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

FINAL
Examination Paper

(COVER PAGE)

Session	:	**AUGUST 2014**
Programme	:	DIPLOMA IN ELECTRICAL & ELECTRONIC ENGINEERING
Course	:	**PHY 1121: PHYSICS**
Date of Examination	:	December 12, 2014 (Friday)
Time	:	3.00pm- 5.00pm 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: AUGUST 2014 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 force of attraction, $\boldsymbol{F}$ between two particles of masses m_1 and m_2 situated a distance d apart is given by $\boldsymbol{F} = \frac{Gm_1m_2}{d^2}$. Show that the dimension of G are $M^{-1}L^3T^{-2}$. (3 marks)

(b) A solid piece of lead has a mass of 23.94 g and a volume of 2.10 cm^3. From these data, calculate the density of lead in SI units (kgm^{-3}). (5 marks)

(c) A car which is moving at a constant velocity of 100 kmh^{-1} along a street of a small town, passes a stationary police patrol car. The patrol car immediately gives chase at a constant acceleration and catches up with the motorist after a distance of 500 m. Calculate:

(i) the time taken by the patrol car to catch up with the motorist, (2 marks)

(ii) the acceleration of the patrol car, (3 marks)

(iii) the velocity of the patrol car when it catches up with the motorist. (2 marks)

(d) The **Figure (1)** shows a block A of mass, m_A = 5.0 kg on a horizontal surface with coefficient of kinetic friction, μ_k = 0.25 connected by a string through a smooth pulley to another block B of mass, m_B = 4 kg. The system is released from rest.

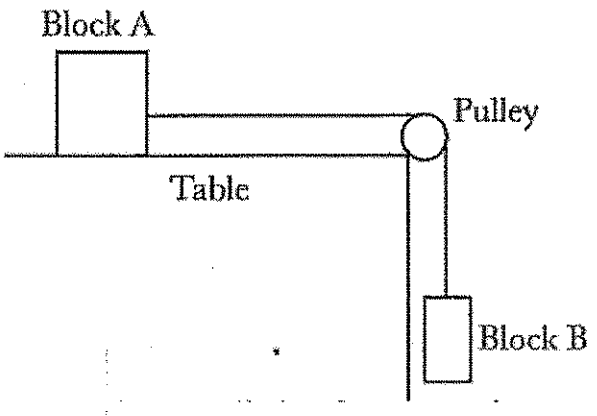

Figure (1)

(i) Draw a free body diagram for the blocks when they are in motion. (3 marks)

(ii) What is the acceleration of the blocks? (5 marks)

(iii) What is the tension in the string? (2 marks)

Question 2

(a) In **Figure (2)**, a cannon ball is fired at an angle of 45° to the horizontal, thus achieving its maximum range of 5297 m on horizontal ground. The cannon ball has a flight time of 30 s. Assume that the cannon ball is projected from ground level. Find:

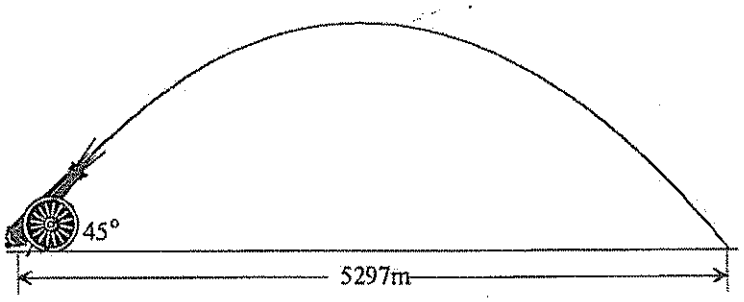

Figure (2)

(i) the horizontal component of the velocity of the cannon ball during its flight, (2 marks)

(ii) the initial velocity of the cannon ball, (3 marks)

(iii) the time taken for the cannon ball to reach its maximum height, (2 marks)

(iv) the speed when the cannon ball hits the ground. (4 marks)

(b) A 200 g sphere is released from a height of 3.0 m. After striking the floor, the sphere rebounds vertically upwards, but it lost 30% of its initial energy. For the first rebound, calculate:

(i) the initial velocity of the sphere, (3 marks)

(ii) the maximum height of the sphere. (3 marks)

(iii) State two ways to increase the potential energy of a body. (2 marks)

(c) (i) State Newton's Law of Gravity. (3 marks)

(ii) Determine the speed of the Hubble space telescope that orbits the Earth at the altitude 600 km. (Given mass of Earth, $M_E = 5.98 \times 10^{24}$ kg, radius of Earth, $R_E = 6.37 \times 10^6$ m and gravitational constant, $G = 6.67 \times 10^{-11}$ Nm^2kg^{-2}) (3 marks)

Question 3

(a) A 7.0 g bullet moving horizontally at 200.0 ms^{-1} strikes and passes through a 150.0 g tin can sitting on a post. Just after the impact, the can has a horizontal speed of 1.80 ms^{-1}.

(i) State the type of collision and justify your answer. (2 marks)

(ii) What was the bullet's speed after leaving the can? (4 marks)

(iii) Find the total kinetic energy for the bullet and can after collision. (4 marks)

(b) A thermos bottle contains 250.0 g of coffee at 90.0 °C is added with 20.0 g of milk at 5.0 °C. After equilibrium is established, what is the final temperature of the liquid? Assume no heat loss to the thermos flask and treat coffee and milk as water. (Given specific heat capacity of water, c_w = 4186 J/kg.C°). (5 marks)

(c) In **Figure (3)**, two charges q_1 and q_2, of magnitudes 30 μC and 50 μC respectively, are placed 40 cm apart in a vacuum. A third charge, q_3 = +40 μC, is placed between q_1 and q_2 and 10 cm from q_1. Find the force on q_3 if:

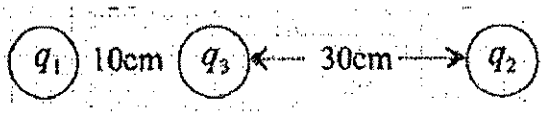

Figure (3)

(i) q_1 and q_2 are both positive, (5 marks)

(ii) q_1 is positive and q_2 is negative. (3 marks)

(iii) If the distance between q_1 and q_3 was increased to 20 cm, what would be the effect on the magnitude of force between q_1 and q_3? (2 marks)

Question 4

(a) A gas confined in a cylinder with a tight-fitting piston is initially in the state P_1 = 2000 Pa, $V_1 = 2.0 \times 10^{-3}$ m^3 and T_1 = 300 K. (Given gas constant, R = 8.31 $Jmol^{-1}K^{-1}$)

(i) How many moles of gas were in the cylinder? (2 marks)

(ii) If the volume is decreased to 0.50×10^{-3} m^3 while the temperature is held fixed, find the new pressure. (2 marks)

(iii) Suppose that the gas is heated to 700 K while the volume is changed to a new value. But, there is 20% of the gas leaked out while the changes were being brought about. If the final pressure is measured to be 6000 Pa, what is the new volume? (4 marks)

(b) A proton is fired into a magnetic field of strength, $\boldsymbol{B}$ = 0.16 T. The velocity of the proton is 8.0 x 10^6 ms^{-1} at right angles to the field. (Given mass of proton, m_p = 1.673 x 10^{-27} kg and charge of proton, e = 1.6 x 10^{-19} C)

(i) Find the magnitude of the force on the proton. (3 marks)

(ii) Find the radius of the path followed by the proton. (3 marks)

(iii) Sketch the path followed by the proton in the magnetic field. Indicate the direction of the magnetic force on the proton in your diagram. (2 marks)

(iv) Explain why the proton moves in a circular path. (2 marks)

(c) (i) Define Snell's Law. (2 marks)

(ii) What is the speed of light in water? Find the angle of refraction of light incident on a water surface at an angle of 48° to the normal. (Given index of refraction of water, n_{water} = 1.33) (5 marks)

Question 5

(a) A parallel plate capacitor consists of two plates, each with area 200 cm^2, separated by a 0.40 cm air gap. (Given the permittivity of free space, ε_o = 8.85 x 10^{-12} Fm^{-1})

(i) Compute its capacitance. (2 marks)

(ii) If the capacitor is connected across a 500 V source, what are the energy stored in it? (4 marks)

(iii) Find the value of electric field, $\boldsymbol{E}$ between the plates. (2 marks)

(b) From **Figure (4)**, find:

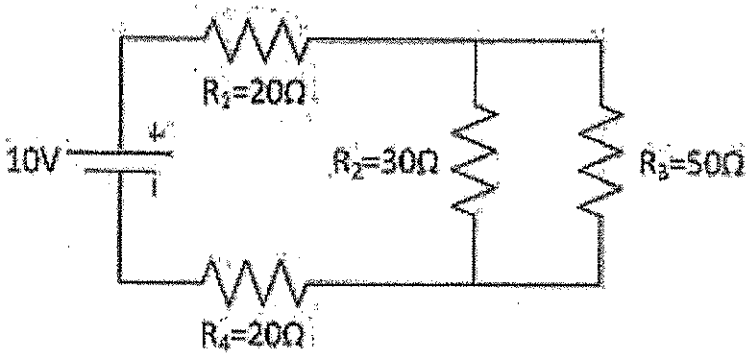

Figure (4)

(i) The equivalent resistance in the circuit. (5 marks)

(ii) The total current in the circuit. (2 marks)

(c) An object is placed 100 cm from a converging lens with 20 cm focal length.

(i) Find the position of the image. (3 marks)

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

(d) A current of 7.5 A is maintained in a wire for 45 s. In this time how much charge and how many electrons flow through the wire? (4 marks)

--THE END—

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