Prince Sultan University

Department of Mathematics & Physics

PHY 205- General Physics2

First Exam

First Semester, Term 161

Monday 31/10/2016

Examination Time: 60 minutes

Name (Please Print)_____ Student I.D. _____

CONSTANTS:

$$k = 9\times10^{9}\ \frac{N.m^2}{C^2}\ , \qquad \varepsilon_o = 8.85\times10^{-12}\ \frac{C^2}{N.m^2}$$

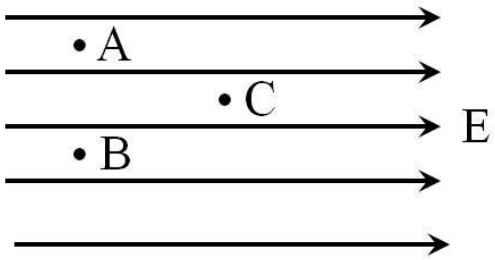
$$\text{Proton mass} = 1.67\times10^{-27}\ kg\ ,\ \text{Proton charge} = 1.6\times10^{-19}\ C$$

Important Instructions:

1. You can use a scientific calculator that does not have programming or graphing capabilities.
*2. You may **NOT** borrow a **calculator** from anyone.*
*3. Do not use **RED pen**.*
*4. This is a closed books and notes exam. Do **NOT** use notes or textbooks.*
*5. There should be **NO** talking during the examination.*
*6. Your will be **expelled** immediately from the exam if your mobile phone is seen or heard.*
*7. Any signs of **cheating** may cause you being expelled from the exam.*
*8. This examination has **2 parts**. **Part 1** has **5 multiple choice** questions, each question worth **1 point**. **Part 2** has **three** workout problems all worth **8 points.***
Make sure your paper has all the questions and problems.

Part 1: 5 Multiple Choice Questions (1 mark each)

1- Suppose a region of space has a uniform electric field, directed towards the right, as shown in the figure. Three points are labeled A, B, and C. Which statement about the electric potential is true?



a) The potential at all three points (A, B, and C) is the same because the field is uniform.
b) The potential at point A is the highest, the potential at point B is the second highest, and the potential at point C is the lowest.
c) The potential at points A and B is the same, and the potential at point C is higher than the potential at point A.
d) The potential at points A and B is the same, and the potential at point C is less than the potential at point A.

2- When atom A loses an electron to atom B,

a) atom A acquires more neutrons than atom B.

b) atom A acquires less neutrons than atom B.

c) atom A becomes a positive ion and atom B becomes a negative ion.

d) atom A becomes a negative ion and atom B becomes a positive ion.

3- A proton has an initial speed of 3×10^6 m/s. What potential difference is required to bring it to rest?

a) 89475 volt b) 46969 volt c) 53678 volt d) 26297 volt

4- A simple circuit has a total resistance of 30 Ω. If a 2 A current is maintained in this circuit, how much energy is dissipated in this circuit in 4 seconds?

a) 24 J b) 4.8 J c) 48 J d) 480 J

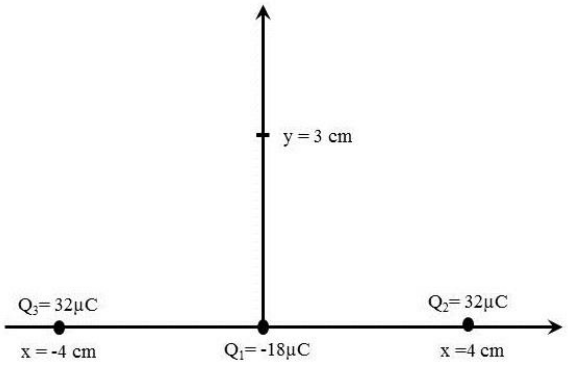
5- A dielectric material of dielectric constant 3 and dielectric strength 8×10^6 N/C is filling all the space between the plates of a parallel plate capacitor of plate area 14 cm^2. What is the maximum charge that can be carried by this capacitor?

a) 0.8 μC b) 0.3 μC c) 2.5 μC d) 6 μC

Part 2: Solve the following three problems in the space provided in between showing all your steps.

Problem 1 (3 marks): Three point charges are placed on the x-axis. A charge of Q_1= -18 μC is placed at the origin, a second charge of Q_2= 32 μC is place to the right at x = 4 cm, and a third charge of Q_3= 32 μC is placed to the left at x= -4 cm.

a) (1 mark) What is the magnitude of the electrostatic force which acts on Q_2?



b) (1 mark) What is the magnitude of the net electric field generated along the y-axis at y= 3 cm?

c) (1 mark) What is the net electric flux through on a spherical surface of radius 2.5 cm centered at the origin?

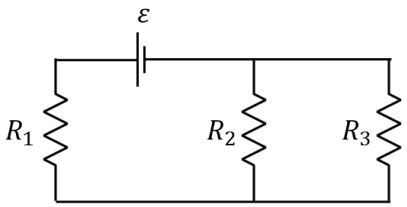
Problem 2 (2 marks): If the electric field everywhere is 6500 N/C directed in the positive y-direction. Consider two points, point A located at (2cm, 9cm) and point b located at (5cm, 4cm).

a) (1 mark) What is the electric potential difference between point A and point B?

b) (1 mark) What is the change in electric potential energy of a 7 μC charge as it moves from point A to point B?

Problem 3 (3 marks): In the figure, a battery of $\varepsilon = 12\ V$, and three resistors $R_1 = 4\ \Omega, R_2 = 6\ \Omega$, and $R_3 = 3\Omega$ are connected as shown. Calculate:

a) (1 mark) The equivalent resistance of the three resistors



b) (1 mark) The power dissipated in R_1

c) (1 mark) The potential difference across R_3

Scratch paper