



ΠΑΜΙΒΙΑ UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH AND APPLIED SCIENCES

DEPARTMENT OF HEALTH SCIENCES

QUALIFICATION: BACHELOR OF ENVIRONMENTAL HEALTH SCIENCES BACHELOR OF HEALTH INFORMATION SYSTEMS MANAGEMENT BACHELOR OF MEDICAL LABORATORY SCIENCES BACHELOR OF HUMAN NUTRITION	
QUALIFICATION CODE: 08BEHS 07BHIS 08BMLS 08BOHN	LEVEL: 5
COURSE CODE: HSP511S	COURSE NAME: HEALTH SCIENCE PHYSICS
SESSION: JULY 2019	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

SUPPLEMENTARY/SECOND OPPORTUNITY PAPER	
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INSTRUCTIONS	
1.	Write all your answers in the answer booklet provided.
2.	Read the whole question before answering.
3.	Begin each question on a new page.

PERMISSIBLE MATERIALS

1. Scientific Calculator

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. $L^2 T^2$ 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. $ML^2 T^{-1}$ C. $M^2 T^2$ D. $M^0 L T^{-2}$

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

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

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

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 25⁰ 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

Use the following information to answer **questions 1.18 – 1.20**.

An isotope of atom X with atomic number of 92 and mass number of 238 decays by alpha to form atom Y and two gamma rays.

1.18 What would be the number of neutrons and protons in the parent nuclide X, respectively? (2)

- A. 92 and 238 B. 238
C. 146 and 238 D. 146 and 92

1.19 Determine the atomic number of the daughter nuclide Y? (2)

- A. 92 B. 90
C. 146 D. 234

1.20 The difference between a helium nucleus and alpha particle is that; (2)

- A. number of neutrons varies
B. number of protons varies
C. no electrons on the alpha nucleus
D. None of the above

SECTION B

QUESTION 2

[20]

DIMENSIONS

2.1 Derive the dimensions of:

- (i) Gravitational potential energy (3)
- (ii) Pressure (3)
- (iii) Momentum (3)
- (iv) 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)

$$\vec{A} = 2\hat{i} - 2\hat{j} + \hat{k} \quad \text{and} \quad \vec{B} = -4\hat{i} + 2\hat{j} - 3\hat{k}$$

3.2 Given that: $\vec{A} = -\hat{i} + 2\hat{j} - 2\hat{k}$, find the magnitude of \vec{A} , and the unit vector in the direction of \vec{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 $2 \text{ m}\cdot\text{s}^{-2}$.

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 an acceleration of 0.9 m/s^2 . 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 RADIOACTIVITY

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 = 1.89×10^{27} kg, radius of the Jupiter = 6.99×10^7 m, $G = 6.67 \times 10^{-11} \text{ Nm}^2 \text{ kg}^{-2}$]. (4)

4.5 Mention and discuss any two chief sources of radiation in our environment. (4)

4.6 Mention any two industrial applications of radiation in agriculture. (2)

END