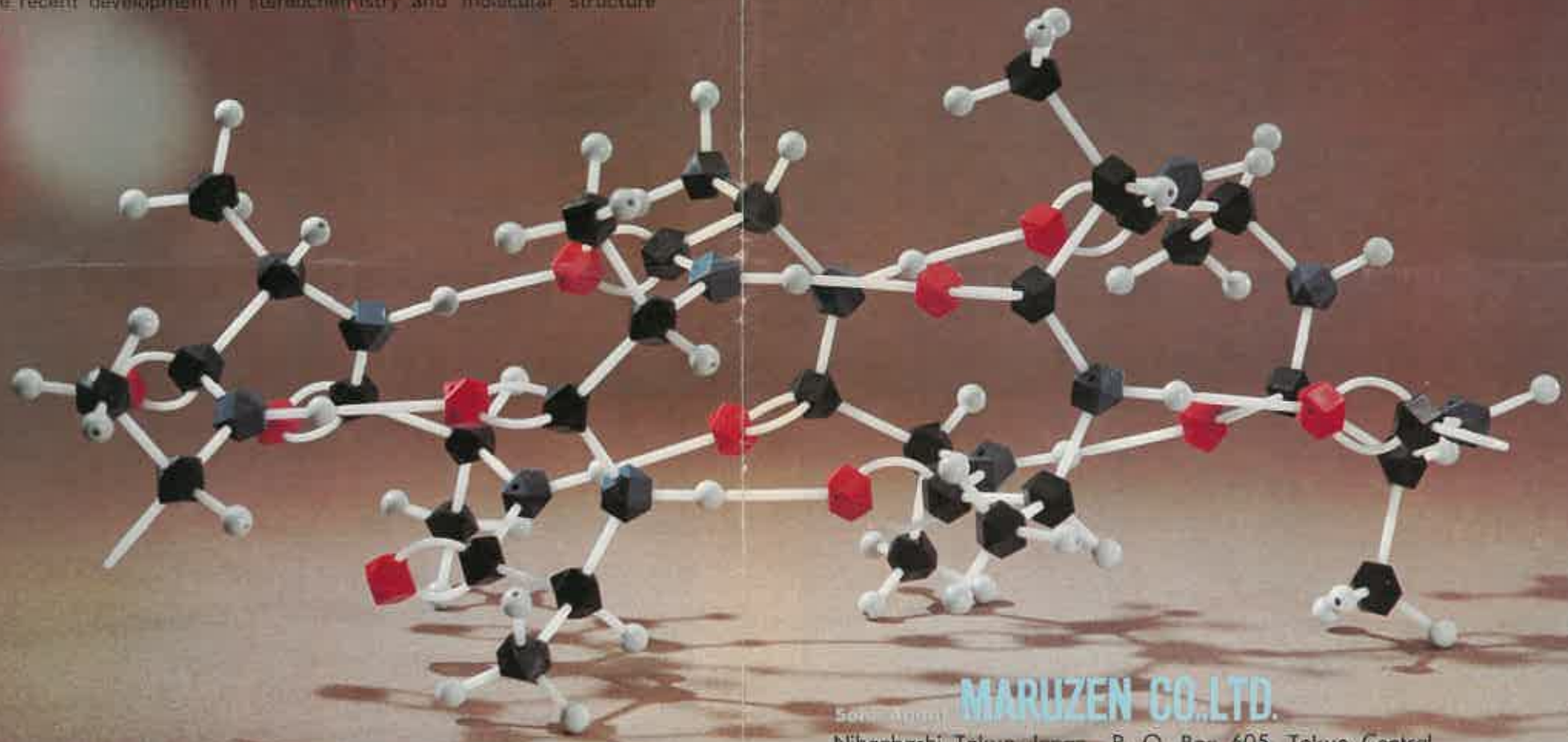
HGS MOLECULAR STRUCTURE MODELS

Our new products, HGS Molecular Structure Models are designed and manufactured for the use of students and researchers in the fields of organic chemistry, inorganic chemistry, crystallography and others under the guidance of Professor Kazuo Hata, Tokyo Metropolitan University and Assistant Professor Masayoshi Nakahara, St. Paul University, to meet with the recent development in stereochemistry and molecular structure theory.



A part of polypeptide linkage in protein

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Prominent features of HGS molecular structure models

The use of polyhedra such as 14-, 20-, and 26-hedron made of ABS resin as the atomic nuclei makes this model as the most distinguished one from any other existing models. By using polyhedra, precise bond angles are easily expressed, and in combination with polyacetal or metal bonds, correct interatomic distances are also realized. All the materials used, ABS and polyacetal resins and brass, are light-weight, strong and durable scarecely break or wear out.

Three kinds of polyhedra used in this HGS molecular model are obtained in the following ways.

1) The basic polyhedron, 14-hedron result by truncating eight corners of a cube along the lines passing centers of each edge (See Fig. 2-A). It is called sp^3 type polyhedron, as it is used for sp^3 type bonding.
2) The sandwitched polyhedron shown in Fig. 2-B, which is sp^2 type and is used for benzene ring, is obtained by inserting the spacer between two halves of the 14-hedron.
3) The third polyhedron, i. e. 26-hedron, is made by truncating all the corners of 14-hedron.

Precise bond angles are obtained by making holes on the surfaces of these polyhedra. Since the model is designed in a scale 1Å=2.5 cm., the bond distance in Å unit is shown by measuring the distance d (See Fig. 3) by the attached scale.

* Stereomodels of any organic molecules as well as various inorganic compounds and complex salts can be easily constructed.
* As the bond is made of bend-free plastics, three- and four-membered ring compounds and also distorted condensed ring systems can be assembled. Benzene ring and multiple bonds are also easily constructed.
* Although rotation about σ-bond is free, it is also possible to stop at any position without the aid of a support. Double and triple bonds may not be rotated.
* Tetra-, hexa- or octa-coordinated metal complexes and also various chelate compounds can be constructed. Furthermore, the optical isomers can be distinguished. It is also suited to examine the mode of coordination in complicated chelate compounds.
* Models of face-centered and body-centered cubic lattice, and lattice of hexagonal closest packing are easily assembled.
* Polyhedra made of ABS resin are beautifully colored to match with the use in the exhibition or display.
* For the convenience in construction, a table showing bonding pattern, use of polyhedra, bond angle and bond distance is attached to each set.
* In B, D and E-sets, a scale in Å unit is included.
* A, B, D and E-sets are made according to the scale 1Å=2.5 cm.

Fig. 1 Polyhedra and Ball, designating atoms

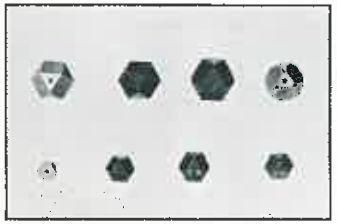


Fig. 2 Fundamental polyhedron

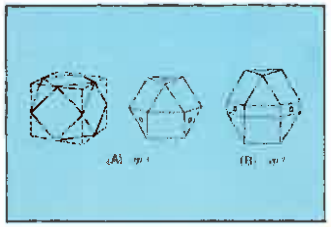
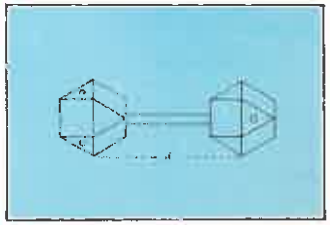
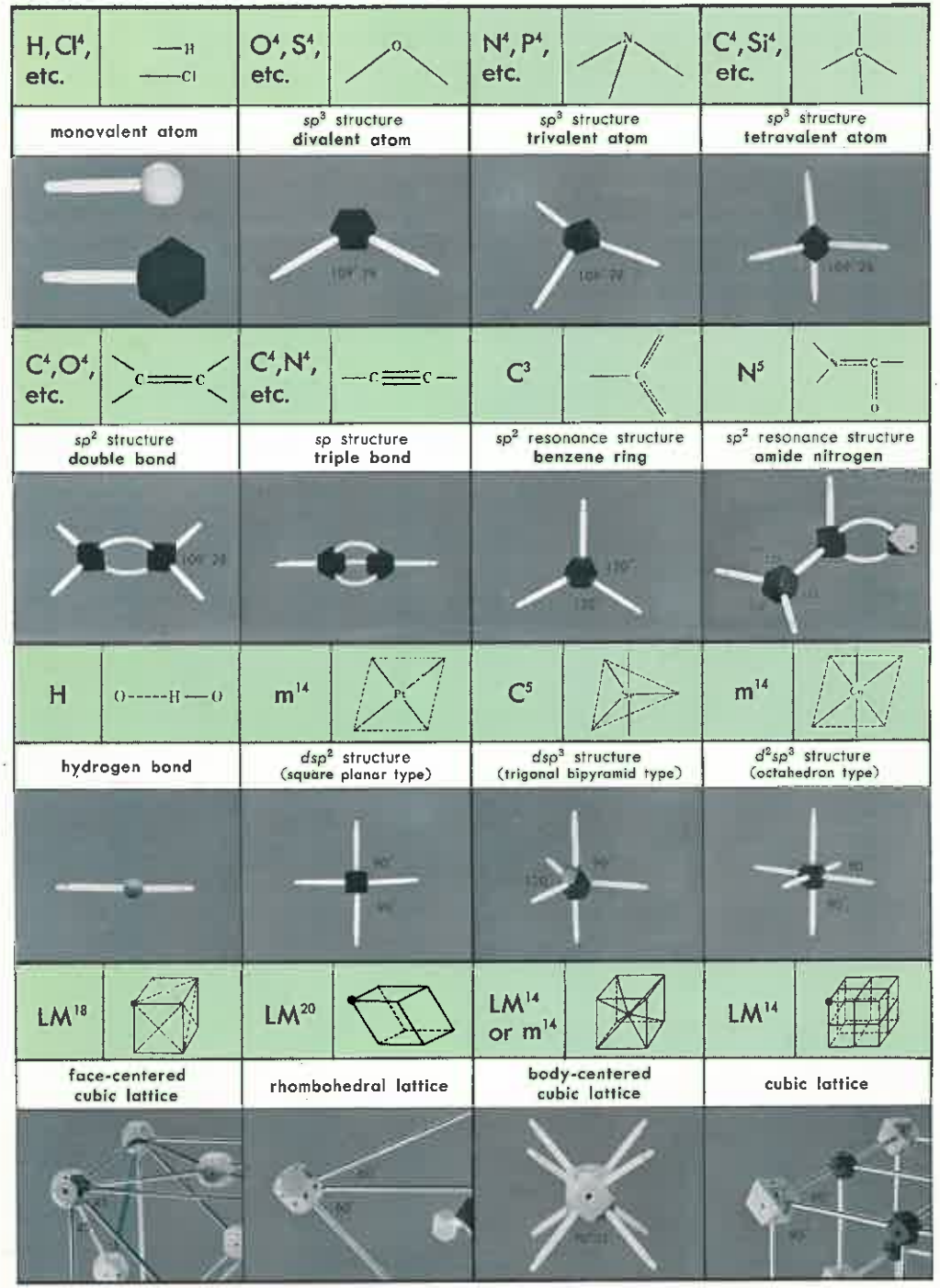


Fig. 3 Connection of polyhedra



Representative use of polyhedra and sphere



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Types of HGS molecular structure model set

Type A set	Student model for organic stereochemistry	US $ 2.00
	Supplementary benzene ring set	US $ 0.80
Type B set	Researcher model for organic chemistry	US $ 12.00
Type D set	Researcher model for inorganic chemistry	US $ 15.50
Type E set	Large set for crystal structure study	US $ 117.00

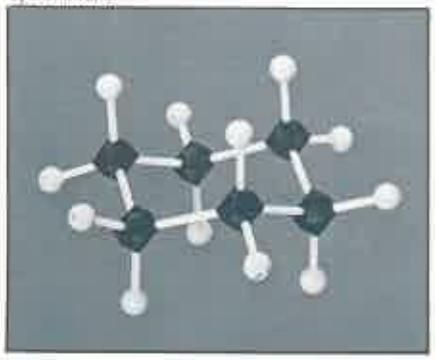
* Any polyhedra or bonds can be supplied separately from our stock at any time.
* In ordering supplementary parts, please refer to the item number in our price list.

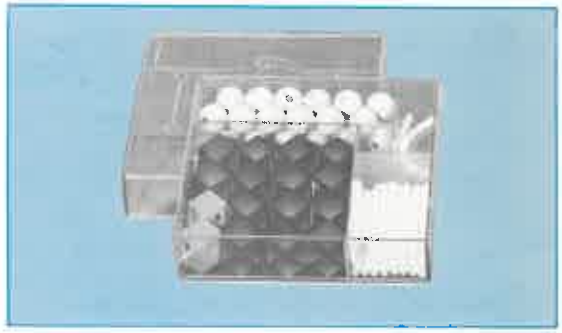
Type A set: Student kit for organic stereochemistry

* This set is designed for students in the course of elementary organic stereochemistry in college and also chemistry club members in high school.
* Two cyclohexanes or one decalin molecule and their simple derivatives can be constructed.
* Such fundamental ideas as configuration or conformation may be mastered through self-practice by students.
* The simple molecules such as ethane or ethylene may also be learned by this model.

ethylene

cyclohexane





Contents of Type A set

Atom

Parts Code	Color	Type	Quantity
H	light blue	sphere	24
C^4	black	sp^3	12
N^4	blue	sp^3	2
O^4	red	sp^3	2

Bond

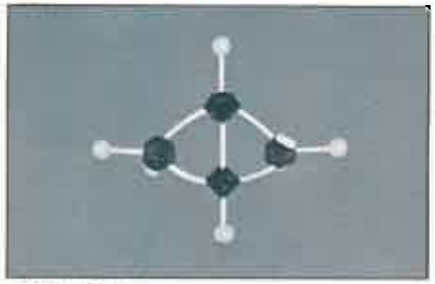
Bond No.	Bond Distance	Use	Quantity
2	1.10 Å	C−H	25
6	1.54	C−C C−N C−O	20
10	1.33	C=C	6

The number on upper right hand of atomic symbol in the parts code column shows the number of holes each polyhedron has.

Type B set: Researcher model for organic chemistry

* This set is designed for students in advanced course and researchers working in organic chemistry.
* As the set contains sufficient parts, in number and variety, it is possible to construct various organic molecules and simple complex salts.
* Precise bond angles necessary for the construction of organic molecules are reproduced.
* By the use of the ten kinds of bonds, correct bond distance is obtained. Further, it is measurable by the scale attached in an Å unit.
* The size of the model (1Å=2.5 cm.) makes the model very handy.
* The flexibility of the bond made of polyacetal resin permits otherwise difficult construction of three- and four-membered rings as well as double and triple bonds.
* Strained condensed systems, of which construction by the conventional models has been difficult, can be easily assembled.
* The fitting of the bonds into polyhedra is so smooth that rotation about the bond is entirely free yet it is possible to stop at any conformation. Thus the conformational mobility of the molecule is easily observable.

bicyclo [1.1.0] butane C_4H_6



cubane C_8H_8

norbornane C_7H_{12}

Contents of Type B set

Atom

Parts Code	Color	Type	Quantity
H	light blue	sphere	60
C^3	black	sp^2	18
C^4	black	sp^3	38
O^4	red	sp^3	6
N^3	blue	sp^2	2
N^4	blue	sp^3	4
B^3	orange	sp^2	2
Si^4	dark blue	sp^3	2
S^4	yellow	sp^3	2
P^4	brown	sp^3	2
Cl^4	green	sp^3	4
m^{14}	grey	sp^3 d^2sp^3	2

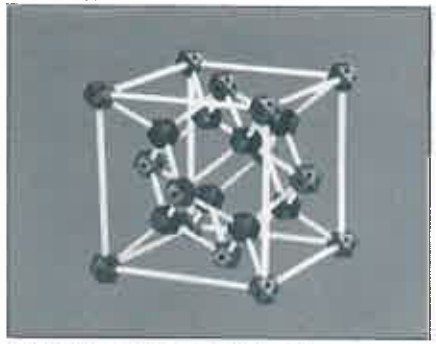
Bond

Bond No.	Bond Distance	Use	Quantity
1	0.96 Å	O−H	10
2	1.10	C−H	60
3	1.33	C=C	10
4	1.40	benzene ring	20
5	1.45	C−O C−N	10
6	1.54	C−C	60
7	1.80	C−Cl	10
8	1.90	C−Br	10
9	2.10	C−I	10
10	1.33	double bond	30

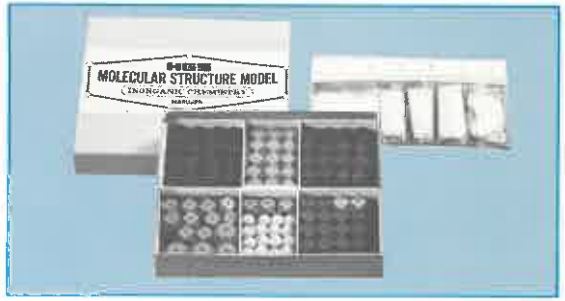
Type D set: Researcher model for inorganic chemistry

* This is the standard set for the research on molecular structure and crystal structure of inorganic compounds.
* By using this set, complicated tetra-, hexa- and octa-coordinated complex compounds including chelate compounds, and typical crystal structures can easily be constructed.
* In case of crystal models, the fundamental structure of ionic crystals such as rock salt, cesium chloride, zinc blende, wurzite, fluorite and perovskite types besides graphite and diamond types can be constructed in turn.
* By using supplementary parts, many other structures such as spinel and cadmium chloride types and three kinds of packing—hexagonal closest packing, face-centered cubic lattice and body-centered cubic lattice—can also be constructed.
* When complex compounds are constructed, complicated steric configuration can be accurately understood, the bond distances being precisely expressed in a scale 1Å=2.5 cm.
* Many kinds of bond angle, which is necessary to show the structure of inorganic compounds, can be represented precisely.
* Nine kinds of bonds, together with extra bonds free in length, make it possible to assemble wide variety of compounds.
* As all sorts of crystal structure can be made, this set is instructive for structural studies of crystals.
* Being made of polyacetal resin, the bonds are flexible and strong, and fit smoothly into polyhedra. Consequently, this model permits the easy construction of many complicated structures, and is useful for the study of steric configuration, coordination type and optical isomerism of complicated chelate compounds including complexons.

fluorite type structure



triethylenediamine cobalt (III) salt



Contents of Type D set

Atom

Parts Code	Color	Type	Use	Quantity
H	light blue	sphere		20
C^4	black	14-hedron	sp^3	16
C^5	black	20-hedron	sp^2 dsp^3	20
m^8	red	14-hedron	sp^3 8 coordination	16
m^{14}	blue	14-hedron	sp^3 d^2sp^3	14
m^{14}	grey	14-hedron	sp^3 d^2sp^3	14
LM^{20}	grey	26-hedron	sp^3 d^2 sp^3 etc.	4

Bond

Bond No.	Bond Distance	Quantity
2	1.10Å	20
6	1.54	60
11	1.85	10
12	2.00	10
13	2.20	10
14	2.40	10
15	2.60	10
16	3.08	10
17	3.55	20
18	Free	10

Type E set: Large set for crystal structure study

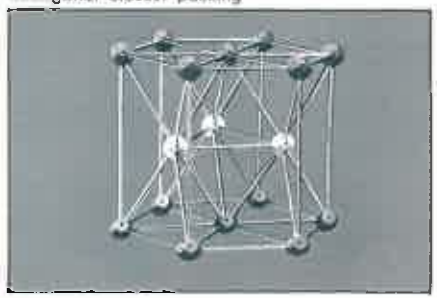
* This set is planned for the use in research and lecture of crystal structure.
* This set contains 292 polyhedra and 588 bonds so that a large number of complex compounds and typical crystal structures can be assembled.
* This set is indispensable for the research and lecture concerning the formation process of inorganic giant molecules, form of spaces in a crystal, formation of optical isomers based upon the difference in configuration, determination of unit lattice and so on.
* A set of twelve kinds of typical crystal structures: rock salt, cesium chloride, zinc blende, wurzite, fluorite, rutile, perovskite, calcite, graphite, face-centered cubic closest packing, hexagonal closest packing, and spinel structure are made up side by side.
* Crystal models and many other complex compounds can be constructed by the aid of supplementary parts and contrivance.

Research set contains two kinds of bonds, made of metal or plastics. Plastic bonds are used for covalent and ionic bonds, whereas the metallic rods are used for the bonds by van der Waals force and the framework of unit lattice.

Exhibition and lecture set contains only metallic bonds. It is somewhat hard to connect or disconnect, but once formed crystal models are very rigid, beautiful, and suitable for keeping or exhibiting for a long time. It is also suitable for the lecture of crystal structure.

* Boron hydrides can also be constructed by using supplementary polyhedra of icosahedron.

hexagonal closest packing



Contents of Type E set

Atom

Parts Code	Color	Type	Use	Quantity
O^4	red	14-hedron	sp^3	6
S^4	yellow	14-hedron	sp^3	4
C^n	black	20-hedron	sp^n d sp^3	39
m^{14}	blue	14-hedron	sp^2 sp^3 d^2sp^3	24
m^{14}	red	14-hedron	sp^n sp^3 d^2sp^3	24
m^{14}	grey	14-hedron	sp^n sp^3 d^2sp^3	18
LM^{14}	blue	14-hedron	sp^x sp^3 d^2sp^3	8
LM^{14}	red	14-hedron	sp^x sp^3 d^2sp^3	1
LM^{14}	grey	14-hedron	sp^2 sp^3 d^2sp^3	76
LM^{14}	yellow	14-hedron	sp^3 sp^3 d^2sp^3	14
LC^6	black	20-hedron	sp^n d sp^2 sp^3	2
LM^{18}	red	26-hedron	d^2sp^3	20
LM^{18}	grey	26-hedron	d^2sp^3	9
LM^{18}	yellow	26-hedron	d^2sp^3	6
LM^{18}	green	26-hedron	d^2sp^3	6
LM^{20}	red	26-hedron	sp^3 sp^3	14
LM^{20}	yellow	26-hedron	sp^3 sp^3	9
LM^{20}	grey	26-hedron	sp^2 sp^3	9
$^{\#}LM^{26}$	yellow	26-hedron		3

Bond

Bond No.	Bond Distance	Use	Quantity
18		Free Size	10
19	1.31Å	C—O in calcite	6
20	1.40	C=C in graphite	45
21	1.89	Ti—O in rutile	14
22	2.05	Ti—O in perovskite	6
23	2.34	Ca—F in fluorite, etc.	59
24	2.54	Ti—Ti in rutile	4
25	2.81	Na—Cl in rock salt	54
26	3.56	Ca—Cl in cesium chloride, etc.	37
27	3.89	Zn-S in wurzite	4
28	3.90	Ca—C in calcite, etc.	135
29	4.11	Framework of unit lattice in cesium chloride, etc.	36
30	4.58	Ti—Ti in rutile	8
31	5.40	Framework of unit lattice in fluorite, etc.	24
32	6.36	Ca—Ca in calcite	12
33	1.75	Mg—O in spinel	32
34	2.02	Al—O in spinel	72
36	8.096	Framework of unit lattice in spinel	12
37	No.28 × $\sqrt{2}$	Face-centered cubic closest packing	12
38	No. 28 × 2cos35°16	Hexagonal closest packing	6