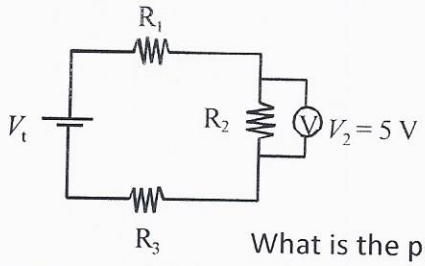
Enriched Circuit #2 Worksheet

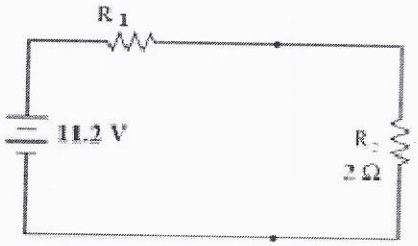
1. The following electric circuit consists of a power source, three identical resistors (R_1, R_2 and R_3) and a voltmeter (V). The potential difference (voltage), V_2, across R_2 is 5 V.



5 + 5 + 5 = 15 V

What is the potential difference (voltage), V_t, across the terminals of the power source?

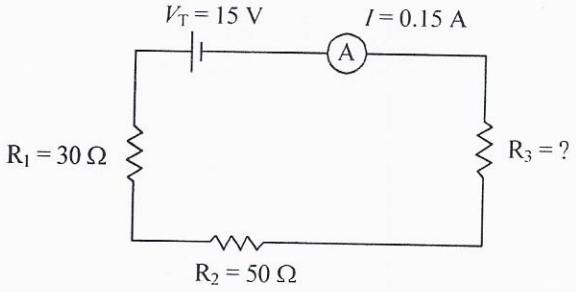
2. If the current intensity of the circuit is 0.035 A, what is the resistance for 'R_1'?



$R_T = \frac{V_T}{I_T}$ $\frac{11.2}{.035} = 320\Omega$

320 - 2 = 318 Ω

3. The following electric circuit consists of a power supply, an ammeter (A) and three resistors (R_1, R_2 and R_3). The voltage across the power supply is 15 V, and the ammeter reads 0.15 A.



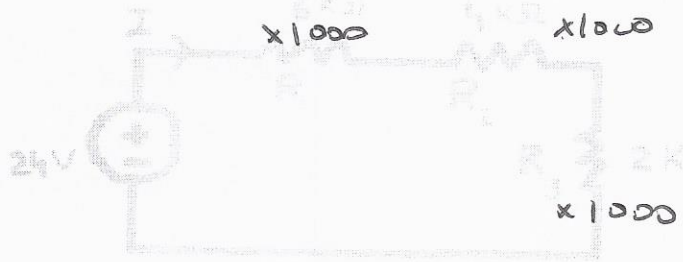
$R_T = \frac{V_T}{I_T}$ $\frac{15}{.15} = 100\Omega$

100Ω - 80Ω = 20Ω

What is the value of R_3?

(C) A) 20 Ω B) 33 Ω C) 80 Ω D) 100 Ω

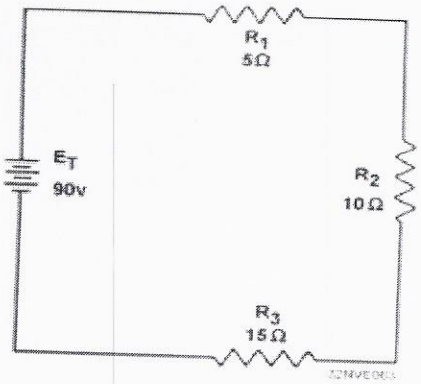
4. What is the current intensity of the circuit? To convert a kΩ to an Ω, multiply by 1 000.



$I_T = \frac{V_T}{R_T}$ $\frac{24}{12\,000}$

0.002 A

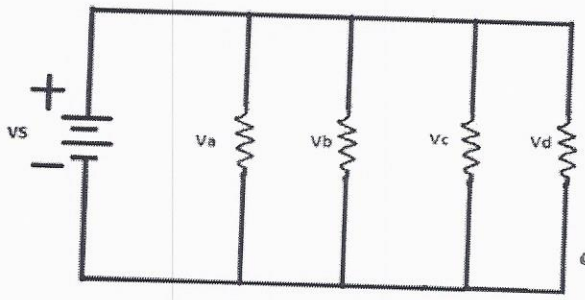
5. What is the potential difference for R_3?



$V = RI \quad 15 \times 3 = 45\ V$

$I_T = \frac{V_T}{R_T} \quad \frac{90}{30} = 3A$

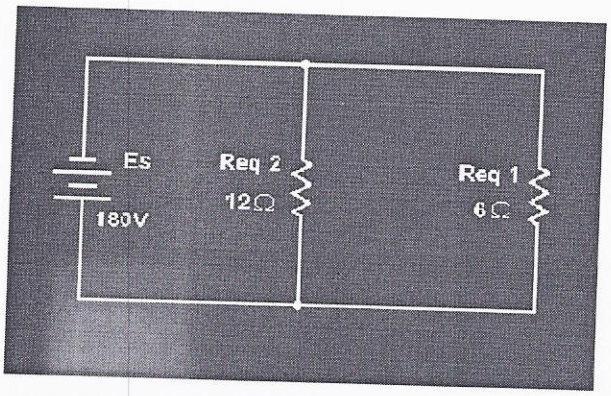
6. All resistors are of equal strength. The voltage for Va is 25 V and the current going through Va is 0.55 A. What is the equivalent resistance of the circuit?



$R = \frac{V}{I} \quad \frac{25}{.55} = 45.5\Omega$

$\frac{1}{45.5} + \frac{1}{45.5} + \frac{1}{45.5} + \frac{1}{45.5} = 11.4\Omega$

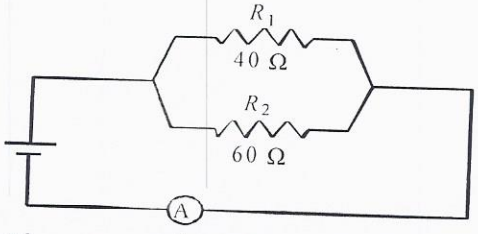
7. What is the current intensity coming from the power source?



$I_T = \frac{V_T}{R_T} = \frac{180}{4\Omega} = 45A$

$\frac{1}{12} + \frac{1}{6} = 4\Omega$

8. The following circuit consists of a power supply, two resistors (R_1 and R_2) and an ammeter.



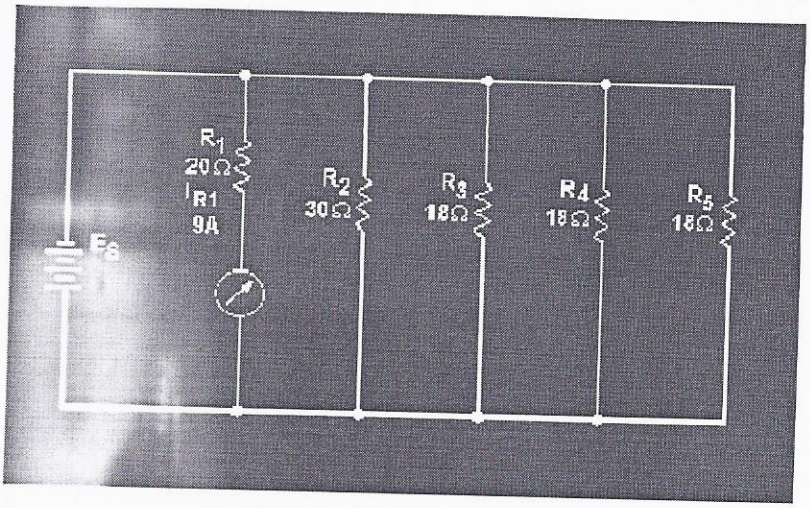
$V = RI \quad 40 \times 2 = 80\ V$

$1/40 + 1/60 = 24\Omega$

$I_T = \frac{V_T}{R_T} \quad \frac{80}{24} = 3.3A$

The current through resistor R_1 is 2 A. What is the current indicated by the ammeter?

9. What is the current intensity for R_3 and the current intensity from the power source?



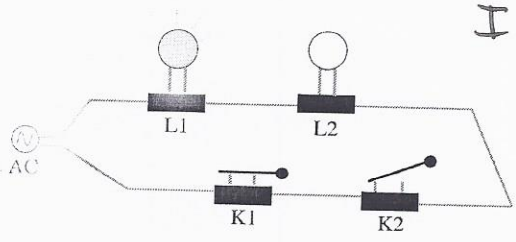
$V = R I$

$20 \times 9 = 180\ V$

$I_T = \frac{V_T}{R_T} = \frac{180}{4} = 45\ A$

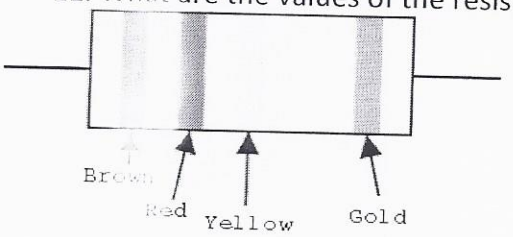
$I_3 = \frac{V}{R} = \frac{180}{18} = 10\ A$

10. What is wrong with the picture below?

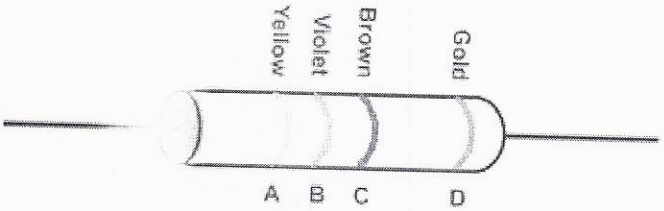


In a series circuit, if the switch is open you cannot have a light on because there is no current.

11. What are the values of the resistors?



$12 \times 10^4 \pm 5\%$



$47 \times 10^1 \pm 5\%$

12. Identify the colours associated with the resistors if they have the following resistances.

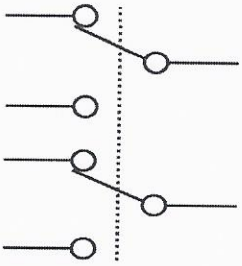
a) 23 000 Ω +-20% red - orange - orange black

b) 44 Ω +- 5 % yellow - yellow - black silver

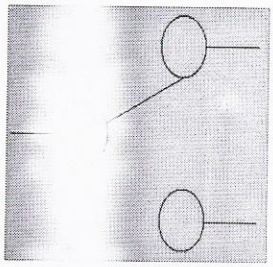
c) 180 Ω +- 5% brown - grey brown - gold

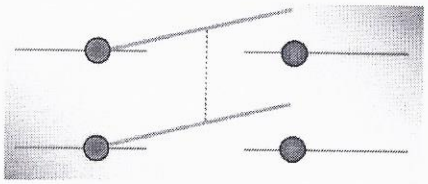
13. Match the following terms with the pictures below:

a) single pole-single throw
b) single pole-double throw
c) double pole-single throw
d) double pole-double throw



SPDT

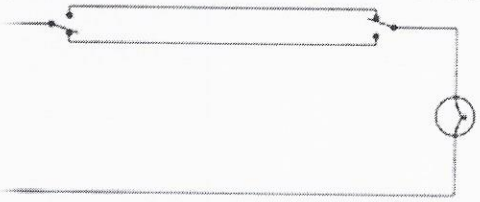




14. Name the appropriate type of switch for the following functions:

a) opening or closing two contacts at once and contact has one path DPST
b) opening one or the other of two circuits DPDT
c) opening one or the other of one circuit SPST

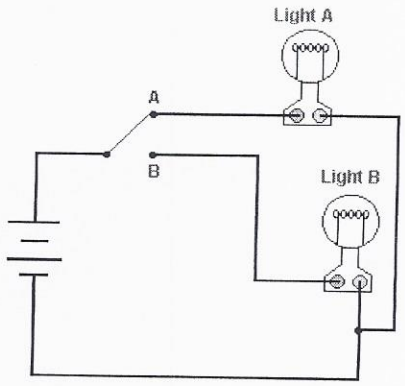
15. What positions do the switches have to be in for the light bulb to receive power?



both up or down
no current goes through

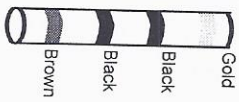
16. Consider the circuit diagram below.

a) Name the switch. SPDT
b) How should the switch be placed so that light bulb A comes on? as is
c) Can light bulb A ever be on at the same time as light bulb B? No, either A or B

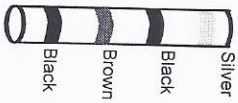


17. Nicolas has decided to participate in the *Engineering Challenge*. This year he plans to build a racecar that can move around obstacles. He needs a resistor to slow down the motor. He asks the laboratory technician for a resistor offering a resistance between 8 Ω and 12 Ω. She offers him the four resistors below.

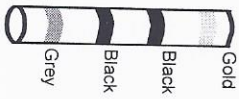
Which of the following resistors should Nicolas use?

( ) Resistor 1: 

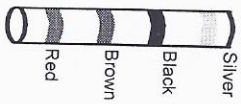
10 ± 5%

( ) Resistor 2: 

1 ± 10%

( ) Resistor 3: 

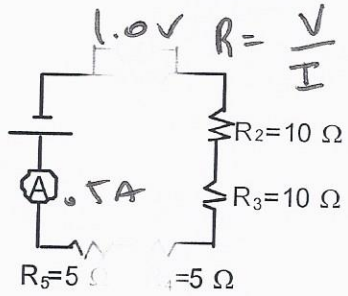
80 ± 5%

( ) Resistor 4: 

21 ± 10%

18. Refer to the illustration of Circuit A and Circuit B in Figure 4 below. Which of the two circuits (Circuit A or Circuit B) has the greatest resistance?

Circuit A



$R = \frac{V}{I}$ $\frac{1}{.5} = 2\Omega$

Voltmeter reading: 1.0 V

Ammeter reading: 0.50 A

R_{eq}

$5+5+10+10+2$

32Ω

↑ greatest resistance

Circuit B

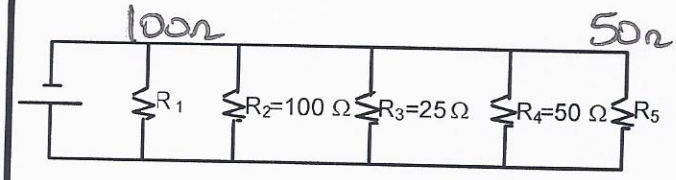
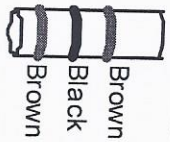
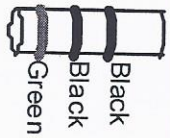


Illustration of resistor 1: 

100Ω

Illustration of resistor 5: 

50Ω

$\frac{1}{100} + \frac{1}{100} + \frac{1}{25} + \frac{1}{50} + \frac{1}{50} =$ 10Ω

19. Y[illegible]riend wants to add some electrical accessories to the circuit of his automobile. The c[illegible] must supply 4 pieces of equipment : a de-mister (M), a small pump (M) and 2[illegible]s. Each item can function with a 6 V or a 12 V power supply.

T[illegible]r's circuits provide a maximum of 12 volts.
H[illegible]poses two ways of connecting the equipment.

DIAGRAM A

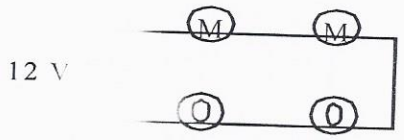
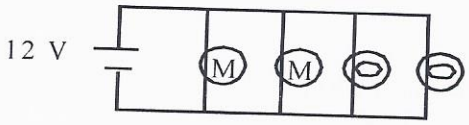


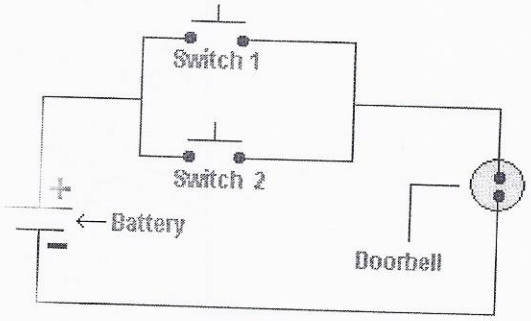
DIAGRAM B



V[illegible] diagram must he choose for each item to function properly?
J[illegible] your answer.

Diagram B - de-mister & pump each getting 6 or 12V, but voltage not added up. Diagram A all voltages would be added & would surpass 12V.

20. V[illegible] switch must be closed for the doorbell to ring in the circuit below?



Either switch 1 or 2.