Reflection of light at curved surfaces

Concave mirror v/s convex mirror

Concave mirror:

Made by silvering the outer surface of a part of the hollow glass sphere.

Converging in nature.

Image may be real or virtual depending on the position of the object.

Image may be diminished, same size or magnified.

The examples of concave mirrors are the mirrors used in automobile head lights, reflecting telescopes, torch lights, etc.

Convex Mirror :

Made by silvering the inner surface of a part of the hollow glass sphere.

Diverging in nature.

Image is virtual.

Image is diminished.

The examples of convex mirrors are the mirrors used as rear side mirrors of vehicles, optical instruments, calling bell, etc.

Convergence and divergence of mirrors

If reflected rays converge to a single point after reflection, then this is called as converging behaviour of the mirror . This is observed when a real image is formed. These can be used in applications where all intensity of light is to be focused at a point.
If reflected rays appear to diverge from a single point, then this is called as diverging behaviour of the mirror . This is observed when a virtual image is formed. These can be used in applications where the intensity of light is to be spread over the required region.

Terms related to spherical mirrors

Centre of curvature (C): Centre of the sphere of which the mirror is a part.
Radius of curvature (R): Radius of the sphere of which the mirror is a part.
Pole (P/O): Geometric centre of the spherical surface of the mirror.
Principal axis: Straight line joining the pole of the mirror to its centre of curvature.

Define focus, focal length and focal plane of spherical mirrors

Focus
Definition:
For a concave mirror. The rays traveling parallel to the principal axis of a mirror after reflection pass through (converge at) a point F This point F is known as the principal focus of the concave mirror. It is a real point in front of a mirror.
For a convex mirror. The rays traveling parallel to the principal axis of a mirror after reflection appear to diverge from a point F on the principal axis. This point F is known as the principal focus of the convex mirror. It is a virtual point, i.e., behind the mirror.

Focal length
Definition:
The focal length (f) is the distance between the lens and the focal point.

Focal Plane:
Definition:
A vertical plane passing through the principal focus and which is perpendicular to the principal axis is called focal plane.

Definition
Focus, Focal length and focal plane of spherical mirrors

The plane through the focus perpendicular to the axis of a mirror or lens is called focal plane.

Image Formation from Spherical Reflecting Surfaces

The curved shining surface of a spoon acts as a mirror. The inner surface of a spoon acts like a concave mirror, while its outer surface acts like a convex mirror.Hence the inner surface of spoon shows inverted image and outer shows erect.

Virtual and Real images

Real Image:

Real image can be seen on the screen.

It is always inverted

It is formed when ray of light after reflection.refraction meet at some point

It is formed due to actual intersection of light ray.

Virtual Image :

Virtual images cannot be formed on the screen.

It is always erect.

It is formed when ray of light appear to meet at a point.

It is formed due to imaginary intersection of light ray.

Difference between real and virtual images formed by spherical mirrors
A real image is defined as one that is formed when rays of light are directed in a fixed point. A real image can be projected or seen on a screen. The best example of a real image is the one formed on a cinema screen.
A virtual image is defined as the opposite of a real image, therefore an image that cannot be obtained on a screen is referred to as a virtual image. The explanation for this is the fact that the rays of light that form a virtual image never converge therefore a virtual image can never be projected onto a screen. The best example of a virtual image is your reflection in the mirror.
Real images are produced by intersecting rays while virtual images are produced by diverging ra
Real images can be projected on a screen while virtual ones cannot.
Real images are formed by two opposite lens, concave and convex.
Virtual images are always upright while real images are always inverted.

Real and virtual image
Real image is formed by the actual intersection of light rays. It can be obtained on a screen. Hence, projectors form real images.
Virtual image is formed when the light rays appear to be originating from a point but does not actually meet. It can be seen by human eyes. Hence, rear-view mirrors form virtual images.

Magnification
Magnification is defined as the ration of height of image to height of object.
m=IO=−vu
Note:
Sign convention must be followed while using formula for magnification. Hence, it can be positive or negative.
|m|>1□ image is magnified.
|m|=1□ image is same size as object.
|m|<1□ image is diminished.

Magnification of mirrors

Magnification is the increase in the image size produced by spherical mirrors with respect to the object size. It is the ratio of the height of the image to the height of the object and is denoted as m. The magnification, m produced by a spherical mirror can be expressed as:

$$m = \frac{h}{h}$$

Here, h is the height of image and h is the height of the object.

Magnification is also equal to the ratio of image distance to the object distance.

$$m = \frac{v}{u}$$

As the object is always above the principal axis, the height of the object is always positive. But sign for image height may vary according to the type of image formed. The height of virtual images should be taken positive while the height of real images should be taken negative.