



**NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY**

FACULTY OF HEALTH, NATURAL RESOURCES AND APPLIED SCIENCES

SCHOOL OF NATURAL AND APPLIED SCIENCES

DEPARTMENT OF BIOLOGY, CHEMISTRY AND PHYSICS

QUALIFICATION: BACHELOR OF HUMAN NUTRITION BACHELOR OF ENVIRONMENTAL HEALTH SCIENCES BACHELOR OF HEALTH INFORMATION SYSTEMS MANAGEMENT BACHELOR OF MEDICAL LABORATORY SCIENCES	
QUALIFICATION CODE: 08BOHN, 08BOHS, 07BHIS, 08BBMS	LEVEL: 5
COURSE CODE: HSP511S	COURSE NAME: HEALTH SCIENCE PHYSICS
SESSION: JULY 2023	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

SECOND OPPORTUNITY/SUPPLEMENTARY EXAMINATIONS PAPER	
EXAMINER(S)	DR VAINO INDONGO
MODERATOR:	PROF DIPTI SAHU

INSTRUCTIONS:

1. Answer all the questions in the booklet provided.
2. Show clearly all the steps used in the calculations.
3. All written work **MUST** be in blue or black ink and sketches/diagrams be in pencils.

PERMISSIBLE MATERIALS

Non-Programmable Calculator

**THIS PAPER CONSISTS OF 7 PAGES
(INCLUDING THIS FRONT PAGE)**

SECTION A

[40]

QUESTION 1

(40)

Multiple choice questions types: Each question carries two marks

1. Dimensional analysis is a method used to..... (2)
 - A. torture mankind.
 - B. convert from one unit into another unit.
 - C. cure mental illness.
 - D. make kids really mad.

2. is a unit of force? (2)
 - A. kg.m/s^2
 - B. kg
 - C. m/s
 - D. cm^3

3. Which of the following physical quantity is dimensionless? (2)
 - A. Momentum
 - B. Strain
 - C. Stress
 - D. Force

4. The dimensional formula of momentum is..... (2)
 - A. MLT
 - B. MLT^{-1}
 - C. $\text{M}^0\text{L}^0\text{T}^{-1}$
 - D. $\text{M}^{-1}\text{LT}^{-1}$

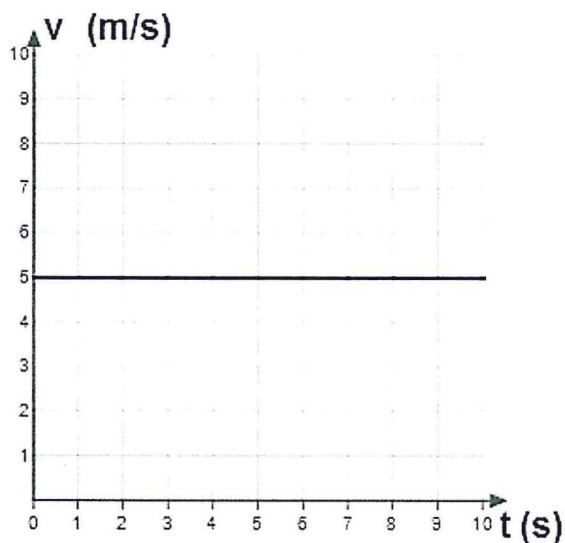
5. The dimensions of WORK are; (2)
 - A. MLT
 - B. ML^2T^{-2}
 - C. MLT^{-2}
 - D. ML^2T^{-1}

6. The rate of change of displacement of a particle is referred to as (2)
 - A. speed
 - B. velocity
 - C. acceleration
 - D. power

7. The difference between speed and velocity is: (2)
A. speed has no units
B. they use different units to represent their magnitude
C. speed shows only magnitude, while velocity represents both magnitude (strength) and direction
D. velocity has a higher magnitude
8. If vector $\mathbf{a} = 5\mathbf{i}$ and $\mathbf{b} = -8\mathbf{j}$. The scalar product is..... (2)
A. $-40\mathbf{k}$
B. $40\mathbf{k}$
C. 0
D. None of the above
9. Which of the following is **not** true? (2)
A. velocity can be negative
B. velocity is a vector
C. speed is a scalar
D. speed can be negative
10. The forces of 20 N towards north and 12 N towards south are acting on an object. What will be resultant force? (2)
A. 32 N toward north
B. 20 N towards north
C. 32 N towards south
D. 8 N towards north
11. A toy car moves 8 m in 4 s at the constant velocity. What is the car's velocity? (2)
A. 1 m/s B. 2 m/s C. 3 m/s D. 4 m/s
12. A train moves at a constant velocity of 50 km/h. How far will it move in 0.5 h? (2)
A. 10 km B. 20 km C. 25 km D. 50 km
13. A boat can move at a constant velocity of 8 km/h in still water. How long will it take for the boat to move 24 km? (2)
A. 2 h B. 3 h C. 4 h D. 6 h
14. The property of water whereby molecules tend to stick to one another is; (2)
A. Cohesion B. Polarity C. Adhesion D. Viscosity

USE THE GRAP BELOW TO ANSWER QUESTION 15 AND 16

The graph represents the relationship between velocity and time for an object moving in a straight line. Use this graph to answer questions 14 and 15



15. Which of the following statements is true? (2)
- A. The object speeds up
 - B. The object moves with a constant velocity
 - C. The object stays at rest
 - D. The object is in free fall
16. What is the acceleration of the object after 5 s? (2)
- A. 0 m/s^2 B. 3 m/s C. 4 m/s^2 D. 5 m/s^2
17. A projectile is fired at an angle of 60.0° above the horizontal with an initial speed of 30.0 m/s . How long does it take the projectile to reach the highest point in its trajectory? (2)
- A. 1.5 s B. 2.7 s C. 6.2 s D. 9.8 s
18. What is the force of gravity that is exerted on earth by the sun? Given That the mass of the sun and the earth are $1.99 \times 10^{30} \text{ kg}$ and $5.97 \times 10^{24} \text{ kg}$ respectively. The distance between the sun and the earth is $1.496 \times 10^{11} \text{ m}$ and G is $6.67 \times 10^{-11} \text{ N}\cdot\text{m}^2/\text{kg}^2$. (2)
- A. $3.54 \times 10^{22} \text{ N}$ B. $4.54 \times 10^{21} \text{ N}$
- C. $3.45 \times 10^{22} \text{ N}$ D. $4.54 \times 10^{22} \text{ N}$

SECTION B**[60]****QUESTION 2****(20)**

2.1 Derive the dimensions of:

- (i) pressure (2)
- (ii) surface tension (2)

2.2 Use dimensionally analysis to prove whether kinetic energy is equals to gravitational potential energy. (3)

2.3 The force F of the wind on the moving car is certainly affected by its velocity 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)2.4 Suppose $A = B^m C^n$, where A has dimension, LT^3 , B has dimension L^2T^{-1} , and C has dimensions LT^2 . Determine the m and n values. (5)**QUESTION 3****(20)**

3.1 Given three vectors;

$$\mathbf{a} = i + 2j + 3k,$$

$$\mathbf{b} = 2i + 3j + k$$

$$\mathbf{c} = 7i + 2j + k,$$

- (i) Evaluate vector \mathbf{p} , such that $\mathbf{p} = (\mathbf{a} \times \mathbf{b}) + (\mathbf{a} \times \mathbf{c})$ (8)
- (ii) From (i), find a unit vector \mathbf{n} in the direction of \mathbf{p} . (2)

3.2 The position \vec{r} of a particle was given by $4.0 t^4 \vec{i} - 2.0 t^2 \vec{j} + 2.0 t^2 \vec{k}$. m(with t in seconds). Determine;

- (i) vector \vec{u} such that $\frac{1}{2} \vec{r} = \vec{u}$. (3)
- (ii) the velocity of the particle at $t = 0.5$ s. (4)
- (iii) the rate of change of velocity of a particle. (3)

QUESTION 4**(20)**

- 4.1 An object is projected from a height of 100 m above the ground at an angle of 30° to the horizontal with a velocity of 100 m/s. Calculate;
- (i) Maximum height (H) reached by the object. (3)
 - (ii) the distance the object travels from the cliff (2)
- 4.2 Two blocks of mass 0.1 kg and 0.2 kg approach each other on a horizontal plane at velocities of 0.4 and 1m/s respectively. If the blocks collide and remain together, calculate the joint velocity after collision. (5)
- 4.3 An object of mass m is attached to a spring of length L . If the spring is extended by a distance e and released, show that the period of oscillation is given by; $T = 2\pi \sqrt{\frac{e}{g}}$, where g is the acceleration due to gravity. (3)
- 4.4 State any two assumptions considered in studying fluid dynamics. (2)
- 4.5 When 620 g of water was cooled down from 92.2°C to 4.5°C and the specific heat capacity, c , of water is $4186 \text{ J} \cdot \text{kg}^{-1}\text{C}^{-1}$. Determine the:
- (i) amount of heat transferred in Kilo Joules (3)
 - (ii) initial temperature of water in Fahrenheit (1)
 - (iii) final temperature of water in Kelvin (1)

END OF EXAM