Prince Sultan University

Department of Mathematics & Physics

PHY 205- General Physics2

Final Exam

First Semester, Term 131

Thursday January/9/2013

Examination Time : 120 minutes

Name (Please Print) . . . . . .

Student I.D. . . . . .

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 **3 parts**. **Part 1** has **9 multiple choice** questions, each question worth **1 point**. **Part 2** has **8 multiple choice** questions, each question worth **2 poinst**. **Part 3** has **four** workout problems each problem worth **5 points.***

Make sure your paper has all the questions and problems.

	Possible Score	**Student's Total Score**
Part 1 Questions	**9**	
Part 2 Questions	**16**	
P. # 1	**5**	
P. # 2	**5**	
P. # 3	**5**	
P. # 4	**5**	
Total	**45**	**/40**

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

1- As more lamps are added into a parallel circuit, the overall current from the power source

a) increases b) decreases c) stays the same d) not enough information

2- For an electron moving in a direction opposite to the electric field

a) its potential energy increases and the electric potential decreases.

b) its potential energy increases and the electric potential increases.

c) its potential energy decreases and the electric potential increases

d) its potential energy decreases and the electric potential decreases.

3- Kirchhoff's current rule is a statement of

a) the law of conservation of momentum.

b) the law of conservation of mass.

c) the law of conservation of energy.

d) the law of conservation of charge.

4- A proton, moving west, enters a uniform magnetic field. Because of this magnetic field the proton curves upward. What is the direction of this magnetic field?

a) towards the east b) towards the west c) towards the south d) towards the north

5- When a coil of wire is moved relative to a magnet, the magnitude of the induced current in the coil can be increased if

a) the number of turns of the coil is increased.

b) the strength of the magnet is increased.

c) the speed of movement is increased.

d) all of the above.

6- The Magnetic flux is measured in a unit called

a) Farad b) Weber c) Tesla d) Gauss

7- The image of an object is **always** virtual when it is placed in front of

a) a concave mirror b) a convex mirror c) a plane mirror d) both b and c

8- Images formed by concave lenses are always

a) virtual and reduced b) virtual and enlarged c) real and reduced d) real and enlarged

9- The focal length of a concave mirror is 15 cm. An object is placed 45 cm away from the mirror. The formed image will be:

a) larger than the object

b) smaller than the object

c) same size as the object

d) anything is possible

Part 2: 8 Multiple Choice Questions (2 mark each)

1- Two point charges, initially 2 cm apart, experience an electric force of 32 N. If they are moved to a new separation of 8 cm, what is the new value of the electric force between them?

a) 2 N b) 8 N c) 128 N d) 512 N

2- The potential difference between the plates of an air parallel plate capacitor is 35 V and the electric field between them is 700 V/m. If the plate area is 400 cm^2, what is the capacitance of this capacitor?

a) 14 pf b) 3 pf c) 22 pf d) 7 pf

3- An electric device delivers a current of 5 A for 10 seconds. How many electrons flow through this device during this time?

a) 2 b) 3.2×10^{-21} c) 3.1×10^{20} d) 50

4- The power rating of a 400 Ω resistor is 0.25 W. What is the maximum voltage?

a) 10 V b) 100 V c) 50 V d) 41600 V

5- In a mass spectrometer, a magnetic field of 7.5 T is used in the velocity selector to select particles having a velocity of 20 m/s. What is the magnitude of the electric field used?

a) 2.66 N/ C b) 150 N/C c) 0.05 N/C d) 15 N/C

6- The magnetic field produced at a certain point P from a long straight wire carrying a current of 3 A is 1.2×10^{-6} T. How far is the point P from the wire?

a) 25 cm b) 50 cm c) 75 cm d) 2 cm

7- What point charge can produce an electric field strength of 3600 N/C at a distance of 15 cm away from it?

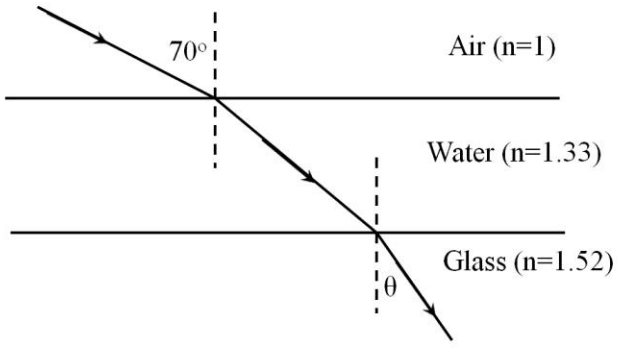
a) 6 µC b) 90 µC c) 60 nC d) 9 nC

8- What is the critical angle for total internal reflection when a light ray travels through diamond (n=2.42) into water (n=1.33)?

a) 17^o b) 33^o c) 49^o d) 24^o

Part 3: Solve the following four problems in the space provided in between showing all your steps (5 marks each)

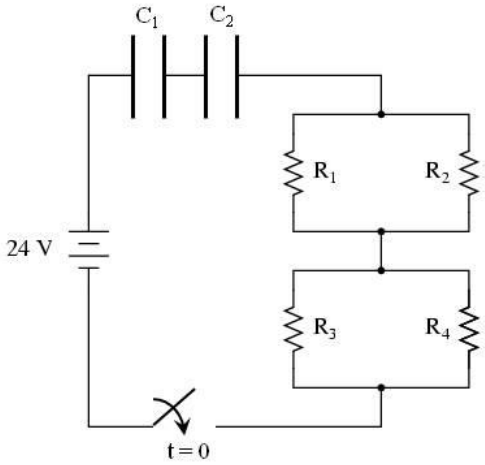
Question 1(5 marks):
Suppose you have a ray of light that passes through three layers: air - water – glass as shown in the figure. The angle of incidence at the first air - water boundary is 70°. Calculate the angle of refraction in glass (θ).



Question 2(5 marks):

In the circuit shown, the capacitors are initially uncharged. At time t = 0, the switch is closed. Given that R_1=12 kΩ, R_2=4 kΩ, R_3=30 kΩ, R_4=6 kΩ, C_1=60 μf , C_2=300 μf, calculate:

a) (1 mark) the time constant of the circuit.



b) (1 mark) the maximum current through the battery

c) (1 mark) the maximum charge carried by capacitor C_1

d) (1 mark) the current through the battery when t = 0.2 s

e) (1 mark) the charge carried by capacitor C_2 when t = 0.2 s

Question 3 (5 marks):

A concave spherical mirror has a 30 cm radius of curvature. An object is placed in front of the mirror and an inverted image is formed with size 3 times larger than the object.

a) (1 marks) What is the focal length of the mirror?

b) (3 marks) How far is the object from the mirror?

c) (1 mark) how far is the image from the mirror?

Question 4 (5 marks):

A 180 turn coil of conducting wire that has an area of 25 cm^2 and electrical resistance of 50 Ω is placed in a uniform magnetic field. The direction of the magnetic field makes an angle of 30^o with respect to the plane of the loop. The magnetic field strength B is increased at a constant rate from 4 T to 10 T in a time interval of 0.2 s.

a) (4 marks) What is the emf generated around the loop?

b) (1 mark) What current flows around the loop as the magnetic field is increased?

Good Luck