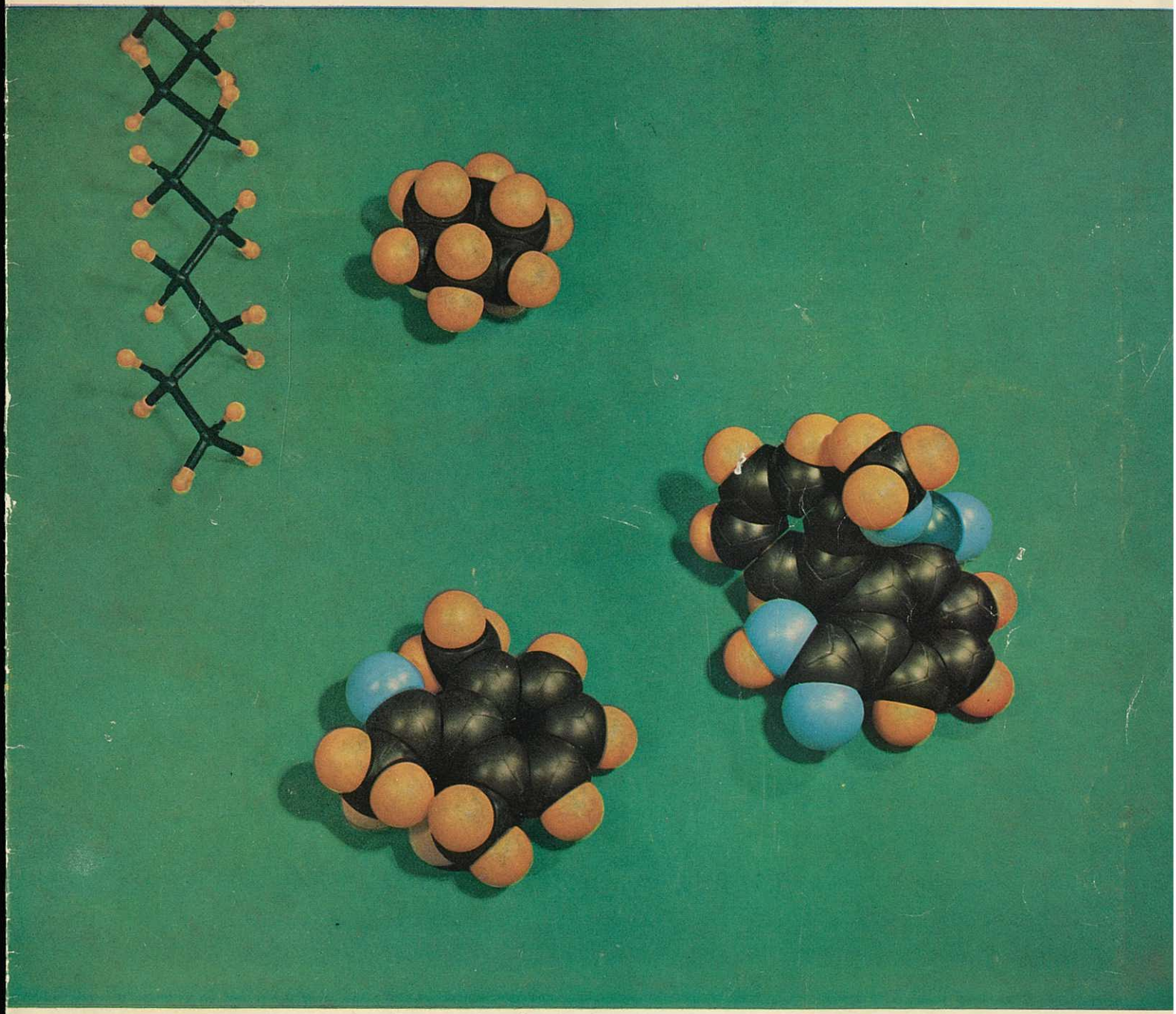
MOLECULAR MODELS

STEREO TYPE • STUART TYPE • JOINT TYPE



MRK MITAMURA RIKEN KOGYO INC.

MRK MOLECULAR STRUCTURE MODELS

In research and teaching of organic chemistry, the concept of the molecular structure of compounds is not easily understood by their structure formula. Sometimes structural formula leads to a serious misunderstanding of atomic configuration.

MRK Molecular Structural Models aim the demonstration of bond radii electron cloud radii, bond angle and dimensional configuration of atoms. It is designed to be easily applied by the users.

In an attempt to reduce the weight of the models, the model is made of plastic: Stereo Type Model is molded by the Injection molding method, and Stuart and Joint Type Models by the Blow molding. Therefore, the model do not collapse by the distortion and the load of atom models, even if a complicated structural model is constructed. This model is very convenient to demonstrate the molecular structure.

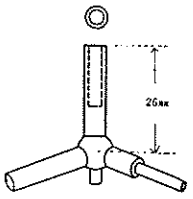
In these new sets, the model for complex atoms with 6-hold coordination is added in each set as metallic coordinate atom. This further enlarges the field of application of the sets. The metallic coordinate atom is made after cobalt atom. It is used to show coordinate group, hydrated isomers and chelated compounds.

It is also used to demonstrate the structure of compounds of atoms with 6-hold coordinations such as Fe, Ni, Mn, Cr and others, as well as to demonstrate the structure of tetravalent metalic coordinate compounds.

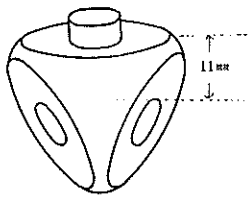
Junior and Middle Sets are kept in beautiful hard paper box, Standard Set (except Stereo Type Model) is kept in a beautiful portable folding box.

This model is based on the data given in Prof. L. Pauling's textbook "THe NATURE OF CHEMICAL BONDS".

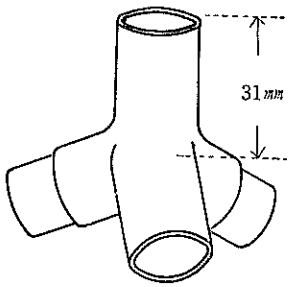
The comparison of the size of each of these models is seen by Carbon (C-4) atom.



Stereo Type



Stuart Type

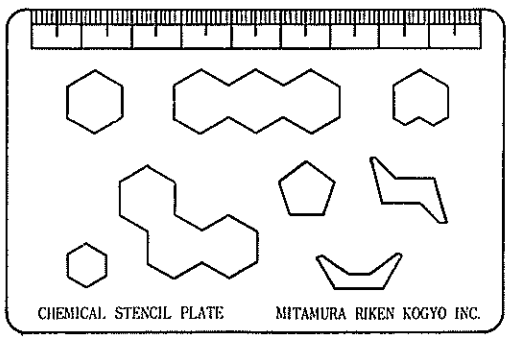


Joint Type

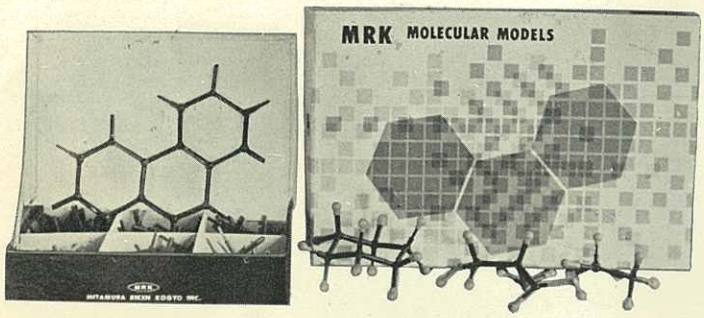
Special Service CHEMICAL STENCIL PLATE

Stencil Plate (100×65 mm)

For a clear drawing of structural formula of benzene nucleus; condensed ring systems of anthracene and phenanthrene; a heterocyclic six-membered ring system, as well as chair and boat form of cyclohexane, are cut on celuloid plate.



STEREO TYPE MOLECULAR MODELS



7-200 Stereo Type Molecular Models

Junior Set
Middle Set
Standard Set

This Model is based on valence hand and the size of each atom model is proportional to the bond length. The atomic nucleus represented by a sphere (radii 8 mm) makes it easy to demonstrate dimensional configuration of molecule and the distance between nuclei.

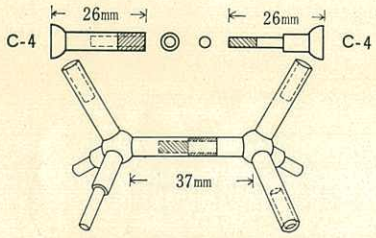
The demonstration of bond type is improved and the size of the model is the most suitable for research and teaching of organic chemistry.

The bond radius of each atom model is 2.50×10^8 times of the true size (1Å = 25 mm). The C-C distance is 37.0 mm.

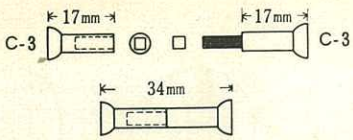
The valence hand of single bond is hemisphere, both concave and convex, and then atoms can be easily combined without connector. The length of valence hand is shown with H-atom, which disappear when atoms are combined to form bond, and the bond length without H-atom is demonstrated.

The valence hand of double and triple bonds are shown by the length of individual atom itself, and the atoms are combined by concave angular edge and convex angular connector attached to the atom.

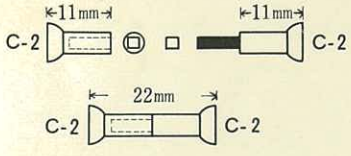
Therefore, rotating single bond is rotable in the model, whereas nonrotable double and triple bonds do not rotate in the model. (The distinction between double and triple bonds is made by marks D (double) and T (triple) on the connector.



Single bond (C-C bond)



Double bond



Triple bond

Note. In this model, the size of carbon and nitrogen are so close that they are represented by the same model, with the size intermediate between the two. Therefore, the single bond of C is 18.5 mm in the model instead of 0.77 Å = 19.25 mm and 0.75 mm shorter than the true proportion.
The single bond of N is 18.5 mm which is 1 mm longer than the true proportion 0.70 Å = 17.5 mm.

STUART TYPE MOLECULAR MODELS

7-210 Stuart Type Molecular Models

Junior Set
Middle Set
Standard Set

This molecular model is designed to the Electron cloud of each atom is demonstrated by sphere, which is partly plane, according to each bond radii.

The electron cloud around the atomic nucleus is also shown, so that it is easy to see steric hindrance and steric isomers.

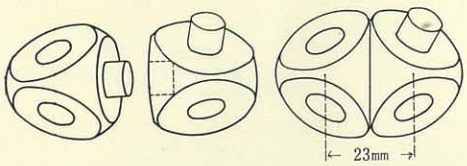
The model of each atom is hollow and this reduce the weight of the model. The atoms are connected by means of simple connector.

The bond radius of each atom is 1.50×10^8 times of true size (1Å = 15 mm). The distortion of electron cloud radii (van der Waals Radii) by strong bond force is taken into consideration and the size is 1.25×10^8 times of the true size (except for C, for which 1.00×10^8 times of the true size, 1Å = 10 mm is given).

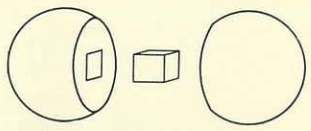
For an example, the C-C distance is 23 mm, which is the most suitable for the desk model for research and teaching.

The simple bond has round connection hole, which is connected by rounded connector. The double and triple bonbs have square and octagonal holes, which are combined by angular connectors.

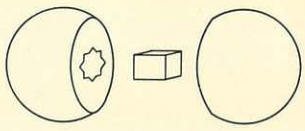
As in the Stereo Type Molecular Models, the single bond rotates freely, whereas the double and triple bonds as well as quaternary bonds do not rotates as in the actual molecule.



Single bond (C-C bond)



Double bond



Triple bond

Note. In this model, N-4 and C-4 have same size and then they are a little different from true proportion.

JOINT TYPE MOLECULAR MODELS

(Designed by Prof. Takehiko Shimanouchi, Unive. Tokyo)

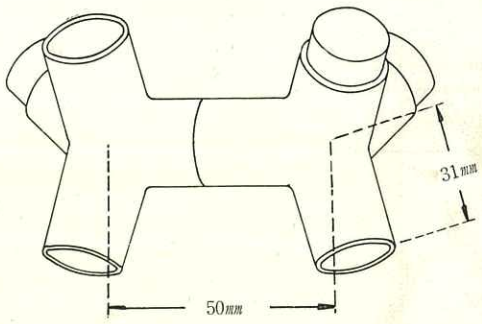
7-220 Joint Type Molecular Models Junior Set
Standard Set

Molecular models are indispensable to understand chemical phenomena from molecular point of view.

This model is designed to reproduce the bond radii and bond angles correctly, and can demonstrate the nature of chemical bonds.

The color of atom model is bluish violet, green, yellow, red or violet in the order of increasing electro-negativity.

This idea is very convenient as the molecular model for chemists:



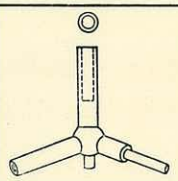
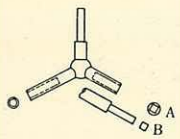
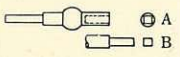
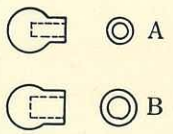
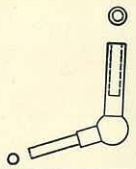
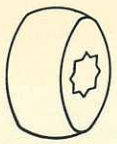
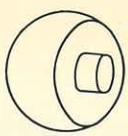
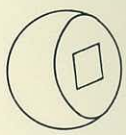
Strong points

1. Each atom model is made of polyethylene tubes and balls. The model is light and is tightly connected.
2. The bond length is 4×10^8 times of the true size (1Å = 40 mm). The bond angle is designed to be close to the true value.
3. The internal rotation angle can be freely adjusted, and the angle can be fixed at any position desired.
4. The color of the atom model represents the electro-negativity, so that the position and strength of the polar group are easily seen.
5. The model of metal atom with hexavalent coordination is included in the set, and the models of complex salts are also constructed.
6. Bonds with various length can be prepared by cutting spare connectors. The spare connector can also be utilized as a hydrogen bond.

Note. N-4 and C-4, N-3b and C-3b, N-2 and O-2, N-1, O-1 and H each they have same size and unit. The atomic color is respectively divided.

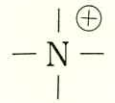
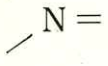
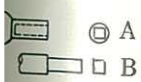
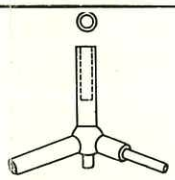
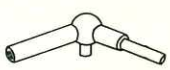
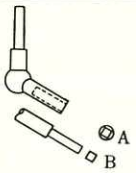
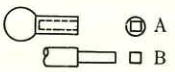
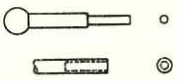
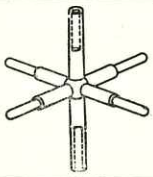
Molecular Models Stereo Ty

SPECIFICATI

Model		C-4	C-3	C-2	H	O-2	O-1	
Atom species		Tetrahedral carbon	Trigonal carbon	Linear carbon	Hydrogen	Divalent oxigen	Carbonyl oxigen	Qua ni
Formula		$-\overset{|}{\underset{|}{C}}-$	$\diagdown C=$	$-C\equiv$	$H-$	$\diagup O \diagdown$	$O=$	—
Color		Black	Black	Black	White	Red	Red	Dar
Bond radii (Å)	single	0.77	0.77	0.77	0.30	0.66	—	
	double	—	0.67	—	—	—	0.55	
	triple	—	—	0.60	—	—	—	
Electron Cloud (Å)		1.85	1.85	1.85	1.10	1.40	1.40	
Bond angle		109.28°	120°	180°	—	110°	—	10
Applications		Paraffin	Olefin	Acetylen	—	Ether	Carbonyl	Am
Stereo Type Unit								
Quantity in set	junior	18	168	6	40	10	4	
	middle	36	36	12	80	20	8	
	standard	72	72	24	160	40	16	
Stuart Type Unit								
Quantity in set	junior	12	12	2	30	6	4	
	middle	24	24	4	60	12	8	
	standard	48	48	8	120	24	16	

s Stereo Type and Stuart Type

PECIFICATIONS

O-1	N-4	N-3	N-2	N-1	Cl	M	spare connector
Carbonyl oxigen	Quateruary nitrogen	Pyramidal nitrogen	Digonal nitrogen	Nitrile nitrogen	Chlorine	Metal Coordination Atom	R-Round S-Square
O=				N≡	Cl−		
Red	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Green	Silver	−
−	0.70	0.70	0.70	−	0.99	−	−
0.55	−	−	0.60	−	−	−	−
−	−	−	−	0.547	−	−	
1.40	1.50	1.50	1.50	1.50	1.90	1.85	
−	109.28°	109.28°	180°	−	−	90°	
Carbonyl	Ammonium	Amid	Imid	Nitril	−	Coordination group	
							
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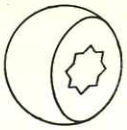
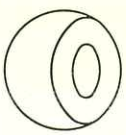
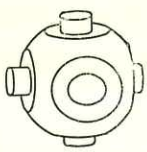
8	4	8	8	8	16	4	−
16	8	16	16	16	32	8	−
							
4	1	2	2	2	4	1	R 50 S 15
8	2	4	4	4	8	2	R 100 S 30
16	4	8	8	8	16	4	R 200 S 60

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