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SOLID STATE PHYSICS (PH-332)
CHAPTER- I
THE CRYSTALLINE STATE
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There are number of ways in which actual crystal structure may be built.

- **Bravais Lattices**: Bravais shown that 5 different lattices can be generated in which lattice points arranged in 2D space such that each point will have identical surroundings. These are known as Bravais lattices.

- Two dimensional lattice is represented by vectors $a$ and $b$ and and angle between them is denoted by $\theta$.

- Based on the relation in between $a$, $b$ and value of $\theta$ the following crystal systems exists in 2D.
1. Oblique lattice:
   i. In this type $a \neq b$ and angle between $a$ and $b$ ($\theta$) is different from $90^\circ$ or $120^\circ$.
   ii. The conventional unit cell is a parallelogram.

2. Square lattice:
   i. In this type $a = b$ and $\theta = 90^\circ$
   ii. The conventional unit cell is square.
3. Hexagonal lattice:

i. In this type $a=b$ and $\theta = \frac{2\pi}{3}$ or $120^\circ$.

ii. A regular hexagon is formed when all the nearby lattice points about a given lattice point $O$ are connected as indicated in Fig.

iii. The primitive cell is a rhombus of $120^\circ$. 
4. Rectangular lattice:

i. In this type $a \neq b$ but $\theta = \frac{\pi}{2}$ or $90^\circ$.

ii. The conventional unit cell is a rectangular.
5. Centered rectangular lattice:

i. In this type of lattice, \(a \neq b\) but \(\theta = \pi/2\) or \(90^\circ\).

ii. The conventional unit cell is a rectangular with an additional atom at the centre of the unit cell.