Prince Sultan University

Department of Mathematics & Physics

PHY 205- General Physics2

First Exam

First Semester, Term 131

Thursday 24/10/2013

Examination Time : 60 minutes

Name (Please Print)----------

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 9 **multiple choice** questions, each question worth **1 point**. **Part 2** has **two** workout problems each problem worth **3 points.***

Make sure your paper has all the questions and problems.

Part 1: 9 Multiple Choice Questions (1 mark each)

1- In order to charge an object with a positive charge of 3μC, you must

a) Add 1.875×10^{13} electrons to it.
b) remove 1.875×10^{13} electrons from it.
c) add 4.8×10^{-25} electrons to it.
d) remove 4.8×10^{-25} electrons from it.

2- Four identical charges are placed at the corners of a square. The net electric forces acting on all charges are

a) in the same direction but different in magnitude.
b) of the same magnitude but in different directions.
c) of the same magnitude and in the same direction.
d) different in magnitude and direction.

3- A negative charge of -7.5μC is placed in a uniform electric field of 400 N/C directed to the north. What is the electric force acting on the charge?

a) 1.875×10^{-8} N to the north.
b) 1.875×10^{-8} N to the south.
c) 3×10^{-3} N to the north.
d) 3×10^{-3} N to the south.

4- Calculate the magnitude of the net electric field half way between a charge of +8 nC and a charge of -15 nC, that are 6m apart.

a) 23 N/C b) 7 N/C c) 17 N/C d) Zero

5- 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.

6- A point positive charge Q is placed at the centre of a cubical closed surface. The outward electric flux through one pair of opposite faces of the cube is

a) Zero b) Q/ε_o c) $Q/3\varepsilon_o$ d) $3Q/\varepsilon_o$

7- The capacitance of a certain capacitor is 28 µf. If a dielectric material of dielectric constant 4 is inserted between the plates of the capacitor, then its new capacitance is

a) 28 µf b) 4 µf c) 7 µf d) 112 µf

8- What is the maximum charge that can be carried by a Porcelain-filled parallel-plate capacitor having plate area of 24 cm^2 given that the dielectric constant of Porcelain is 6 and its dielectric strength is $12x10^6$ volt/m.

a) 1.53 µC b) 7.33 µC c) 4.08 µC d) 1.91 µC

9- An air parallel plate capacitor is attached to a voltage source and is fully charged. The voltage source is then removed and the plates are separated to double their previous distance. What happens to the energy stored by the capacitor when the distance between the plates is doubled?

a) it doubles b) it quadruples c) it halves d) it stays the same

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

Problem 1: A proton has a speed of 3.5×10^5 m/s at a point where the electrical potential is 600 V. It moves through a point where the electric potential is 1000 V. What is the proton's speed at this second point?

Problem 2: three charges Q_1=24μC, Q_2=40μC, and Q_3=-15μC are placed at the points (2m,0), (0,3m), and (0,0) respectively.

a) What is the magnitude and direction of the net electric force acting on Q_1?

b) What is the net electric potential generated at the point (-4m,0)?

Scratch paper