Phys. 1253.4
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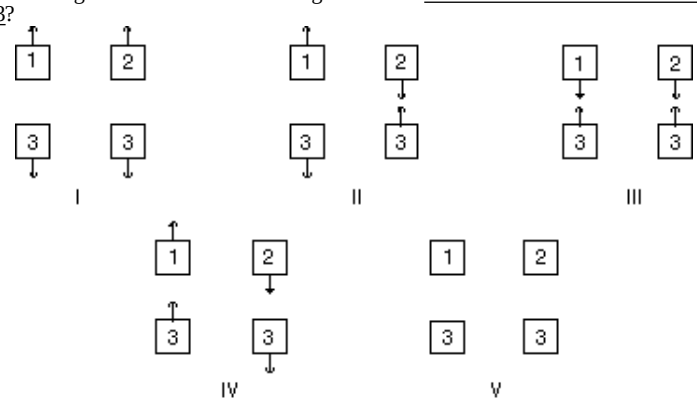
Mc 1 test key

1. The charge on a glass rod which has been rubbed with silk is called positive
   - **a. by arbitrary convention chosen by Benjamin Franklin,**
   - b. so that the proton charge will be positive,
   - c. to conform to the conventions adopted for G and m in Newton's law of gravitation,
   - d. because like charges repel,
   - e. because glass is an insulator.

2. To make an uncharged object have a negative charge we must
   - a. add some atoms,
   - b. remove some atoms,
   - **c. add some electrons,**
   - d. remove some electrons,
   - e. write down a negative sign on it.

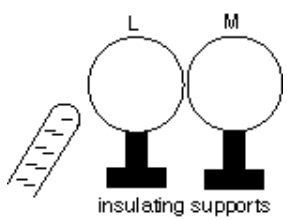
3. A pair of heavily charged plastic cubes, 1 and 2, that attract each other. Cube 3 is a conductor and is uncharged. Which of the following illustrates the forces between 1 and 3 and between 2 and 3?



a. I, b. II, **c. III,** d. IV, e. V.

4. A positively charged insulating rod is brought close to an object that is suspended by a string. If the object is repelled away from the rod the object may be
   - **a. positively charged,**
   - b. negatively charged,
   - c. a neutral insulator,
   - d. a neutral conductor,
   - e. None of the above.

5. Two uncharged metal spheres, L and M, are initailly in contact. A negatively charged rod is brought close to L, but not touching it, as shown. The two spheres are then slightly separated. Finally, the rod is withdrawn. As a result

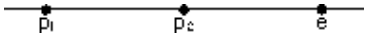


   - a. both spheres are neutral,
   - b. both spheres are positive,
   - c. both spheres are negative,
   - d. L is negative and M is positive,
   - **e. L is positive and M is negative.**

6. A negatively charged rubber rod is brought near the top disk of an electroscope, which has already been charged positive. The result is that
   - a. electroscope indicator will move farther away from vertical,
   - b. the rod will lose its charge,
   - **c. electroscope indicator will tend to go back to vertical,**
   - d. electroscope will become discharged,
   - e. nothing noticeable will happen.

7. 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.

8. 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



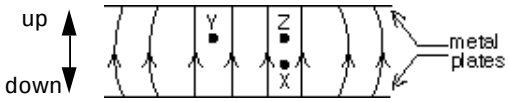
   - a. →, ←, →,
   - b. ←, →, →,
   - c. →, ←, ←,
   - **d. ←, →, ←,**
   - e. ←, ←, ←.

9. An electric field is most directly related to
   - a. the momentum of a test charge,
   - b. the kinetic energy of a test charge,
   - c. the potential energy of a test charge,
   - **d. the force acting on a test charge,**
   - e. the charge carried by a test charge.

10. The units of the electric field are
    - a. N C^2,
    - b. C/N,
    - c. N,
    - **d. N/C,**
    - e. C/m^2.

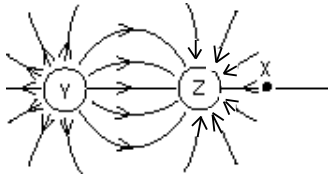
11. Choose the correct statement(s) concerning electric field lines
    - a. field lines may cross,
    - **b. field lines are close together where the field is large,**
    - **c. field lines point away from positive charges,**
    - d. a point charge released from rest moves along a field line,
    - e. none of these are correct.

12. The diagram shows the electric field lines due to two charged parallel metal plates. We conclude that



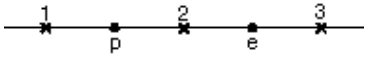
    - **a. the upper plate is negative and the lower plate is positive,**
    - **b. a positive charge at X would experience the same force if it were placed at Y,**
    - c. a positive charge at X experiences a greater force than if it were placed at Z,
    - d. a positive charge at X experiences less force than if it were placed at Z,
    - **e. a positive charge at X could have its weight balanced by the electrical force, provided that the electric field points vertically up.**

13. The diagram shows the electric field lines in a region of space containing two small charged spheres (Y and Z). Then



   a. Y is positive and Z is negative,
   b. the magnitude of the electric field is the same everywhere,
   c. the electric field is strongest midway between Y and Z,
   d. a small negatively charged body placed at X would be pushed to the left,
   e. Y and Z must have the same sign.

14. A proton, p, and an electron, e, are on the *x* axis. The directions of the electric field at points 1, 2, and 3, respectively, are



   a. →, ←, →,
   b. ←, →, ←,
   c. ←, →, →,
   d. ←, ←, ←,
   e. none of the above.

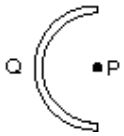
15. Two point charges, q_1 and q_2, are placed a distance *r* apart. The electric field is zero at a point P between the charges on the line segment connecting them. We conclude that

   a. q_1 and q_2 must have the same magnitude and sign,
   b. P must be midway between q_1 and q_2,
   c. q_1 and q_2 must have the same sign but may have different magnitudes,
   d. q_1 and q_2 must have equal magnitudes and opposite signs,
   e. q_1 and q_2 must have opposite signs and may have different magnitudes.

16. The diagram shows a positive charge Q and a negative charge -Q with the same magnitude. The electric field at point P on the perpendicular bisector of the line joining them is

   a. ↑, b. ↓, c. →, d. ←, e. zero.

17. Positive charge Q is uniformly distributed on a semicircular rod. What is the direction of the electric field at point P, the center of the semicircle?



   a. ↑, b. ↓, **c. →,** d. ←, e. ↗.

18. A point charge is placed in an electric field that varies with location. No force is exerted on this charge

   a. at locations where the electric field is zero,
   b. at locations where the electric field strength is $1/(1.6 \times 10^{-19})$ N/C,
   c. if the charge is moving along a field line,
   d. if the charge is moving perpendicular to a field line,
   e. if the field is caused by an equal amount of positive and negative charge.