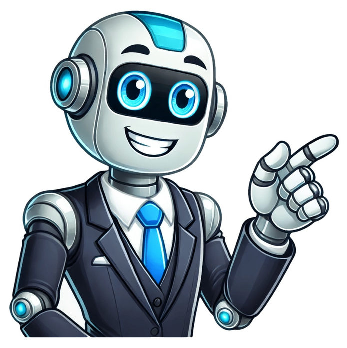

Spherical lens class 10 notes

A lens is a transparent refracting material with two surfaces or one surface that bounds it, used in various optical instruments like microscopes, telescopes, and cameras. Lenses come in two main types: convex and concave. Convex lenses are thicker at the center and thinner at the edges. They curve outward from both sides. Concave lenses are thinner in the middle and thicker on the edges. They curve inward from both sides. In simple terms, a lens that bends light rays toward or away from its center is called a convex or concave lens, respectively. A lens is categorized as a diverging lens since it separates light rays by causing them to diverge when they hit its surface, which is concave in nature. The diagram below illustrates a common biconcave lens used in laboratories. When parallel light beams travel along the principal axis of a concave lens, they spread out through it and appear as if they are passing through the focus. If a light ray passes through the center of curvature like a convex lens, it does not get refracted. A light ray that passes through the focal point is bent parallel to the principal axis. Watch the video to grasp the concept of spherical mirrors Class 10 Lenses work by dispersing or focusing light beams using refraction. The two primary types of lenses are concave and convex lenses. The main difference between a lens and a mirror lies in that light rays pass through a lens while being reflected off a mirror. Convex lenses are used in microscopes, cameras, contact lenses, etc. They converge straight light rays but concave lenses spread them out instead. Lenses are utilized in various imaging tools such as cameras, binoculars, and telescopes. They also serve to correct vision disorders like hypermetropia and myopia. Spherical lenses are widely used in various applications due to their ability to converge or diverge light rays. They come in two main types: convex lenses, which bend light towards each other, and concave lenses, which spread out light rays. #### Uses of Spherical Lenses: - **Magnifying Glass:** Convex lenses are used to magnify objects by focusing light. - **Corrective Lenses:** Both convex and concave lenses correct vision defects like myopia (nearsightedness) and hyperopia (farsightedness). - **Camera Lenses:** Convex lenses focus light in cameras, allowing for sharp images. - **Microscopes and Telescopes:** Convex lenses magnify distant or small objects in microscopes and telescopes. - **Peepholes:** Concave lenses provide a wider field of view by spreading out light rays. #### Key Concepts: - **Convex Lenses:** Converge light rays, forming real or virtual images at the focal point. Used for magnifying glasses, cameras, microscopes, and corrective lenses for farsightedness. - **Concave Lenses:** Diverge light rays, making them appear to come from a point behind the lens. Used in peepholes, laser systems, and corrective lenses for nearsightedness. - **Focal Length:** The distance from the center of the lens to the focal point where light converges (convex) or appears to diverge (concave). - **Power of a Lens:** Measured by its ability to converge or diverge light, calculated as the reciprocal of its focal length (P = 1/f), with diopters as the unit. - **Refractive Index:** A measure of how much a lens bends light, depending on the material and determining the degree of refraction. #### Formulas: - **Lens Formula:** 1/f = 1/v – 1/u, where v is the image distance, u is the object distance, and f is the focal length. - **Thin Lens Formula:** 1/f = (n – 1) [(1/R1) – (1/R2)], where R1 and R2 are the radii of curvature of the lens surfaces, and n is the refractive index. #### Applications: - **Eyeglasses:** Use convex or concave lenses to correct vision by bending light in such a way that it properly focuses on the retina. - **Magnifying Glass:** A convex lens that enlarges objects by focusing light to create a magnified virtual image. - **Telescopes:** Use convex lenses to focus light from distant objects and magnify them, allowing us to see faraway objects more clearly. #### Important Notes: - Convex lenses are used in magnifying glasses, cameras, microscopes, and corrective lenses for farsightedness. - Concave lenses are used in peepholes, laser systems, and corrective lenses for nearsightedness. - Spherical aberration occurs when light rays passing through the edges of a lens are focused at a different point than those passing through the center, causing image blur. CBSE Class 10 Science Notes Chapter 10 Light Reflection and Refraction: Reflection of Light The phenomenon where light bounces back into the same medium by a smooth surface is known as reflection. Incident light is the light that falls on the surface, while reflected light is the light that goes back after reflection. The angle of incidence refers to the angle between the incident ray and the normal, whereas the angle of reflection is the angle between the reflected ray and the normal. A mirror is a surface that can reflect light, with plane mirrors being flat surfaces and spherical mirrors being part of a hollow sphere. Spherical mirrors come in two types: convex mirrors, which diverge light, and concave mirrors, which converge light. The parameters of a mirror include its center of curvature, radius of curvature, pole, principal axis, aperture, and principal focus. Focal length is the distance between the pole and focus point. Rays of light that are parallel to the principal axis, pass through or appear from the center of curvature, or pass through or appear from the focus of a spherical mirror all have special properties after reflection. Concave mirrors are used in makeup mirrors, torches, car headlights, doctor's head-mirrors, and solar furnaces. Sign conventions for spherical mirrors involve measuring distances from the pole as the origin, with positive values for distances measured in the direction of incident rays and negative values for those opposite to the direction of incident rays. { 1 }{ f } =\frac { 1 }{ v } +\frac { 1 }{ u }\) Linear Magnification is the ratio of the image height to object height, given by \(m=\frac { { h }^{ ' } }{ h }\). Convex mirrors are used in rear view mirrors of vehicles and shop security mirrors. Refraction occurs when light passes from one medium to another, with speed of light varying between mediums. Refractive index represents the bending of light as it passes from one medium to another. There are two types of refractive indices: relative and absolute. The law of refraction states that incident, refracted, and normal rays all lie in the same plane and that the ratio of sine of angles is constant. Lenses can be convex or concave, with the center of curvature being the midpoint of the lens's curved surfaces. Principal axis is the line joining centers of curvature on both surfaces of a lens. Optical center is a point where light passes through without deviation and forms an image. Principal focus is the point on principal axis where parallel rays converge after passing through the lens. Light, a form of electromagnetic radiation, travels in straight lines until it interacts with other matter, such as mirrors or polished surfaces. The curvature center retraces its path after being reflected from the mirror. For mirrors, the following rules apply: if the object is in front of the mirror, u is -ve (real object); if it's behind the mirror, u is +ve (virtual object). Similarly, v is -ve if the image is in front of the mirror (real image) and +ve if it's behind (virtual image). The focal length of a concave mirror is considered -ve, while that of a convex mirror is +ve. Some questions to consider: What exactly is a lens? How many types of lenses exist? Can you describe a convex lens? What about a concave lens? Please draw examples of Bi-convex, plane-convex, and concavo-convex lenses. Additionally, illustrate Bi-concave, plane-concave, and convexo-concave lenses. Refraction by Spherical Lenses occurs when light passes through a transparent medium bounded by two refracting surfaces. There are two primary types of lenses: convex (or converging) and concave (or diverging). A convex lens can have two spherical surfaces or one spherical and one plane surface, with the characteristic of being thicker in the middle and thinner at the edges. There are three subtypes of convex lenses: Bi-convex, Plane-convex, and Concavo-convex. On the other hand, a concave lens also has three variations: Bi-concave, Plane-concave, and Convexo-Concave.

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