NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH AND APPLIED SCIENCES
DEPARTMENT OF NATURAL AND APPLIES SCIENCES

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

SUPPLEMENTARY/SECOND OPPORTUNITY EXAMINATION QUESTION PAPER	
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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 6 PAGES

(INCLUDING THIS FRONT PAGE)

SECTION A

QUESTION 1 **[40]**

Suggested Question Types: Multiple Choice/Objectives

Each question in this section carries two marks

1.1 The dimension of volume is given by; (2)

A. L^3 B. L^2T^2 C. dimensionless D. MLT^{-1}

1.2 ..... is the unit of force. (2)

A. W B. Hz C. N D. NS

1.3 One of these is the dimension of acceleration. (2)

A. ML^2 B. ML^2T^{-1} C. M^2T^2 D. M^oLT^{-2}

1.4 One of the following is an example of a scalar quantity. (2)

A. force B. magnetic flux
C. mass D. electric field intensity

1.5 A car moves around a circular track with a constant speed. Which of the following statements are true concerning this motion? (2)

I. The average speed is zero.
II. Centripetal force is towards the centre of the circle.
III. The acceleration is zero.

A. only I is true B. only II is true
C. only III is true D. both II and III are true

1.6 How long would it take a car that starts from rest and accelerates uniformly in a straight line at 3 m/s^2 to cover a distance of 14 m? (2)

A. 15.0 s B. 30.5 s C. 9.8 s D. 3.1 s

1.7 A soccer ball, at rest on the ground, is kicked with and initial velocity of 12 m/s at a launched angle of 35° to the horizontal plane. Determine its time to reach the top of its accent, assuming that its air resistance is negligible. (2)

A. 0.5 s B. 1.0 s C 1.7 s D. 0.7 s

1.8 Power is measured in: (2)

A. $W\ s^{-1}$ B. W C. m/s D. W^2

1.9 One of these statements is not true for Universal gravitation constant, G. (2)

A. it is a constant
B. acceleration due to gravity
C. it is a scalar quantity
D. Use Boyle's meter involving two objects to determine

1.10 ..... is a method of determining acceleration due to gravity, g. (2)

A. Spring balance
B. Simple pendulum involving one object.
C. Intrinsic method.
D. Beam balance

1.11 Determine the density of copper if a copper ball with radius 1 cm has a mass of 37.3 g. (2)

A. $7.77 \times 10^3\ kg.m^{-3}$ B. $44 \times 10^2\ g$
C. $8.88 \times 10^3\ kg.m^{-3}$ D. $1 \times 10^2\ g$

1.12 Calculate the volume of an ice block with mass of 2460 g and density 917 kg/m^3. (2)

A. $2.68 \times 10^{-3}\ m^3$ B. $3.1 \times 10^4\ m^3$
C. $19.3 \times 10^{-3}\ m^3$ D. 2.0×10^3 cm

1.13 A streamline flow is also called ..... (2)

A. Laminar flow B. Turbulent flow
C. Volume flow D. Bernoulli's flow

1.14 A steel bar is precisely 1.60 m at 25^0 C. Its length is then increased to 1.64 m? Determine its initial temperature in Kelvin. (2)

A. 273 B. 198 C. 25 D. 298

1.15 When a liquid freezes to become a solid: (2)

A. it absorbs energy
B. its temperature increases
C. its temperature decreases
D. it emits energy

1.16 How much heat is required to raise the temperature of a 0.04 kg stainless steel cup from 20°C to 50°C if the specific heat capacity of stainless steel is 0.50 kJ / kg.°C. (2)

A. 200 J B. 400 J C. 800 J D. 1000 J

1.17 ..... is a vector that is tangential to path of an object in a circle: (2)

A. angular force
B. centripetal acceleration
C. centripetal velocity
D. centripetal force

1.18 ..... Is the total time taken by a vibrating body to make one complete cycle. (2)

A. amplitude B. crest C. period D. frequency

1.19 A load is pulled 10 m along a horizontal floor by a contact force of 15 N which acts at 60^O to the floor. Calculate the work done by the force. (2)

A. 150 J B. 1.5 J C. 75 J D. 120 J

1.20 Calculate the escape velocity of a satellite from the earth's gravitational field. If the radius of earth = 6.4×10^6 m, and g = 9.8 m/s^2 . (2)

A. 11200 m/s B. 62720000 m/s C. 125440000m/s D. 653061 m/s

SECTION B

QUESTION 2 **[20]**

DIMENSIONS

2.1 Derive the dimensions of:

(i) Gravitational potential energy (3)

(ii) Pressure (3)

(iii) Momentum (3)

(iii) Universal gravitational constant (3)

2.2 The force F of the wind on the car is certainly affected by the speed v of the car, density ρ and the surface area A of the car directly exposed to the wind's direction. Use dimensional analysis to show the equation of force. (8)

QUESTION 3 **[20]**

VECTORS AND SCALARS, ONE AND TWO DIMENSIONAL MOTION

3.1 Use the scalar product to determine the angle between the two vectors. (5)

$\bar{A} = 2\check{\imath} - 2\hat{\jmath} + \check{k}$ and $\bar{B} = -4\check{\imath} + 2\hat{\jmath} - 3\check{k}$

3.2 Given that: $\bar{A} = -\check{\imath} + 2\hat{\jmath} - 2\check{k}$, find the magnitude of $\bar{A}$, and the unit vector in the direction of $\bar{A}$. (3)

3.3 Show the derivation for the expression $v^2 = u^2 + 2as$: (4)

3.4 A passenger plane accelerated to rest down a runway at a constant deceleration of 2 $m.s^{-2}$.

3.4.1 Determine the velocity and position of the plane 8 seconds after it comes to a complete stop. (4)

3.4.2 A car moves from rest with and acceleration of 0.9 m/s/s. Find its velocity when it has moved a distance of 42.3 m. (4)

QUESTION 4 **[20]**

WORK, ENERGY AND POWER, CIRCULAR MOTION, SIMPLE HARMONIC MOTION AND UNIVERSAL GRAVITATIONAL AND FLUID PRESSURE

4.1 Determine the work done when an object of mass 7.5 kg falls vertically at a height of 4 m. (3)

4.2 Show that power is equal to the product of force and velocity. (3)

4.3 A CD starts from rest and accelerates to an angular frequency of 3 rev/s. Determine the disc's average period T and centripetal velocity V_c of the edge of the a disc when the radius is 4.0×10^{-2} m. (4)

4.4 A spacecraft of mass 450 kg land on planet Jupiter. Calculate Jupiter's gravitational acceleration, g, on the spacecraft. [Take mass of Jupiter = 1.89 x 10^{27} kg, radius of the Jupiter = 6.99 x 10^{7} m, G = 6.67 x 10^{-11} Nm^{2} kg^{-2}]. (4)

4.5 Show that pressure in fluid depends on depth and density, P = ρhg. (4)

4.6 Calculate the length of the liquid in a barometer tube that would support an Atmospheric pressure of 3.06 x 10^{5} Nm^{-2} if the density of the liquid is 1.36 x 10^{4} kgm^{-3} (g = 10m/s^{2}). (2)

End