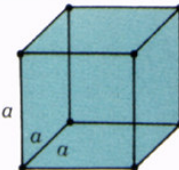
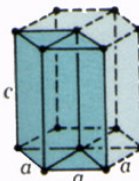
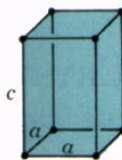
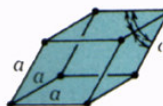
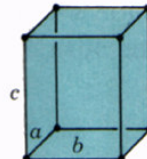
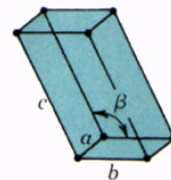
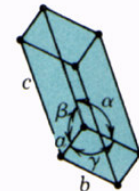
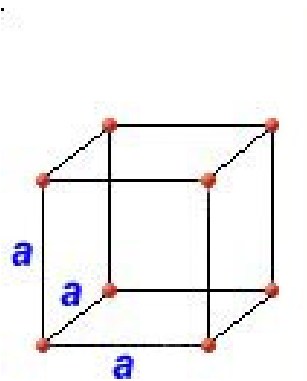
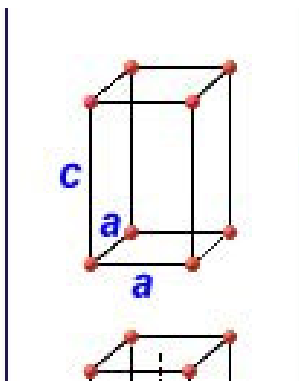
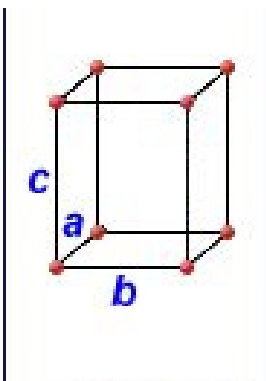
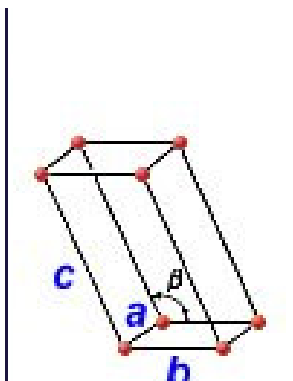
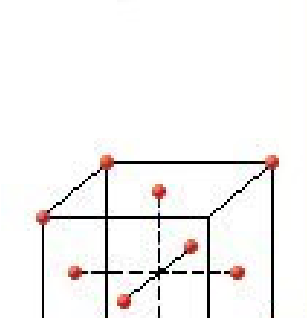
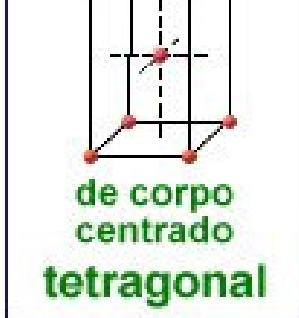
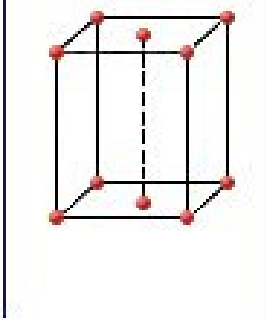
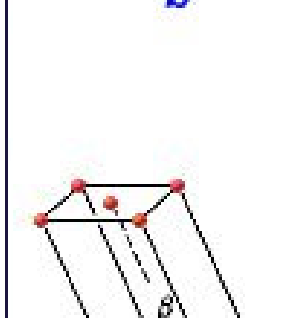
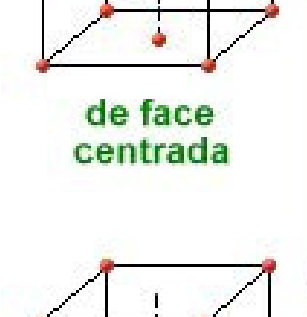
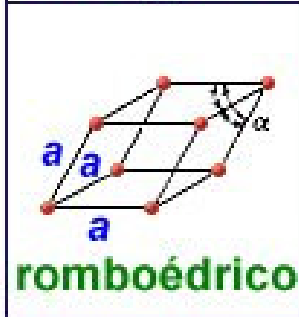
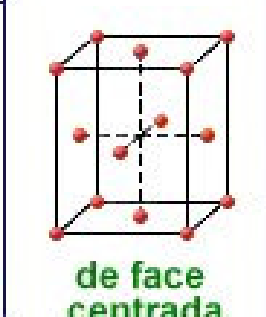
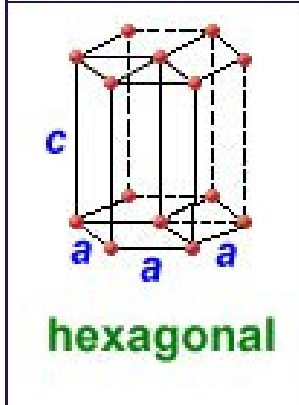
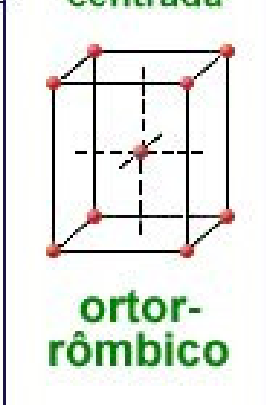
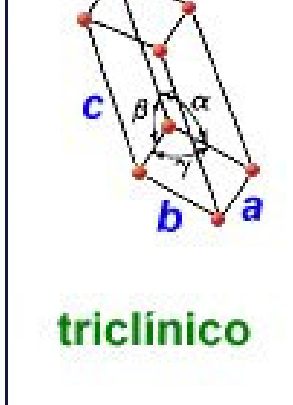


Os 7 Sistemas Cristalinos

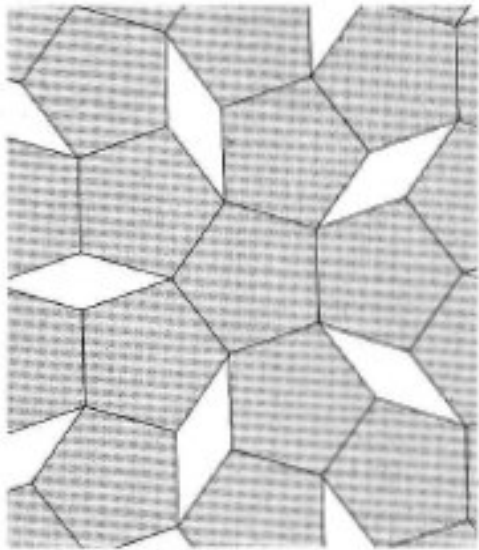
Table 3.2 Lattice Parameter Relationships and Figures Showing Unit Cell Geometries for the Seven Crystal Systems

<i>Crystal System</i>	<i>Axial Relationships</i>	<i>Interaxial Angles</i>	<i>Unit Cell Geometry</i>
Cubic	$a = b = c$	$\alpha = \beta = \gamma = 90^\circ$	
Hexagonal	$a = b \neq c$	$\alpha = \beta = 90^\circ, \gamma = 120^\circ$	
Tetragonal	$a = b \neq c$	$\alpha = \beta = \gamma = 90^\circ$	
Rhombohedral	$a = b = c$	$\alpha = \beta = \gamma \neq 90^\circ$	
Orthorhombic	$a \neq b \neq c$	$\alpha = \beta = \gamma = 90^\circ$	
Monoclinic	$a \neq b \neq c$	$\alpha = \gamma = 90^\circ \neq \beta$	
Triclinic	$a \neq b \neq c$	$\alpha \neq \beta \neq \gamma \neq 90^\circ$	

As 14 Redes de Bravais

			
 <p>de face centrada</p>	 <p>de corpo centrado tetragonal</p>		
 <p>de corpo centrado cúbico</p>	 <p>romboédrico</p>	 <p>de face centrada</p>	<p>monoclinico</p>
	 <p>hexagonal</p>	 <p>ortor- rômbico</p>	 <p>triclinico</p>

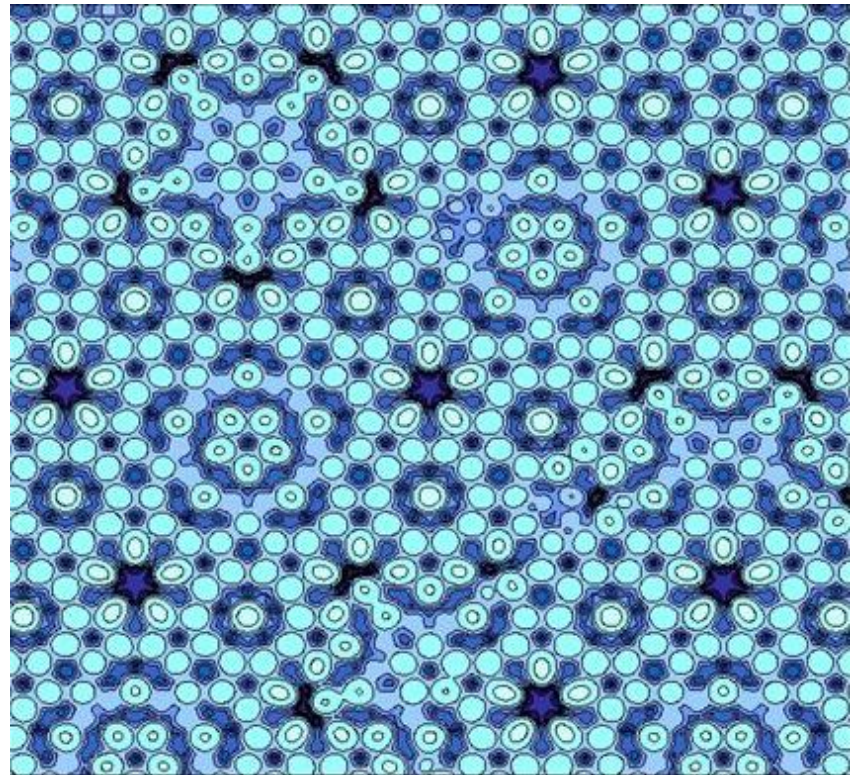
Impossibilidade da Simetria da 5-a Ordem nos Cristais. Quasicristais



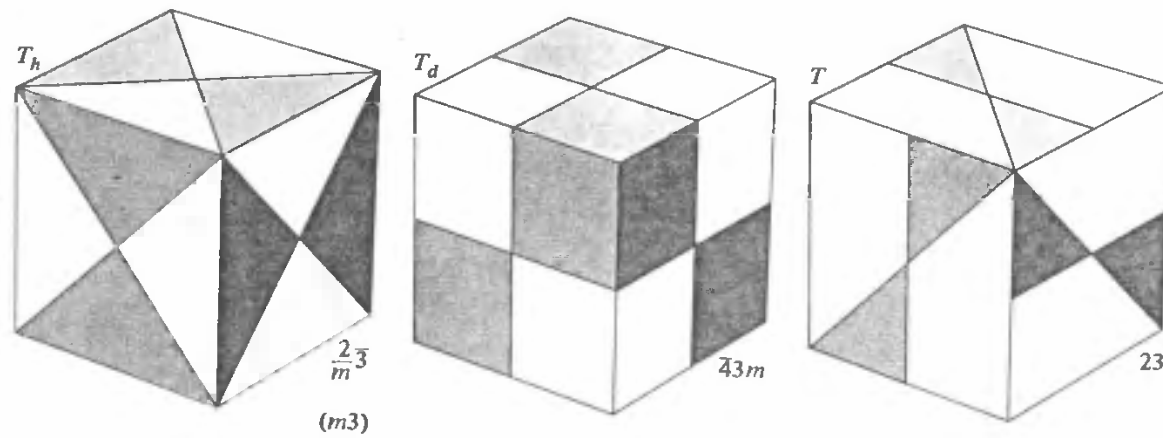
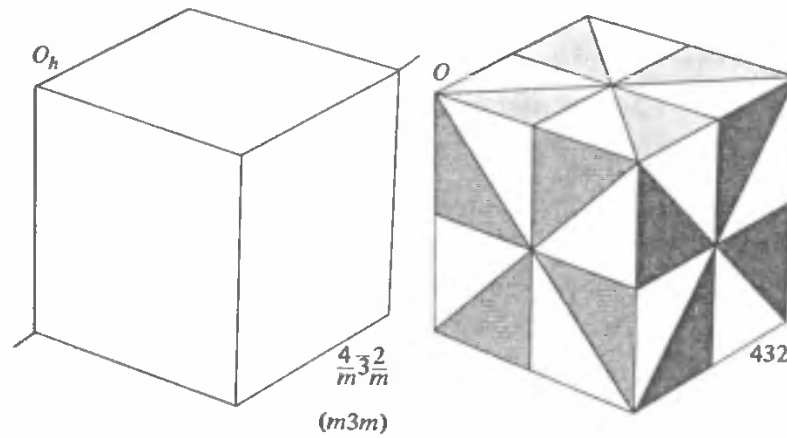
A simetria de rotação de 5-a ordem não é compatível com a simetria de translação.

No entanto, podem existir objectos aperiódicos com ordem de longo alcance.


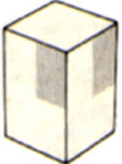




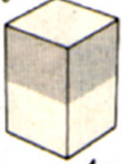






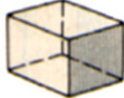
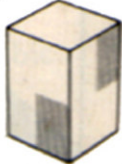


[Dan Shechtman “*Metallic Phase with Long-Range Orientational Order and No Translational Symmetry*” (Prémio Nobel de Química de 2011)]




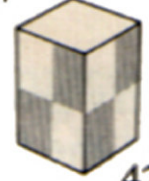


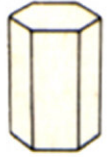
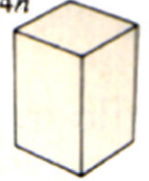


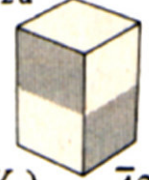

Grupos Pontuais de Simetria Cúbica



THE NONCUBIC CRYSTALLOGRAPHIC POINT GROUPS^a

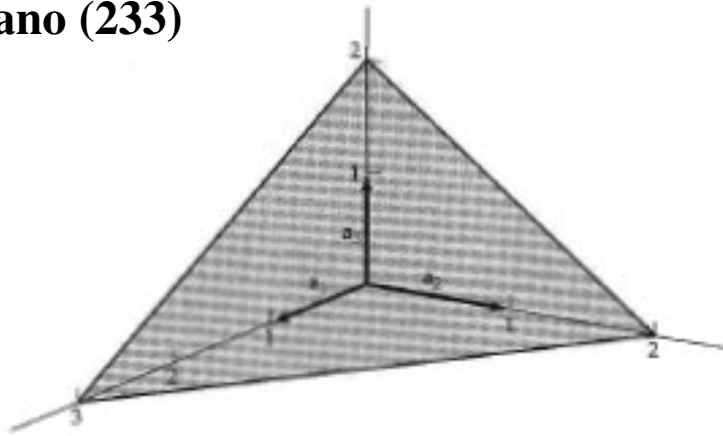
SCHOENFLIES	HEXAGONAL	TETRAGONAL	TRIGONAL	ORTHO-RHOMBIC	MONOCLINIC	TRICLINIC	INTER-NATIONAL
C_n	C_6  6	C_4  4	C_3  3		C_2  2	C_1  1	n
C_{nv}	C_{6v}  6mm	C_{4v}  4mm	C_{3v}  3m	C_{2v}  2mm			$nm\bar{m}$ (n even) nm (n odd)
C_{nh}	C_{6h}  6/m	C_{4h}  4/m			C_{2h}  2/m		n/m
	C_{3h}  $\bar{6}$				C_{1h} ($\bar{2}$)  m		\bar{n}
S_n		S_4  $\bar{4}$	S_6  (C_{3i}) $\bar{3}$			S_2  (C_i) $\bar{1}$	

THE NONCUBIC CRYSTALLOGRAPHIC POINT GROUPS (continued)

D_n	D_6  622	D_4  422	D_3  32	D_2  $(V) \quad 222$			$n2\mathcal{C}$ $(n \text{ even})$ $n2$ $(n \text{ odd})$
D_{nh}	D_{6h}  $6/mmm$	D_{4h}  $4/mmm$		$D_{2h} \quad (mmm)$  $(V_h) \quad 2/mmm$			$\frac{n}{m} \frac{2}{m} \frac{2}{m}$ (n/mmm)
	D_{3h}  $\bar{6}2m$						$\bar{n}2m$ $(n \text{ even})$
D_{nd}		D_{2d}  $(V_d) \quad \bar{4}2m$	$D_{3d} \quad (\bar{3}m)$  $\bar{3} \frac{2}{m}$				$\bar{n} \frac{2}{m}$ $(n \text{ odd})$

Índices de Miller

$x_0=3a, y_0=2b, z_0=2c \rightarrow l=2, m=3, n=3$;
plano (233)



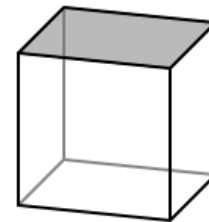
Num cristal cúbico:

vector normal a um plano cristalino com os índices de Miller (hkl):

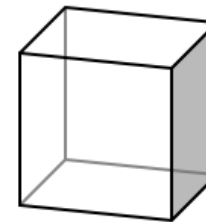
$$\vec{n}_{hkl} = h\vec{a}_1 + k\vec{a}_2 + l\vec{a}_3$$

distância entre os planos equivalentes:

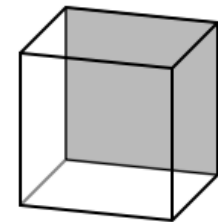
$$d_{hkl} = a / \sqrt{h^2 + k^2 + l^2}$$



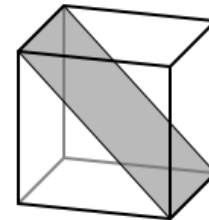
(001)



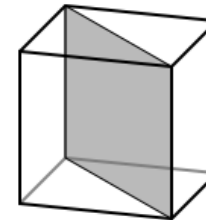
(100)



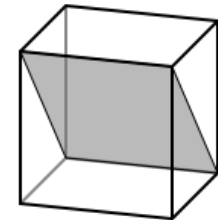
(010)



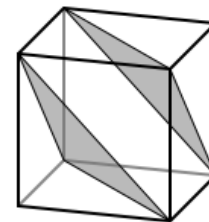
(101)



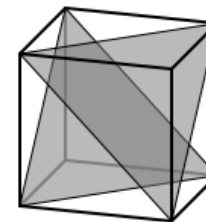
(110)



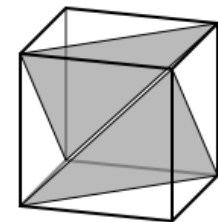
(011)



(111)



(111)

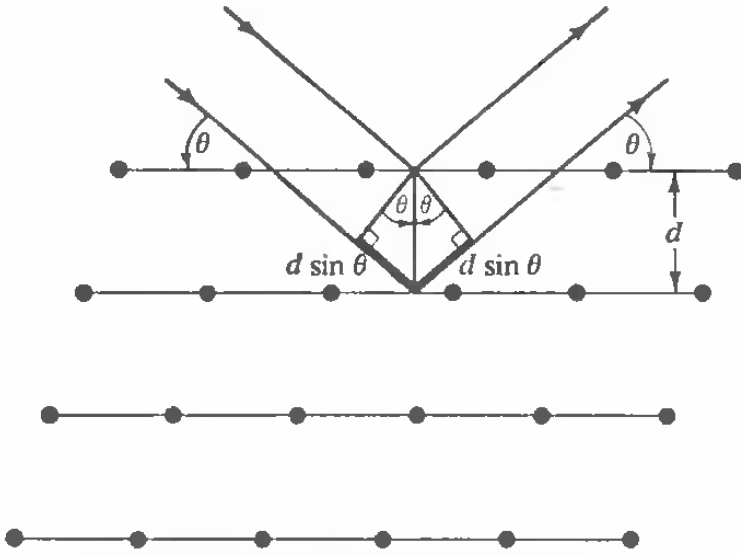
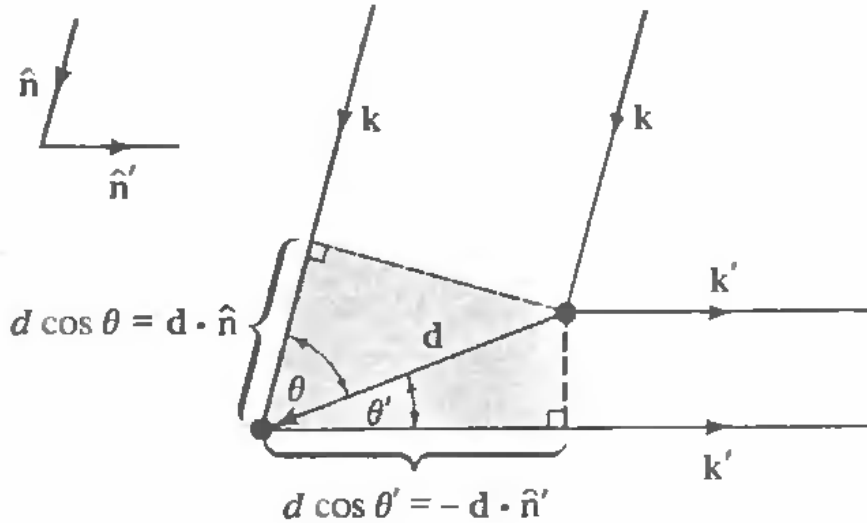


(111)

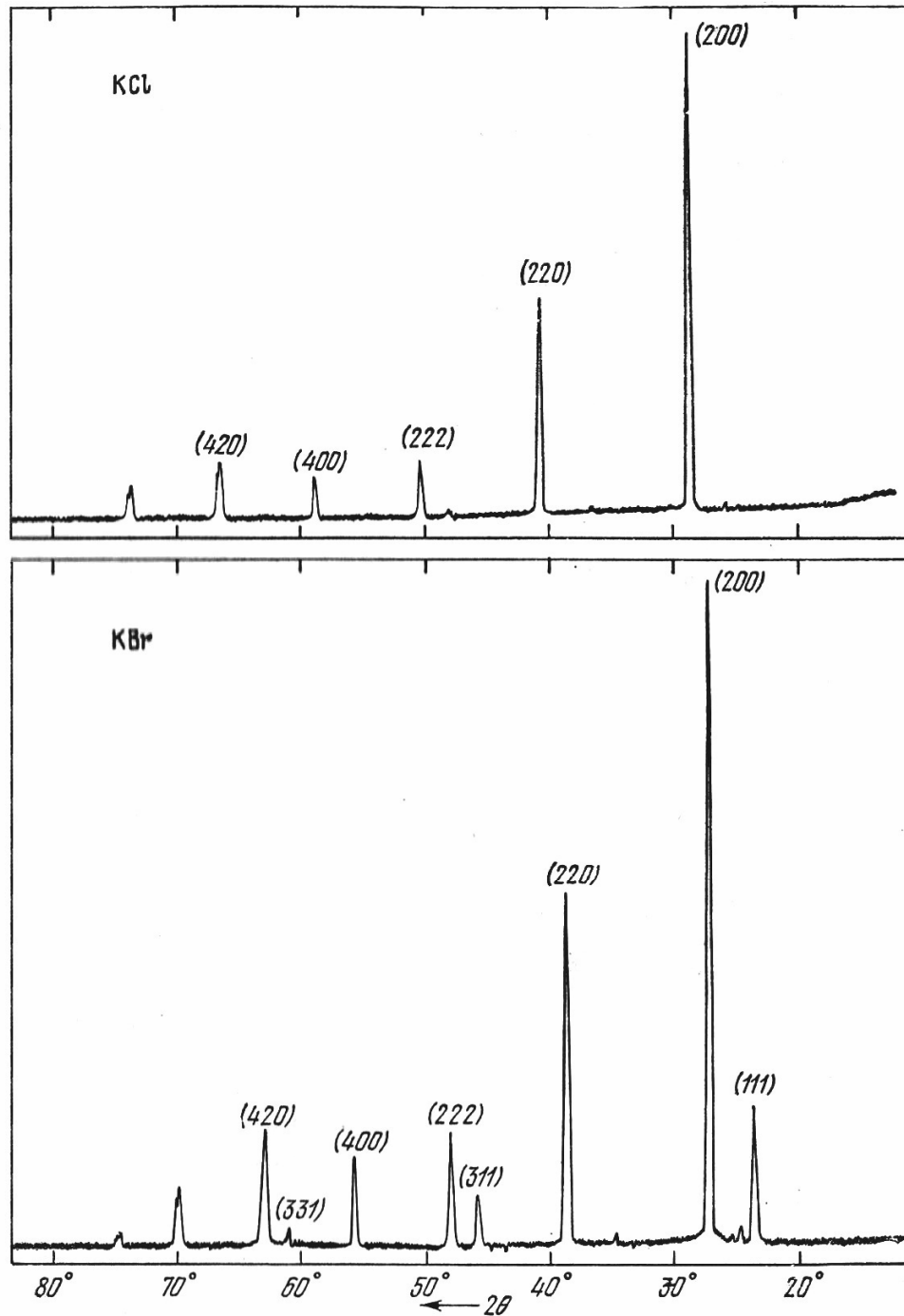
Algumas Redes com Base

Estrutura de CsCl		Estrutura de NaCl (sal)		Estrutura de ZnS (blenda)	
<p style="text-align: center;">● Cs ○ Cl</p>		<p style="text-align: center;">● Na ○ Cl</p>		<p style="text-align: center;">● Zn ○ S</p>	
Substância	$a, \text{\AA}^\circ$	Substância	$a, \text{\AA}^\circ$	Substância	$a, \text{\AA}^\circ$
CsCl	4.12	LiF	4.02	CuCl	5.41
CsBr	4.29	NaCl	5.64	ZnS	5.41
CsI	4.57	KCl	6.20	GaAs	5.65
TlCl	3.83	AgCl	5.55	SiC	4.35

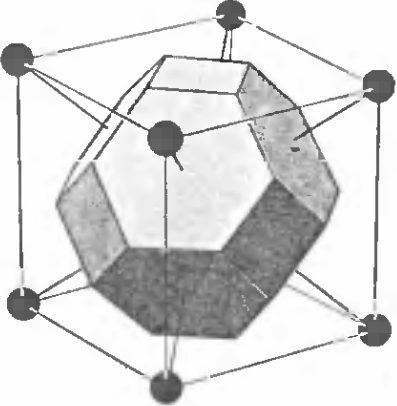
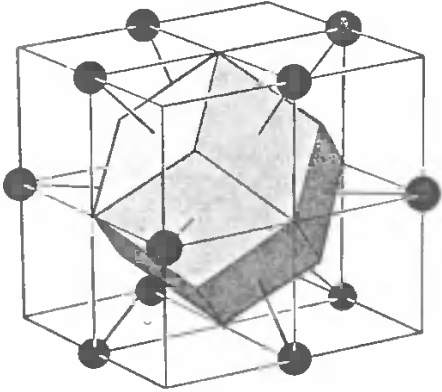
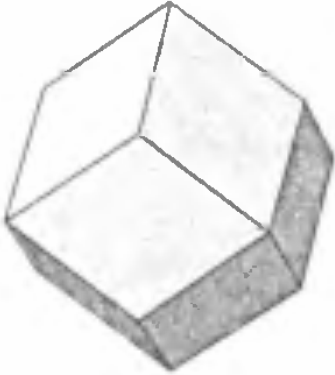
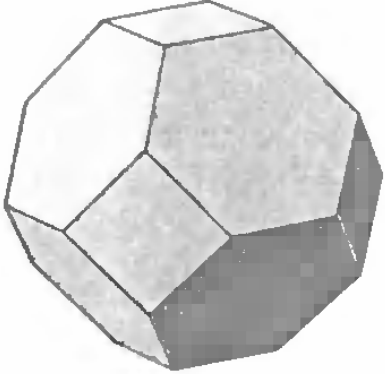
Difração de Raios X nos Cristais

Bragg	Laue
	
$n\lambda = 2d \sin \vartheta$	$\vec{d} \cdot (\vec{n} - \vec{n}') = m\lambda;$ $\vec{d} \cdot (\vec{k} - \vec{k}') = 2\pi m$

Difractogramas de Raios X dos Cristais de KCl e KBr

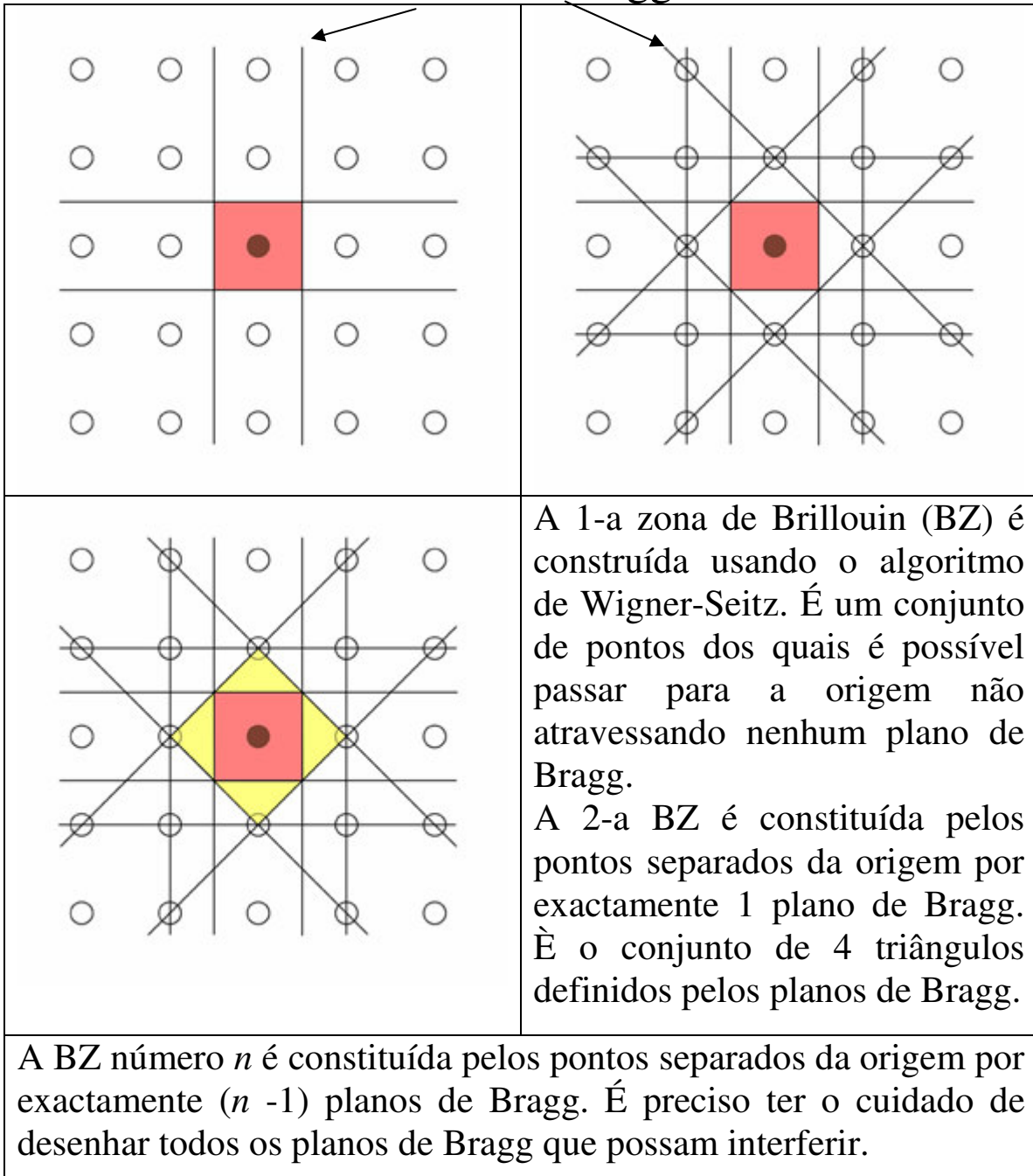


**A Célula de Wigner-Seitz
E a 1-a Zona de Brillouin das
Redes de Bravais Cúbicas**

Rede cúbica de corpo centrado (I)	Rede cúbica de faces centradas (F)
	
 Rombododecaedro	 Octaedro truncado

As Primeiras Zonas de Brillouin para Uma Rede Quadrada

Planos de Bragg



Deslocações em Cristais

