EL FORCE and EL FIELD HW-PRACTICE 2016

1. A difference between electrical forces and gravitational forces is that electrical forces include
   a. separation distance.
   b. repulsive interactions.
   c. the inverse square law.
   d. infinite range.
   e. none of the above

2. In a good insulator, electrons are usually
   a. free to move around.
   b. free to move around after an impurity has been added.
   c. semi-free to move around.
   d. tightly bound in place.
   e. not moving at all.

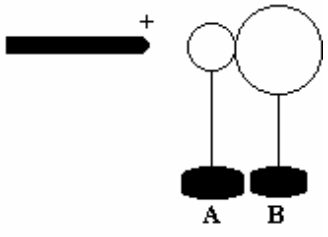
3. A conducting sphere has a net charge of -4.8×10^{-17} C. What is the approximate number of excess electrons on the sphere?
   a. 100
   b. 200
   c. 300
   d. 400
   e. 500

4. When a hard rubber rod is given a negative charge by rubbing it with wool:
   a. positive charges are transferred from rod to wool
   b. negative charges are transferred from rod to wool
   c. positive charges are transferred from wool to rod
   d. negative charges are transferred from wool to rod
   e. negative charges are created and stored on the rod

5. An electrical insulator is a material:
   a. containing no electrons
   b. through which electrons do not flow easily
   c. which has more electrons than protons on its surface
   d. cannot be a pure chemical element
   e. must be a crystal

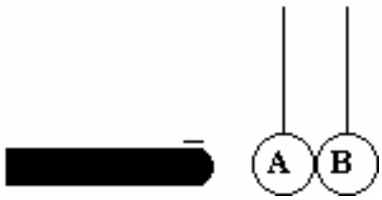
6. A conductor is distinguished from an insulator with the same number of atoms by the number of:
   a. nearly free atoms
   b. electrons
   c. nearly free electrons
   d. protons
   e. molecules

7. Two uncharged, conducting spheres, **A** and **B**, are held at rest on insulating stands and are in contact. A positively charged rod is brought near sphere **A** as suggested in the figure. While the rod is in place, the two spheres are separated.
   How will the spheres be charged, *if at all*?



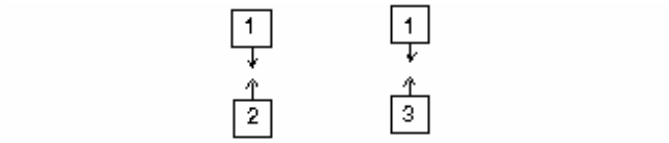
	Sphere **A**	*Sphere* **B**
a.	positive	positive
b.	positive	negative
c.	zero	zero
d.	negative	positive
e.	negative	negative

7a. Two uncharged conducting spheres, **A** and **B**, are suspended from insulating threads so that they touch each other. While a negatively charged rod is held *near, but not touching* sphere **A**, the two spheres are separated. How will the spheres be charged, *if at all*?

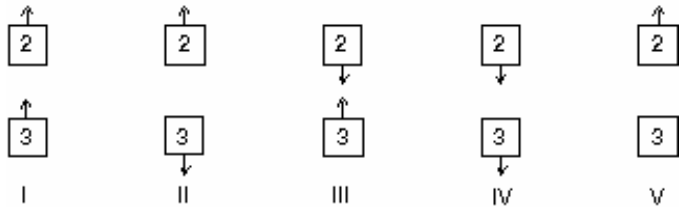


	Sphere **A**	*Sphere* **B**
a.	0	+
b.	-	0
c.	+	-
d.	0	0
e.	-	+

8. The diagram shows two pairs of heavily charged plastic cubes. Cubes 1 and 2 attract each other and so do cubes 1 and 3.



Which of the following illustrates the forces of 2 on 3 and 3 on 2?



9. At what separation will two charges, each of magnitude 6 μC, exert a force of 1.4 N on each other?
   a. 0.48 m
   b. 5.1×10^{-6} m
   c. 0.23 m
   d. 40 m
   e. 2.0 m

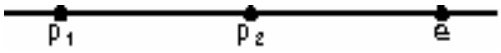
10. Two positive point charges Q and $2Q$ are separated by a distance R. If the charge Q experiences a force of magnitude F when the separation is R, what is the magnitude of the force on the charge $2Q$ when the separation is $2R$?
   a. F b. F/4 c. 4F d. 2F e. F/2

11. Two small charged objects repel each other with a force F when separated by a distance d. If the charge on each object is reduced to one-fourth of its original value and the distance between them is reduced to $d/2$ the force becomes:
   a. $F/16$
   b. $F/8$
   c. $F/4$
   d. $F/2$
   e. F

12. A 5.0-C charge is 10 m from a –2.0-C charge. The electrostatic force is on the positive charge is:
    a. 9.0×10^{8} N toward the negative charge
    b. 9.0×10^{8} N away from the negative charge
    c. 9.0×10^{9} N toward the negative charge
    d. 9.0×10^{9} N away from the negative charge
    e. none of these

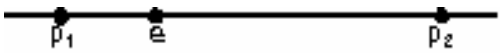
13. Two identical charges, 2.0 m apart, exert forces of magnitude 4.0 N on each other. The value of either charge is:
    a. 1.8×10^{-9} C
    b. 2.1×10^{-5} C
    c. 4.2×10^{-5} C
    d. 1.9×10^{5} C
    e. 3.8×10^{5} C

14. Two protons (p_1 and p_2) and an eletron (e) lie on a straight line, as shown. The directions of the force of p_2 on p_1, the force of e on p_1, and the total force on p_1, respectively, are:



    a. →, ←, →
    b. ←, →, →
    c. →, ←, ←
    d. ←, →, ←
    e. ←, ←, ←

15. Two protons (p_1 and p_2) and an electron (e) lie on a straight line, as shown. The directions of the force of p_1 on e, the force of p_2 on e, and the total force on e, respectively, are:



    a. →, ←, →
    b. ←, →, →
    c. →, ←, ←
    d. ←, →, ←
    e. ←, ←, ←

16. Two particles have charges *Q* and *–Q* (equal magnitude and opposite sign). For a net force of zero to be exerted on a third charge it must be placed:
    a. midway between *Q* and *–Q*
    b. on the perpendicular bisector of the line joining *Q* and *–Q*, but not on that line itself
    c. on the line joining *Q* and *–Q*, to the side of *Q* opposite *–Q*
    d. on the line joining *Q* and *–Q*, to the side of *–Q* opposite *Q*
    e. at none of these places (there is no place)

17. Two point charges, initially 2 cm apart, are moved to a distance of 10 cm apart. By what factor do the resulting electric and gravitational forces between them change?

    a. 5 b. 25 c. 1/5 d. 1/25

18. If the charge and mass are tripled for two identical charges maintained at a constant separation, the electric and gravitational forces between them will be changed by what factor?

    a. 9 b. 2/3 c. 1/9 d. 3

19. The electric field around an isolated electron has a certain strength 1 cm from the electron. The electric field strength 2 cm from the electron is
    a. half as much.
    b. the same.
    c. twice as much.
    d. four times as much.
    e. none of the above

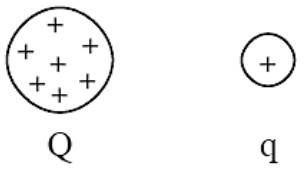
20. A beam of electrons accelerates from the back of your TV set to the screen. In order to make the beam hit the top of the screen, oppositely charged parallel plates create a vertical electric field. How will the top plate be charged?
    a. Positively
    b. Negatively

21. Two parallel plates are oppositely charged. The left plate is negative and the right plate is positive. In which direction does the electric field point?
    a. To the right
    b. To the left

22. Which of the following statements is not true?

    A. Electric charge is quantized.
    B. Electric charge is conserved.
    C. The force between two point charges is proportional to the sum of the charges.
    D. The force between two point charges is proportional to the inverse square of the separation of the charges.

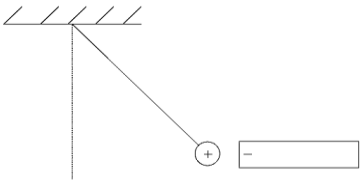
23. A positive test charge q is released near a positive fixed charge Q



    As q moves away from Q, it will move with

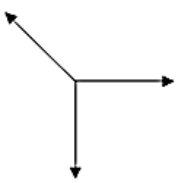
    A. constant velocity.
    B. constant acceleration.
    C. increasing acceleration.
    D. decreasing acceleration.

24. A small electrically charged sphere is suspended vertically from a thread. An oppositely charged rod is brought close to the sphere such that the sphere is in equilibrium when displaced from the vertical by an angle of 45^0.

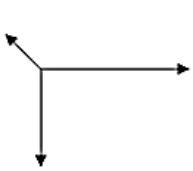


    Which **one** of the following best represents the free body diagram for the sphere?

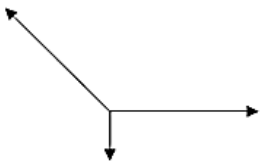
A.



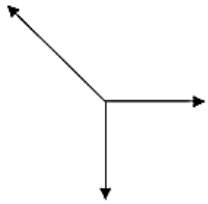
B.



C.



D.



25. Three equal point charges X, Y and Z are fixed in the positions shown.

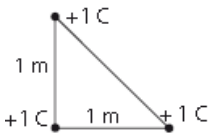
The distance between q_1 and q_2 and the distance between q_2 and q_3 is 1.0 m.
The electric force between the charges at X and Y is *F*.
The electric force between the charges at X and Z is

A. *F*/2.
B. *F*/*v*2.
C. *F*.
D. 2*F*.

26. Calculate the force acting between two point charges of +10.0 μC and -5.0 μC separated by a distance of 10.0 cm in a vacuum.

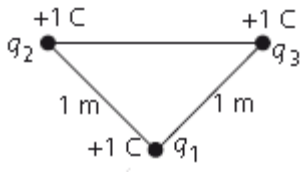
27. The force between two point charges is 20.0 N. If one charge is doubled, the other charge tripled and the distance between th em is halved, calculate the resultant force between them.

28. Charges of +1C are located at the corners of a 45 rightangled triangle as shown in the Figure below.



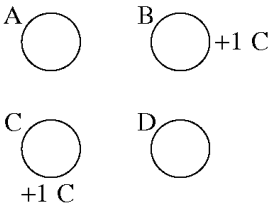
Determine the resultant force on the charge located at the right angle.

29. Charges of +1C are located at the corners of a 45 rightangled triangle as shown in the Figure below.



Determine the resultant force on the charge located at the right angle.

29.a



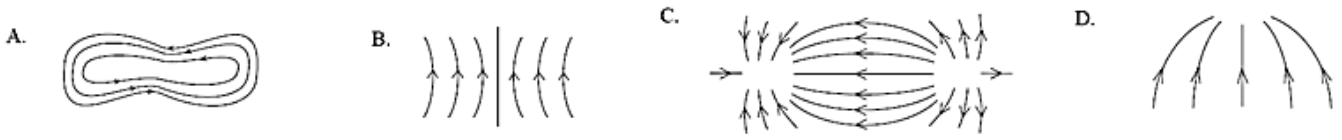
Four charges—A, B, C, and D— are at the corners of a square. Charges A and D, on opposite corners, have equal charge, whereas both B and C have a charge of 1.0 C. If the force on B is zero, what is the charge on A?

a. –1.0 C b. –0.20 C c. –0.35 C d. –0.71 C

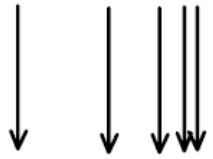
29.b Two charges are located on the positive *x*-axis of a coordinate system. Charge $q_1 = 2.00 \times 10^{-9}$C, and it is 0.02 m from the origin. Charge $q_2 = -3.00 \times 10^{-9}$C, and it is 0.04 m from the origin. What is the electric force exerted by these two charges on a third charge, $q_3 = 5.00 \times 10^{-9}$, located at the origin?

a. 2.2×10^{-4} N b. 1.4×10^{-4} N c. 3.1×10^{-4} N d. 8.4×10^{-4} N

30. Which **one** of the field patterns below could be produced by two point charges?



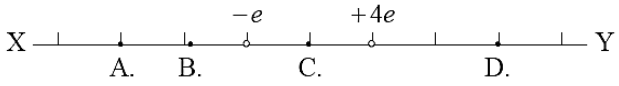
31. The distribution of electric field lines in a certain region of space varies as shown in the figure.



The magnitude of the electric field in this region

A. increases to the right.
B. decreases to the right.
C. increases in the downward direction.
D. decreases in the downward direction.

32. Two charges of $-e$ and $+4e$ are fixed at the positions shown below. At which position along the line XY is the electric field due to these charges equal to zero?



33. The diagram below shows two stationary point charges $+2Q$ and $-Q$.