LIGHT

We can see when our eyes receive light from an object and our brain interprets the light messages received by our eyes. Light contains a lot of information about the object from which it originates, such as its color, shape, and movement.

The eyes must receive light and correctly focus it on the retina at the back of the eye in order to see clearly. Spectacles may be required to provide clear vision if an eye fails to focus light correctly.

BEHAVIOUR OF LIGHT سلوك الضوء

Light rays can travel in different directions or in the same direction. Types of light rays include:

- **parallel light rays**: Light travels from an object into our eyes by moving in straight lines. These lines are called light rays.

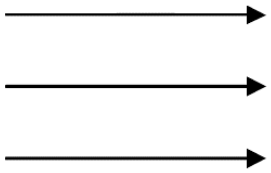

Figure 1 : Parallel light rays

- **convergent light rays**: Convergent light rays will meet at a focal point.

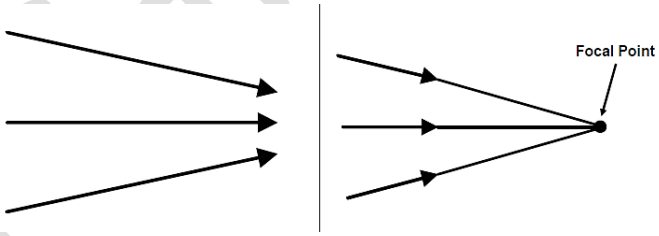

Figure 2 : Convergent light rays converge to a focal point

- **divergent light rays**: Divergent light rays come from an object less than 6 m from the eye.

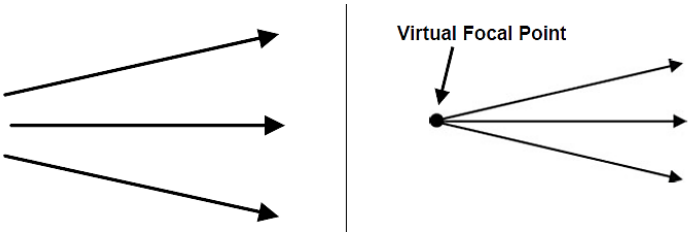

Figure 3 : *Divergent light rays*

OPTICAL MEDIUM الوسط البصري

Light rays can travel through any transparent (clear) material. A transparent material that lets light travel through it is called an optical medium.

An optical medium can be a:

- **gas (like air)**
- **liquid (like water)**
- **solid (like glass or clear plastic)**

REFRACTIVE INDEX معامل الانكسار

Every optical medium has a specific refractive index. It is ratio of the speed of light in a vacuum to that in a second medium of greater density

Light travels faster in a medium that has a low refractive index (like air), and slower in a medium that has a high refractive index (like glass).

Example:

Air has a refractive index of 1 and glass has a refractive index of 1.5.

This means that light travels 1.5 times faster in air than it does in glass.

REFLECTION الانعكاس

light ray will bounce off a surface when it reaches a smooth reflecting surface, such as a mirror.

***Law of reflection*: angle of incidence = angle of reflection**

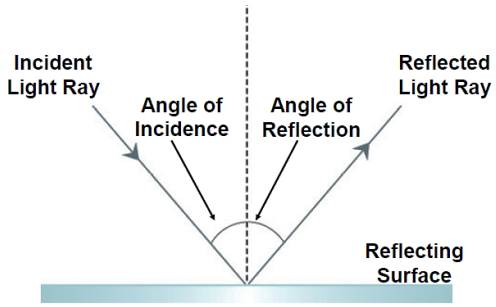

Figure 4 : Reflection

REFRACTION الانكسار

When a light ray travels from a medium with a lower refractive index into a medium with a higher refractive index, the light ray is bent towards the normal.

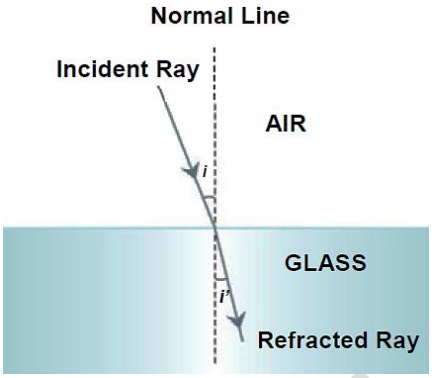

Figure 5 : Refraction

When a light ray travels from a medium with a higher refractive index (high density) into a medium with a lower refractive index (low density), the light ray is bent away from the normal.

LENSES

An optical lens (or simply a lens) is a piece of transparent material that is shaped so that it refracts light rays to focus at point – called the focal point. While prisms just bend light, lenses focus light.

Lenses are used for:

- **spectacles**
- **magnifying glasses**
- **microscopes**
- **slide projectors**

Lenses are usually made of glass or plastic, and they come in many shapes. The most common lens shapes are:

- **Spherical: plus and minus lenses**
- **Astigmatic: cylindrical and sphero-cylindrical lenses**

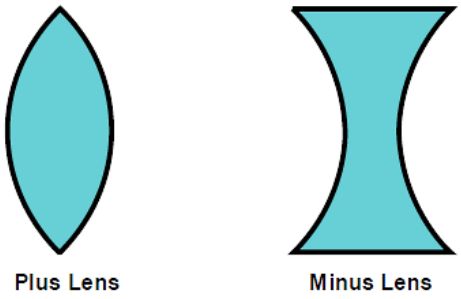

Figure 6 : Plus and minus lenses

A plus lens can be thought of as two prisms that are joined base to base.

A minus lens can be thought of as two prisms that are joined apex to apex.

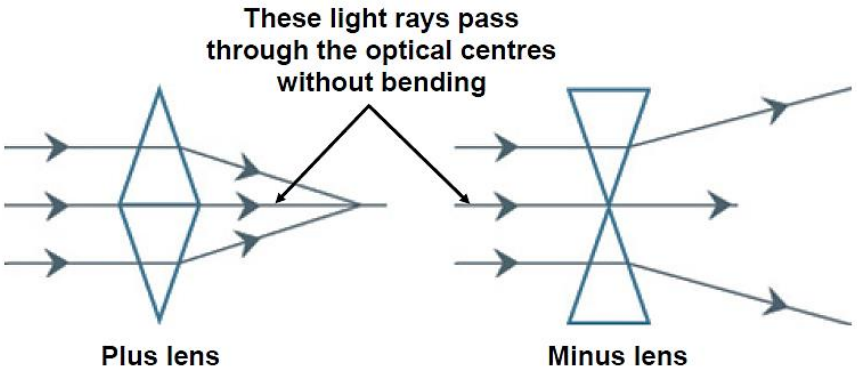

Figure 7 : Lenses can be thought of as prisms that are joined together

Optical Center: is the only part of a lens that a light ray can travel through without being refracted.

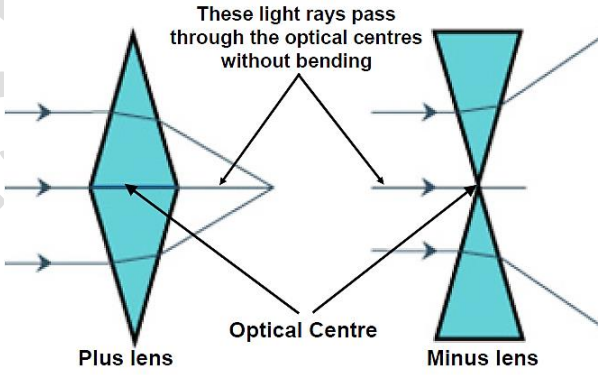

Figure 8 : Optical centers of a plus and minus lens