RH = /22 CH1 = /50

PHYS 202 Test #1 1/30/19 Dr. Holmes NAME **Key**

DO ALL EIGHT PROBLEMS. THE WORTH OF EACH PROBLEM IS MARKED NEXT TO THE PROBLEM. SHOW YOUR WORK FOR PARTIAL CREDIT.

1) Consider two charged particles ($q_1 = -12\ \mu C$, $m_1 = 8$ grams; $q_2 = +5\ \mu C$, $m_2 = 14$ grams). The first particle is 21 cm to the West of the second one.

a) What is the magnitude and direction of the electric FORCE on the 1st particle due to the presence of the 2nd particle? [when answering this direction question, answer with North, East, South, West, Up or Down.] magnitude: direction:

[3] **12.2 Nt**, [3] **East**.

b) Is the magnitude of the force on the 2nd particle due to the 1st particle [bigger than, the same as, or smaller than] the force on the 1st particle due to the 2nd particle?

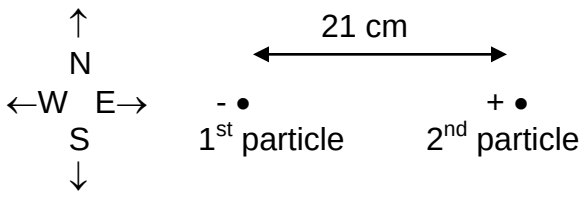
[2] **same**.

c) Is the direction of the force on the 1st particle due to the 2nd particle [the same as or opposite that of] the force on the 2nd particle due to the 1st particle?

[2] **opposite**.

d) Is the magnitude of the acceleration of the 2nd particle due to the presence of the 1st particle [bigger than, the same as, or smaller than] the acceleration of the 1st particle due to the 2nd particle? (Assume there are no other forces acting on the two particles).

[2] **smaller .**



2) Consider the same two point charges as in problem #1.

a) What is the electric field (magnitude, direction) due to 1st charge at the location of the 2nd charge? magnitude: direction:

[3] **2.45×10^6 Nt/C** [3] **West**;

b) What is the voltage due to the 1st charge at the location of the 2nd charge?

[6] **-5.14×10^5 Volts**

3) a) What is the magnitude of the **gravitational** force between a proton and an electron when they are separated by 0.5 nm?

[6] 4.05×10^{-49} Nt . b) What is the magnitude of the **electrica**l force between a proton and an electron when they are separated by 0.5 nm?

[6] 9.22×10^{-10} Nt .

4) An electron is to be accelerated from rest by using an accelerating voltage of 40 volts.

a) How fast will the electron be going after the acceleration through 40 volts?

[8] 3.75×10^{6} m/s .

b) Should the electron start out at a higher or lower voltage?

[2] lower .

c) If the electron is to be accelerated with twice the voltage (80 volts), will the final velocity of the electron be [twice as large, less than twice as large, or greater than twice as large] as in part a?

[2] less than twice .

5) A 5 microFarad capacitor has a voltage of 40 volts applied across it. a) How much charge is stored on the capacitor?

[5] 2.0×10^{-4} C . b) How much energy is stored on the capacitor?

[4] 4.0×10^{-3} J . c) If the capacitor is a parallel plate type of capacitor, and the area of its places is doubled (with the distance between the plates and the voltage remaining the same), which of the following quantities will change (relative to the original 5 microF capacitor with 40 volts applied): (1) capacitance, (2) energy stored, (3) charge stored?

[if none change, then answer none; if one changes, simply indicate which changes, if two change, then indicate both of those that change, if all three change then answer all]

[3] all .

6) A particular light bulb is rated at 8 Watts when a voltage of 12 volts is placed across it.

a) What is the electric current through the light bulb in this circumstance?

[5] __0.67 A_____.

b) What is the resistance of the light bulb?

[5] _____18 Ω_____. c) In designing a new wattage light bulb, should the resistance of the light bulb be [lowered or raised] from that in part b above if the power of the light bulb is to be **decreased** when used with the same 12 volts power supply?

[2] _____raised_____.

7) Consider three capacitors: $C_1 = 4$ nF, $C_2 = 8$ nF, $C_3 = 16$ nF .

a) Connect the three capacitors in a circuit (make a circuit drawing) such that the effective capacitance is the **largest** it can be: [5]

b) Are the three capacitors above connected in series, parallel, or some other combination?

[2] ___parallel_____. c) What is the effective capacitance of this circuit that has the largest effective capacitance using these three capacitors?

[5] ___28 nF_____.

8) Consider three resistors: $R_1 = 4\ \Omega$, $R_2 = 8\ \Omega$, $R_3 = 16\ \Omega$.

a) Connect the three resistors in a circuit (make a circuit drawing) such that the effective resistance is the **largest** it can be: [5]

b) Are the three resistors above connected in series, parallel, or some other combination?

[2] ____**series**_____. c) What is the effective resistance of this circuit that has the largest effective resistance using these three resistors?

[5] ____**28 Ω**_____.

d) Connect all three resistors in a circuit (make a circuit drawing) such that the effective resistance is between 8 Ω and 16 Ω. If no combination will work, then write NONE. [4]