General Physics II
2009 Fall
Prof Richard Ignace

HOMEWORK #1

- *This homework is due by the beginning of class on September 15. It covers material in chapters 15 and 16.*
- *You will need a calculator and lots of scrap paper.*
- *Answers are to be recorded on a scantron that you will turn in. You may keep the questions (i.e., these sheets).*
- *You may (should) use your book. You may even work with other students. However, you should not copy the answers of other students. Since the exams are multiple choice, the homeworks are also exam prep, and so you need to be able to work these problems yourself. If you do not apply yourself to the homework and do your own work, you are not likely to perform well on the exams.*

1. A repelling force must occur between two charged objects under which conditions?

   a. charges are of unlike signs
   b. charges are of like signs
   c. charges are of equal magnitude
   d. charges are of unequal magnitude

2. A metallic object holds a charge of -3.8×10^{-6} C. What total number of electrons does this represent? ($e = 1.6 \times 10^{-19}$ C is the magnitude of the electronic charge.)

   a. 4.2×10^{14}
   b. 6.1×10^{13}
   c. 2.4×10^{13}
   d. 1.6×10^{14}

3. If the distance between two point charges is tripled, the mutual force between them will be changed by what factor?

   a. 9.0
   b. 3.0
   c. 0.33
   d. 1/9

4. The constant k_e, which appears in Coulomb's law formula, is equivalent dimensionally to which of the following?

   a. N·m/C
   b. N/C
   c. $N \cdot m^2/C^2$
   d. N/C^2

5. Charge A and charge B are 3.00 m apart, and charge A is +2.00 C and charge B is +3.00 C. Charge C is located between them at a certain point and the force on charge C is zero. How far from charge A is charge C?

   a. 0.555 m
   b. 0.667 m
   c. 1.35 m
   d. 1.50 m

6. Charges of 4.0 μC and −6.0 μC are placed at two corners of an equilateral triangle with sides of 0.10 m. At the third corner, what is the electric field magnitude created by these two charges? ($k_e = 8.99 \times 10^9$ $N \cdot m^2/C^2$)

   a. 4.5×10^6 N/C
   b. 3.1×10^6 N/C
   c. 1.6×10^6 N/C
   d. 4.8×10^6 N/C

7. An electron with a speed of 2.0×10^6 m/s moves into a uniform electric field of 500 N/C that is parallel to the electron's motion. How long does it take to bring the electron to rest? ($m_e = 9.11 \times 10^{-31}$ kg, $e = 1.6 \times 10^{-19}$ C)

   a. 2.3×10^{-8} s
   b. 3.5×10^{-8} s
   c. 1.2×10^{-7} s
   d. 2.3×10^{-6} s

8. The electric field at the surface of a positively charged conductor has a direction characterized by which of the following?

   a. tangent to the surface
   b. perpendicular inward toward the charge
   c. at a 45° angle to the surface
   d. perpendicular outward and away from the charge

9. If a charge $+Q$ is placed inside a hollow isolated conductor that is originally neutral and the charge does not touch that conductor at any time:

    a. the inside surface of the conductor will become positively charged.
    b. the outside surface of the conductor will become positively charged.
    c. both the inner and outer surfaces will remain neutral.
    d. both the inner and outer surfaces will become negative.

10. A closed surface contains the following point charges: +6 C, +4 C, –2 C, –4 C. The electric flux coming out of the surface is:

    a. $+16\ \text{C}/\varepsilon_o$.
    b. $-16\ \text{C}/\varepsilon_o$.
    c. $+4\ \text{C}/\varepsilon_o$.
    d. $-4\ \text{C}/\varepsilon_o$.

11. A proton ($+1.6 \times 10^{-19}$ C) moves 10 cm on a path in the direction of a uniform electric field of strength 3.0 N/C. How much work is done on the proton by the electrical field?

    a. $+4.8 \times 10^{-20}$ J
    b. -4.8×10^{-20} J
    c. $+1.6 \times 10^{-20}$ J
    d. zero

12. If an electron is accelerated from rest through a potential difference of 1 200 V, find its approximate velocity at the end of this process. ($e = 1.6 \times 10^{-19}$ C; $m_e = 9.1 \times 10^{-31}$ kg)

    a. 1.0×10^7 m/s
    b. 1.4×10^7 m/s
    c. 2.1×10^7 m/s
    d. 2.5×10^7 m/s

13. In which case does an electric field do positive work on a charged particle?

    a. a negative charge moves opposite to the direction of the electric field.
    b. a positive charge is moved to a point of higher potential energy.
    c. a positive charge completes one circular path around a stationary positive charge.
    d. a positive charge completes one elliptical path around a stationary positive charge.

14. An electron with velocity $v = 1.0 \times 10^6$ m/s is sent between the plates of a capacitor where the electric field is $E = 500$ V/m. If the distance the electron travels through the field is 1.0 cm, how far is it deviated (Y) in its path when it emerges from the electric field? ($m_e = 9.1 \times 10^{-31}$ kg, $e = 1.6 \times 10^{-19}$ C)

a. 2.2 mm
b. 4.4 mm
c. 2.2 cm
d. 4.4 cm