NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH AND APPLIED SCIENCES

DEPARTMENT OF NATURAL AND APPLIED SCIENCES

QUALIFICATION : BACHELOR OF SCIENCE	
QUALIFICATION CODE: 07BOSC	**LEVEL:** 5
COURSE: GENERAL PHYSICS 1A	**COURSE CODE:** GNP501S
SESSION: JUNE 2019	**PAPER:** THEORY
DURATION: 3 HOURS	**MARKS:** 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER(S)	Dr Sylvanus A. Onjefu
MODERATOR:	Prof Dipti R. Sahu

INSTRUCTIONS
1. Answer ALL the question 2. Write clearly and neatly 3. Number the answers clearly

PERMISSIBLE MATERIALS
Non-programmable Calculator

ATTACHMENT
None

THIS QUESTION PAPER CONSISTS OF 4 PAGES
(Including this front page)

QUESTION 1 **[20]**

1.1 Derive the dimension of the following:

1.1.1 Impulse, (3)

1.1.2 Surface tension, (3)

1.1.3 Strain. (3)

1.2 The period of vibration of the liquid surface of a drop depends on the density, radius and surface tension of the liquid. Use dimensional analysis or otherwise to deduce an an expression for the dependence of the period of vibration of the liquid drop on these quantities. (11)

QUESTION 2 **[20]**

2.1 If $\vec{A}$ = i + 2j – 3k, $\vec{B}$ = 2i – 3j + 4k. Find;

2.1.1 $\vec{A}.\vec{B}$, (3)

2.1.2 the magnitude of $\vec{A}$, (3)

2.1.3 the magnitude of $\vec{B}$, (3)

2.1.4 the angle between the two vectors $\vec{A}$ and $\vec{B}$ (3)

2.2 What is the cross product of vectors, $\vec{A}$ = i + 2j – 3k, $\vec{B}$ = 2i – 3j – k. (4)

2.3 The position of a particle is given by $\vec{r} = 2\vec{\imath} + 4t^3\vec{\jmath} + 2t^2\vec{k}$ metre (with time t in seconds). Find expressions for;

2.3.1 its velocity, (2)

2.3.2 its acceleration as a function of time. (2)

QUESTION 3 **[20]**

3.1 Define instantaneous velocity. (2)

3.2 A train travelling at 20 m/s undergoes a uniform retardation of 2 m/s^2 when brakes are applied. Calculate;

3.2.1 the time to come to rest, (3)

3.2.2 the distance travelled from the place where the brakes were applied. (3)

3.3 A body is projected from the ground at an angle θ to the horizontal with a velocity of 30m/s. it reaches a maximum height of 11.25m. Calculate

3.3.1 the value of θ, (3)

3.3.2 the time to strike the ground. (3)

3.4 An arrow of mass 0.3 kg is fired with a velocity of 100 m/s into a wooden block of mass 0.7 kg. Calculate the final kinetic energy after impact, given that the wooden block can freely move. (6)

QUESTION 4 **[20]**

4.1 An object of weight 150 N moves with a speed of 4.5 m/s in a circular path of radius 3m. Calculate its centripetal acceleration and the magnitude of the centripetal force [Take g = 10 m/s^2] (5)

4.2 A stone of mass 500 g tied to a rope 50 cm long is whirled at an angular velocity of 12.0 rad/sec. Calculate the centripetal force. (3)

4.3 A force is required to keep a 5 kg mass moving round a cycle of radius 3.5 km at a speed of 7 m/s. What is the speed, if the force is doubled? (3)

4.4 A body of mass 20 g is suspended from the end of a spiral spring whose force constant is 0.4 N/m. The body is set into a simple harmonic motion with amplitude 0.2 m. Calculate

4.4.1 the period of the motion, (3)

4.4.2 the frequency of the motion, (3)

4.4.3 the total energy, (3)

QUESTION 5 **[20]**

5.1 Distinguish between a lamina flow and a turbulent flow. (4)

5.2 A reservoir is filled with a liquid of density 2000 kgm^{-3}. Calculate the depth at which the pressure in the liquid will be equal to 9100Nm^{-2} [Take g = 10 m/s^2]. (3)

5.3 A rectangular block of wood floats in water with two-third of its volume immersed. When placed in another liquid, it floats with half of its volume immersed. Calculate the relative density of the liquid. (4)

5.4 Normal human body temperature is 34 ^{O}C, what is the equivalent value in

5.4.1 Fahrenheit, (3)

5.4.2 Kelvin. (3)

5.5 An iron plate 2 x 10^{-2} m thick has a cross-sectional area of 5000 cm^{2}. One side is at 180 ^{O}C and the other side at 160 ^{O}C. How much heat is transmitted per second? The thermal conductivity of iron is 76 $Wm^{-1}K^{-1}$. (3)

END