NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH, NATURAL RESOURCES AND APPLIED SCIENCES

DEPARTMENT OF NATURAL AND APPLIED SCIENCES

QUALIFICATION: BACHELOR OF SCIENCE	
QUALIFICATION CODE: 07BOSC	**LEVEL:** 5
COURSE: GENERAL PHYSICS 1B	**COURSE CODE:** GNP502S
SESSION: NOVEMBER 2022	**PAPER:** THEORY
DURATION: 3 Hours	**MARKS:** 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER(S)	PROF ONJEFU SYLVANUS
MODERATOR:	PROF DIPTI SAHU

PERMISSIBLE MATERIALS

Non-programmable 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   One of the following is not an example of electromagnetic waves.   (2)

   a. beta   b. gamma   c. x rays   d. ultraviolet light

1.2   In which of the following is the speed of sound greatest?   (2)

      a. air at $100^{\circ}C$ b. water   c. wood   d. steel

1.3   Which of the following statements about images formed by a plane mirror
      is false? It is;   (2)

      a. The same size as the object   b. virtual   c. enlarged   d. lateral inverted

1.4   The diagram below shows a ray of light IK incident on plane mirror at K.
      Calculate the angle of deviation of the ray after reflection.   (2)
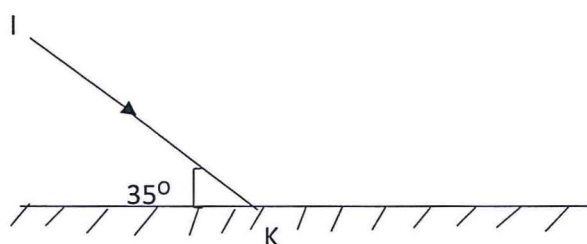
      a. 35° b. 70° c. 55° d. 90°

1.5   The combination of two overlapping waves is called what?   (2)

      a. aggregate   b. superposition   c. dispersion   d. wavelength

1.6   A hunter at a distance x from a cliff fires a gun. He hears the echo from the cliff
      after 2.4 seconds. If the speed of sound in air is 340 m/s, determine x.   (2)

      a. 408 m   b. 209 m   c. 100 m   d. 501 m

1.7 One of these is not a wind instrument. (2)

    a. clarinets   b. trumpets   c. drums   d. flutes

1.8 A beam of polarized light is one constrained to vibrate in a ………… plane perpendicular to the beam. (2)

    a. multiple   b. triple   c. single   d. quadruplet

1.9 Sound wave below 20 Hz is called what? (2)

    a. ultrasonic wave   b. audible wave   c. infrasonic wave   d. critical wave

Questions 1.10 and 1.11 are based on the statement below:

The amplitude modulation (AM) radio band extends from 5.4×10^5 Hz to 1.7×10^6 Hz. If the speed of light is 3×10^8 m/s;

1.10 What is the longest wavelength in meters? (2)

    a. 1.8×10^2 m   b. 5.6×10^2 m   c. 6.5×10^3 m   d. 0.9×10^3 m

1.11 Determine the shortest wavelength. (2)

    a. 1.8×10^2 m   b. 5.6×10^2 m   c. 6.5×10^3 m   d. 0.9×10^3 m

1.12 Light reflecting off a flat mirror creates an image that appears to be ………… the mirror. (2)

    a. infront   b. behind   c. lateral   d. tangential

1.13 ……….. image cannot be projected on a screen. (2)

    a. real   b. virtual   c. critical   d. principal

1.14 A light ray of wavelength 589 nm traveling through air strikes a smooth, flat slab of crown glass at an angle of 30^0 to the normal. Determine the angle of refraction. (2)

    a. 18.2^0 b. 20.1^0 c. 17.2^0 d. 19.2^0

1.15 A type of aberration in which the wavelength is dependent on refraction is called what? (2)

a. spherical aberration   b. chromatic aberration

c. cubical aberration   d. sita aberration

1.16   The combination of rays gives rise to ....?   (2)

    a. beam   b. radiation   c. particles   d. incident rays

1.17   .... Is a device that transforms energy into a beam of coherent monochromatic light.   (2)

    a. lasers   b. slit order   c. path difference   d. diffraction gating

1.18   Suppose the real depth of a pond is 6 m and its apparent depth is 4.5 m. The refractive index of the water of the pond is given by?   (2)

    a. 1.35   b. 1.36   c. 1.47   d. 1.33

1.19   The change of direction of wave front because of a change in the velocity of the wave in another medium is called what?   (2)

    a. Polarization   b. interference   c. diffraction   d. refraction

1.20   .... is the unit of frequency.   (2)

    a. decibel   b. meters   c. Hertz   d. seconds

SECTION B

QUESTION 2 [18]

2.1 A wave is represented by the equation y = 2sin (0.5x – 200t), where all distances are measured in centimetre and time in seconds. For this wave, calculate its

2.1.1 Wavelength, (5)

2.1.2 Speed, (5)

2.1.3 Frequency. (4)

2.2 If the angle of incidence for light traveling from air to glass is 45 ^{0} and the angle of refraction in glass is 28 ^{0}, Evaluate the refractive index of glass with respect to air. (4)

QUESTION 3 [12]

3.1 If u is the object distance and v is the image distance, show that the magnification M is given by; $M = (v/u) = \frac{v}{f} - 1.$ (4)

3.2 A ray of light strikes a plane mirror at a glancing angle of 55°. Calculate the angle between the incident and reflected rays as shown in the diagram below. (4)
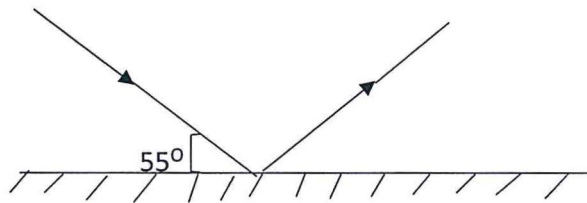
3.3 The velocity of light in air and glass are 3 x 10^8 m/s and 1.8 x 10^8 m/s respectively. Calculate the sine of the angle of incidence that will produce and angle of refraction of 30° for a ray of light incident on glass. (4)

QUESTION 4 [16]

4.1 Illustrate with the aid of a diagram destructive interference. (3)

4.2 The distance between the two slits is 0.030 mm. The second-order bright fringe is measured on a viewing screen at an angle of 2.15° from the central maximum. Evaluate the wavelength of the light in nano meter (4)

4.3 What is meant by 'a beam of polarized light? (2)

4.4 With the aid of well labelled diagrams, illustrate the action of a Polaroid on beam of sunlight. (4)

4.5 List three crystals that serve as light polarizing filter. (3)

QUESTION 5 [14]

5.1 Suppose a stationary siren emits a note of frequency 440 Hz as the train approaches it with a velocity of 30 m/s. Determine the frequency that is received on the train. [Take speed of wave to be 331 m/s]. (3)

5.2 Define resonance. (2)

5.3 Explain the term end correction. (2)

5.4 If the fundamental frequency of a closed pipe organ on a day when the speed of sound is 340 m/s is 170 Hz, then the length of the pipe is given as what? (5)

5.5 Explain why a tuning fork sounds louder when its stem is pressed against a table top. (2)

END