Linnemann,

James T

Keep this exam **CLOSED** until advised by the instructor.

Fill out the bubble sheet: last name, first initial, student number, section number. Leave the code area empty.

50 minute long closed book exam.

One 8.5 by 11 handwritten help sheet is allowed.

When done, hand in your **bubble sheet**, and your **exam**.

Thank you and good luck!

Possibly useful constants:

- $k_e = 8.99 \times 10^9$ Nm^2/C^2
- $\epsilon_0 = 8.85 \times 10^{-12}$ C^2/Nm^2
- $e = 1.60 \times 10^{-19}$ C

$\boxed{6\ pt}$ What is the magnitude of the electric field at a point d = 4.14 cm away from a charge of $Q_1 = 2.65\ \mu$C ?
(in `N/C`*)*

1.A◯ 1.89×10^{6} **B**◯ 2.51×10^{6} **C**◯ 3.34×10^{6}
D◯ 4.44×10^{6} **E**◯ 5.91×10^{6} **F**◯ 7.86×10^{6}
G◯ 1.05×10^{7} **H**◯ 1.39×10^{7}

$\boxed{6\ pt}$ What is the magnitude of the force on a charge of Q_2 = -4.75 μC placed at this point?
(in `N`*)*

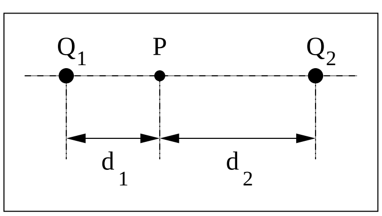
2.A◯ 4.58×10^{1} **B**◯ 5.17×10^{1} **C**◯ 5.84×10^{1}
D◯ 6.60×10^{1} **E**◯ 7.46×10^{1} **F**◯ 8.43×10^{1}
G◯ 9.53×10^{1} **H**◯ 1.08×10^{2}

$\boxed{12\ pt}$ Two positive point charges both with an electric charge of **Q** are at a distance of **d** from each other. The magnitude of the force between the charges is **F**. Select True or False for the following statements.

▷ If one of the charges is halved in size, then the magnitude of the force halves.
3. **A**◯ True **B**◯ False

▷ If both of the charges are halved in size, then the magnitude of the force remains the same.
4. **A**◯ True **B**◯ False

▷ If the distance between the charges is doubled, then the magnitude of the force doubles.
5. **A**◯ True **B**◯ False



$\boxed{6\ pt}$
Consider two point charges $Q_1 = 1.77\ \mu$C and $Q_2 = 5.83\ \mu$C as shown in the figure. Point P is between the two charges at a distance of $d_1 = 1.39$ m from Q_1 and $d_2 = 1.95$ m from Q_2. What is the electric potential at point P?
(in `V`*)*

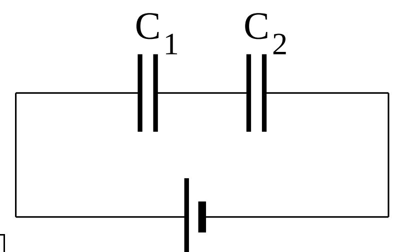
6.A◯ 9.21×10^{3} **B**◯ 1.22×10^{4} **C**◯ 1.63×10^{4}
D◯ 2.17×10^{4} **E**◯ 2.88×10^{4} **F**◯ 3.83×10^{4}
G◯ 5.10×10^{4} **H**◯ 6.78×10^{4}

$\boxed{7\ pt}$ How much work is done in bringing a third charge of $Q_3 = 4.81\ \mu$C from infinity to point P?
(in `J`*)*

7.A◯ 1.63×10^{-1} **B**◯ 1.84×10^{-1} **C**◯ 2.08×10^{-1}
D◯ 2.35×10^{-1} **E**◯ 2.66×10^{-1} **F**◯ 3.01×10^{-1}
G◯ 3.40×10^{-1} **H**◯ 3.84×10^{-1}

$\boxed{12\ pt}$ The potential difference between two parallel conducting plates in vacuum is 390 V. An alpha particle with mass of 6.50×10^{-27} kg and charge of 3.20×10^{-19} C is released from rest near the positive plate. What is the kinetic energy of the alpha particle when it reaches the other plate? The distance between the plates is 40.0 cm.
(in `J`*)*

8.A◯ 6.66×10^{-17} **B**◯ 7.79×10^{-17}
C◯ 9.12×10^{-17} **D**◯ 1.07×10^{-16}
E◯ 1.25×10^{-16} **F**◯ 1.46×10^{-16}
G◯ 1.71×10^{-16} **H**◯ 2.00×10^{-16}



$\boxed{5\ pt}$
Two capacitors, $C_1 = 2.06\ \mu$F and $C_2 = 9.01\ \mu$F, are connected in series to a 130.0 V battery. (See figure.) What is the equivalent capacitance of the two capacitors?
(in `F`*)*

9.A◯ 5.50×10^{-7} **B**◯ 7.97×10^{-7} **C**◯ 1.16×10^{-6}
D◯ 1.68×10^{-6} **E**◯ 2.43×10^{-6} **F**◯ 3.53×10^{-6}
G◯ 5.11×10^{-6} **H**◯ 7.41×10^{-6}

$\boxed{5\ pt}$ What is total charge stored in the capacitors?
(in `C`*)*

10.A◯ 4.57×10^{-5} **B**◯ 5.71×10^{-5} **C**◯ 7.14×10^{-5}
D◯ 8.93×10^{-5} **E**◯ 1.12×10^{-4} **F**◯ 1.39×10^{-4}
G◯ 1.74×10^{-4} **H**◯ 2.18×10^{-4}

$\boxed{5\ pt}$ What is the potential difference across C_1?
(in `V`*)*

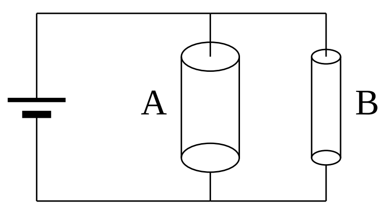
11.A◯ 3.47×10^{1} **B**◯ 5.03×10^{1} **C**◯ 7.30×10^{1}
D◯ 1.06×10^{2} **E**◯ 1.53×10^{2} **F**◯ 2.22×10^{2}
G◯ 3.23×10^{2} **H**◯ 4.68×10^{2}

$\boxed{12\ pt}$ What resistance should be used with a voltage source of 90 V in order to construct a heater which dissipates 1.35 kW?
(in `ohms`*)*

12.A◯ 5.31 **B**◯ 6.00 **C**◯ 6.78
D◯ 7.66 **E**◯ 8.66 **F**◯ 9.78
G◯ 1.11×10^1 **H**◯ 1.25×10^1

$\boxed{12\ pt}$ A certain wire has a resistance of 57.2 Ω. If another wire consists of the same material but has twice the length and half the diameter of the first wire, what will be the resistance of the second wire?
(in `ohms`*)*

13.A◯ 4.05×10^2 **B**◯ 4.58×10^2 **C**◯ 5.17×10^2
D◯ 5.84×10^2 **E**◯ 6.60×10^2 **F**◯ 7.46×10^2
G◯ 8.43×10^2 **H**◯ 9.53×10^2



$\boxed{12\ pt}$
The picture shows a battery connected to two cylindrical wires in parallel. Both wires are made out of the same material and are of the same length, but the diameter of wire **A** is twice the diameter of wire **B**. Select True or False for the following statements.

▷ The resistance of wire **B** is four times larger than the resistance of wire **A**.
14. **A**◯ True **B**◯ False

▷ The voltage drop across wire **B** is the same as the voltage drop across wire **A**.
15. **A**◯ True **B**◯ False

▷ The power dissipated by wire **A** is one quarter the power dissipated by wire **B**.
16. **A**◯ True **B**◯ False