INTI
International College Penang
LAUREATE INTERNATIONAL UNIVERSITIES

FINAL
Examination Paper

(COVER PAGE)

Session	:	January 2017
Programme	:	Diploma In Electrical & Electronic Engineering (DEEI)
Course	:	**PHY 1131: PHYSICS**
Date of Examination	:	10 March 2017 (Friday)
Time	:	11:00am – 1:00pm 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) : **Chong Mee Teng**

Moderator : Dr. Khoo Bee Ee

This paper consists of 7 printed pages, including the cover page.

INTI INTERNATIONAL COLLEGE PENANG

DIPLOMA IN ELECTRICAL & ELECTRONIC ENGINEERING PROGRAMME
PHY 1131: PHYSICS
FINAL EXAMINATION: JANUARY 2017 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) A typical atom has a diameter of about 1.0×10^{-8} m.

(i) Calculate the diameter of a typical atom in inches? (1 inch = 25.4 mm) (3 marks)

(ii) How many atoms are there along a 1.5 m line of typical atom? (2 marks)

(b) A sphere of radius r moves at a speed v in a viscous fluid. The sphere is acted on by a viscous force F which is given by $F = krv$. Determine the dimensions of k. (5 marks)

(c) A person is going for a walk follows the path shown in **Figure (1)**. Determine the person's resultant displacement (magnitude and direction) from the starting point. (8 marks)

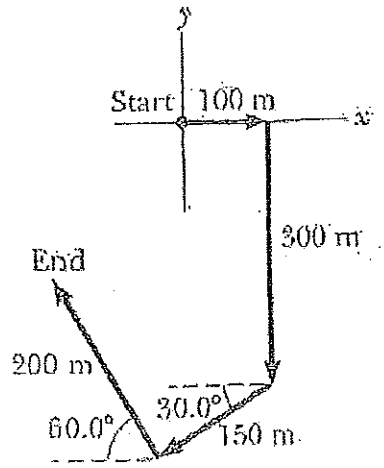

Figure (1)

(d) A car is stopped at a traffic light. It then travels along a straight road so that its distance from the light is given by $x = bt^2 + ct^3$, where $b = 1.20$ ms^{-2} and $c = 0.140$ ms^{-3}. Calculate:

(i) the average velocity of the car for the time interval $t = 0$ to $t = 12.0$ s, (4 marks)

(ii) the instantaneous velocity of the car at $t = 4.0$ s. (3 marks)

Question 2

(a) A ball is thrown upward from the top of a 35.0 m tower, as shown in **Figure (2)**, with initial velocity, $v_o = 80.0$ ms^{-1} at an angle, $\theta = 25°$. Find:

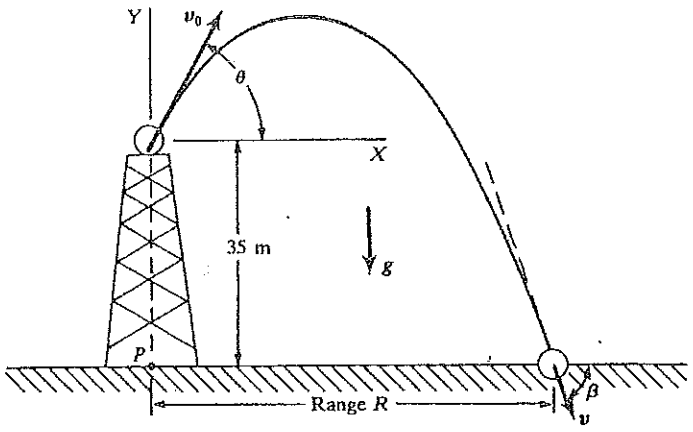

Figure (2)

(i) the time for the ball to reach the ground, (3 marks)

(ii) the velocity at the moment of impact. (5 marks)

(b) When a body is moving at constant velocity, does it need a force to maintain its state of motion? Justify your answer. (3 marks)

(c)

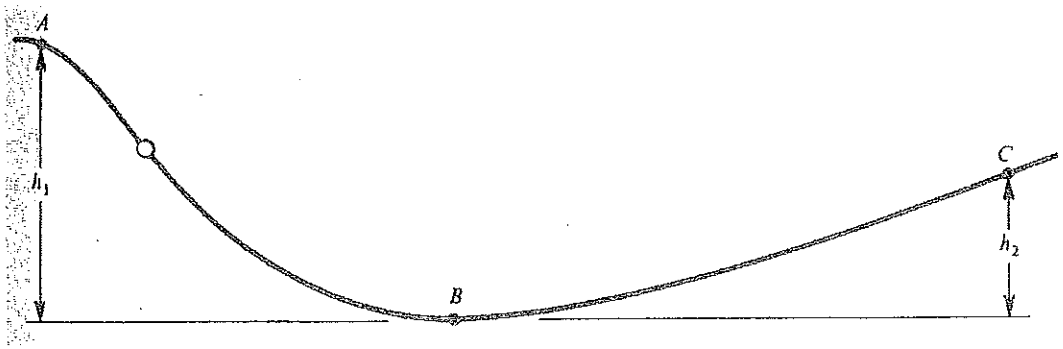

Figure (3)

(i) **Figure (3)** shows a bead sliding on a wire. How large must height h_1 be if the bead, starting at rest at A, is to have a speed of 200 cms^{-1} at point B? Ignore friction. (3 marks)

(ii) Given $h_1 = 50$ cm, $h_2 = 30$ cm, and the length along the wire from A to C is 400 cm. A 3.0 g bead released at A coasts to point C and stops. How large an average friction force opposed its motion? (3 marks)

(d) **Figure (4)** shows the 2.0 kg block is being pushed along a rough horizontal plane by a force $F = 10$ N at an angle 30° from the horizontal.

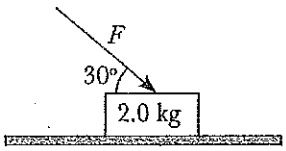

Figure (4)

(i) Sketch a free body diagram for the block. (2 marks)

(ii) The block moves at a constant acceleration 0.8 ms^{-2}, calculate the coefficient of friction. (6 marks)

Question 3

(a) A 16.0 g object is moving to the right at 0.3 ms^{-1} while a 4.0 g object is moving in the opposite direction at 0.5 ms^{-1}. They collide head on and stick together.

(i) Find the magnitude and direction of their velocity after the collision. (4 marks)

(ii) Find their kinetic energy after the collision. (2 marks)

(b) A homogeneous material will have the same expansivity properties in every direction. Hence such an object changes its overall size upon heating, but not its shape.

(i) Given this fact, find the new diameter of a solid brass sphere of radius 0.9535 m when its temperature rises 200 °C. (3 marks)

(ii) If the sphere of part (i) were hollow instead, with inner diameter 0.8535 m, what would be the new inside and outside diameters for the same temperature rise? (3 marks)

(iii) In part (ii), by how much does the thickness of the spherical shell increase?(2 marks)

(c) Find the heat of fusion, L_f of ice from the following calorimetric data:

Mass of calorimeter (aluminium)	30 g
Mass of warm water	400 g
Temperature of warm water	38°C
Mass of ice added at 10°C	158 g
Final temperature	5 °C

Assume no heat gain or loss from the surroundings. Given the specific heat capacity of aluminium, c_a = 0.22 kcal/kg.C° and the specific heat capacity of water, c_w = 1.0 kcal/kg.C°. (6 marks)

(d) **Figure (5)** shows three small charges *A*, *B* and *C* in a line. Charges *A* and *C* are positive while charge *B* is negative. Calculate the resultant force on charge *C*. (Given $k = 8.988 \times 10^9$ N.m^{2}C^{-2}) (5 marks)

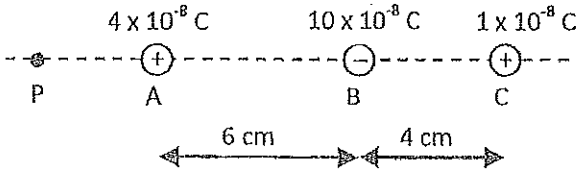

Figure (5)

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) The **Figure (6)** shows two charged particles P and Q entering a uniform magnetic field B of flux density 0.85 T with the same velocity, v. The magnitude of the charges on the particles is 1.60×10^{-19} C. The radius of curvature of the path of Q is 15.0 cm and is twice that of P.

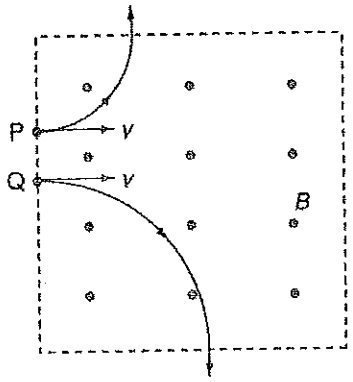

Figure (6)

(i) State two differences in the paths of particles P and Q. (2 marks)

(ii) Identify the sign of the charges on the particles. Give a reason for your answer. (3 marks)

(iii) Compare the masses of the particles. (2 marks)

(iv) The mass of Q is 3.32×10^{-27} kg. Find the speed, v and the time taken by P to move through the magnetic field. (4 marks)

(c) Calculate the nature, position and magnification of the image of an object placed 12.0 cm in front of a converging lens of focal length 8.0 cm. (6 marks)

Question 5

(a) A bulb is connected in series with a variable resistor and an 18 V battery of negligible internal resistance. The variable resistor is adjusted until the bulb operates at its normal rating of 12 V and 24 W.

(i) Calculate the current in the bulb and its resistance. (2 marks)

(ii) What is the electrical energy dissipated by the bulb and the amount of charge that flows through the bulb in an hour? (3 marks)

(iii) Calculate the potential difference and the power dissipation in the variable resistor. (3 marks)

(b) Three capacitors are connected in the circuit shown in **Figure (7)**. Calculate:

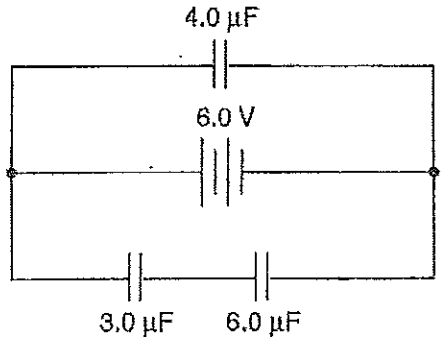

Figure (7)

(i) the effective capacitance in the circuit, (2 marks)

(ii) the potential difference across each capacitor, (4 marks)

(iii) the charge on each capacitor. (4 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)

—THE END—
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