The 17 Wallpaper Groups

1 - Group p1 -

The group $p_1$ contains only translations; there are no rotations, reflections, or glide reflections.

\[ \text{p1} \]

2 - Group p2 –

The group $p_2$ contains four rotation centres of order two (180°), but no reflections or glide reflections.

\[ \text{p2} \]
3 - Group pm –

The group \textbf{pm} has no rotations. It has reflection axes, they are all parallel.

\begin{center}
\includegraphics[width=0.5\textwidth]{pm.png}
\end{center}

4 - Group pg –

The group \textbf{pg} contains glide reflections only, and their axes are all parallel. There are no rotations or reflections.

\begin{center}
\includegraphics[width=0.5\textwidth]{pg.png}
\end{center}
5 - Group cm –

The group cm contains no rotations. It has reflection axes, all parallel. There is at least one glide reflection whose axis is *not* a reflection axis; it is halfway between two adjacent parallel reflection axes.

6 - Group pmm –

The group pmm has reflections in two perpendicular directions, and four rotation centres of order two (180°) located at the intersections of the reflection axes.
7 - Group pmg –

The group pmg has two rotation centres of order two (180°), and reflections in only one direction. It has glide reflections whose axes are perpendicular to the reflection axes. The centres of rotation all lie on glide reflection axes.

8 - Group pgg –

The group pgg contains two rotation centres of order two (180°), and glide reflections in two perpendicular directions. The centres of rotation are not located on the glide reflection axes. There are no reflections.
9 - Group cmm –

The group cmm has reflections in two perpendicular directions, and a rotation of order two (180°) whose centre is not on a reflection axis. It also has two rotations whose centres are on a reflection axis.

10 - Group p4 –

The group p4 has two rotation centres of order four (90°), and one rotation centre of order two (180°). It has no reflections or glide reflections.
11 - Group p4m –

The group \textbf{p4m} has two rotation centres of order four \((90^\circ)\), and reflections in four distinct directions (horizontal, vertical, and diagonals). It has additional glide reflections whose axes are not reflection axes; rotations of order two \((180^\circ)\) are centred at the intersection of the glide reflection axes. All rotation centres lie on reflection axes.

\begin{figure}
\centering
\includegraphics[width=0.5\textwidth]{p4m}
\caption{p4m}
\end{figure}

12 - Group p4g –

The group \textbf{p4g} has two centres of rotation of order four \((90^\circ)\), which are each other's mirror image, but it has reflections in only two directions, which are perpendicular. There are rotations of order two \((180^\circ)\) whose centres are located at the intersections of reflection axes. It has glide reflections axes parallel to the reflection axes, in between them, and also at an angle of 45° with these.

\begin{figure}
\centering
\includegraphics[width=0.5\textwidth]{p4g}
\caption{p4g}
\end{figure}
13 - Group \textit{p3} –

The group \textit{p3} has three different rotation centres of order three (120°), but no reflections or glide reflections.

14 - Group \textit{p3m1} –

The group \textit{p3m1} has three different rotation centres of order three (120°). It has reflections in the three sides of an equilateral triangle. The centre of every rotation lies on a reflection axis. There are additional glide reflections in three distinct directions, whose axes are located halfway between adjacent parallel reflection axes.
15 - Group p31m –

The group $p31m$ has three different rotation centres of order three ($120^\circ$), of which two are each other's mirror image. It has reflections in three distinct directions. It has at least one rotation whose centre does not lie on a reflection axis. There are additional glide reflections in three distinct directions, whose axes are located halfway between adjacent parallel reflection axes.

16 - Group p6 –

The group $p6$ has one rotation centre of order six ($60^\circ$); it has also two rotation centres of order three, which only differ by a rotation of $60^\circ$ (or, equivalently, $180^\circ$), and three of order two, which only differ by a rotation of $60^\circ$. It has no reflections or glide reflections.
17 - Group p6m –

The group p6m has one rotation centre of order six (60°); it has also two rotation centres of order three, which only differ by a rotation of 60° (or, equivalently, 180°), and three of order two, which only differ by a rotation of 60°. It has also reflections in six distinct directions. There are additional glide reflections in six distinct directions, whose axes are located halfway between adjacent parallel reflection axes.

The above information and diagrams were obtained from the Wikipedia Wallpaper Article found at http://en.wikipedia.org/wiki/Wallpaper_group