PRINCE SULTAN UNVIERSITY

Department of Mathematics and General Sciences

Physics II (PHY205)

First Major Exam

Term 171

Monday 30/10/2017

Name:	
Student ID #:	
Section # or time:	

Instructions:

1. Examination time: **1 hour**.
2. Write your name before starting with the questions.
3. **Switch off your mobile phone** and put any books and notes away.
4. Check that you have **6 pages** in total.
5. You may use a calculator but you may not borrow one.

Constants

Elementary charge	$e = 1.6 \times 10^{-19}$ C
Electron mass	$m_e = 9.11 \times 10^{-31}$ kg
Proton mass	$m_p = 1.67 \times 10^{-27}$ kg
Coulomb constant	$k = 9 \times 10^{9}$ N.m^2/C^2
Permittivity of free space	$\varepsilon_0 = \frac{1}{4\pi k} = 8.85 \times 10^{-12}$ C^2/N.m^2

Mark

Part 1 (5 points):

Indicate the answer choice that best completes the statement or answers the question

Q1. How many electrons pass through a 1 Ω resistor in 5 seconds if the dissipated power in the resistor is 16 W?

A) 2.5×10^{19}
B) 1.25×10^{20}
C) 6.4×10^{-19}
D) 3.2×10^{-18}

Q2. An electron is initially at rest. It is accelerated through a potential difference of 40 V. What is the final speed of the electron?

A) 1.41×10^{13} m/s
B) 4.05×10^{7} m/s
C) 6.4×10^{-18} m/s
D) 3.75×10^{6} m/s

Q3. The potential difference between the plates of a parallel plate capacitor with the plate separation of 6 cm is 60 V. What is the electric field between the plates of this capacitor?

A) 1000 N/C
B) 60 N/C
C) 3600 N/C
D) 2000 N/C

Q4. The length of a certain wire is doubled and at the same time its radius is also doubled. What is the change in the resistance of this wire?

A) It stays the same
B) It is reduced by a factor of 2
C) It is reduced by a factor of 4
D) It is doubled.

Q5. A capacitor consists of two parallel plates of area A separated by a distance d. This capacitor is connected to a battery and charged until its plates carry charges +Q and −Q and then disconnected from the battery. If the separation between the plates is doubled, the electrical energy stored in the capacitor will

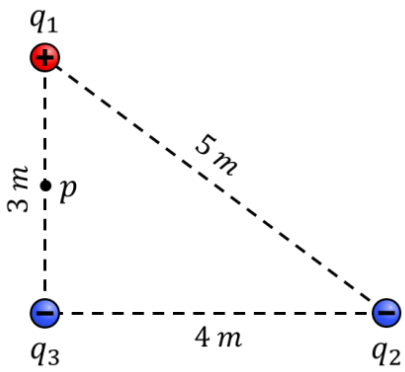
A) not change
B) be cut in half
C) double
D) quadruple

Part 2 (10 points): Solve the following 4 problems in the provided space. **Show your solution** in detail and include units.

Q1. (4 points) Three charges are placed on the edges of a right angle triangle, as shown below. Given that $q_1 = 25\ nC$, and $q_2 = q_3 = -9\ nC$

a) Calculate the net electrostatic force on the charge q_1 (magnitude and direction)

b) Calculate the electric potential at the point p located at the middle between q_1 and q_3



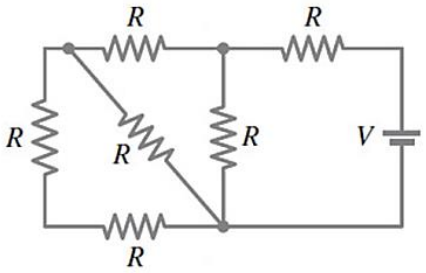
Q2. (2 points) A $-16\ \mu C$ charge is placed at $(0, 0)\ cm$ and a $-4\ \mu C$ charge is placed at $(30, 0)\ cm$. At what point on the line joining the two charges is the electric field zero?

Q3. (2 points) Consider a uniform electric field of magnitude $E = 200$ N/C pointing in the negative y-direction. Given the two points $P_1 = (0, 0)\ cm$ and $P_2 = (2, 3)\ cm$ located inside the electric field,

a) Calculate the potential difference between the two points $\Delta V_{2,1} = V_{P_2} - V_{P_1}$

b) An electron is moved from P_1 to P_2, calculate the change in its potential energy.

Q4. (2 points) Six equal resistors each has a resistance of R are connected as in the circuit shown below. Determine the equivalent resistance of the resistors in terms of R.



Scratch sheet

Name: