Prince Sultan University

Deanship of Educational Services
Department of Mathematics
and General Sciences

COURSE DETAILS:

PHYSICS II	PHY205	MAJOR EXAM I
Semester:	Spring Semester --Term 172	
Date:	Monday, March 5, 2018	
Time Allowed:	60 minutes	

STUDENT DETAILS:

Student Name:	
Student ID Number:	
Section:	Circle your section: 192 (8-9 Sun, Tue, Thu), 186 (9-10 Sun, Tue, Thu), 189 (1-2:15)
Instructor's Name:	Circle the name of your Instructor: Dr. Muaffaq Nofal, Dr. Hazem Abu-Farsakh

INSTRUCTIONS:

- You may use a scientific calculator that does not have programming or graphing capabilities. NO borrowing calculators.
- NO talking or looking around during the examination.
- NO mobile phones. If your mobile is seen or heard, your exam will be taken immediately.
- Show all your work and be organized.
- You may use the back of the pages for extra space, but be sure to indicate that on the page with the problem.

GRADING:

	Page 1	Page 2	Page 3	Page 4	Total	
Questions						
Marks	**3**	**6**	**3**	**3**	**15**	

Part 1: 6 Multiple Choice Questions (0.5 mark each)

1-If a piece of plastic is negatively charged, this means

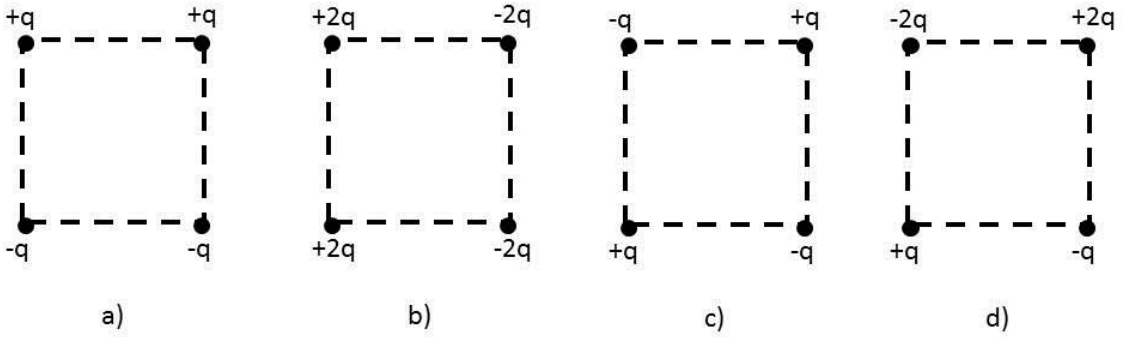
a) Some electrons are added to it. b) Some electrons are removed from it.

c) Some protons are added to it. d) Some protons are removed from it.

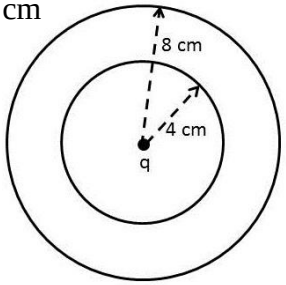
2- Two identical point charges q_1 and q_2 are placed a certain distance apart. A third positive charge q_3 is placed midway between them along the line that connects them. Which of the following statements is true about charge q_3?

a) It exerts an electric force on q_1 and q_2. b) It experiences no net force.
c) It is placed at a zero net electric field location. d) all of the above.

3- In which of the following charge arrangements is the net electric field at the center of the square equals zero?



4- A point charge is placed at the common center of two spheres of radii 4 cm and 8 cm as shown. If the net electric flux through the smaller sphere is 400 $N.m^2/C$, what is the net electric flux through the larger sphere?



a) 800 $N.m^2/C$.
b) 400 $N.m^2/C$.
c) 200 $N.m^2/C$.
d) 100 $N.m^2/C$.

5- Which of the following changes would be certain to increase the resistance of a copper wire?

a) Decreasing its diameter and decreasing its length.

b) Increasing its diameter and increasing its length.

c) Decreasing its diameter and increasing its length.

d) Increasing its diameter and decreasing its length**.**

6- Which of the following statements is **false**?

a) The electric force on an electron is directed opposite to the direction of the electric field.

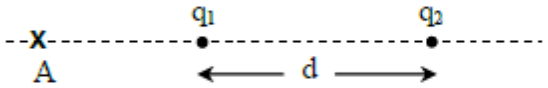
b) Electrons are accelerated by the electric field from high electric potential to low electric potential.

c) The net electric field inside any conductor is zero.

d) No work is required to move a charge along an equipotential surface.

Part 2: 6 Multiple Choice Questions (1 mark each)

1- Point charges $q_1 = +5$ nC and $q_2 = -7$ nC shown below are a distance d = 0.5 m apart. The magnitude of the electric field due to q_1 at point A is 370 N/C. Find the magnitude of the electric field due to q_2 at A.



a) 62 N/C b) 13 N/C c) 87 N/C d) 46 N/C

2- What is the speed of a proton that has been accelerated by an electric field from rest through a potential difference of -14 volt?

a) 2.7×10^9 m/s b) 5.2×10^4 m/s c) 3.7×10^4 m/s d) 1.3×10^9 m/s

3- A point charge of 3.2 nC generates a potential of 72 volt at a certain point. What is the magnitude of the electric field generated by that charge at that same point?

a) 180 N/C b) 72 N/C c) 3.2 N/C d) 0.4 N/C

4- A 70 m long copper wire of cross sectional area 0.02 mm^2 is connected through a potential difference of 147 volt. Given that the resistivity of copper is 1.68×10^{-8}, how many electrons pass through the wire in 4 minutes.

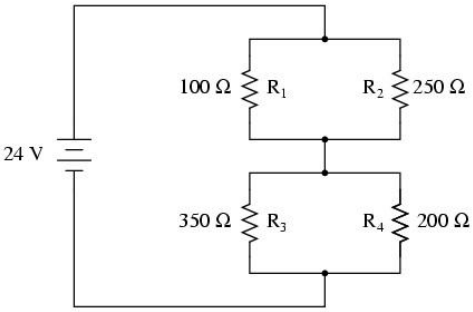
a) 59 electrons b) 600 electrons c) 3.75×10^{21} electrons d) 2.67×10^{-22} electrons

5- An electric heater is rated at 600 watts when it is connected to 115 volt source. What is the resistance of this electric heater?

a) 5.26 Ω b) 0.045 Ω c) 0.19 Ω d) 22 Ω

6- A battery with no internal resistance is connected to a set of resistors as shown. How much current flows in the battery?

a) 0.12 A
b) 0.19 A
c) 3055 A
d) 5142 A



Part 2: Solve the following two problems in the space provided in between showing all your steps (3 marks each)

Problem 1: A parallel-plate capacitor of plate area of 8 cm^2 is constructed using a dielectric material whose dielectric constant is 2.7 and whose dielectric strength is 6×10^7 N/C. The capacitor must withstand a maximum potential difference of 9000 V.

a) (1 mark) Calculate the plate separation of this capacitor.

b) (1 mark) Calculate the capacitance of this capacitor.

c) (1 mark) Calculate the charge on the plate of this capacitor.

Problem 2: Three point charges Q_1=126μC, Q_2= -170μC, and Q_3=320μC are placed at the points (15cm,0), (0,8 cm), and (0,-8 cm) respectively.

a) (1 mark) What is the magnitude and direction of the net electric force acting on Q_2?

b) (1 mark) Calculate the electric potential difference $V_A - V_B$ between point A located at (6 cm,0) and point B located at (-6 cm, 0)?

c) (1 mark) calculate the work done by the electric field when a charge of 7 μC is moved from point A to point B.

Scratch paper

CONSTANTS:

$k = 9 \times 10^{9} \frac{N.m^2}{C^2}$, $\varepsilon_o = 8.85 \times 10^{-12} \frac{C^2}{N.m^2}$

Proton mass $= 1.67 \times 10^{-27} kg$, Proton charge $= 1.6 \times 10^{-19} C$

$m(mili) = 10^{-3}$, $\mu(micro) = 10^{-6}$, $n(nano) = 10^{-9}$, $p(pico) = 10^{-12}$