OBJECTIVE
Investigate reflection from a plane mirror and a curved mirror.

SUMMARY
Light rays are reflected by a mirror such that the angle of incidence is equal to the angle of reflection. This law of reflection applies not only to plane mirrors but also to curved ones. Only plane mirrors, though, reflect parallel incident rays in such a way that they remain parallel upon reflection. This is because the angle of incidence of all these parallel rays will be the same. For curved mirrors, concave and convex, parallel rays do not remain parallel after reflection. Instead, they are focussed towards a focal point.

REQUIRED APPARATUS

<table>
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<th>Quantity</th>
<th>Description</th>
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<tr>
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<td>Iris on Stem</td>
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<td>Object Holder on Stem</td>
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<td>1</td>
<td>Optical Disc with Accessories</td>
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<td>1</td>
<td>Set of 5 Slit and Hole Diaphragms</td>
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BASIC PRINCIPLES

Light rays are reflected by a mirror such that the angle of incidence is equal to the angle of reflection. This law of reflection applies not only to plane mirrors but also to curved ones. Only plane mirrors, though, reflect parallel incident rays in such a way that they remain parallel upon reflection. This is because the angle of incidence of all these parallel rays will be the same. For curved mirrors, concave and convex, parallel rays do not remain parallel after reflection. Instead, they are focussed towards a focal point.

If parallel light rays strike a plane mirror at angle \( \alpha \), the law of reflection indicates that they should be reflected to an angle \( \beta \):

\[
\alpha = \beta
\]

\( \alpha \): Angle of incidence, \( \beta \): Angle of reflection

In this experiment the angle of reflection will be measured directly for three parallel beams and it will be determined how this angle is related to the angle of incidence.

If a light ray which is parallel to the optical axis is incident upon a concave mirror, the law of reflection says that it will be reflected symmetrically about a normal to the point of incidence and will then cross the optical axis at the following distance from the mirror:

\[
f = \frac{r}{2(\cos \alpha)}
\]

\( f \): focal length, \( r \): radius of curvature, \( \alpha \): angle of incidence

\( f \) for a concave mirror is given by the following:

\[
f = \frac{r}{2}
\]

In the experiment the focal length of the concave mirror and the virtual focal length of the convex mirror will be determined from the paths of the rays on an optical disc. The validity of the law of reflection will be checked for the ray in the centre.

EVALUATION

Parallel light rays incident upon a plane mirror are reflected back as parallel rays. The law of reflection applies to this process.

When a beam of parallel rays is reflected by a concave mirror, the angle of incidence is different for each of the rays and all the rays are then focussed towards a focal point.

Similarly, when a beam of parallel rays is reflected by a convex mirror, the rays converge at a virtual focal point behind the mirror.

\[
f = \frac{r}{2(\cos \alpha)}
\]

\( f \): focal length, \( r \): radius of curvature, \( \alpha \): angle of incidence

Fig. 1: Schematic for determining focal length of a concave mirror and a convex mirror.

Fig. 2: Reflection of three parallel rays by a plane mirror.

Fig. 3: Reflection of three parallel rays by a concave mirror.

Fig. 4: Reflection of three parallel rays by a convex mirror.