

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.
(For candidates admitted during the academic year 2011-12 & thereafter)

SUBJECT CODE : 11PH/MC/OS44

B.Sc. DEGREE EXAMINATION APRIL 2016

BRANCH III - PHYSICS

FOURTH SEMESTER

REG. No. _____

COURSE : MAJOR – CORE
PAPER : OPTICS AND SPECTROSCOPY
TIME : 30 MINS.

MAX. MARKS : 30

TO BE ANSWERED IN THE QUESTION PAPER ITSELF
SECTION – A

ANSWER ALL QUESTIONS:

(30 x 1 = 30)

I Choose the Correct Answer:

1. Which of the lens or lenses is the converging lens?
a) concave b) convex c) both d) none
2. Light travels fastest through
a) vacuum b) water c) glass d) diamond
3. The principle on which fiber optics is based is
a) refraction b) polarization c) dispersion d) total internal reflection
4. Wave nature of light is evidenced by
a) Photo-electric b) Interference c) polarisation d) all the three
5. In reflected light the central fringe of Newton's ring is
a) dark b) non-uniform c) bright d) none of them
6. Two sources are said to be coherent if their emitted waves have
a) same wavelength b) same amplitude
c) constant phase difference d) all the three
7. The bending property of light at the sharp edge of the obstacle is known as
a) Interference b) Dispersion c) Diffraction d) Polarisation
8. The tip of a needle does not give a sharp image on the screen. This is due to the fact
a) Interference b) diffraction c) polarization d) refraction
9. The conditions for observing Fraunhofer diffraction from a single slit is that the light wave front incident on the slit must be
a) Spherical b) Plane c) Cylindrical d) Elliptical
10. Polarization of light is used in
a) sunglasses b) photography c) both d) none

11. Light usually vibrates in multiple vibrational planes. It can be transformed into light vibrating in a single plane of vibration. The process of doing this is known as ____.
- a) translation b) interference c) polarization d) refraction
12. In elliptically polarized light _____ of light vary continuously.
- a) the magnitude b) the orientation c) the both vary d) none
13. Absorption of what type of electromagnetic radiation results in ionization?
- a) microwaves b) X-rays c) infrared light d) radio waves
14. Absorption of what type of electromagnetic radiation results in transitions among allowed vibrational motions?
- a) infrared light b) X-rays c) radio waves d) ultraviolet light
15. Which of the following wavelength ranges is associated with UV spectroscopy?
- a) 0.8 - 500 μ m b) 400 - 100nm c) 380 - 750nm d) 0.01 - 10nm

II Fill in the blanks:

16. Reciprocal of focal length in metres is known as the _____ of a lens.
17. The phenomenon of _____ of light is due to the superposition of waves.
18. The phenomenon of bending of light around the corners of an obstacle or an aperture into region of geometrical shadow of obstacle is called _____ of Light.
19. _____ can be produced by Nicol prism.
20. Raman Effect supports _____ theory.

III State whether True or false:

21. White and black are actual colors of light.
22. A convex lens is called converging lens.
23. In Laurent's polarimeter half shade plate is used.
24. Light which is vibrating in a single plane is referred to as polarized light.
25. Raman Effect supports wave theory.

IV Answer briefly:

26. What is the unit power of lens?

27. Why does interference occur?

28. What is diffraction?

29. What is polraised waves?

30. What is Raman effect?



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TIME : 2 ½ HOURS **MAX. MARKS : 70**

SECTION – B

Answer any FIVE of the following: (5 x 5 = 25)

1. The dispersive powers for crown and flint glass are 0.015 and 0.030 respectively. Calculate the focal lengths of the lenses which form an achromatic doublet of focal length 60 cm when placed in contact.
2. A grating has 1000 per m lines ruled on it. In the region of wavelengths 6000 find
 - i.) the difference between two wavelengths that just appear separated in the first order and
 - ii.) the resolving power in the second order spectrum
3. A grating is labelled '500 lines per mm. Calculate the spacing of the slits in the grating. Calculate the position of the first-order maximum when red light of wavelength 730 nm is shone directly at the grating.
4. Explain how you can use Nicol prism as polarizer and analyzer.
5. Give the applications of Raman effect.
6. A 20 cm long tube containing 48 cm³ of sugar solution produces an optical rotation of 11 when placed in a sauharimeter. If the specific rotation is 66° calculate the quantity of sugar contained in the tube in the form of a solution.
7. The inclined faces of a glass prism ($\mu = 1.5$) make angle of 1° with the base of the prism. The slit is 10cm from the biprism and is illuminated by light of $\lambda = 5900 \text{ \AA}$. Find the fringe width observed at a distance of 1 m from the biprism.

SECTION – C

Answer any THREE of the following: (3x15 =45)

8. Explain the construction and working of Ramsden's eyepiece.

9. Explain Newton's rings method for determining the wavelength of monochromatic light. Why is the centre of the rings dark in reflected light?
10. Discuss the Fraunhofer's diffraction at a single slit. Derive the necessary conditions for minima and maxima produced.
11. Explain optical activity. Explain the construction and working of Laurentz half shade polarimeter.
12. Explain Infra-red Spectrophotometer and give its applications.

