Prince Sultan University

Department of Mathematics & Physics

PHY 205- General Physics2

First Exam

First Semester, Term 141

Monday 27/10/2014

Examination Time : 60 minutes

Name: ----------

Student I.D. ----------

CONSTANTS:

$$k = 9\times10^{9}\,\frac{N.m^2}{C^2}\ ,\quad \varepsilon_o = 8.85\times10^{-12}\,\frac{C^2}{N.m^2}\ ,\quad e = 1.6\times10^{-19}C$$

$$\text{Proton mass} = 1.67\times10^{-27}\,kg\ ,\quad \text{electron mass} = 9.1\times10^{-31}\,kg$$

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 7 **multiple choice** questions, each question worth **1 point**. **Part 2** has **two** workout problems each problem worth 4 **points.***

Make sure your paper has all the questions and problems.

Part 1: 7- Multiple Choice Questions (1 mark each)

1) In order to charge a metal ball with a positive charge of 1μC, you must

a) Add 1.875×10^{13} electrons to it.
b) Remove 6.25×10^{12} electrons from it.
c) Add 4.8×10^{-25} electrons to it.
d) Remove 4.8×10^{19} electrons from it.

2) When a conductor is charged by induction using a charged rod,

a) the conductor carries a charge of the same sign to that on the charged rod.
b) the conductor carries a charge that is opposite in sign to that on the charged rod.
c) the conductor carries a charge that does not depend on the sign of the rod's charge.
d) charging by induction is not possible.

3) If distance between the two protons is decreased by 1/2 then new force 'F' between protons will be:

a) 1/2 F b) ¼ F c) 2 F d) 4 F

4) Two equal and opposite charges of +10 nC & -10 nC are placed along x-axis 10 cm apart. what is the magnitude of the electric potential midway between these charges?

a) 180 V b) Zero c) 360 V d) None of these.

5) A 9.0-V battery is connected between two parallel metal plates 4.0 mm apart. What is the magnitude of the electric field between the plates?

a). 2.3×10^{3} N/C b) 9.0 N/C C) 2.3 N/C d) None of these

6) A closed surface contains the following point charges: 6 C, 4 C, –2 C, –4 C. The electric flux coming out of the surface is:
a). 16 C/ε_o.
b). –16 C/ε_o.
c). 4 C/ε_o.
d). –4 C/ε_o.

7) The electrons in a TV picture tube are accelerated from rest through a potential difference of 25KV. What is the speed of electrons after they have been accelerated by this potential difference?

(a) 9.4×10^{7} m/s (b) 3×10^{7} m/s (c) 5.4×10^{6} m/s (d) None of these

Part 2: Solve the following two problems in the space provided in between showing all your steps (4 marks each)

Problem 1:

(a) Find Electric field at point 'p' in the diagram q_1 = 10 nC ; q_2 = - 10 nC & a = 30 cm.

(b) Find electric potential energy in part 'a', Is this system bound?

Problem 2:

A parallel plate capacitor has plate area of 6×10^{-4} m^2. The plates of capacitor are separated by 1 mm thick paper as a dielectric material with dielectric constant of 3.7. This paper can hold maximum electric field of 16×10^6 V/m.

(a) What is the capacitance of this capacitor?

(b) How much maximum voltage can be applied to this capacitor?

(c) How much maximum charge this capacitor can store?

Scratch paper (DO NOT REMOVE)