# PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY, LAE

## ENTRANCE EXAMINATION - 2014

## SUBJECT: PHYSICS

## TIME ALLOWED: 3 HOURS

### INFORMATION FOR CANDIDATES

1.  You have TEN (10) minutes to read this question paper. You must NOT begin writing during this time.

2.  There are 15 Questions in this Question Paper. Answer ALL Questions.

3.  No Answer Book is required. To write answers, blank spaces are provided following every question in the question paper. However, if necessary the space at the back of the page and also extra papers may be used.

4.  Calculators are permitted in the examination room.  But notes and text books are NOT allowed in the examination room.

6.  Maximum marks = 100.

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**NAME:** _____

               **(First Name)**            **(Surname)**

**Signature:** _____

**Date:** _____

**Location:** _____

**Intending Course:** _____

## Some Formulas and Constants:

$s = \bar{v}t$      $v = u + at$      $s = ut + \frac{1}{2}at^2$      $v^2 = u^2 + 2as$

$F = ma$      $W = mg$

$PE = mgh$      $KE = \frac{1}{2}mv^2$      $P = \dfrac{W}{t} = F.v$

$Q = I.t$      $E = Q.V$      $P = \dfrac{E}{t} = I.V$

$\lambda = \dfrac{0.693}{t_{\frac{1}{2}}}$      $A = -\dfrac{\Delta N}{\Delta t} = \lambda N$

Acceleration due to gravity, $g = 10 \text{ m/s}^2$

1 year $= 3.15 \times 10^7$ s

Electronic charge, $e = 1.6 \times 10^{-19}$ C

## Question 1

**Q1(a)** Find the *significant figures* in the following numbers.  **(3 marks)**

| | Number | Significant figures |
|---|---|---|
| (i) | 70.004 | ................................... |
| (ii) | 37.0 | ................................. |
| (iii) | 650.2 | .................................. |

**Q1(b)** Write the following numbers in *scientific notation*.   **(3 mark)**

| | Number | Scientific notation |
|---|---|---|
| (i) | 0.0000700 s | ...................................... |
| (ii) | 46000 m | ...................................... |
| (iii) | 0.0065 W | ...................................... |

**Q1(c)** Write the following numbers using appropriate *prefixes*.  **(3 marks)**

| | Number | Expressed with appropriate prefixes |
|---|---|---|
| (i) | 0.00050 m | ...................................... |
| (ii) | 60000000 Hz | ...................................... |
| (iii) | 55000 J | ...................................... |

**Q1(d)** Write down the *order of magnitude* for the numbers given below. **(3 mark)**

| | Number | Order of magnitude |
|---|---|---|
| (i) | $4.72 \times 10^{-7}$ | ...................................... |
| (ii) | $8.65 \times 10^{4}$ | ...................................... |
| (iii) | $7.59 \times 10^{-5}$ | ...................................... |

## Question 2

A motor car of mass 1100 kg starts from rest on a level road and reaches the speed of 50.4 km/h in 10 seconds.

(i)     What is the magnitude of acceleration of the car in m/s$^2$? **(3 marks)**
*Answer :*

(ii)     How far did the car travel in this time?     **(3 marks)**
*Answer :*

## Question 3

A car is travelling at 60 km/hr when the driver applies his brakes. If the car decelerates uniformly at 5.6 m/s$^2$, how far does the car go after the brakes are applied before coming to rest? **(6 marks)**

*Answer :*

## Question 4

A ball is thrown vertically upwards with a velocity of 49 m/s. Calculate the:

(i)     greatest height reached.   **(3 marks)**

*Answer :*

(ii)    time taken to reach the greatest height.  **(3 marks)**

*Answer :*

## Question 5

A truck of mass 600 kg reverses at 6.0 m/s into a trailer of mass 400 kg at rest. After colliding the truck and trailer remains connected together and move with same velocity, v. Find the value of v. **(6 marks)**

*Answer :*

# Question 6

Assume that the acceleration due to gravity on the surface of the Moon is 1/6 of that on the surface of the Earth. The weight of an object on the surface of the Moon is 200 N. Determine the weight of it on the surface of the Earth. [*Take the acceleration due to gravity of the Earth, $g_E = 10 \ m/s^2$*]. **(8 marks)**

*Answer :*

# Question 7

A load of mass 50 kg dropped from a hovering (i.e. steady) helicopter at a height of 15 m.

(i)      What is its *potential energy* at 150 m height?

(ii)      What will be its *velocity* just before hitting the ground? **(3 + 3 = 6 marks)**

*Answer :*

## Question 8

A crane lifts a 200 kg load at a steady velocity. It takes 12 seconds to raise the load through 60 m.

i)      What is the *power* needed to lift the load if there is no friction?

ii)     What is the *power* needed if the friction force is constant at 170 N?
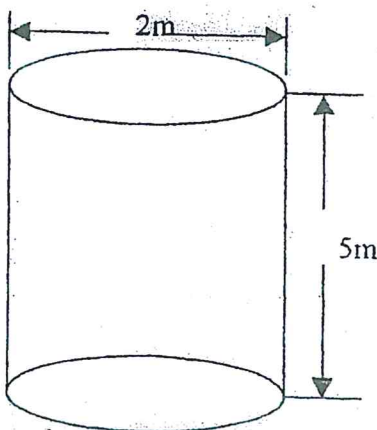
(3 + 3 = 6 marks)

*Answer:*

## Question 9

A cylindrical metallic tank of 5.0 m height and 2.0 m in diameter is filled with rain water until it overflows as shown in the Figure below . Find the pressure exerted at bottom of the tank. [*Density of water is 10³ kg/m³*]. (6 marks)

*Answer:*

## Question 10

If 313 joules of heat energy are needed to be added to a copper block of mass 55.0 gram to raise its temperature from $35^0$C to $50^0$C. find the *specific heat capacity* of copper.

[ 6 Marks ]

Answer:

## Question 11

How much heat energy is required to change 40 g of ice at -10 °C to water at 70 °C?

[Specific heat of ice $= 2100$ J/kg. C$^o$

Specific heat of water $= 4200$ J/kg.C$^o$] (6 marks)

Answer:

## Question 12

A longitudinal wave of frequency 30 Hz takes 1.7 s to travel the length of a 2.5 km slinky. Find the wavelength of the wave. **(6 marks)**

*Answer:*

## Question 13

    (a)    State Snell's law of refraction of light by drawing an appropriate diagram for a pair of media.

    (b)    How is the index of refraction of any medium defined? **(4 + 2 = 6 marks)**

*Answer:*

## Question 14

A beam of light travelling in air strikes a material being incident at angle $45.0^\circ$ with the normal to the boundary. The beam of light is found to refract at an angle of $30^\circ$ in the material. Find the speed of propagation of light in the material.

[ Speed of light in air $= 3 \times 10^8$ m/s ] **(7 marks)**

***Answer:***

## Question 15

An electric kettle uses 1200 C of charge in 5 minutes working. During this time, it delivers 240 kJ of heat energy. Calculate:

(i)   the *emf* of the main supply (i.e. supply voltage)
(ii)  the *current* used.   ( 4 + 3 = 7 )

*Answer:*

**The End**