INTI
INTERNATIONAL COLLEGE PENANG (507232-U)
LAUREATE INTERNATIONAL UNIVERSITIES

FINAL
Examination Paper

(COVER PAGE)

Session	:	JANUARY/MARCH 2015
Programme	:	DIPLOMA IN ELECTRICAL & ELECTRONIC ENGINEERING
Course	:	**PHY 1121: PHYSICS**
Date of Examination	:	16 March 2015 (Monday)
Time	:	2:00pm – 4:00pm Reading Time : Nil
Duration	:	2 Hours
Special Instructions	:	

This paper consists of **FIVE (5)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

Materials permitted :

Non-Programmable Calculator

Materials provided :

Physics Formula Booklet

Examiner(s) : **Ms. Chong Mee Teng**

Moderator : **Dr. Khoo Bee Ee**

This paper consists of 6 printed pages, including the cover page.

INTI INTERNATIONAL COLLEGE PENANG
DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING PROGRAMME

PHY 1121: PHYSICS
FINAL EXAMINATION: JANUARY 2015 SESSION

Instructions: This paper consists of **FIVE (5)** questions. Answer any **FOUR** questions in the answer booklet provided. All questions carry equal marks.

Question 1

(a) The fastest growing plant on record grew 3.7 m in 14 days. What was its growth rate in micrometers per millisecond? (5 marks)

(b) The angular momentum, L of a particle of mass, m moving at a constant speed, v in a circular radius, r is given by $L = mvr$. Using dimensional analysis, find the dimensions for angular momentum. (5 marks)

(c) A ball is dropped at a height of 100.0 m above the ground.

(i) What is its speed just before it hits the ground? (2 marks)

(ii) How long does it take to reach the ground? (2 marks)

(iii) Find its speed when it travels 30.0 m from the starting point. (2 marks)

(iv) State two assumptions that you have made in the above calculations. (2 marks)

(d) In **Figure (1)**, a 70 kg block is pulled by a 400 N force at an angle of 30° to the horizontal. The coefficient of kinetic frictional force is 0.50. Find the acceleration of the box. (7 marks)

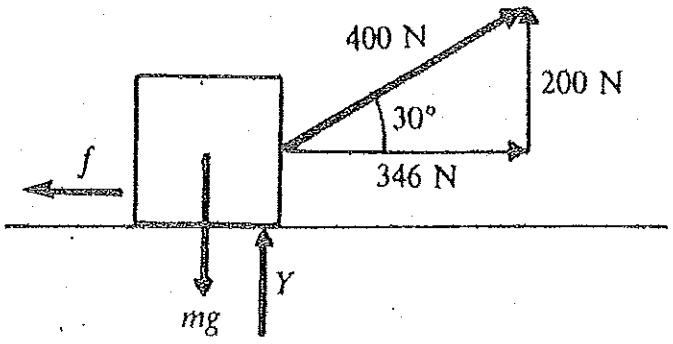

Figure (1)

Question 2

(a) A man stands on the roof of a building that is 30.0 m tall and throws a rock with a velocity of magnitude 40.0 ms^{-1} at an angle of 33.0° above the horizontal. Air resistance may be ignored. Calculate:

(i) The maximum height above the roof reached by the rock. (2 marks)

(ii) The speed of the rock just before it strikes the ground. (4 marks)

(iii) The horizontal distance from the base of the building to the point where the rock strikes the ground. (3 marks)

(b) A crate of mass 50.0 kg slides down a 30° incline. The crate's acceleration is 2.0 ms^{-2} and the incline is 10.0 m long.

(i) What is the kinetic energy of the crate as it reaches the bottom of the incline? (3 marks)

(ii) How much work is spent in overcoming friction? (4 marks)

(iii) What is the magnitude of the frictional force that acts on the crate as it slides down the incline? (2 marks)

(c) Given the mass of Earth, $M_{Earth} = 5.98 \times 10^{24}$ kg, radius of Earth, $R_{Earth} = 6.37 \times 10^{6}$ m and gravitational constant, $G = 6.67 \times 10^{-11}$ Nm^2kg^{-2}. A 550.0 kg satellite orbits the Earth and has a period of 6200.0 s. Find:

(i) the radius of the orbit. (3 marks)

(ii) the Earth's gravitational force on the satellite. (2 marks)

(iii) the altitude for the satellite. (2 marks)

Question 3

(a) A force of 10 000 N acts separately on a 5000 kg truck and a 2000 kg car for 10 seconds. If both vehicles start from rest, find:

(i) The velocity of both after 10 seconds. (4 marks)

(ii) The momentum of both after 10 seconds. (2 marks)

(iii) The change in momentum of both. (2 marks)

(b) A 0.40 kg hot iron horseshoe is dropped into 1.35 kg of water in a 0.30 kg iron pot initially at 20.0 °C. If the final equilibrium temperature is 25.0 °C, find the initial temperature of the hot horseshoe. (Given specific heat capacity of water, c_{water} = 4186.0 J/kg·C^o and specific heat capacity of iron , c_{iron} = 450.0 J/kg·C^o) (6 marks)

(c) Two particles, A and B, carrying charges of equal magnitude enter a uniform electric field with the same speed, and follow paths as depicted in **Figure (2)**.

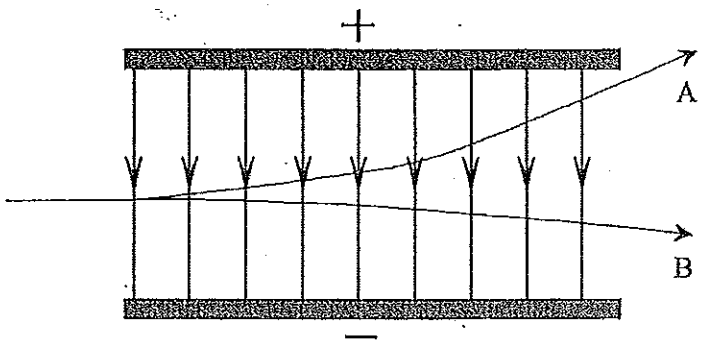

Figure (2)

(i) What is the sign of the charge on each particle? (2 marks)

(ii) Which particle has the larger mass? Explain. (3 marks)

(iii) Which particle will take longer to cross the field? Explain. (2 marks)

(iv) Which particle will have the greater force acting on it? Explain. (2 marks)

(v) Which particle has the greater acceleration? Explain. (2 marks)

Question 4

(a) Oxygen gas having a volume of 1 x 10^{-3} m^3 at 40.0 °C and 1.01 x 10^5 Pa expands until its volume is 1.5 x 10^{-3} m^3 and its pressure is 1.06 x 10^5 Pa.

(i) Convert the 40.0 °C to Kelvin temperature scale and Fahrenheit temperature scale respectively. (3 marks)

(ii) Find the number of moles of oxygen present. (2 marks)

(iii) Find the final temperature of the sample. (2 marks)

(b) A 1.6 m steel rod is attached to a fixed wall as shown in **Figure (3)**. At 25°C, a gap between the rod and the opposite wall is 8.0 mm. By neglecting the expansion of the walls, at what temperature will the gap be closed? The coefficient of linear expansion for steel is 1.5×10^{-5} $°C^{-1}$. (4 marks)

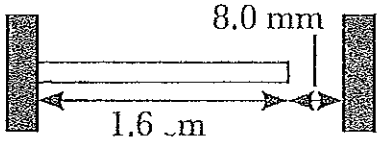

Figure (3)

(c) **Figure (4)** shows a charged particle entering a region of uniform magnetic field of flux density 2.00 T, directed into the plane of the paper. The particle's speed was measured to be 2.5×10^{7} ms^{-1} before entering the magnetic field. The arrow indicates the direction of the electromagnetic force experienced by the particle upon entering the magnetic field.

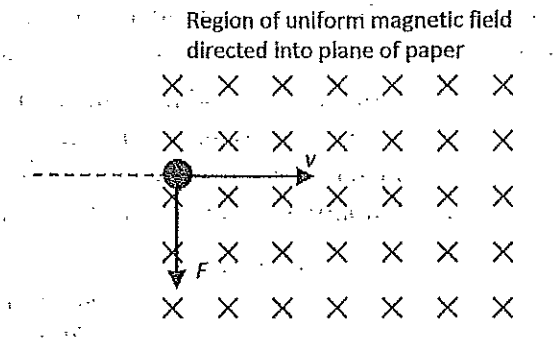

Figure (4)

(i) State whether the particle is positively or negatively charge. Explain. (2 marks)

(ii) Given that the charged particle undergoes circular motion inside the magnetic field, show that the radius of the circular motion is given by:

$$r = \frac{mv}{Bq}$$

where r is the radius of the circular path, m is the mass of the particle, v is the particle's velocity, B is the magnetic flux density and q is the charge of the particle. (3 marks)

(iii) Show that the period of the circular motion is independent of the particle's velocity. (3 marks)

(iv) The radius of the particle's motion is measured to be 1.47×10^{-2} m. Calculate the charge to mass ratio, q/m, of the particles. (3marks)

(d) A 50.0 cm solenoid has 300.0 turns. The magnetic field at the center of the solenoid is 0.08T. What is the current in the solenoid? (3 marks)

Question 5

(a) A current of 13.0 A is maintained through a wire for 50 minutes. (Given charge of electron, $q = 1.6 \times 10^{-19}$ C)

(i) Define electric current. (1 mark)

(ii) How many electrons flow through the wire in 50.0 minutes? (4 marks)

(b) In **Figure (5)**, $C_1 = 4.0$ μF, $C_2 = 1.0$ μF, $C_3 = 5.0$ μF and $C_4 = 3.0$ μF are connected to a battery of 10.0 V. Calculate:

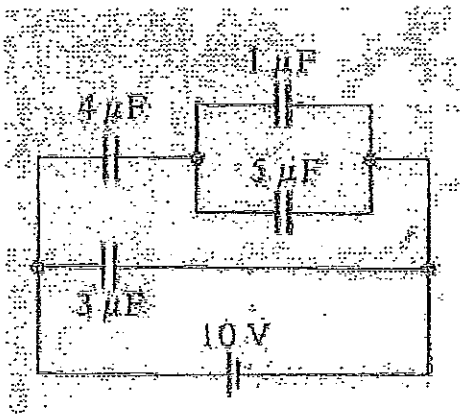

Figure (5)

(i) The equivalent capacitance of the combination. (5 marks)

(ii) The equivalent charge in the circuit. (2 marks)

(c) An object is placed 35 cm from a converging lens with 15 cm focal length.

(i) Find the position of the image. (2 marks)

(ii) Define the characteristic of the image formed. (3 marks)

(iii) If the lens is diverging, what will be the characteristic of the image formed? (3 marks)

(d) The index of refraction of a flint glass is 1.64.

(i) Define Snell's Law of refraction. (2 marks)

(ii) Find the angle of refraction in the water if light is incident from air at an angle of 44.0° (Given $n_{water} = 1.33$) (3 marks)

—THE END—

Phy1121/F/jan15/cmt