Test 2 Physics 161 Spring 2008, Dr. Morrison

Name______________________________ Student ID (three digit, not your banner ID)________

All problems are worth 7.7 points each.
Some (perhaps) useful information: e = 1.602 E-19 C, mass of electron = 9.109E-31 kg,
acceleration due to gravity = g = 9.80 m/s^2, k= 1/(4*pi*epsilon_0) = 8.99E9 Nm^2/C^2

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Two conductors are joined by a long copper wire. Thus 1) ________

A) each carries the same free charge.
B) no free charge can be present on either conductor.
C) the electric field at the surface of each conductor is the same.
D) each conductor must be at the same potential.
E) the potential on the wire is the average of the potential of each conductor.

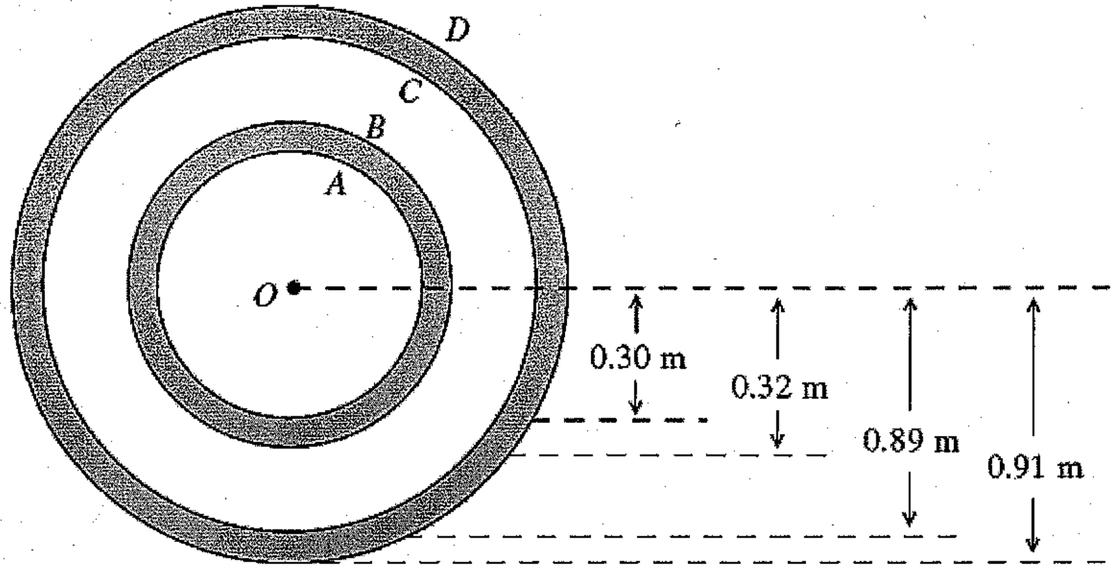
2) When a positive charge moves opposite to the direction of the electric field: 2) ________

A) The field does positive work on it and the potential energy increases.
B) The field does negative work on it and the potential energy increases.
C) The field does negative work on it and the potential energy decreases.
D) The field does positive work on it and the potential energy decreases.

3) An uncharged conductor has a hollow cavity inside of it. Within this cavity there is a charge of +10 μC that does not touch the conductor. There are no other charges in the vicinity. Which statement about this conductor is true? 3) ________

A) The inner and outer surfaces of the conductor each contain charges of -5 μC.
B) Both surfaces of the conductor carry no excess charge because the conductor is uncharged.
C) The inner surface of the conductor carries a charge of -10 μC and its outer surface carries no excess charge.
D) The outer surface of the conductor contains +10 μC of charge and the inner surface contains -10 μC.
E) The net electric field within the material of the conductor points away from the +10 μC charge.

Figure 22.3



4) Two hollow conducting spheres have a common center *O*. The dimensions of the spheres are as shown. A charge of -200 nC is placed on the inner conductor and a charge of +80 nC is placed on the outer conductor. The inner and outer surfaces of the spheres are respectively denoted by *A*, *B*, *C*, and *D*, as shown. In Fig. 22.3, the charges on surfaces *C* and *D* respectively, in nC, are closest to: 4) ______

A) +80 and -120
B) 0 and +80
C) +80 and 0
D) +200 and -120
E) +200 and +80

8) You reposition the two plates of a capacitor so that the capacitance doubles. There is vacuum between the plates. If the charges +Q and -Q on the two plates are kept constant in this process, the energy stored in the capacitor: 8) ________

A) remains the same.
B) becomes 4 times greater.
C) becomes twice as great.
D) becomes 1/2 as great.
E) becomes 1/4 as great.

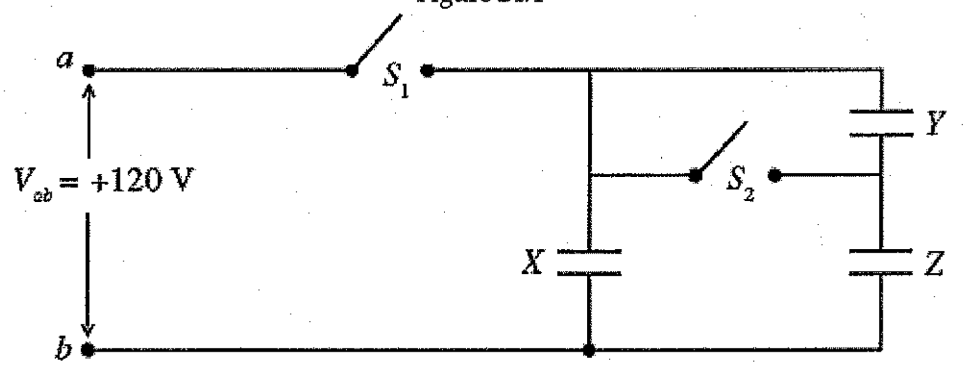
9) At a distance D from a very long (essentially infinite) uniform line of charge, the electric field strength is 1000 N/C. For the field strength to be 2000 N/C, the distance from the line would have to be: 9) ________

A) $D/\sqrt{2}$
B) $D/2$
C) $\sqrt{2}D$
D) $2D$
E) $D/4$

10) Two very large parallel sheets carry equal but opposite uniform surface charge densities. A point charge that is placed near the middle of the sheets equidistant from both of them feels an electrical force F due to the sheets. If this charge is now moved twice as close to one of the sheets, the force it will feel is closest to: 10) ________

A) $4F$
B) $F/4$
C) $2F$
D) F
E) $F/2$

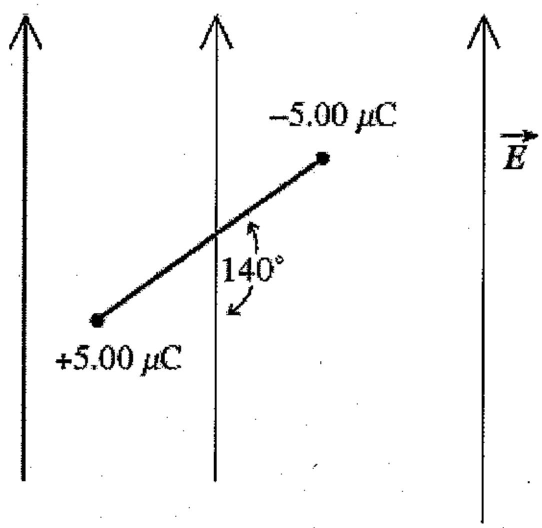
Figure 24.4



11) The network shown is assembled with uncharged capacitors X, Y, and Z, with $C_X = 1\ \mu F$, $C_Y = 5\ \mu F$, and $C_Z = 8\ \mu F$, and open switches, S_1 and S_2. A potential difference $V_{ab} = +120$ V is applied between points a and b. After the network is assembled, switch S_1 is closed, but switch S_2 is kept open. In Fig. 24.4, the charge on capacitor Y, in μC, is closest to: 11) ________

A) 460
B) 370
C) 180
D) 550
E) 280

Figure 21.4



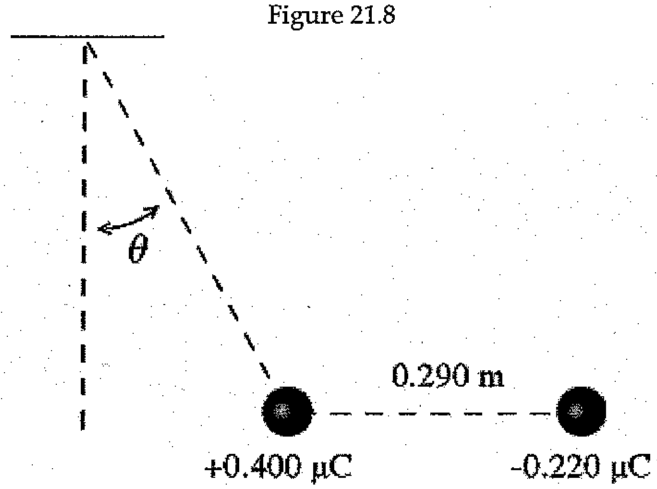
5) A dipole consists of charges ±5.00 μC separated by 1.20 mm. It is placed in a vertical electric field of magnitude 525 N/C oriented as shown in Fig. 21.4. The magnitude of the net torque this field exerts on the dipole is closest to: 5) ______

A) 2.41×10^{-6} N • m
B) 1.01×10^{-6} N • m
C) 3.15×10^{-6} N • m
D) 2.02×10^{-6} N • m
E) 1.21×10^{-6} N • m

6) Each plate of a parallel-plate air capacitor has an area of 0.0010 m^2, and the separation of the plates is 0.030 mm. An electric field of 9.3×10^6 V/m is present between the plates. The potential difference across the capacitor is closest to: 6) ______

A) 279 V B) 465 V C) 372 V D) 186 V E) 558 V

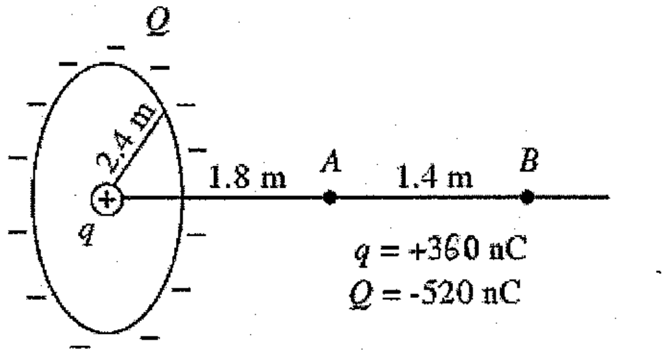
Figure 21.8



7) In Fig. 21.8, a small spherical insulator of mass 6×10^{-2} kg and charge +0.400 μC is hung by a thin wire of negligible mass. A charge of -0.220 μC is held 0.290 m away from the sphere and directly to the right of it, so the wire makes an angle θ with the vertical (see drawing). What is the angle θ? 7) ______

A) 1.30° B) 1.10° C) 1.50° D) 1.70° E) 0.917°

Figure 23.2b



12) A charge $Q = -520$ nC is uniformly distributed on a ring of 2.4 m radius. A charge $q = +360$ nC is placed at the center of the ring. Points A and B are located on the axis of the ring, as shown. In Fig. 23.2b, the electric potential is equal to zero at a point on the axis of the ring. The distance of this point from the center of the ring is closest to: 12) _______

A) 2.4 m B) 2.5 m C) 2.2 m D) 2.3 m E) 2.1 m

13) An air-filled parallel-plate capacitor is connected to a battery and allowed to charge up. Now a slab of dielectric material is placed between the plates of the capacitor while the capacitor is still connected to the battery. After this is done one would find that 13) _______

A) the charge on the capacitor had increased.
B) the energy stored in the capacitor had decreased.
C) the charge on the capacitor had not changed.
D) the voltage across the capacitor had increased.
E) None of these is true.