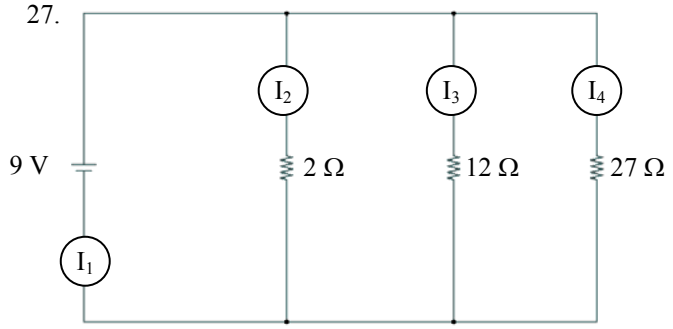
Determine all of the unknowns in the following circuits:

26.



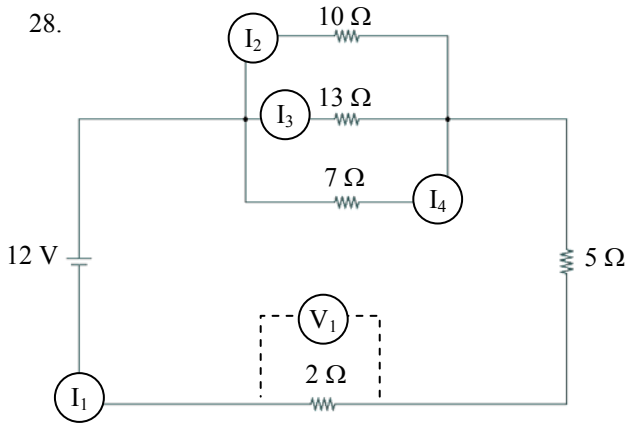
[I_1 = 1.3 A V_1 = 19.4 V]

27.



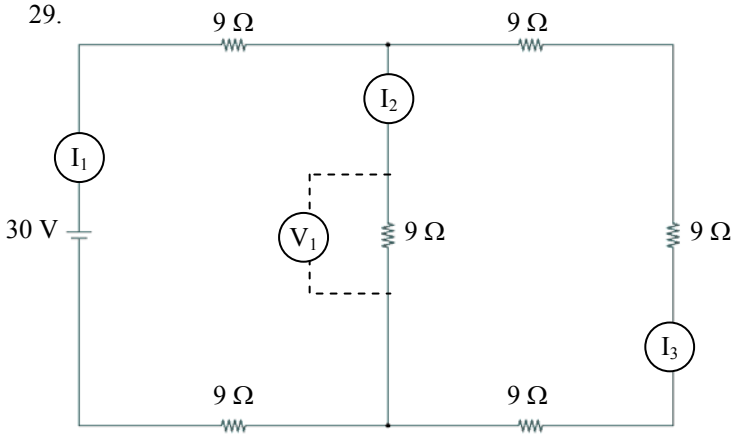
[I_1=5.6 A I_2=4.5 A I_3=0.7 A I_4=0.33 A]

28.



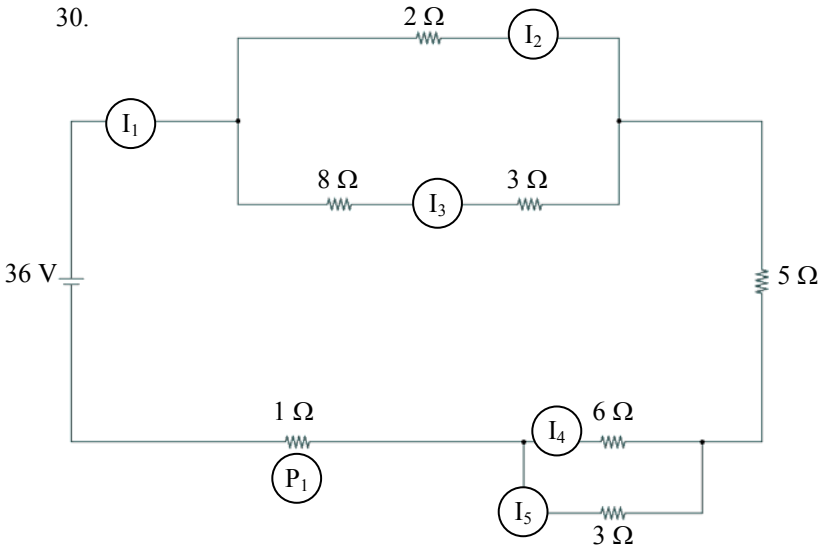
[I_1=1.18 A I_2=0.37 A I_3=0.29 A I_4=0.53 A V_1= 2.36 V]

29.



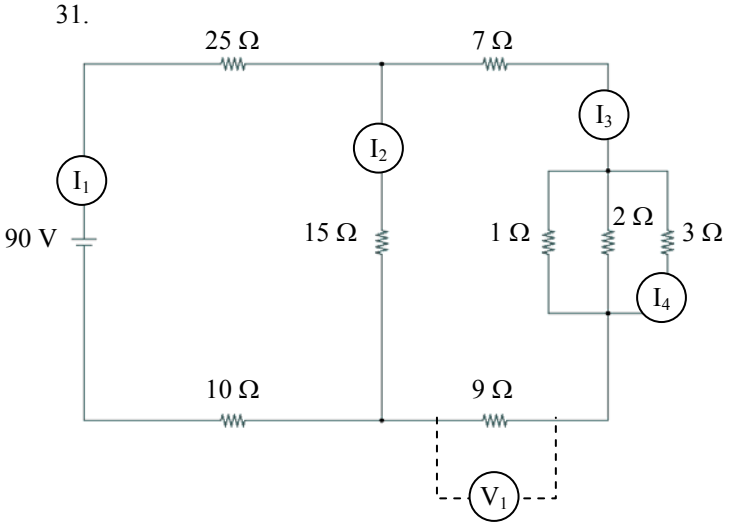
[I_1=1.21 A I_2=0.91 A I_3=0.30 A V_1= 8.17 V]

30.



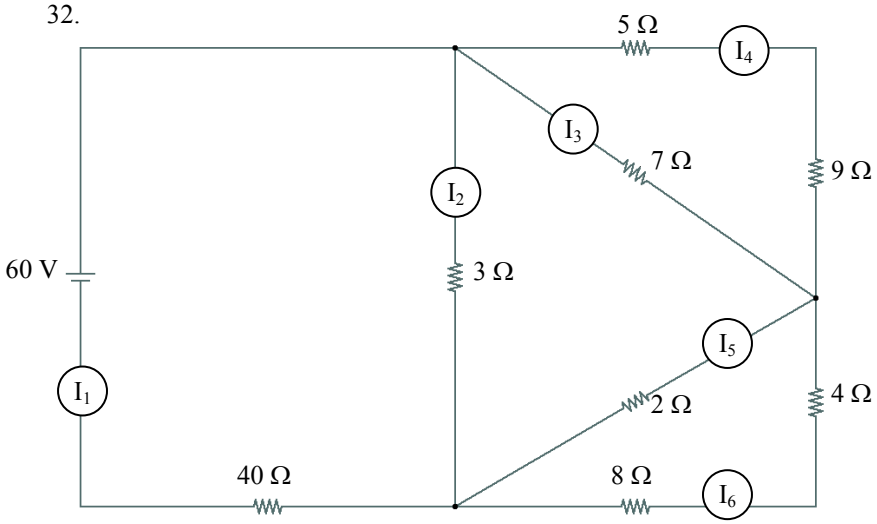
[I_1=3.71 A I_2=3.14 A I_3=0.571 A I_4=1.24 A I_5=2.47 A P_1= 13.8 W]

31.



[I_1=2.1 A I_2=1.1 A I_3=1.0 A I_4=0.18 A V_1= 9 V]

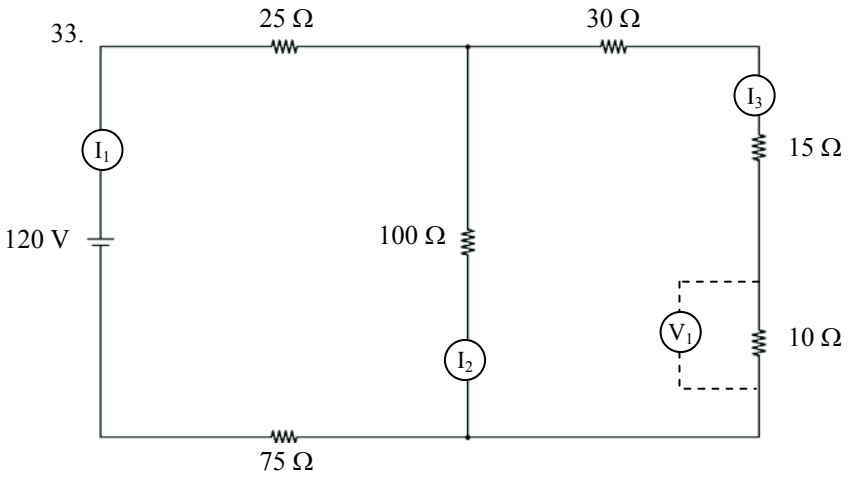
32.



[I_1=1.43 A I_2=0.97 A I_3=0.305 A I_4=0.153 A I_5=0.39 A I_6=0.067 A]

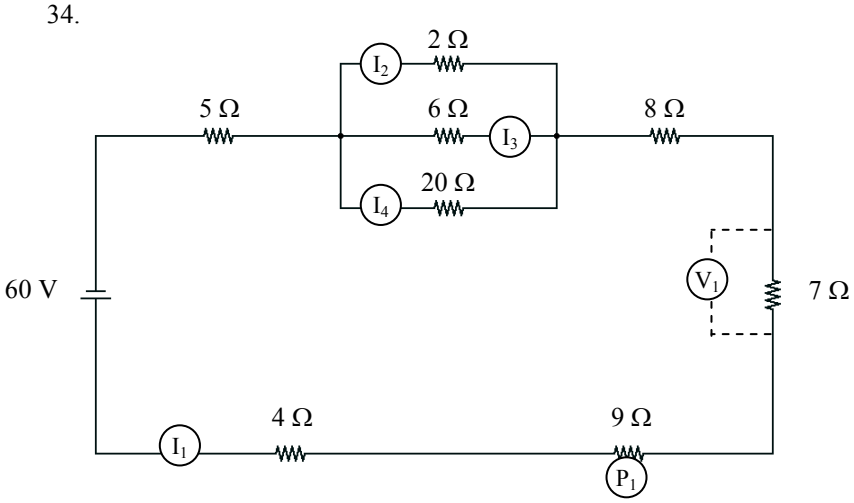
Determine all unknowns..

33.



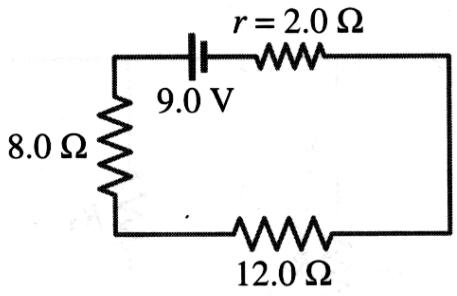
[$I_1 = 0.886$ A $I_2 = 0.314$ A $I_3 = 0.571$ A $V_1 = 5.71$ V]

34.



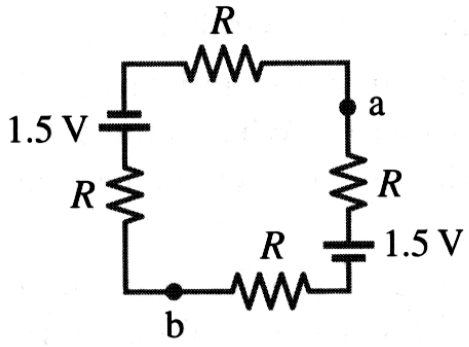
[I_1 = 1.74 A I_2 = 1.22 A I_3 = 0.406 A I_4 = 0.122 A V_1 = 12.2 V P_1 = 27.4 W]

35. Using a loop, determine the current in the following circuit:



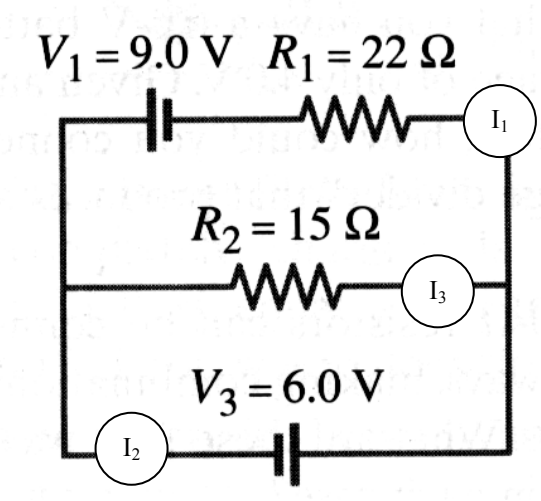
[0.41 A]

36. Determine the current in the following circuit if R = 75 Ω:



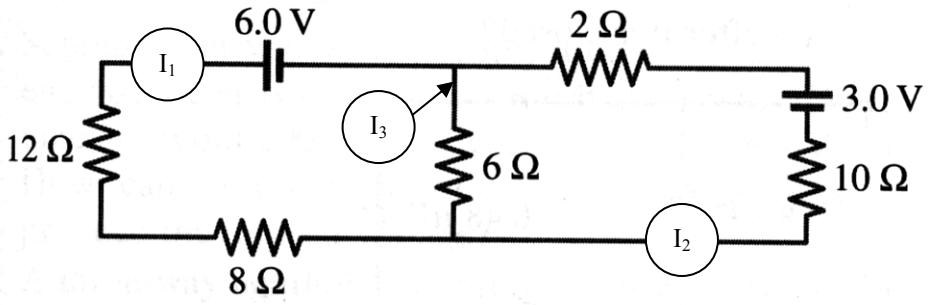
[0.01 A]

37. Determine I_1, I_2, and I_3 in the following circuit:



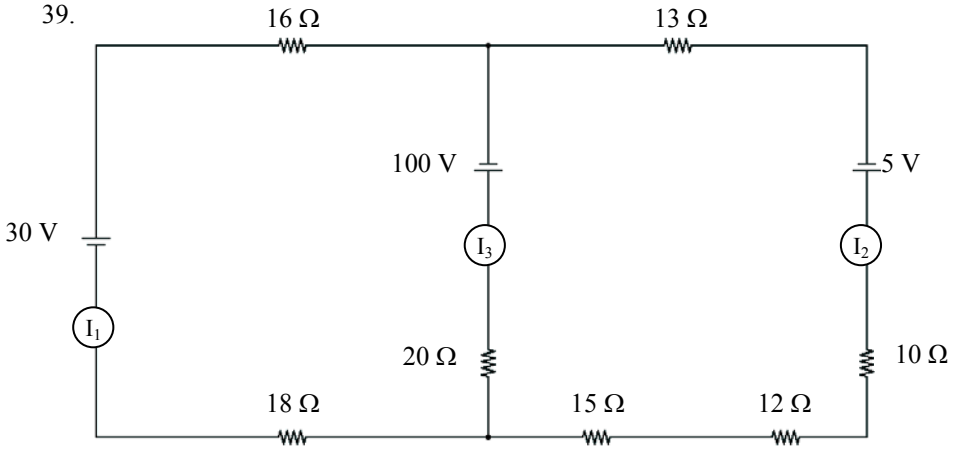
[$I_1 = 0.681$ A, $I_2 = 1.08$ A, $I_3 = 0.40$ A]

38. Determine I_1, I_2, and I_3 in the following circuit:



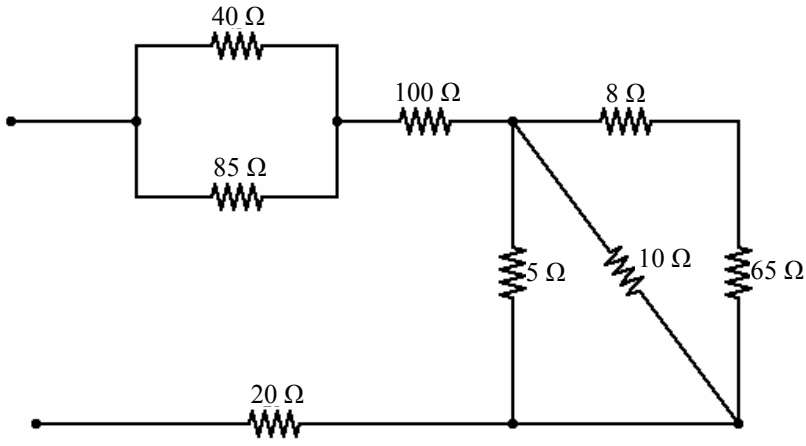
[$I_1 = 0.292$ A, $I_2 = 0.264$ A, $I_3 = 0.0278$ A]

39.



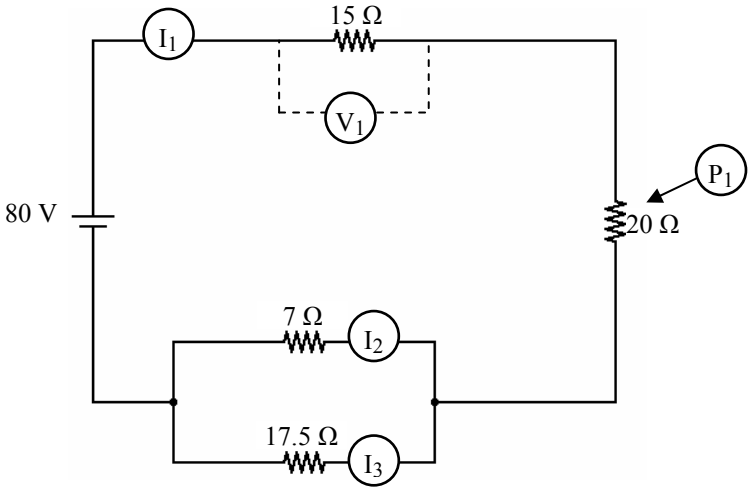
[$I_1 = 2.13$ A $I_2 = 0.749$ A $I_3 = 2.88$ A]

40. What is the total resistance of the following?



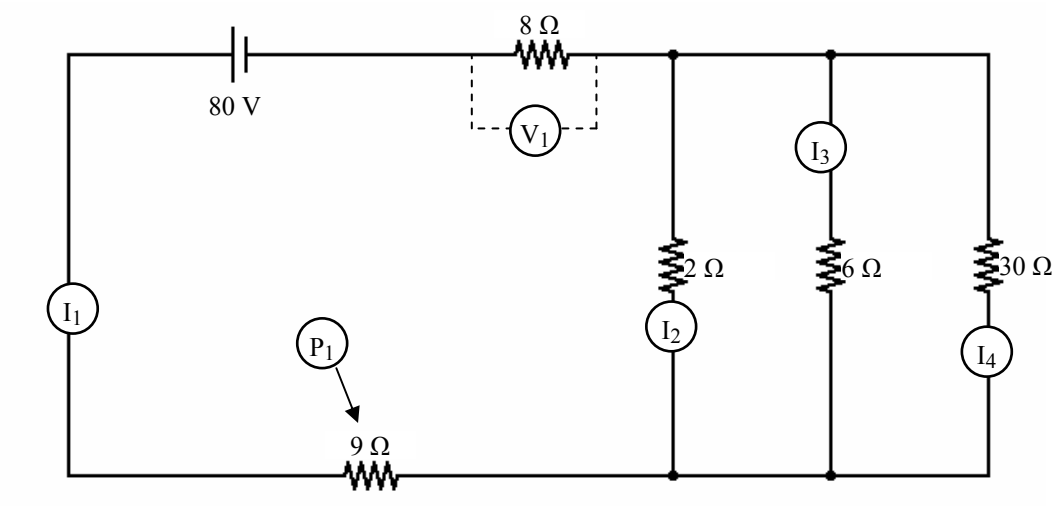
150.4 Ω

41. Find the unknowns:



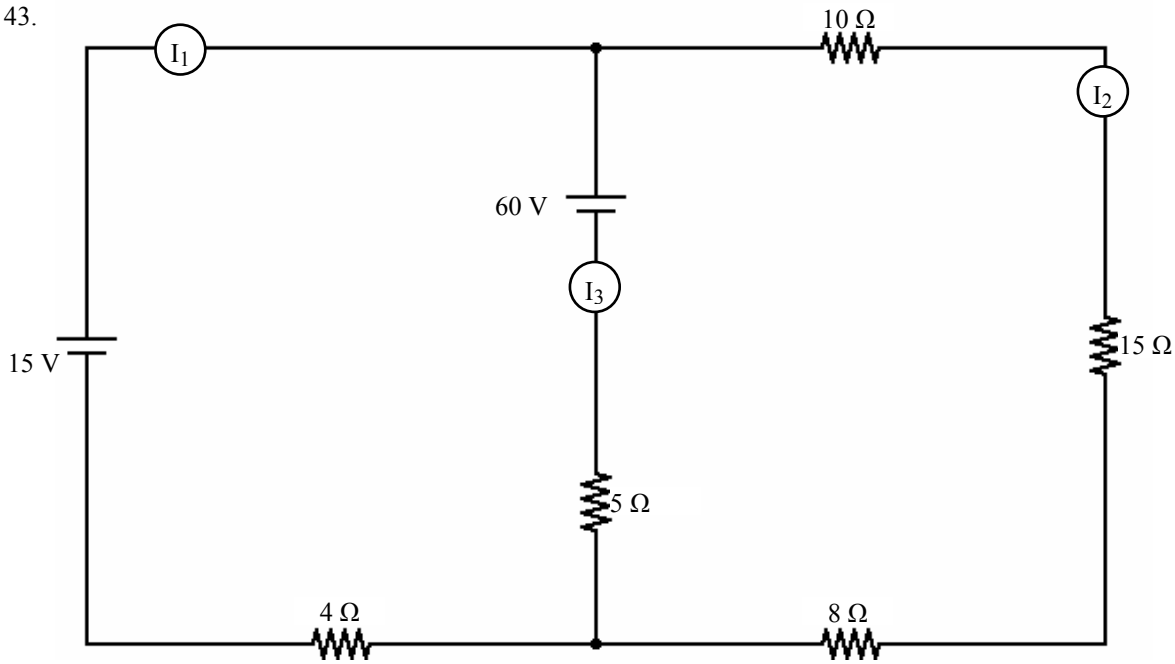
I_1=2 A, I_2=1.43 A, I_3=0.57 A, V_1=30V, P_1=80 W

42.



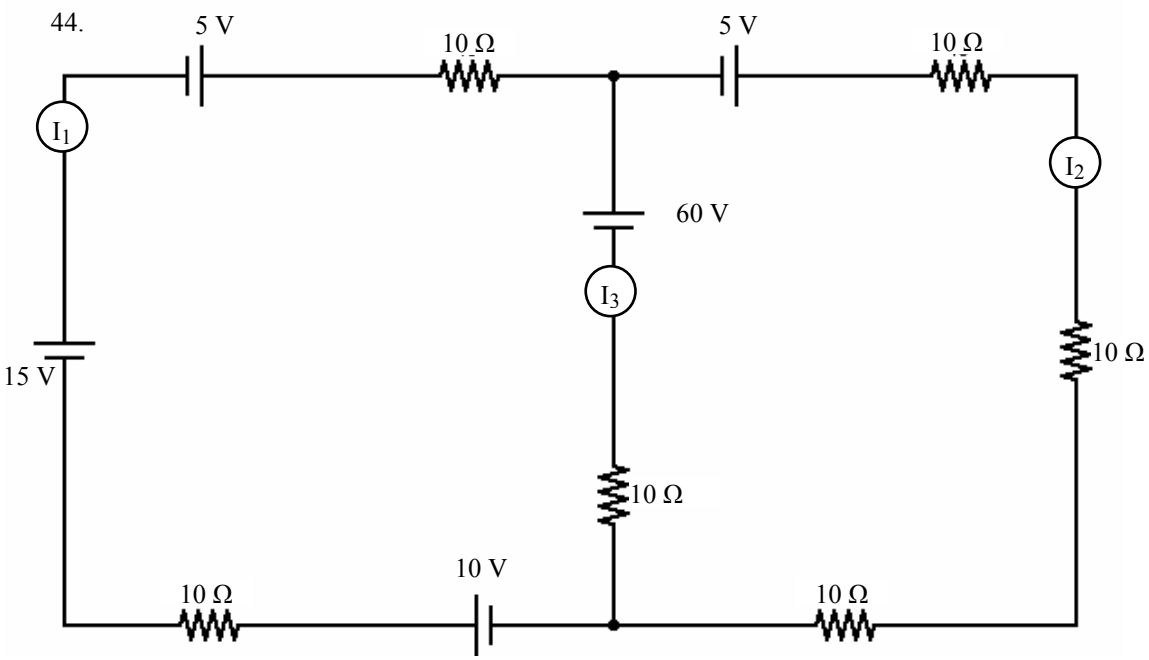
I_1=4.3 A, I_2=3.1 A, I_3=1 A, I_4=0.207 A,V_1=35V, P_1=170 W

43.



I_1=4.4 A, I_2=1 A, I_3=5.5 A

44.



I_1=0.5 A, I_2=1.5 A, I_3=2 A