



PAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH, APPLIED SCIENCES AND NATURAL RESOURCES

DEPARTMENT: NATURAL AND APPLIED SCIENCES

QUALIFICATION : BACHELOR OF SCIENCE BACHELOR OF HUMAN NUTRITION BACHELOR OF ENVIRONMENTAL HEALTH SCIENCES BACHELOR OF HEALTH INFORMATION SYSTEMS MANAGEMENT BACHELOR OF MEDICAL LABORATORY SCIENCES BACHELOR OF HORTICULTURE	
QUALIFICATION CODE: 07BOSC, 08BOHN, 08BOHS, 07BHIS, 08BBMS, 07BHOR	LEVEL: 5
COURSE CODE: HSP511S GNP501S	COURSE NAME: HEALTH SCIENCE PHYSICS GENERAL PHYSICS 1A
SESSION: JULY 2022	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

SUPPLEMENTARY/SECOND OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER(S)	DR MUNYARADZI ZIVUKU MR VAINO INDONGO
MODERATOR:	PROF. DIPTI SAHU

Instructions

1. Answer **all** questions.
2. Answer the questions in the booklet provided
3. All written work **MUST** be done in blue or black ink
4. Mark all answers clearly with their respective question numbers

THIS QUESTION PAPER CONSISTS OF 6 PAGE (INCLUDING THIS FRONT PAGE)

- 1.8 Which of these statements is not true about why weight varies? (2)
- A. due to rotation of the earth about its axis
 - B. due to constant in density of earth
 - C. due to elliptical shape of the earth
 - D. due to variation in latitude
- 1.9 Whenever a liquid is touched slightly, small ripples run across the surface. This statement is an evidence of (2)
- A. Bernoulli principle
 - B. Newton s law
 - C. Pure magic
 - D. Surface tension
- 1.10 Which of the following is not relevant in fluid dynamics? (2)
- A. viscosity
 - B. laminar flow
 - C. incompressible
 - D. turbulent flow
- 1.11 Which of the following physical quantity is dimensionless? (2)
- A. Momentum
 - B. Strain
 - C. Stress
 - D. velocity
- 1.12 An object is projected from the ground at an angle of 30° to the horizontal with a velocity of 100m/s. The velocity and the direction of the object 1 sec before it hit the ground is... (2)
- A. 86.94 m/s and 27.4°
 - B. 91.78 m/s and 19.3°
 - C. 88.02 m/s and 52.4°
 - D. 82.02 m/s and 53.4°

SECTION B

QUESTION 2

(15)

- 2.1 A vehicle moving with a velocity v experiences a force F , due to air resistance, given by;

$$F = \frac{1}{2} C \rho^\alpha v^\beta A^\gamma$$

Where ρ is the density of air, A is the cross-sectional area of the vehicle and C is the dimensionless quantity called the drag coefficient.

- 2.1.1 Use dimensional analysis to find α , β and γ (7)
- 2.2 When a solid sphere moves through a liquid, the liquid opposes the motion with a force F . The magnitude of F depends on the coefficient of viscosity η of the liquid, the radius r of the sphere and the speed of the sphere. Use dimensional analysis to derive a formula for the force (F). (8)

QUESTION 3

(16)

- 3.4 Consider the following vectors:

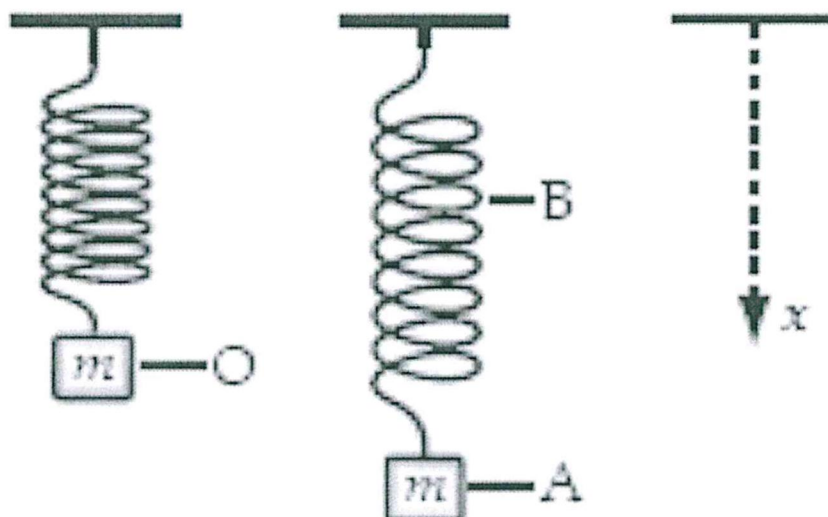
$$\vec{A} = \hat{i} + 3\hat{j} - 2\hat{k} \quad \text{and} \quad \vec{B} = 5\hat{i} - 3\hat{k}$$

- (i) Find: $\vec{A} \times \vec{B}$ (5)
- (ii) Determine a unit vector that is perpendicular to both vectors, \vec{A} and \vec{B} (3)
- 3.5 The position \vec{r} of an object is given by $1.0 t^3 \hat{i} - 2.0 t^2 \hat{j} + 3.0 t^2 \hat{k}$. m (with t in seconds). Determine;
- (i) the magnitude of the position \vec{r} when $t = 3$ seconds (4)
- (ii) the acceleration of the particle for 3 seconds. (4)

QUESTION 4

(15)

- 4.1 State the law of conservation of momentum. (3)
- 4.2 A weight of mass m is at rest at O when suspended from a spring, as shown in figure 1.0. The energy applied (E) of pulling down the spring is combination of potential energy (PE) and kinetic energy (KE). When released, the spring oscillates between positions A and B.



- 4.2.1 Given that the amplitude A is equal to the maximum displacement, X_{\max} i.e $A = X_{\max}$, show that the velocity of the object is given by the equation.

$$v = \sqrt{\frac{k}{m}(A^2 - x^2)} \quad (6)$$

- 4.3 Two blocks A and B, with mass of 0.1 kg and 0.2 kg approach each other on a horizontal plane at velocities of 0.4 and 1m/s respectively. Block B is moving to the left. If the blocks collide and remain together, calculate the joint velocity after collision. (6)

QUESTION 5 (15)

- 5.1 A cyclist rides a bicycle over circular hill at a velocity of 6 m/s. The hill has a radius of 8 m. Given that the mass of the cyclist and the bicycle are 100 kg.
- 5.1.1 Calculate the normal force as the cyclist rides over the crest on the hill. (5)
- 5.1.2 Determine the force exerted by of the cyclist on top of the crest of the hill. (3)
- 5.1.3 Comment on what will happen if the Normal force is removed. i.e if its zero. (2)
- 5.2 If you are experiencing a force of 200 N against your seatbelt as you turn a Corner (radius of the curve is 15 m) in a car, how fast must you be traveling in your car if the mass of your body is 80 kg? (5)

QUESTION 6**(15)**

- 6.1 Define surface tension. (2)
- 6.2 Find the density of the copper, given that the copper ball has a radius of 1 cm with mass of 37.3 g. (3)
- 6.3 Discuss the Bernoulli principle both conceptually and mathematically in relation to water in a dam and water flowing through a gorge. (5)
- 6.4 After water has boiled, the temperature of water decrease by 22°C. The mass of water in the kettle is 0.5 kg. Specific heat capacity of water is 4182 J /kg °C.
- 6.4.1 Calculate the energy transferred to the surroundings from water. (3)
- 6.4.1 Explain why the total energy input to the kettle is higher than the energy used to heat. (2)

END OF EXAMINATION QUESTION PAPER