

Octahedral dimensions

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<http://homepage.mac.com/whitby/>

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<http://web.me.com/whitby/Octahedron/Welcome.html>

Reference

1. Octahedron1stEd.pdf by Robert William Whitby

The octahedral periodicity of the atomic elements and its implications, 500 pages

<http://homepage.mac.com/whitby/FileSharing103.html>

Introduction

This chapter has been excerpted from Reference 1.

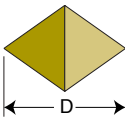
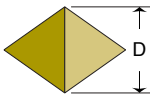
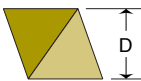
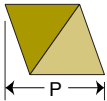
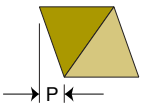
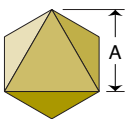
OCTAHEDRON

twelve edges, and six vertexes. The edges are the same length, the faces are triangular. In the following table the dimensions are expressed using the length of the edge, s .

Octahedron: Faces, edges, and vertexes

The regular octahedron has eight faces,

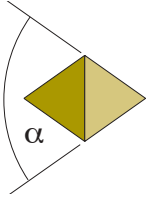
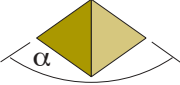
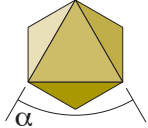
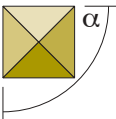
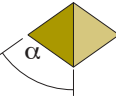

Table 1: Octahedron: dimensions

	Description	Expression
	Vertexial diameter	$D = s \times \sqrt{2}$
	Edgial diameter	$D = s$
	Facial diameter	$D = s \times \sqrt{\frac{2}{3}}$
	Projection of vertexial diameter on facial plane	$P = s \times \frac{2}{\sqrt{3}}$
	Projection of altitude of face upon plane of adjacent face	$P = \frac{s}{2\sqrt{3}}$
	Altitude of face	$A = s \times \frac{\sqrt{3}}{2}$

The angular relationships between the topological features of the octahedron are shown in

the next table.

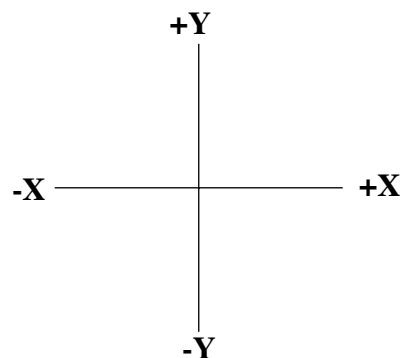
Table 2: Octahedron: angles

	Description	Expression	Degrees
	Between faces across vertex	$\alpha = \text{atan} \sqrt{8}$	70°31'43"
	Between faces at edge	$\alpha = 2 \times \text{atan} \sqrt{2}$	109°28'16"
	Between edges on face	$\alpha = \text{atan} \sqrt{3}$	60° exact
	Between edges across vertex	$\alpha = 2 \times \text{atan} 1$	90° exact
	Between face and edgial equator	$\alpha = \text{atan} \sqrt{2}$	54°44'08"
	Between face and vertexial diameter	$\alpha = \text{atan} \sqrt{\frac{1}{2}}$	35°15'51"

Octahedron: Graphical representations

To show the symmetry of an assembly of atoms or to give a true geometrical representation the orthographic projection is used. The table presented here shows the principal projections of the octahedron. The graphic coordinates listed in the table have their origin at the centroid of the octahedron which lies at the intersection of lines joining opposite vertexes. **+X** is towards the right and **-X** is toward the left; **+Y** is towards the top of the page and **-Y** is towards the bottom of the page; **+Z** is towards the reader and **-Z** is away from the

reader.



+Z towards; **-Z** away

Table 3: Octahedron: orthographic views

	vertex	xdelt	ydelt	zdelt
	1	0	1	0
	2	0.707107	0	0.707107
	3	-0.70711	0	0.707107
	4	-0.70711	0	-0.70711
	5	0.707107	0	-0.70711
	6	0	1	0
	1	0.816497	-0.57735	0
	2	0.408248	0.57735	0.707107
	3	-0.40825	-0.57735	0.707107
	4	-0.40825	-0.57735	-0.70711
	5	0.408248	0.57735	-0.70711
	6	-0.8165	0.57735	0
	1	1	0	0
	2	0	0.707107	0.707107
	3	0	-0.70711	0.707107
	4	0	-0.70711	-0.70711
	5	0	0.707107	-0.70711
	6	-1	0	0

Table 3: Octahedron: orthographic views

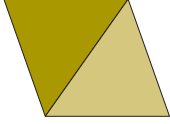
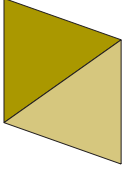
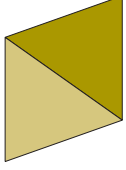
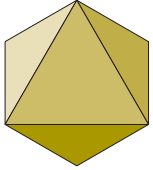
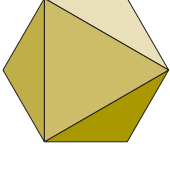
	vertex	xdelt	ydelt	zdelt
	1	0.816497	0.57735	0
	2	-0.40825	0.57735	0.707107
	3	0.408248	-0.57735	0.707107
	4	0.408248	-0.57735	-0.70711
	5	-0.40825	0.57735	-0.70711
	6	-0.8165	-0.57735	0
	1	0.57735	0.816497	0
	2	-0.57735	0.408248	0.707107
	3	0.57735	-0.40825	0.707107
	4	0.57735	-0.40825	-0.70711
	5	-0.57735	0.408248	-0.70711
	6	-0.57735	-0.8165	0
	1	-0.57735	0.816497	0
	2	-0.57735	-0.40825	0.707107
	3	0.57735	0.408248	0.707107
	4	0.57735	0.408248	-0.70711
	5	-0.57735	-0.40825	-0.70711
	6	0.57735	-0.8165	0
	1	0	-0.8165	0.57735
	2	0.707107	0.408248	0.57735
	3	-0.70711	0.408248	0.57735
	4	-0.70711	-0.40825	-0.57735
	5	0.707107	-0.40825	-0.57735
	6	0	0.816497	-0.57735
	1	0.816497	0	0.57735
	2	-0.40825	0.707107	0.57735
	3	-0.40825	-0.70711	0.57735
	4	0.408248	-0.70711	-0.57735
	5	0.408248	0.707107	-0.57735
	6	-0.8165	0	-0.57735

Table 3: Octahedron: orthographic views

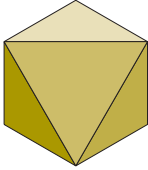
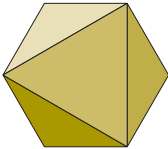
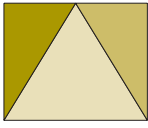
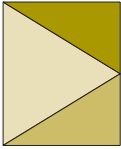
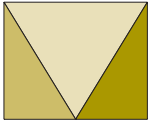
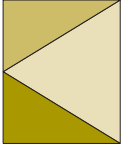
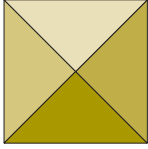
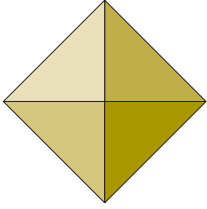
	vertex	xdelt	ydelt	zdelt
	1	0	0.816497	0.57735
	2	-0.70711	-0.40825	0.57735
	3	0.707107	-0.40825	0.57735
	4	0.707107	0.408248	-0.57735
	5	-0.70711	0.408248	-0.57735
	6	0	-0.8165	-0.57735
	1	-0.8165	0	0.57735
	2	0.408248	-0.70711	0.57735
	3	0.408248	0.707107	0.57735
	4	-0.40825	0.707107	-0.57735
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	3	0.57735	0.707107	0.408248
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	3	-0.70711	0.57735	0.408248
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	5	0.707107	-0.57735	-0.40825
	6	0	-0.57735	-0.8165

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	4	0.57735	-0.70711	-0.40825
	5	0.57735	0.707107	-0.40825
	6	0.57735		-0.8165
	1	0	0	1
	2	0.707107	0.707107	0
	3	0.707107	-0.70711	0
	4	-0.70711	-0.70711	0
	5	-0.70711	0.707107	0
	6	0	0	-1
	1	0	0	1
	2	0	1	0
	3	1	0	0
	4	0	-1	0
	5	-1	0	0
	6	0	0	-1

