OPTICS: It is the branch of physics which deals with the study of light.

(1)RAY OPTICS: The study of light based on the concept of a ray, a pencil of rays, and a beam of light is known as Ray optics (or) Geometrical optics.

(2)WAVE OPTICS: The study of light based on the concept of wave (light propagation of light) is known as wave optics.

(1A)REFLECTION: Reflection of light is the process of deflecting a beam of light in the same medium.

(1A (i))SPHERICAL MIRROR: Concave spherical mirror and convex spherical mirror and new Cartesian sign convention.

(1A (ii))MIRROR FORMULA: Derivation of mirror formula both for concave mirror (real and virtual image) and convex mirror (virtual image). $(1/v + 1/u = 1/f)$

(1A (iii))MAGNIFICATION: Magnification – definition and formula $(m= -v/u = I/O)$.

***(1B)*REFRACTION:** The phenomenon of bending of light from one optical medium (denser (or) rarer) to another optical medium (denser (or) rarer) is called refraction of light.

(1B-1)REFRACTIVE INDEX – REAL DEPTH AND APPARENT DEPTH: Definition of refractive index, relative refractive index and the formula derivation for real depth and apparent depth-

$$\mu = \text{real depth/ apparent depth}$$

(1B (i))SPHERICAL REFRACTING SURFACE: The refracting surface which forms a part of a sphere of a transparent medium is called a spherical refracting surface.

New Cartesian sign convention for spherical refracting surface to be explained.

Derivation of Descartes' formula for refraction at a spherical surface

$$\mu_2/v - \mu_1/u = (\mu_2 - \mu_1)/R$$

(1B (ii))LENS MAKERS FORMULA: Derivation of lens maker's formula for double convex lens.

$$1/f = (\mu - 1)(1/R_1 - 1/R_2)$$

(1B (iii))LENS FORMULA & MAGNIFICATION: Concave lens and convex lens. New Cartesian sign conventions. Derivation of lens formula both for convex lens (real and virtual image) and concave lens (virtual image).

$$1/v - 1/u = 1/f$$

Magnification – definition and formula $(m=v/u=I/O)$

(1B (iv))TOTAL INTERNAL REFLECTION: Definition of total internal reflection; conditions for total internal reflection and derivation of relation between critical angle and refractive index.

$$1/\mu = \sin i_c$$

Applications of total internal reflectionand derivation of formula for refractive index through prism.

(1B (v))DISPERSION & SCATTERING: Dispersion and scattering of light with some examples.

(1B (vi))POWER OF LENS & ITS COMBINATION: Definition of power of lens, unit, formula and numerical based on combination of lenses. P = 1/f(m) = 100/f(cm)

(1C)OPTICAL INSTRUMENTS: Human eye, microscope and telescope-necessity and importance of optical instruments in daily life.

(1C-1)HUMAN EYE: Basic idea about different parts of human eye and defects of vision – myopia, hyperopia, presbyopia and astigmatism and their rectification with ray diagrams.

(1C (i))MICROSCOPE: Instrument used to see magnified image of small size object placed closed to the eye.

(1C (ii))TELESCOPE: Instrument used to see magnified image of distant object.

(1C (iii))SIMPLE MICROSCOPE: principle and magnification of simple microscope with ray diagrams when the image is formed at (i) least distance of distinct vision and (ii) infinity.

(1C (iv))COMPOUND MICROSCOPE: principle and magnification of compound microscope with ray diagrams when the image is formed at (i) least distance of distinct vision and (ii) infinity.

(1C(v))REFLECTING TELESCOPE: Cassegrain telescope – ray diagram, construction, working and magnification.

(1C (vi))REFRACTING TELESCOPE: Astronomical telescope – principle and magnification of astronomical telescope with ray diagrams when image formed at (i) least distance of distinct vision and (ii) infinity.

(2A)HUYGEN'S PRINCIPLE: Principle, formation of wavelets with diagram.

(2A (i))VERIFICATION OF REFLECTION: Verifying laws of reflection of light waves on the basis of Huygens wave theory with diagram.

(2A (ii))VERIFICATION OFREFRACTION: Verifying laws of refraction of light waves on the basis of Huygens wave theory with diagram. Also refraction of waves through prism, concave & convex (mirrors & lenses).

(2B)INTERFERENCE: The distribution of light energy due to superposition of two waves is called interference.

(2B (i))PRINCIPLE OF SUPERPOSITION: Explanation about constructive and destructive interference. Explanation about coherent sources and conditions for sustained interference.

(2B (ii))YOUNG'S DOUBLE SLIT EXPERIMENT: Analytical treatment of young's double slit experiment – derivation of formula for bright fringes and dark fringes – fringe width.

Intensity distribution curve in interference pattern.

(2C)DIFFRACTION: The phenomenon of bending of light waves around corners and spreading into the regions of geometrical shadow is called diffraction of light.

(2C (i))SINGLE SLIT EXPERIMENT: Derivation of fraunhoffer diffraction at a single slit – positions of maxima and minima.

Intensity distribution curve in diffraction pattern.

Difference between interference and diffraction.

Validity of ray optics – Fresnel distance.

Resolving power of microscope and telescope.

(2D)POLARISATION: A wave exhibiting different properties in different directions is said to be polarized and the phenomenon is referred to as the polarization.

(2D (i))PLANE POLARISATION: The plane within which the vibrations of the polarized light are confined is known as the plane of vibration.

A plane at right angles to the plane of vibration and passing through the direction of propagation of light is known as the plane of polarization.

Method of representing polarized light and ordinary light.

(2D (ii))BREWSTER'S LAW: When unpolarised light is reflected from a plane boundary between two transparent media, such as air and glass (or) air and water, the reflected light is partially polarized. The degree of polarization depends on the angle of incidence and the ratio of wave speeds in the two media.

At polarizing angle, the reflected and refracted beams are mutually perpendicular to each other.
$\mu = \tan i_p$

The refractive index of a transparent medium is equal to the tangent of the polarizing angle.

(2D(iii))POLAROIDS AND ITS APPLICATIONS: uses of polaroid.


CONCEPT MAP ON OPTICS
RAY OPTICS (1)
WAVE OPTICS (2)
REFLECTION (1A)
REFRACTION (1B)
OPTICAL INSTRUMENTS (1C)
HUMAN EYE (1C-1)
SPHERICAL MIRROR (1A (i))
MIRROR FORMULA (1A (ii)) & MAGNIFICATION (1A(iii))
MICROSCOPE (1C (i))
TELESCOPE (1C (ii))
SIMPLE MICROSCOPE (1C (iii))
COMPOUND MICROSCOPE (1C (iv))
REFRACTIVE INDEX- REAL DEPTH AND APPARENT DEPTH (1B-1)
REFLECTING TELESCOPE (1C(v))
REFRACTING TELESCOPE (1C (vi))
SPHERICAL REFRACTING SURFACE (1B (i))
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POLAROIDS AND ITS APPLICATIONS (2D(iii))