

PHY114 S09 MidTerm Exam 1

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Feb 17 2009

12:30 pm to 1:45 pm

PLEASE write your workshop number and your workshop leader's name at the top of your book.

Each of the four questions carry the same number of points.

Each part of a question also carries the same number of points.

Derive a formula for the answer before you put in the numbers. This will help you get partial credit if your final numerical answer is wrong!

Put a box around your final answer for each question.

Give answers to two significant digits.

The magnitude of the charge on an electron is $1.6 \times 10^{-19}C$

The mass of the proton is $1.67 \times 10^{-27}kg$.

The permittivity of the vaccum is $\epsilon_0 = 8.85 \times 10^{-12}C^2N^{-1}m^{-2}$

Newton's Gravitational constant is $G = 6.67 \times 10^{-11}Nm^2kg^{-1}$.

$\pi = 3.1415927$.

1. A $25\mu C$ charge is placed at a distance of 25 cm from another point charge Q . It experiences a force of magnitude $9.2N$. What is the magnitude of Q ?
2. The electric field midway between two equal and opposite point charges is 591 Vm^{-1} ; the distance between the charges is 16.0 cm. What is the magnitude of the charge on each? What would have been the electric field at the midpoint if the two charges were equal in both magnitude and sign?
3. A pair of parallel plates carry equal and opposite charge densities and are 1.53cm apart. A proton is released from rest at the surface of the positively charged plate and strikes the surface of the opposite plate in a time interval $1.48 \times 10^{-6}\text{s}$. What is its acceleration? What is the electric field between the plates? What is the magnitude of the electric charge per unit area on the plates?
4.
 - The distance between a charged particle and an infinite straight wire with uniform line charge density is doubled. By what factor does the force on the charge change?
 - Can electric field lines cross? Explain your answer.
 - Newton's law and Coulomb's law are similar in form. What are the differences? Is there something similar to Gauss's law for gravitation? If so, what is it?