International Tables for Crystallography (2012). Vol. F, Figure 2.1.3.3, p. 52.

Table 2.1.3.3
The icosahedral point group 532

For details see Table 2.1.3.1. Adapted with permission from *IT* A (2005), Table 10.1.4.3.

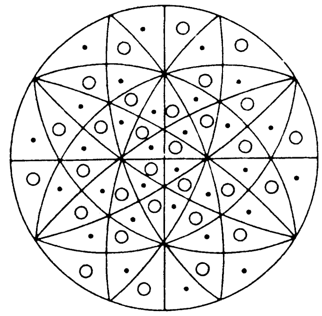
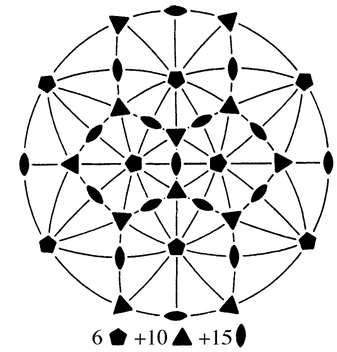
ICOSAHEDRAL	532		

Table 2.1.3.4
The seven crystal systems

Crystal system	Conditions imposed on cell geometry	Minimum point-group symmetry
Triclinic	None	1
Monoclinic	Unique axis b: $\alpha = \gamma = 90^\circ$	2
Orthorhombic	$\alpha = \beta = \gamma = 90^\circ$	222
Tetragonal	$a = b$; $\alpha = \beta = \gamma = 90^\circ$	4
Trigonal	Hexagonal axes: $a = b$; $\alpha = \beta = 90^\circ$; $\gamma = 120^\circ$	3
	Rhombohedral axes: $a = b = c$; $\alpha = \beta = \gamma$ †	
Hexagonal	$a = b$; $\alpha = \beta = 90^\circ$; $\gamma = 120^\circ$	6
Cubic	$a = b = c$; $\alpha = \beta = \gamma = 90^\circ$	23

† A rhombohedral unit cell can be regarded as a cube extended or compressed along the body diagonal (the threefold axis) (see Fig. 2.1.3.2).

has three mutually perpendicular twofold (screw) axes. Another convention is that in tetragonal, trigonal and hexagonal crystals, the axis of highest symmetry is labelled c. These conventions can deviate from the guide rules for unit-cell choice given in Section 2.1.1.

The seven crystal systems are based on the point-group symmetry. Except for the triclinic unit cell, all other cells can occur either as primitive unit cells or as centred unit cells (Section 2.1.1). A total of 14 different types of unit cell exist, depicted in Fig. 2.1.3.3. Their corresponding crystal lattices are commonly called Bravais lattices.

2.1.4. Basic diffraction physics

2.1.4.1. Diffraction by one electron

The scattering of an X-ray beam by a crystal results from interaction between the electric component of the beam and the electrons in the crystal. The magnetic component has hardly any effect and can be disregarded.

If a monochromatic polarized beam hits an electron, the electron starts to oscillate in the direction of the electric vector of the incident beam (Fig. 2.1.4.1). This oscillating electron acts as the aerial of a transmitter and radiates X-rays with the same or lower frequency as the incident beam. The frequency change is due to the Compton effect: the photons of the incident beam collide with the electron and lose part of their energy. This is inelastic scattering, and the scattered radiation is incoherent with the incident beam. Compton scattering contributes to the background in a diffraction experiment. In elastic scattering, the scattered radiation has the same wavelength as the incident

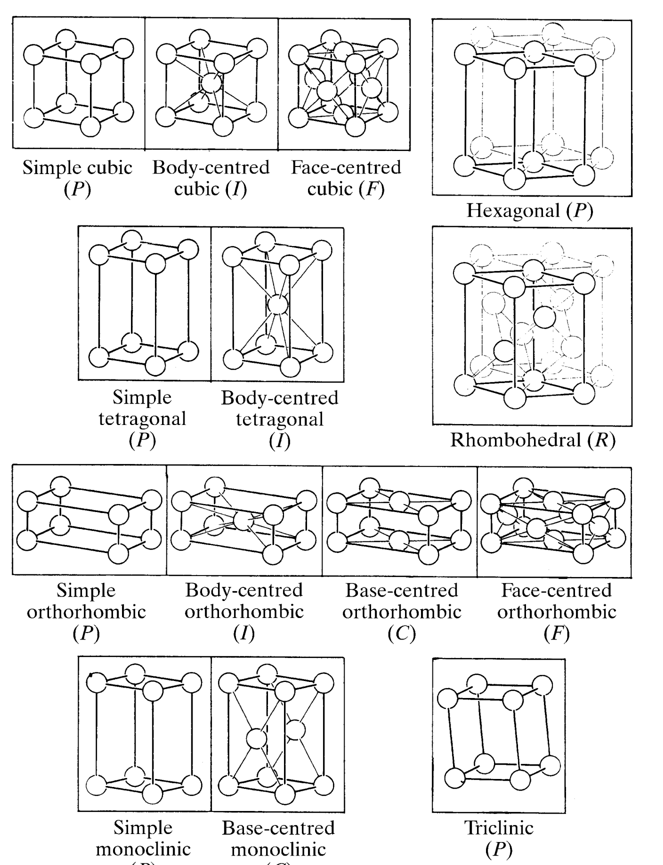


Figure 2.1.3.3
The 14 Bravais lattices. Reproduced with permission from Burzlaff & Zimmermann (2005).

references