



**INTI**  
**International College Penang**  
LAUREATE INTERNATIONAL UNIVERSITIES\*

**FINAL**  
Examination Paper

(COVER PAGE)

Session : April 2016

Programme : Diploma in Electrical and Electronic Engineering (DEEL)

Course : PHY 1121: Physics

Date of Examination : 25 July 2016, 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 7 printed pages, including the cover page.*

## INTI INTERNATIONAL COLLEGE

## DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING (DEE)

## PHY 1121: PHYSICS

## FINAL EXAMINATION: APRIL 2016 SESSION

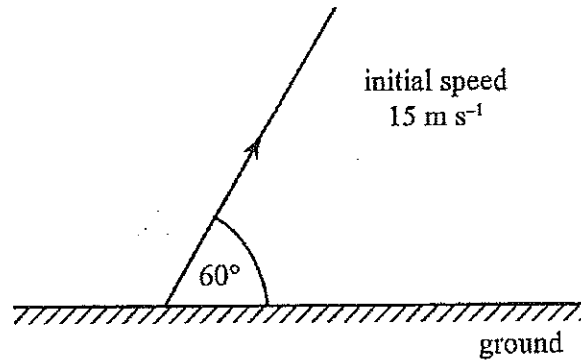
Instructions: This paper consists of **FIVE (5)** questions. Answer any **FOUR** questions in the answer booklet provided. All questions carry equal marks.

**Question 1**

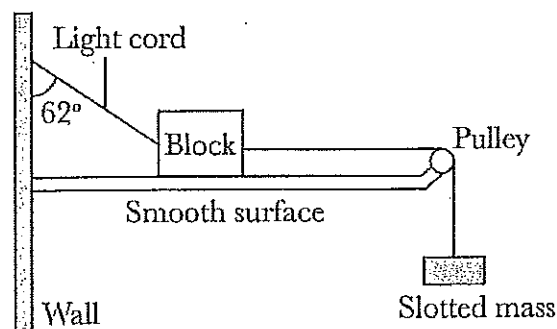
- (a) The distance between two towns  $P$  and  $Q$  is 120 miles. A car travelling at an average speed of 45 miles per hour consumes 3.5 gallons of fuel. Given that 1 mile = 1.609 km and 1 gallon = 4.546 litres, calculate:
- (i) the average speed in  $\text{ms}^{-1}$ , (3 marks)
  - (ii) the fuel consumption of the car in km per litre. (3 marks)
- (b) A body falls freely from rest. Find:
- (i) the displacement it falls in 3 s, (2 marks)
  - (ii) its speed after falling 70 m, (2 marks)
  - (iii) the time taken to fall 300 m. (2 marks)
- (c) A field mouse trying to escape a hawk runs east for 5.0 m, darts Southeast for 3.0 m, then drops south for 1.0 m down a hole into its burrow.
- (i) By using graphical method, show these displacements and the resultant displacement. (2 marks)
  - (ii) Find the resultant displacement of the mouse from the starting point? (7 marks)
- (d) The retarding force,  $F$  on a sphere of radius,  $R$  moving with a speed of  $v$  in the streamline flow of a viscous fluid is given by  $F = kvR$ , where  $k$  is a constant. What is the dimension of  $k$ ? (4 marks)

**Question 2**

- (a) A ball is thrown from horizontal ground with an initial velocity of  $15 \text{ m s}^{-1}$  at an angle of  $60^\circ$  to the horizontal, as shown in **Figure (1)**. Assuming that air resistance can be neglected, determine:

**Figure (1)**

- (i) the maximum height to which the ball rises, (3 marks)
- (ii) the horizontal distance between the point from which the ball was thrown and the point where it strikes the ground. (5 marks)
- (b) A  $50 \text{ N}$  block is placed on a frictionless table as shown in **Figure (2)**. A  $20 \text{ N}$  mass is connected to one end of the block through a light cord that runs over a frictionless pulley. The other end of the block is tied to a wall with a light cord.

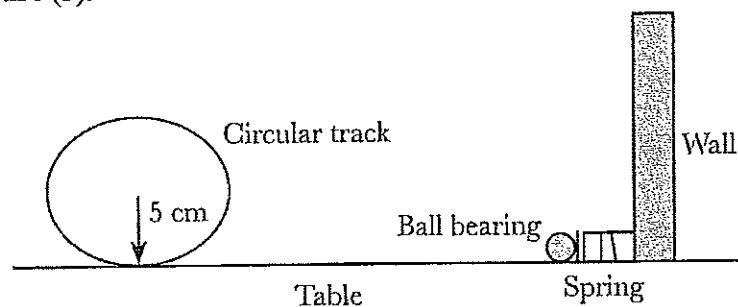
**Figure (2)**

- (i) Draw a free body diagram to show all the forces acting on the block. (2 marks)
- (ii) Calculate the tension,  $T$  in the light cord between the wall and the block. (3 marks)
- (iii) Calculate the normal reaction force,  $N$  that acting on the block. (3 marks)

- (c) The following data concern a tennis ball at a given instant just before it is struck by a tennis racket:
- horizontal momentum of tennis ball = 2.4 Ns,  
kinetic energy of tennis ball = 45 J
- (i) Calculate the mass and the velocity of the tennis ball. (5 marks)
- (ii) When the racket hits the ball it strikes it with a constant force of 60 N in a direction opposite to its momentum, bringing it to rest momentarily. Calculate the time the tennis ball takes to stop. (4 marks)

### Question 3

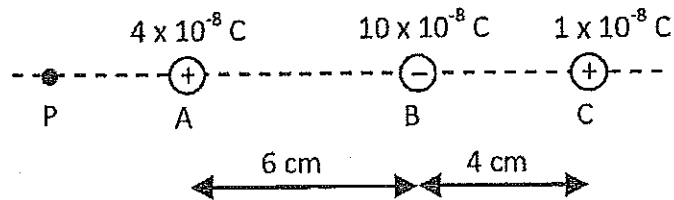
- (a) In an experiment a spring is compressed 1.6 mm by a force 6 N. Now this spring is compressed by 25 mm and a ball bearing of mass 5 g is placed at one end of the spring as shown in the **Figure (3)**.



**Figure (3)**

- (i) How much of energy is stored in the spring when it is compressed by 25 cm? (3 marks)
- (ii) If the ball bearing moves up a vertical frictionless circular track of radius 5 cm, calculate the speed of the ball bearing at the highest point of the track. (4 marks)
- (b) 30 g of copper pellets are removed from a 300 °C oven and immediately dropped into 100 mL of water at 20 °C in an insulated cup. What will the new water temperature be? Ignored the heat transfer to the cup. Given the specific heat of copper,  $c_{copper} = 390.0 \text{ Jkg}^{-1}\text{°C}^{-1}$ , the specific heat of water,  $c_{water} = 4186.0 \text{ Jkg}^{-1}\text{°C}^{-1}$ ,  $1 \text{ L} = 1 \times 10^{-3} \text{ m}^3$  and density of water,  $\rho = 1000 \text{ kgm}^{-3}$ . (5 marks)
- (c) (i) Give **ONE** difference between heat and temperature. (2 marks)
- (ii) Calculate the amount of heat loss through a sheet of copper 1.5 m x 0.6 m of thickness 2.0 mm for 5.0 minutes if the temperatures of the surfaces are 45 °C and 25 °C respectively? Given that the thermal conductivity of copper =  $401 \text{ Wm}^{-1}\text{K}^{-1}$ . (3 marks)

- (d) **Figure (4)** shows three small charges  $A$ ,  $B$  and  $C$  in a line. Charges  $A$  and  $C$  are positive while charge  $B$  is negative. (Given Coulomb constant,  $k = 9 \times 10^9 \text{ Nm}^2\text{C}^{-2}$ )

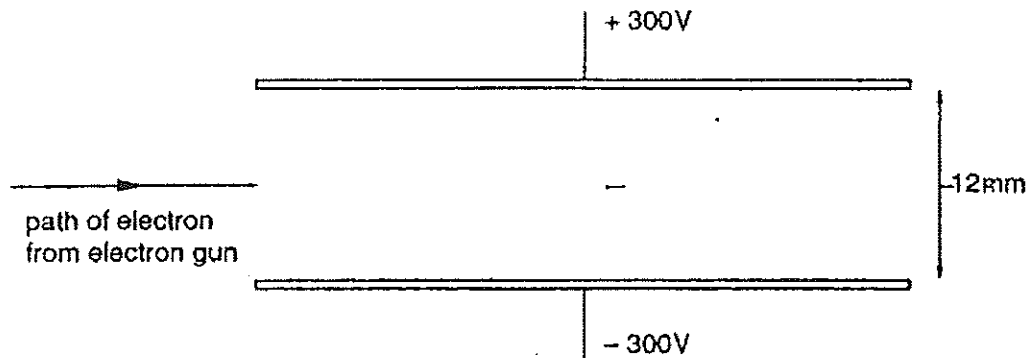


**Figure (4)**

- (i) Calculate the resultant force on the charge at  $C$ . (4 marks)
- (ii) How would you solve for the location of point  $P$  on the line  $AB$  where there would be no resultant force on the charge  $C$  if it were placed there? (4 marks)

**Question 4**

- (a) Two parallel plates are set a distance of 12 mm apart in a vacuum as in **Figure (5)**. The top plate is at potential of +300 V and the bottom plate is at a potential of -300 V. (Given magnitude charge of electron,  $e = 1.602 \times 10^{-19} \text{ C}$ )



**Figure (5)**

- (i) Copy the figure, draw lines to show the electric field between the plates. (2 marks)
- (ii) At the point mid-way between the plates the field is uniform. Calculate the magnitudes of the electric field strength and the force on an electron at this point. (5 marks)
- (iii) A high speed electron from an electron gun is projected towards the pair of plates as shown. Show a possible path of the electron as it passes between the plates. (2 marks)

- (b) A sealed glass container is filled with  $2500 \text{ cm}^3$  of helium at a temperature of  $24 \text{ }^\circ\text{C}$  and pressure of  $1.8 \text{ atm}$ . Calculate the mass of the gas. (Given the universal gas constant,  $R = 8.31 \text{ Jmol}^{-1}\text{K}^{-1}$ ,  $1 \text{ atm} = 1.013 \times 10^5 \text{ Pa}$  & relative atomic mass of helium = 2) (4 marks)
- (c) A current of  $2.0 \text{ A}$  flowing through a heater for an hour converts  $1.7 \text{ MJ}$  of electrical energy into heat energy. Calculate:
- the net flow of electrical charge, (2 marks)
  - the potential difference across the heater, (2 marks)
  - the power rating of the heater. (2 marks)
- (d) Calculate the nature, position and magnification of the image of an object placed  $12.0 \text{ cm}$  in front of a converging lens of focal length  $8.0 \text{ cm}$ . (6 marks)

### Question 5

- (a) A conductor,  $PR$ , of length  $1.0 \text{ m}$  is suspended by two flexible wires and has a mass of  $0.040 \text{ kg}$ . It is connected to a cell and placed in a uniform magnetic field as shown in the Figure (6).

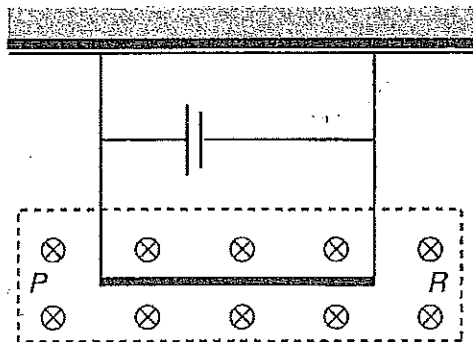
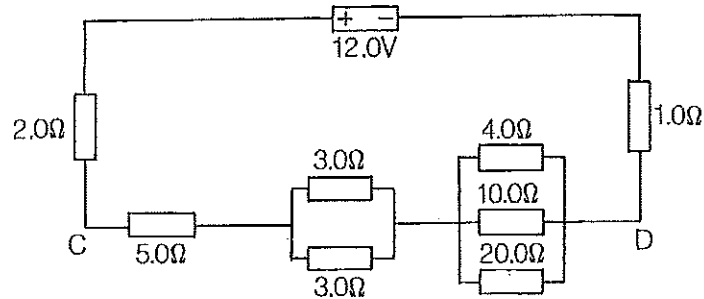


Figure (6)

- Find the current that must flow in the conductor so that the tension in the supporting wires is zero when the magnetic field is  $1.2 \text{ T}$  into the page. (3 marks)
- What is the direction of the current? (2 marks)
- What is the tension in each wire if the direction of the current is reversed? (5 marks)

(b) For the circuit of **Figure (7)**, find:



**Figure (7)**

- (i) the total resistance, (4 marks)
- (ii) the current flowing through the battery, (2 marks)
- (iii) the potential drop between *C* and *D*, (2 marks)
- (iv) the power dissipated in the 4.0 Ω resistor. (3 marks)
- (c) Light passes through parallel layers of water ( $n_{\text{water}} = 1.33$ ) and glass ( $n_{\text{glass}} = 1.66$ ). If the incident angle from air to water is 50 °C; what are the angles of refraction in the:
- (i) water, (2 marks)
- (ii) glass. (2 marks)

**--THE END--**  
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