A-day: Due Thurs., Apr 2
B-day: Due Fri., Apr 3

2009 Electricity 2

Name: _____

1. Find the number of electrons gained or lost by a –7.3 coulomb object.

2. How much charge do 6.5 x 10^8 electrons have?

3. A. A 4.5μC charge and a 6.2μC charge are 4.2 mm away from each other. Find the electric force between them.

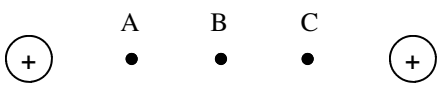
   B. Is the above force attractive or repulsive?

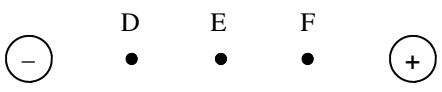
4. Electric force will increase or decrease?
   A. _____If the distance between two charges decreases.
   B. _____If both of the charges decreases.
   C. _____If the distance increases.
   D. _____If q_1 increases.

5. Let's understand how charge and force affect the electric force between two charges. In the following table calculate the electric force for each of the situations. Leave kc in your answer. This is for comparison, so you don't need to fully calculate your answer.

Situation	q_1 =	q_2 =	r =	F = (keep k_c in the equation)
1. control	1	1	1	$F_e = k_c \frac{q_1 q_2}{r^2} = k_c \frac{1(1)}{1^2} = k_c \frac{1}{1} = 1k_c$
2. double the charge	2	1	1	
3. half the charge	1	0.5	1	
4. double the distance	1	1	2	
5. half the distance	1	1	.5	

6. Use the information you just collected to answer the following.
   A. If the distance between two charges doubles, by how much does the force change?
   B. If the charge doubles, by how much does the force change?
   C. If the distance between two charges is halved, by how much does the force change?
   Now, continue the logic:
   D. If one of the charges is tripled, by how much does the force change?
   E. If the distance is tripled, by how much does the force change?
   F. If the distance is 1/3 the original, by how much does the force change?





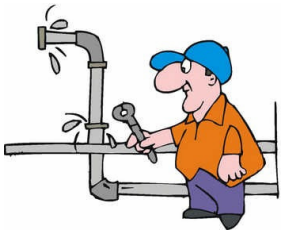
7. Will it move to the left, right, or stay stationary?
   A. A +6 C charge is placed at C.
   B. An object that has gained electrons is placed at A.

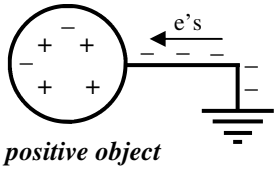
8. Will it move to the left, right, or stay stationary?
   A. A +6 C charge is placed at F.
   B. A negative charge is placed at E.

Ground

Ground (the earth) can take or give an infinite number of electrons. Ground is electrically neutral. Both positive and negative charges will neutralize when grounded.

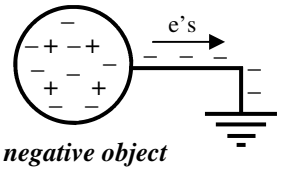
To ground something you can often touch it to a pipe. Metal pipes are good electrical conductors and usually connected to ground somewhere in the building.





Symbol for ground

A positive object **will take electrons** from ground and become neutral.



A negative object **will give electrons** to ground and become neutral.

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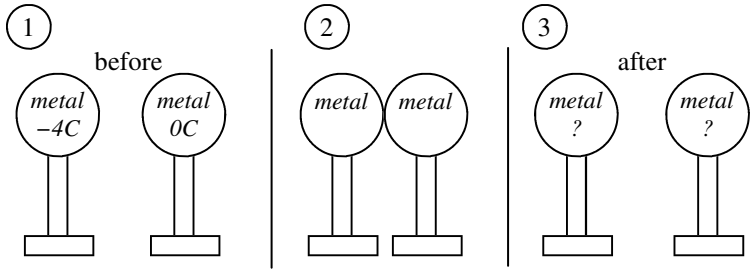
9. An object has a charge of 4.5 C.
   A) ____Is the object positive or negative?
   B) ____Did it gain or lose electrons?
   C) ____If you touch it to ground, will it lose electrons to ground or gain electrons from ground?
   D) _____What will its charge be after it is grounded?

– 8C

10. A) ____ Did the object at the left gain or lose electrons?
    B) ____ When grounded, will it gain or lose electrons from ground?
    C) Draw a wire grounding it (be accurate—use the right symbol from above).
    D) ____ What will its charge be after grounding?

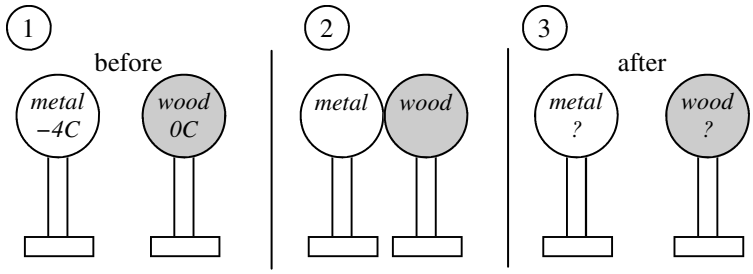
Since electrons repel each other. Electrons will try to get away from each other as far as possible. Given an electrical conductor to travel thru, electrons will spread out. Use this concept to answer the following SIMPLE questions.

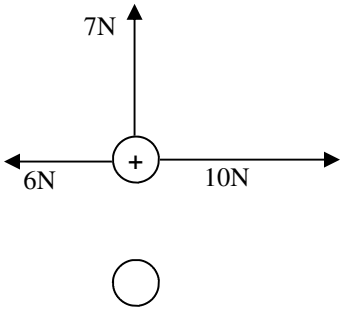
11. A metal sphere has a charge of –4C. It is touched to another metal sphere that is neutral to begin with.
    A. Are the spheres conductors or insulators?
    B. Will they allow electrons to flow?
    C. Will the electrons attract or repel each other?
    D. Will the electrons want to stay together or spread apart as far as possible?
    E. What will be the charge of the right sphere afterwards?



12. This time the metal sphere is touched to a neutral wood sphere.
    A. What is the final charge of the metal sphere?

    B. What is the final charge of the wood sphere?

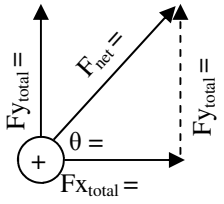


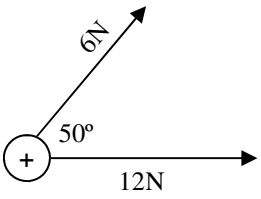


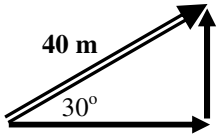
13. A. To cause the 7N force upward, is the bottom charge a + or –?
    B. What is the net horizontal force on the object (Fx_{total})?

    C. Transfer Fx_{total} and Fy_{total} to the diagram at the right and calculate F_{net}.

    D. Calculate the direction (θ), too.







y – component = ***20 m***

$\sin 30^\circ = \frac{y}{40\text{ m}}$

$y = (40\text{m})\sin 30^\circ$

$\mathbf{y} = (40\text{m})0.5 = \mathbf{20\ m}$

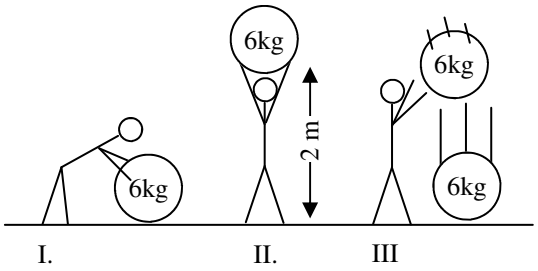
x – component = ***34.6 m***

$\cos 30^\circ = \frac{x}{40\text{ m}}$

$x = (40\text{m})\cos 30^\circ$

$x = (40\text{m})(.866) = \mathbf{34.6\ m}$

14. After resolving the 6 N force above into its components (*see diagram at the right*), find the net force's magnitude and direction.



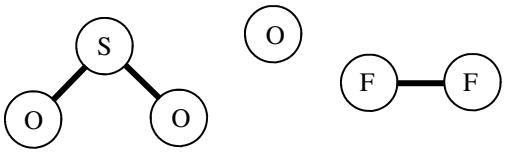
15. Ever eager, Slim Jim helps us with an energy demo.
    A. How energy does the ball have in picture I?
    B. What kind of energy does the ball have in picture II?
    C. How much energy does the ball have in picture II?

    D. How much work what necessary to lift the ball up?

    E. How much kinetic energy does the ball have just before it hits the ground?

    F. How fast is the ball moving at the ground?

    G. So the amount of potential energy equals the amount of _____ done on it and equals the amount of _____ _____ after it is let go.



16. Using the diagrams at the left answer the following:
    A. # of Atoms:
    B. # of Elements:
    C. # of Molecules:
    D. # of Compounds: