



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

MAIN CAMPUS

**UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR**

MAIN EXAM

**FOR THE DEGREE
OF
BACHELOR OF OPTOMETRY AND VISION SCIENCE**

COURSE CODE: BOV 122

COURSE TITLE: PHYSICAL AND GEOMETRICAL OPTICS

DATE: Wednesday 19/4/2023

TIME: 3.00 PM - 5.00 PM

INSTRUCTIONS TO CANDIDATES

The paper contains three sections (A, B & C)

Answer all questions

TIME: 2 Hours

MMUST observes ZERO tolerance to examination

SECTION CONTAIN 20 MCQ

1. Dispersion can be observed through _____
 - a. Wood
 - b. Wall
 - c. Paper
 - d. Prism

2. What are the types of images formed?
 - a. On screen
 - b. In front and on screen
 - c. Neither real nor virtual
 - d. Both real and virtual

3. Photons have a mass of more than two grams.
 - a. TRUE
 - b. FALSE

4. Formation of images by mirrors is studied by:
 - a. Geometrical optics
 - b. Physical optics
 - c. Neither Physical optics nor Geometrical optics
 - d. None of the options

5. The bending of light when it passes from one medium to another is called _____
 - a. Refraction
 - b. Diffraction
 - c. Reflection
 - d. Total internal reflection

6. Refraction is used in devices like
 - a. Torch
 - b. Mirror
 - c. Telescope
 - d. Screen

7. The higher density materials will have greater refractive indices.
 - a. True
 - b. False

8. How far from a piece of paper must you hold a +2.25 D reading glasses to try to burn a hole in the paper with sunlight?
 - a. 50.1cm
 - b. 40.5cm
 - c. 44.4 cm
 - d. 1m

9. A beam of white light goes from air into water at an incident angle of 75.0° . At what angles are the red (660 nm) and violet (410 nm) parts of the light refracted?
- 47.5° , red; 45.0° , violet
 - 46.5° , red; 46.0° , violet
 - 46.5° , red; 46.0° , violet
 - 46.5° , red; 45.5° , violet
10. Calculate the index of refraction for a medium in which the speed of light is 2.012×10^8 m/s
- 1.490
 - 1.530
 - 1.661
 - 1.44
11. Suppose you have an unknown clear substance immersed in water, and you wish to identify it by finding its index of refraction. You arrange to have a beam of light enter it at an angle of 45.0° , and you observe the angle of refraction to be 40.3° . What is the index of refraction of the substance and its likely identity?
- 1.446, flint
 - 1.460 flint
 - 1.460 fused quartz
 - 1.446 fused quartz
12. Your camera's zoom lens has an adjustable focal length ranging from 80.0 to 200 mm. What is its range of powers?
- 5.00 to 12.50 D
 - 0.50 to 1.25 D
 - 2.50 to 10.5 D
 - 50 to 125 D
13. Doctor examines a mole with a 15.0 cm focal length magnifying glass held 13.5 cm from the mole. Where is the image?
- Same side as the doctor
 - Opposite side of the doctor
 - On the same plane
 - Both bellow and upper portion of the spectrum
14. The patient note that the prescription for new eyeglasses is -4.50 D. What will their focal length be?
- 0.11m
 - 0.33m
 - 0.22m
 - 0.44m
15. Certain slide projector has a 100 mm focal length lens. How far away is the screen, if a slide is placed 103 mm from the lens and produces a sharp image?
- 3.43m
 - 3.00m
 - 4.00m
 - 3.34m
16. What is the focal length of a makeup mirror that has a power of 1.50 D?

- a. 0.50m
- b. 0.60m
- c. 0.66m
- d. 0.70m

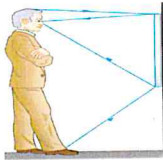
17. Calculate the intensity of IR radiation in W/m^2 projected by the concave mirror on a person 3.00 m away. Assume that the heating element radiates 1500 W and has an area of 100cm^2 , and that half of the radiated power is reflected and focused by the mirror.

- a. 5.12kW/m^2
- b. 6.82kW/m^2
- c. 7.80kW/m^2
- d. 5.82kW/m^2

18. Components of some computers communicate with each other through optical fibers having an index of refraction. What time in nanoseconds is required for a signal to travel 0.200 m through such a fiber?

- a. 1.03ns
- b. 1.00ns
- c. 1.30ns
- d. 1.11ns

19. Suppose a man stands in front of a mirror as shown in the figure. His eyes are 1.65 m above the floor, and the top of his head is 0.13 m higher. Find the height above the floor of the top and bottom of the smallest mirror in which he can see both the top of his head and his feet.



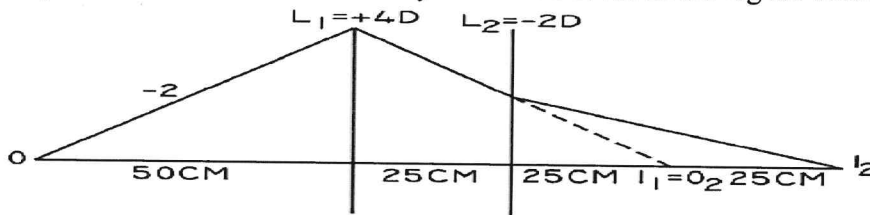
- a. top from floor 0.715m; bottom from floor 1.825m
- b. top from floor 0.715m; bottom from floor 1.825m
- c. top from floor 1.715m; bottom from floor 0.825m
- d. top from floor 2.715m; bottom from floor 1.825m

20. How far apart must a +5.00D lens and a -1.00 D lens be placed to form Galilean (afocal) telescope?

- a. 20cm
- b. 30cm
- c. 10 cm
- d. Not possible

SECTION B SHORT ANSWERED QUESTION

1. Where will the image be formed for an object placed 50cm in front of a +4.00 lens that is separated from a -2.00 D lens by 25cm as shown in the figure bellow (7marks)



2. Using focal point, differentiate between minus lens and plus lens in a ray form (6 marks)
3. State how chromatic aberration can be modified (4marks).
4. Discuss some of the problems encountered during multifocal lens designs (6marks).
5. Discuss different types of refractive errors suggesting mode of correction (7marks)

SECTION C LONG ANSWERED QUESTION

1. Discuss five types of visual acuity used in clinical examination (20 marks)

