Prince Sultan University

Deanship of Educational Services
Department of Mathematics
and General Sciences

COURSE DETAILS:

Physics II	**PHY205**	**MAJOR EXAM I**
Semester:	First Semester - Term 191	
Date:	Tuesday October 15, 2019	
Time Allowed:	60 minutes	

STUDENT DETAILS:

Student Name:	
Student ID Number:	
Section:	Circle section number: 645 (8-9 am) 642 (9-10 am)
Instructor's Name:	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 when required 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.
- **Some useful physical constants are listed on the last page**

GRADING:

	Part 1	**Part 2 - Q1**	**Part 2 - Q2**			**Total**
Mark						
Full Mark	**7**	**4**	**4**			**15**

Part 1 (7 marks): Indicate the answer choice that best completes the statement or answers the question

Q1. Which of the following is **NOT** true concerning charges at rest:
a) The electric field lines are always perpendicular to the surface of a charged conductor.
b) The surface of a charged conductor is an equipotential surface
c) An insulator can be charged by induction
d) The electric field inside a charged conductor is always zero

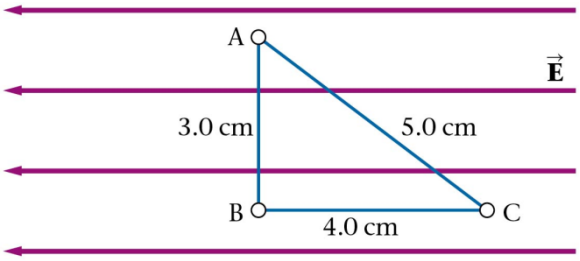
Q2. How long it takes for a trillion electrons (10^{12} electrons) to pass through the cross sectional area of a wire that carries a current of 2 mA?
a) 8×10^{-5} s b) 5×10^{11} s c) 8×10^{-17} s d) 2×10^{-3} s

Q3. A parallel-plate capacitor with plate area of 2 cm^2 and plate separation of 0.5 mm is charged by a 5 V battery. How much energy is stored in the capacitor?
a) 3.52×10^{-12} J b) 4.4×10^{-11} J c) 8.8×10^{-11} J d) 8.8×10^{-12} J

Q4. When a 120 cm long wire is connected to a potential difference of 0.2 V a current of 2 A flows through the wire. If the wire cross-section has a diameter of 1 mm, what is the resistivity of the wire material?
a) $1.3 \times 10^{-7}\ \Omega.\mathrm{m}$ b) $0.13\ \Omega.\mathrm{m}$ c) $2.6 \times 10^{-3}\ \Omega.\mathrm{m}$ d) $6.5 \times 10^{-8}\ \Omega.\mathrm{m}$

Q5. Two point charges $q_1 = 6$ nC and $q_2 = -3$ nC are separated by a distance of 18 m. What is the magnitude of the net electric field at the midpoint between the two charges?
a) 0.33 N/C b) 1.0 N/C c) 0.67 N/C d) zero

Q6. The figure shows a uniform electric field of magnitude $E = 600$ N/C pointing in the negative x-direction. Considering the three points shown, which of the following is **correct**:
a) $V_A - V_c = 30$ V
b) $V_B > V_c$
c) $V_A - V_B = 0$
d) $V_B - V_c = 0$

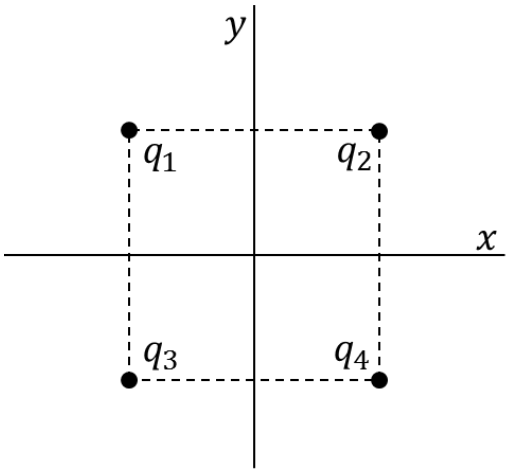


Q7. An electron initially moving at 3×10^6 m/s enters an external uniform electric field of magnitude 600 N/C such that it is moving in the direction of the field. What is the final speed of the electron as it travels a distance of 2 cm along the field?
a) 2.19×10^6 m/s b) 3.64×10^6 m/s c) 1.48×10^7 m/s d) 1.56×10^6 m/s

Part 2 (8 marks): Solve the following TWO problems in the provided space and show your work in detail.

Q1. Four equal negative point charges $q_1 = q_2 = q_3 = q_4 = -6$ nC are placed at the corners of a square of side length 6 m centered at the origin, as shown. Calculate:

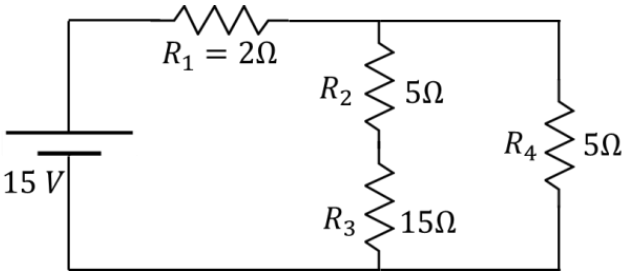
a) The magnitude and direction of the net electric force acting on q_1
b) The electric potential at the origin.
c) The net electric flux through a sphere of radius 6 m centered at the origin.



Q2. Four resistors are connected to a 15 Volts battery as shown. Determine:

a) The equivalent resistance

b) The currents in resistors R_1 and R_4, and the potential difference across them.



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Physical Constants

Acceleration of gravity	$g = 9.8$ m/s^2
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