STE Pretest 3.1v2015

1. The force, F, between two objects with charge q_1 and q_2, is given by:

$F = \frac{k q_1 q_2}{r^2}$, where r = distance between the two charges in meters

k = Coulomb's constant = 9 X 10^9 Nm^2/C^2.

Charges of 3 X 10^{-8} C and 5 X 10^{-8} C are 200 cm apart.

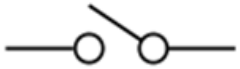
How much force repels these like-charges?

2. Two spheres are attracted to each other while separated by a distance of 0.020 m. If we want the force of attraction to increase by a factor of 5, what distance in metres should separate the spheres?

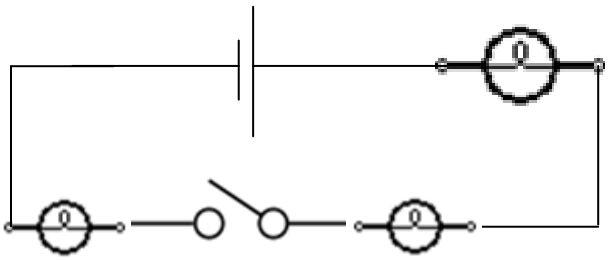
3. Draw a circuit in which two 10 Ω resistors create an equivalent resistance of 5 Ω .

4. Draw three light bulbs in a series circuit. Show that if one bulb is off, the rest will not receive current.

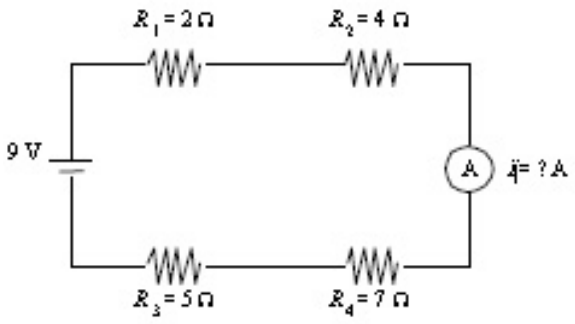
Symbol for switch in off position :



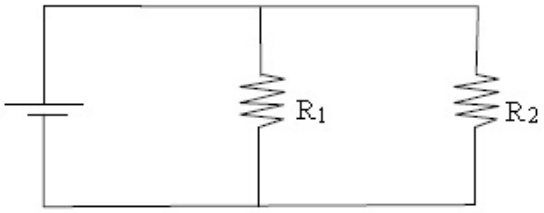
Symbol for light bulb:



5. The circuit in the diagram at the right consists of 4 resistors whose values are 2 Ω, 4 Ω, 5 Ω and 7 Ω respectively.
What is the reading of the ammeter if the cell's voltage is 9V?



6. The following electric circuit consists of two resistors R_1 and R_2 and a power source. Using an ammeter, you measured the current intensity (I) through each resistor. Here are the results :



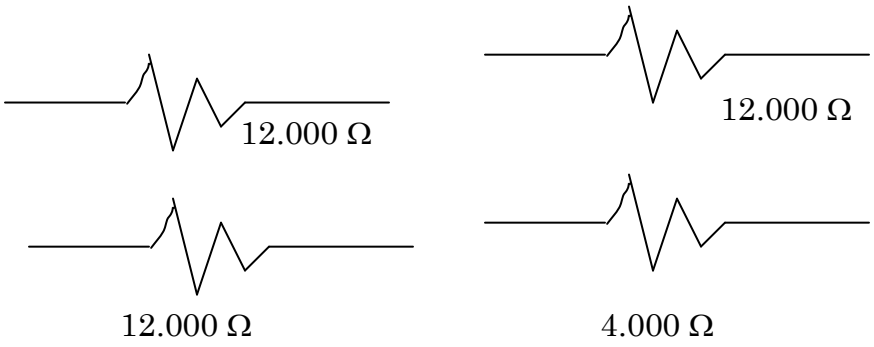
Resistor	Intensity (A)
R_1	0.75
R_2	0.75

a) Given this information, what is the current provided by the power source I_S? (Find the total current)

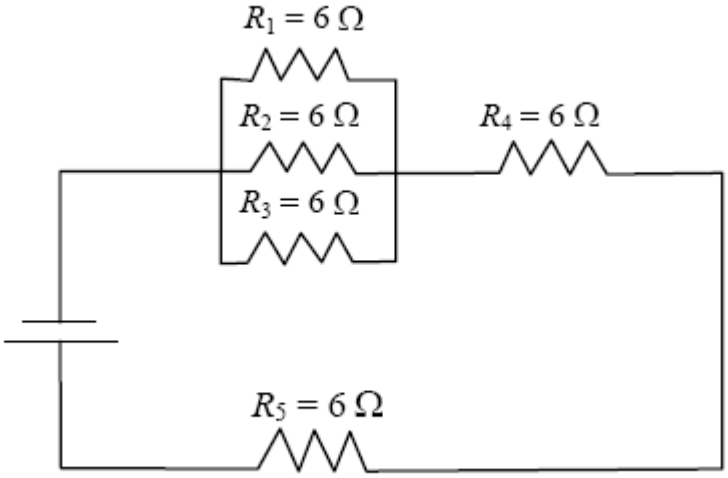
b) Are the resistors identical?
How do you know?Show all your work.

7. Design a circuit so that its total resistance is exactly 8 Ω. You are given the following resistors and

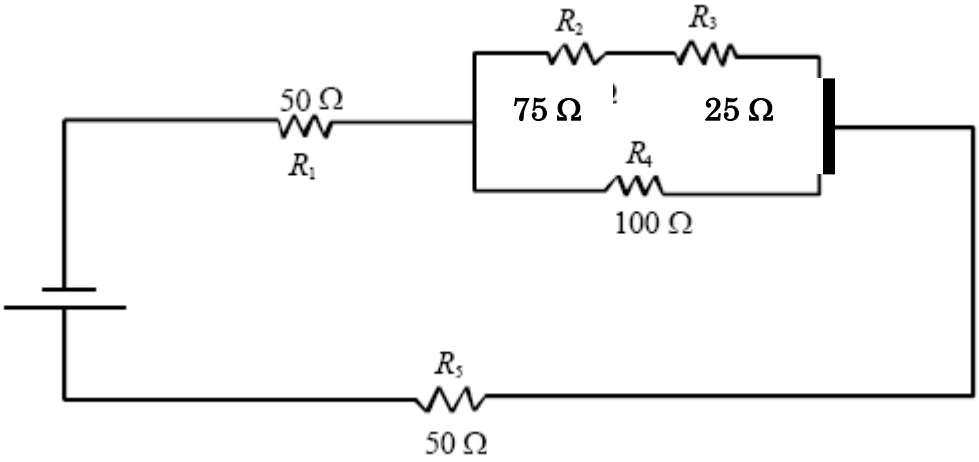
you have to use all four of them



8. Find the **total resistance** and then the **voltage of the power source** if 1A flows through each of the resistors in parallel. (3 marks)

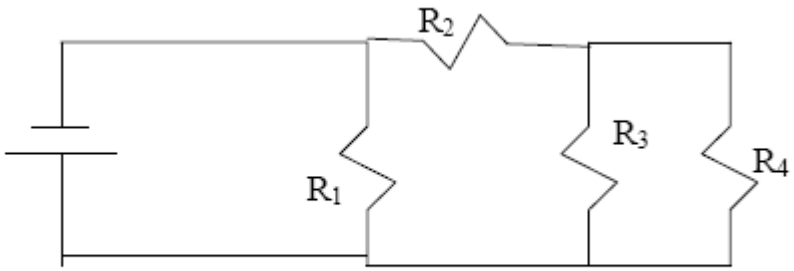


9.



If the voltage of the power source is 150 V, what is the potential difference across R_3?

10. If all four resistors are identical, what is the ammeter reading across R_3? Total current = 10.0 A



(3 marks)

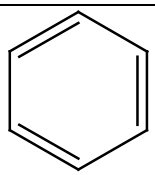
FLASHBACK

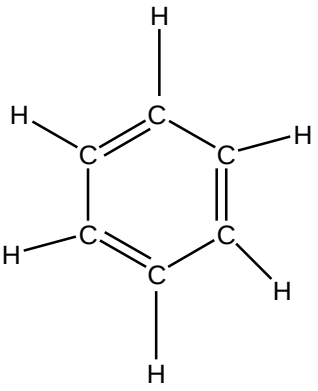
11. a) Use a dot structure to show what happens when chlorine reacts with nitrogen. Give a formula for the resulting compound.

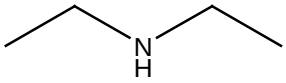
N makes 3 bonds (it has 5 valence electrons but its valence shell has room for 8)
Cl makes 1 bond (it has 7 valence electrons but its valence shell has room for 8)

Extra

b) Use the following molecular formulas and structures as a guideline to place the atoms in their proper spots in the structural formulas (A structural formula is like a Lewis dot structure, but only the bonds are shown).

EXAMPLE	ANSWER
 C_6H_6	You know that each carbon makes 4 bonds and that there are six corners for six carbons. Hydrogens can only make 1

	 bond each

$C_4H_{11}N$ 

12. Find the **number of moles f**or each of these ions or molecules involved in the nitrogen cycle.

a) 30 g of NO_3^-

b) 6.02 X 10^{22} ions of NO_2^-

c) The amount of N_2 that will completely react with 30 g of H_2 according to:

$N_2 + 3\ H_2 \rightarrow 2\ NH_3$