NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH 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 2019	PAPER: THEORY
DURATION: 3 Hours	MARKS: 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
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MODERATOR:	PROF DIPTI SAHU

INSTRUCTIONS
1. Answer ALL the questions
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 A radio station broadcast at a frequency of 400 KHz. If the speed of the wave
is 3×10^8 m/s, calculate the wavelength of the radio wave. (2)

   a. 1.3×10^{10} m   b. 7.5×10^2 m   c. 1.2×10^{14} m   d. 1.3×10^{-3} m

1.2 The diagram below illustrates a variation of the displacement y of a wave
   particle with time t. If the velocity of wave is 250 m/s, calculate the frequency. (2)
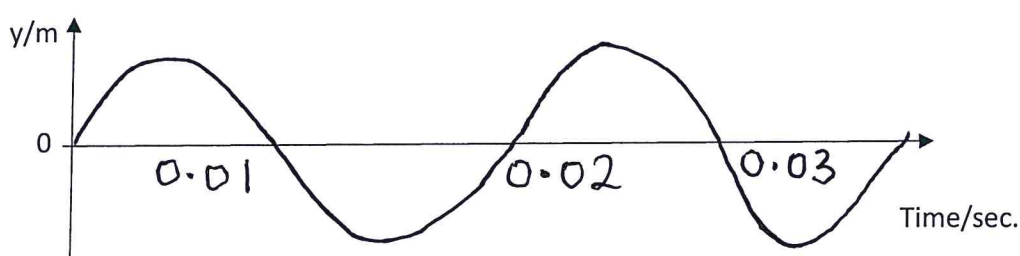
   a. 0.02 Hz   b. 0.5 Hz   c. 5.0 Hz   d. 50 Hz

1.3 What is the distance between two successive particle which are in phase in
   Question 1.2? (2)

   a. 50 m   b. 5.0 m   c. 0.2 m   d. 0.0008 m

1.4 What is the refractive index of a substance if the real depth is 6 m and its
   apparent depth is 4.5 m? (2)

   a. 10.5   b. 1.33   c. 1.50   d. 0.75

1.5 One cycle of a wave takes 0.1 s to pass a stationary observer. What is the
   frequency of the wave? (2)

   a. 0.1 Hz   b. 0.2 Hz   **c. 10 Hz**   d. 20 Hz

1.6 What is the speed of the wave in Question 1.5, if its wavelength is 20 cm? (2)

   a. 200 m/s   b. 2 cm/s   c. 2 m/s   d. 20 m/s

1.7 An object with a height of 1.00 cm is placed 10.0 cm from a concave mirror
   whose radius of curvature is 30.0 cm. Determine the position of the image. (2)

   a. 30 cm   b. − 30 cm   c. 20 cm   d. - 20 cm

2

1.8 To what level is the image in Question 1.7 magnified? (2)

   a. + 3.0   b. + 2.0   c. + 4.0   d. + 5.0

1.9 In the dispersion of white light into its component colors, ……… is the least bent. (2)

   a. Violet   b. blue   c. green   d. red

1.10 …………. has the shortest wavelength when a triangular prism spreads white
     light out into its component colors. (2)

   a. Yellow   b. indigo   c. orange   d. violet

1.11 Which of the following is not a mechanical wave? (2)

   a. Wave propagated in stretched string   b. Waves in closed pipe
   c. Radio waves   d. water wave

1.12 Wave tend to spread out or bend in when they pass an edge or through
     a gap. This bending effect is called what? (2)

   a. dispersion   b. diffraction   c. superposition   d. interference

1.13 The focusing of different colours of light at different distances behind a
     lens is known as what? (2)

   a. myopia   b. hyperopia   c. astigmatism   d. chromatic aberration

1.14 The whistle of a train emits a tone of frequency 440 Hz as the train
     approaches a stationary observer at 30 m/s. What frequency does the
     observer hear? [Speed of wave is 331 m/s]. (2)

   a. 380 Hz   b. 483 Hz   c. 485 Hz   d. 484 Hz

1.15 ………… is the characteristic of a note which enables us to differentiate
     a high note from a low note. (2)

   a. Intensity   b. node   c. pitch   d. loudness

1.16 A normal human ear can respond to …………. frequency range. (2)

   a. 20 Hz to 20,000 Hz   b. 20,000 Hz to 20, 000000 Hz   c. below 20 Hz
   d. above 20,000 Hz

1.16 The figure below shows the path of light passing through a glass block. Calculate the refractive index of the glass? (2)

30° 60°
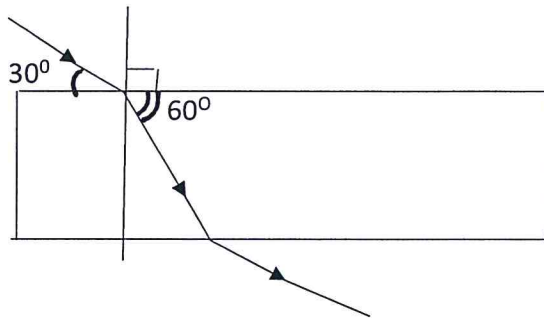
    a. 30   b. 1.73   c. 1.50   d. 1.33

1.18 If the angle of incidence for light travelling from air to glass is 45° and the angle of refraction in the glass is 28°, determine the refractive index of glass with respect to air. (2)

    a. 1.51   b. 0.66   c. 1.62   2.25

1.19 What is the critical angle for light travelling from water to air? [Take $_an_w = \frac{4}{3}$]. (2)

    a. 0.75° 1'   b. 48°' 36'   c. 28° 40'   d. 25° 17'

1.20 The mirage is a phenomenon of ……………… (2)

    a. Interference   b. total internal reflection   c. dispersion
    d. diffraction
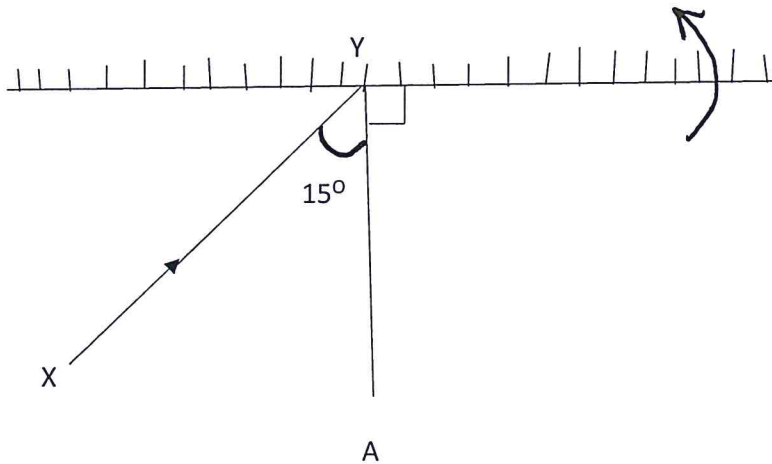
SECTION B [60]

QUESTION 2 [16]

2.1 In the figure below, an incident ray XY makes an angle of 15° with a fixed line AY which is normal to the surface of the plane mirror. If the mirror is turned as indicated by the arrow through 40°, what angle will the reflected ray make with AY? (4)

2.2 At what angle (θ) will 2 plane mirrors be inclined so that 11 images will be formed when an object is placed in front of the two mirrors? (4)

2.3 State the two condition that must be fulfilled for total internal reflection to occur. (4)

2.4 A thin glass lens (n = 1.5) has a focal length of + 10 cm in air. Compute its focal length in water (n = 1.33). (4)

QUESTION 3 [15]

3.1 Differentiate between chromatic aberration and spherical aberration and give one example for each of their correction. (6)

3.2 Explain and illustrate schematically a constructive interference. (4)

3.3 Light of wavelength 750 nm passes through a slit 1.0×10^{-3} mm wide. How wide is the central maximum on a screen 20 cm away? (5)

QUESTION 4 [14]

4.1 State Doppler Effect in sound. (2)

4.2 A tuning fork having a frequency of 400 Hz is moved away from an observer
and toward a flat wall with a speed of 2.0 m/s. Assume the speed of sound in
air to be 340 m/s.

4.2.1 What is the apparent frequency of the unreflected sound wave coming directly
to the observer? (3)

4.2.2 What is the apparent frequency of the sound waves coming to the observer
after reflection? (3)

4.2.3 How many beats per second are heard? (3)

4.3 A tiny piece of chewing gum is placed on a prong of one fork. Now there is
one beat every 0.40 seconds. Was this turning fork lower- or the higher
frequency fork? (3)

QUESTION 5 [15]

5.1 Describe an experiment and show how the fundamental frequency of
a closed pipe is obtained. (4)

5.2 The length of air column at which the first resonance was observed, when
a vibrating fork was placed on a resonance tube, was 30 cm. Determine
the wavelength of the air column and the frequency of the fork.
[Take speed of sound as 330 m/s] (4)

5.3 Compute the speed of sound in neon gas at 27°C. For neon, M = 20.18kg/kmol.
[Take the ratio of the specific heat γ, for monoatomic gas as 1.67, R = gas
constant = 8314 J/Kmol.K]. (3)

5.4 A Sonometer wire of linear density 0.08 kg/m subjected to a tension of 800 N
is plucked. Calculate the speed of a pulse, which moves, from one end of the wire
to the other. [Note: linear density = mass per unit length]. (4)

END