Name: ___KEY_____ Period: _____

Electrostatic and Electromagnetic Exam
Wednesday 3-9-2016

This is a review guide…none of these questions are on the test. You have to understand the skills necessary to answer these questions and apply those skills to the questions on the test. Practice! Take your time.

Topics: Electrostatics and Electric Fields

1. Fill in the following table:

Variable	Concept	Units
F	Force	N
K	Coulomb's constant 9×10^9	Nm^2 / C^2
q	Charge	C
r	Radius/ distance	m
E	Electric field	N/C

2. Know the following vocabulary terms: Look up these terms in your booklet…

Coulombs Law	Field force	
Electric Field	Polarization	Neutral
Conduction	Field Lines	
Friction	Static Electricity	
Induction	Insulator	
Grounding	Conservation of Charge	
Conductor		

3. Identify the following values:

k = $9 \times 10^9 Nm^2 / C^2$

charge of one electron = -1.6×10^{-19}

charge of one proton = 1.6×10^{-19}

4. Like charges __repel__ each other. Opposite charges _attract__ each other.

5. Use the t chart to list information for electric force and gravitational force.

Electical force	**gravititaional force**
Attracts or repels	attracts
Charge is (+) or (-)	charge is (+)
Inverse square law	inverse square law

6. Has a positive charge gained or lost electrons? __lost__
Has a negative charge gained or lost electrons? _gained__

Identify each of the following charges as having GAINED or LOST electrons:

6.5×10^{-6} C __lost__ -4.1×10^{-4} C __gained__ -9.18×10^{4} C __ gained __

7. What effect does the force of electrical field have on two objects as the objects move farther away from it (increase the radius)? Decrease the force

What effect does the force of electrical field have on two objects as the objects move closer to it (decrease the radius)? Increase the force

How does the electrostatic force change if the distance between two bodies is cut by 1/9?
Closer so we know it should be stronger.
Follows the inverse square law
1/9 9x9= 81 ***so Force is 81***

Two objects are 6m from each other and a force of 10 N exists between them. The objects move to 12m away from each other. What is the force?
Moves apart so know it should decrease in force
Inverse square law
Doubles (6m to 12m) so (1/2)(1/2)= ¼ is the new distance
(F)(new distance) ***10 (1/4)= 2.5 N***

9. What is the charge of 230 electrons?
1 electron has a charge of -1.6×10^{-19}
(230 electrons)(-1.6×10^{-19} q (charge)
$= -3.68 \times 10^{-17}$ C

10. If one body loses 75 electrons during contact, how many electrons does the second body gain?
75 electrons

How do you know this to be true? Law of Conservation of Charge

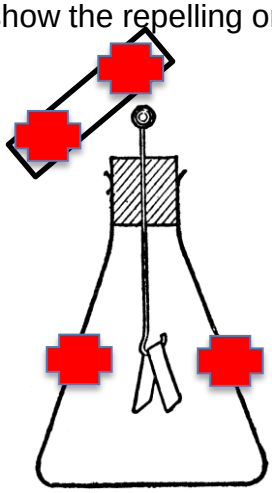
11. List the three types of charge transfer?
1. Friction
2. Conduction
3. Induction

12. How does friction transfer a charge? Give an example of this.

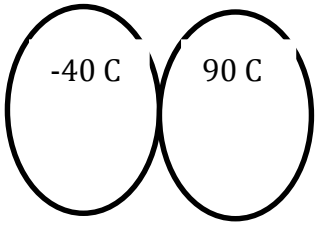
Rubbing two objects together. Balloon (neutral) rubbed on your hair (neutral). Balloon will take electrons from your hair. This leaves the balloon negatively and your hair positively charged.

13. Explain how conduction of a charge occurs between a positively charged object (the rod) and a neutral conductor (the electroscope) in words. (Hint: think about what we did during the electroscope lab and what happened). Then, draw the charges on the picture to the right to show the repelling or attraction of the leaves.

Conduction → touch so charge will transfer and stay
Rod= positive so all of object is positive



14. Conduction occurs between the two charged objects. After the objects are separated, what charge will each object have? The charge will be the _same_ after the separation.

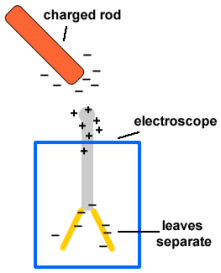


90 + (-40)= 50 C

The objects are touching so they will share the 50 C
Each will have 25 C

15. How does conduction affect a neutral insulator?
Transfers charge only to the location the charged object touched.

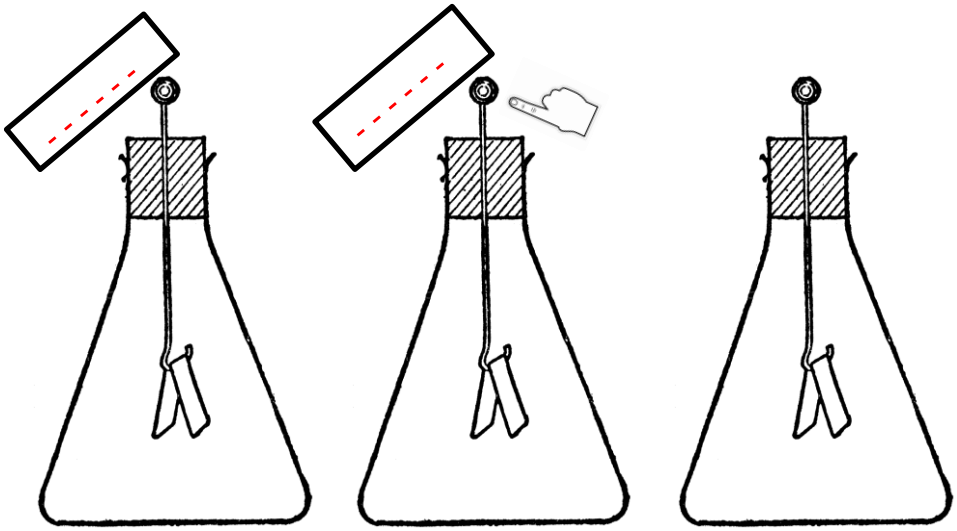
16. The following picture describes what type of charge transfer?
Conduction



16. Explain how grounding happens.

Grounding takes the excess electrons
Makes the object neutral.

Draw in the charges to the right.



Negative
Leaves repel

Neutral

Positive
leaves repel

17. Can induction happen to an insulator? YES or NO
Explain.
The electrons are held tightly to the nucleus, so the charges cannot rearrange.

18. (Contact or Induction) results in the object having the opposite charge from the charged object (rod) that induced the charge on it. Induction

19. Why would you be safe to stay inside your car if it was in contact with a fallen electrical cable?
The car is grounded because of the tires.

20. A 3μC charge and a -15μC charge are separated by a distance of 8 cm. What is the force between them? μ= 1 x 10^{6}

F= ?
q_1= 3 = 3 x 10^{6}
q_2= -15 = -15 x 10^{6}
r= 8 cm = .08m

$F= \frac{Kq_1q_2}{r^2}$ $F= \frac{(9x10^{9})(3x10^{6})(-15x10^{6})}{(.08)^2}$

F= (9x109) $\frac{(-4.5x10^{13})}{(.0064)}$

F= -6.33 x 10^{25} N (-) so attracting

21. What is the distance between two objects with the same -4.1 x 10^{8} C charge if the force is 417 N?

r=?
F= 417 N
q1= -4.1 x 10^{8}
q2= -4.1 x 10^{8}

$F= \frac{K(q1q2)}{r^2}$ $417= \frac{(9x10^{9})(-4.1 \times 10^{8})^2}{r^2}$

$417= \frac{(1.51 \times 10^{27})}{r^2}$

$417\ (r^2)= 1.51 \times 10^{27}$

$r^2= \frac{1.51 \times 10^{27}}{417}$

r^2= 3.62 x 10^{24} ***r= 1.90 x 10^{12} m***

22. Do field lines really exist? No

23. What direction do the field lines point on a negative and positive charge?
Negative lines point in
Positive lines point out
Move from positive to negative

24. A 45 μC charge is positioned in an electric field that has a strength of 9.78 x 10^{6} N/C. What is the electrical force on this charge?

q= 45 uc= 45 x 10^{-6}
E= 9.78 x 10^{6}
F=?

E=F/q
9.78 x 10^{6}= (F) (45 x 10^{6})
F= (45 x 10^{-6})(9.78 x 10^{6})
F= 440.1 N

25. A TV has a charge on its screen of 1.6 μC. What is the electric field strength on a person standing 36 cm in front of it?

q= 1.6uc= 1.6 x 10^{-6}
E=?
r= 36 cm= .36 m

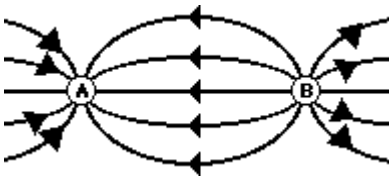
$E= kq/r^2$

$E= \frac{(9 \times 10^{9})(1.6 \times 10^{-6})}{(.36)^2}$

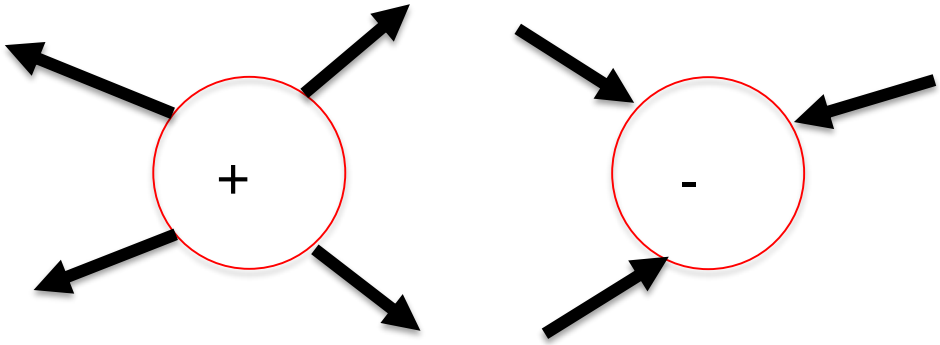
E= 1.11 x 10^{5} N/C

26. Electric field lines start on a _+_ charge and end on a __-__ charge.

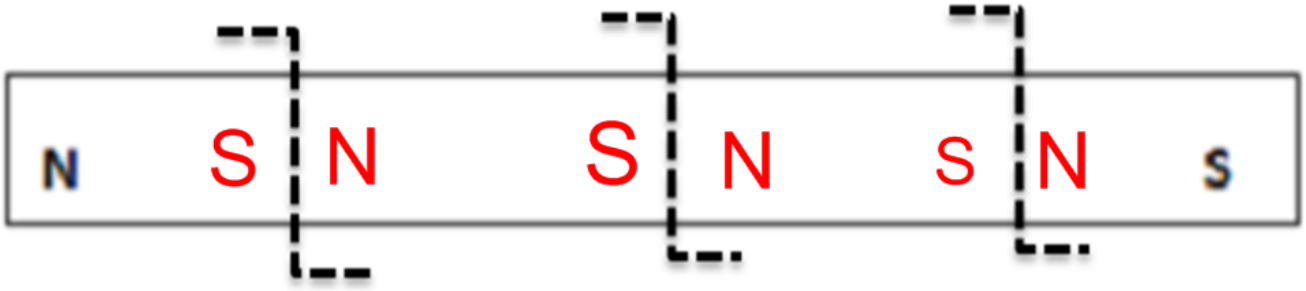
27. Consider the electric field lines shown in the diagram below. From the diagram, it is apparent that object A is _-_ and object B is __+__.



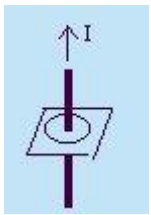
29. Be able to draw electric field lines proportionally between two like and two unlike charges.

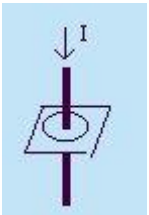


30. If you break this bar magnet in pieces how would you put it back together?



31. What is the direction of the magnetic field in the following diagrams?

To the left 

to the right 

*Please note that there is not much math practice on this review. Please practice the problems in your booklet if you need more practice.