

Teoria x Prática

Esta unidade, entre teoria e prática, deve ser o núcleo articulador da formação docente e constitui uma relação, simultânea e recíproca, de autonomia e dependência, entre esses dois componentes indissolúveis da práxis, “atividade teórico-prática, ou seja, tem um lado ideal, teórico, e um lado material, propriamente prático, com a particularidade de que só artificialmente, por um processo de abstração, podemos separar, isolar um do outro” (VÁSQUEZ, 1977, p. 241 apud CANDAU, 1995, p. 55).

A partir de uma perspectiva didática, ao longo da história da educação, é visível à percepção de que o processo de ensino-aprendizagem se compõe em práticas e teorias indissociáveis. Torna-se indiscutível o discurso sobre o rompimento da dualidade existente entre prática e teoria, a fim de estabelecer uma ressignificação de ambas, pois não podem ser fracionadas, enquanto parte do todo educacional.

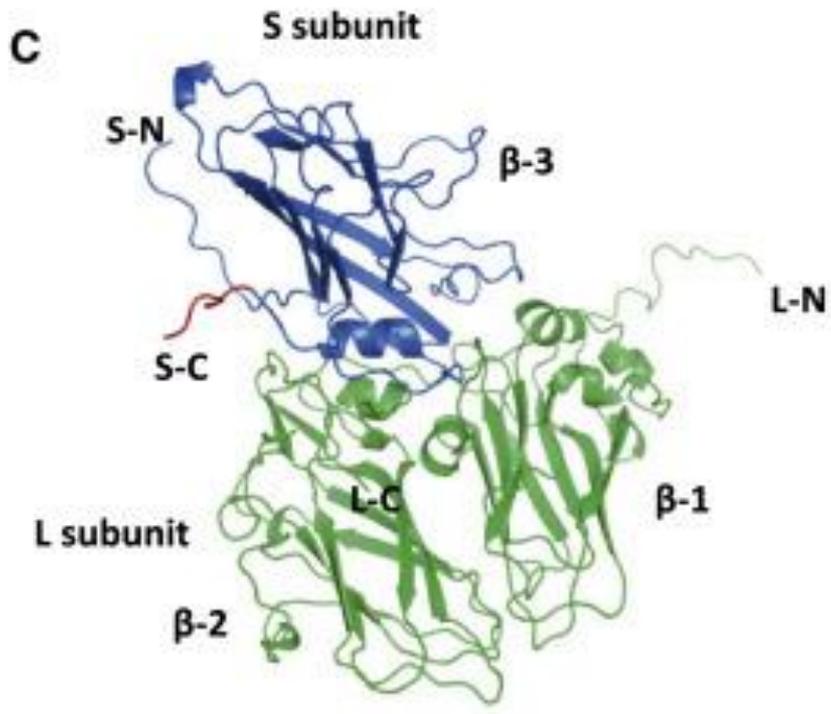
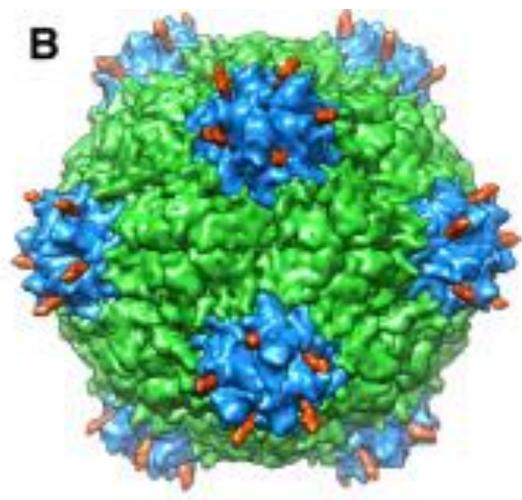
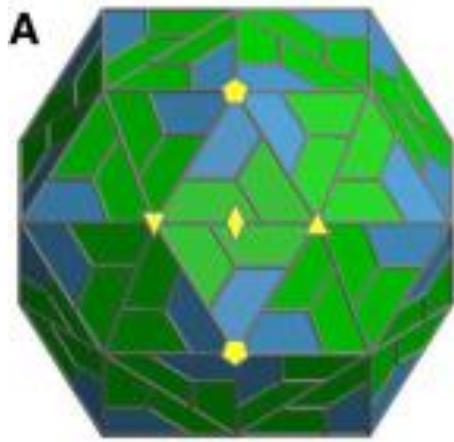
experiências do cotidiano dos alunos e não estavam de acordo com as realidades sociais. Para Veiga (1989, p. 44), nesta concepção “a Didática é compreendida como um conjunto de regras visando assegurar aos futuros professores as orientações necessárias ao trabalho docente”, que “separa teoria e prática, sendo a prática vista como aplicação da teoria, e o ensino como forma de doutrinação”. Esta concepção ainda influencia de maneira direta e/ou indireta a forma de ensinar de muitos docentes.

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Scientists announce high-resolution crystal structure of new coronavirus 3CL hydrolysis enzyme

January 26, 2020

Following the January 25th, the Joint Emergency Response Team on The Infection of The New Coronavirus (2019-nCoV) of Shanghai University of Science and Technology and the Shanghai Institute of Medicine of the Chinese Academy of Sciences announced 30 possible anti-2019-nCoV coronavirus and Chinese medicine. The joint research team today further announced the high-resolution crystal structure of the 2019-nCoV coronavirus 3CL hydrolysis.





中国青年报  

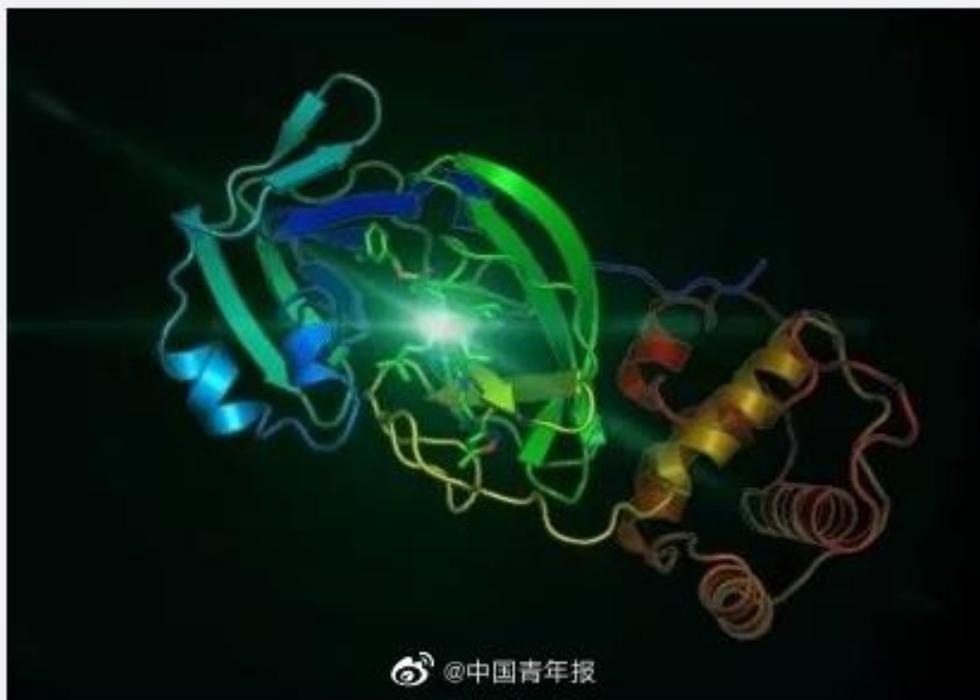
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[#科学家公布新型冠状病毒晶体结构#](#)【刚刚，科学家公布新型冠状病毒3CL水解酶高分辨率晶体结构】继1月25日上海科技大学免疫化学研究所和中国科学院上海药物研究所抗新型冠状病毒（2019-nCoV）感染联合应急攻关团队公布30个可能的抗2019-nCoV冠状病毒老药和中药后，这一联合攻关团队于今天进一步公布2019-nCoV冠状病毒3CL水解酶的高分率晶体结构。（中青报·中青网记者 邱晨辉）  刚刚，科学家公布新型冠状病毒3CL水解酶高分...

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 @中国青年报

Crystal Structure of the Receptor-Binding Domain from Newly Emerged Middle East Respiratory Syndrome Coronavirus

Yaoqing Chen,^a Kanagalaghatta R. Rajashankar,^b Yang Yang,^a Sudhakar S. Agnihothram,^c Chang Liu,^a Yi-Lun Lin,^a Ralph S. Baric,^c Fang Li^a

Department of Pharmacology, University of Minnesota Medical School, Minneapolis, Minnesota, USA^a; Department of Chemistry and Chemical Biology, Cornell University, NE-CAT, Advanced Photon Source, Argonne, Illinois, USA^b; Department of Epidemiology, University of North Carolina, Chapel Hill, North Carolina, USA^c

The newly emerged Middle East respiratory syndrome coronavirus (MERS-CoV) has infected at least 77 people, with a fatality rate of more than 50%. Alarming, the virus demonstrates the capability of human-to-human transmission, raising the possibility of global spread and endangering world health and economy. Here we have identified the receptor-binding domain (RBD) from the MERS-CoV spike protein and determined its crystal structure. This study also presents a structural comparison of MERS-CoV RBD with other coronavirus RBDs, successfully positioning MERS-CoV on the landscape of coronavirus evolution and providing insights into receptor binding by MERS-CoV. Furthermore, we found that MERS-CoV RBD functions as an effective entry inhibitor of MERS-CoV. The identified MERS-CoV RBD may also serve as a potential candidate for MERS-CoV subunit vaccines. Overall, this study enhances our understanding of the evolution of coronavirus RBDs, provides insights into receptor recognition by MERS-CoV, and may help control the transmission of MERS-CoV in humans.

Since the summer of 2012, a novel coronavirus, Middle East respiratory syndrome coronavirus (MERS-CoV), has emerged from the Middle East and spread to parts of Europe. MERS-CoV infection often leads to acute pneumonia and renal failure, and the human fatality rate is more than 50% (1, 2). To date, MERS-CoV has infected at least 77 people and was able to be transmitted from human to human. The genomic sequence of MERS-CoV is closely related to the sequences of certain bat coronaviruses (3–5), raising concerns over persistent bat-to-human cross-species transmission of the virus. The clinical signs and epidemic patterns of

mains, an N-terminal domain (NTD) and a C-domain, both of which can potentially function as receptor-binding domains (RBD) (Fig. 1A) (23). Specifically, coronavirus S1 C-domains can function as ACE2-, APN-, or heparan sulfate-binding RBDs, whereas S1 NTDs can function as CEACAM1- or sugar-binding RBDs. To date, crystal structures have been determined for a number of coronavirus RBDs by themselves or in complex with their host receptors, revealing how coronaviruses have evolved to recognize host receptors and thereby traffic between different species (24–28). It is not known which one of MERS-CoV S1 domains

TABLE 1 Data collection and refinement statistics

| Parameter | MERS-RBD native ^a | NaI derivative ^a |
|--|---|---|
| Data collection | | |
| Space group | P2 ₁ 2 ₁ 2 ₁ | P2 ₁ 2 ₁ 2 ₁ |
| Cell dimensions | | |
| <i>a</i> , <i>b</i> , <i>c</i> (Å) | 45.361, 108.065, 124.287 | 45.822, 108.817, 124.328 |
| α , β , γ (°) | 90, 90, 90 | 90, 90, 90 |
| Resolution (Å) | 50–2.13 (2.17–2.13) | 50–2.32 (2.36–2.32) |
| <i>R</i> _{sym} or <i>R</i> _{merge} | 0.065 (0.459) | 0.119 (0.574) |
| <i>I</i> / σ <i>I</i> | 31.8 (2.0) | 18.3 (2.0) |
| Completeness (%) | 97.8 (62.3) | 98.5 (90.5) |
| Redundancy | 6.9 (4.3) | 4.3 (2.7) |
| Refinement | | |
| Resolution (Å) | 49.6–2.13 | |
| No. of reflections | 34770 | |
| <i>R</i> _{work} / <i>R</i> _{free} | 0.149/0.206 | |
| No. of atoms | 3,701 | |
| Protein | 3,261 | |
| Ligand | 120 | |
| Water | 320 | |
| <i>B</i> factors (Å ²) | 43.3 | |
| Protein | 40.1 | |
| Ligand | 104.3 | |
| Water | 53.1 | |
| RMSD | | |
| Bond lengths (Å) | 0.008 | |
| Bond angles (°) | 1.33 | |

^a Values in parentheses are for the highest-resolution shell.

Coronavirus Crystals - Which Healing Crystals Are The Best For COVID-19?

by Perry Valentine • March 14, 2020

ATPERRYS HEALING CRYSTALS

CORONAVIRUS CRYSTALS

Which are the best crystals to avoid and cure Coronavirus?

Table of contents



1. Crystals for Coronavirus
 - 1.1. BLACK TOURMALINE
 - 1.2. CLEAR QUARTZ
 - 1.3. RUBY
 - 1.4. CARNELIAN

Crystals for Coronavirus

Although we strongly recommend following medical precautions, opting for healing crystals can act as an additional shield for you and your family's well-being.

Here are some crystals whose vibrational frequency will protect you from fever and similar viral illnesses.

BLACK TOURMALINE

Institucional

Ensino

Assistência

Pesquisa

Editais

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LEIA TAMBÉM

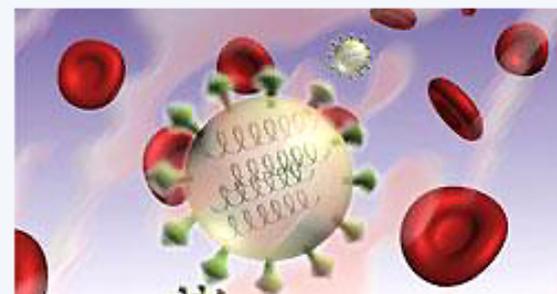
[Grã-Bretanha
Cientistas identificam novos
genes associados ao câncer
de mama.](#)

Pesquisa : Pesquisas Realizadas e em Andamento

Mineral recém-identificado poderá ajudar no combate à Aids

Tribuna da Imprensa online

Uma nova espécie mineral, a menezesita, foi identificada pelo professor Daniel Atencio, do Instituto de Geociências (IGc), da USP. Descoberta no Vale do Ribeira, é o primeiro heteropoliniobato - composto que contém agrupamentos de 12 octaedros de oxigênio cada qual com um íon de nióbio no centro - encontrado na natureza.



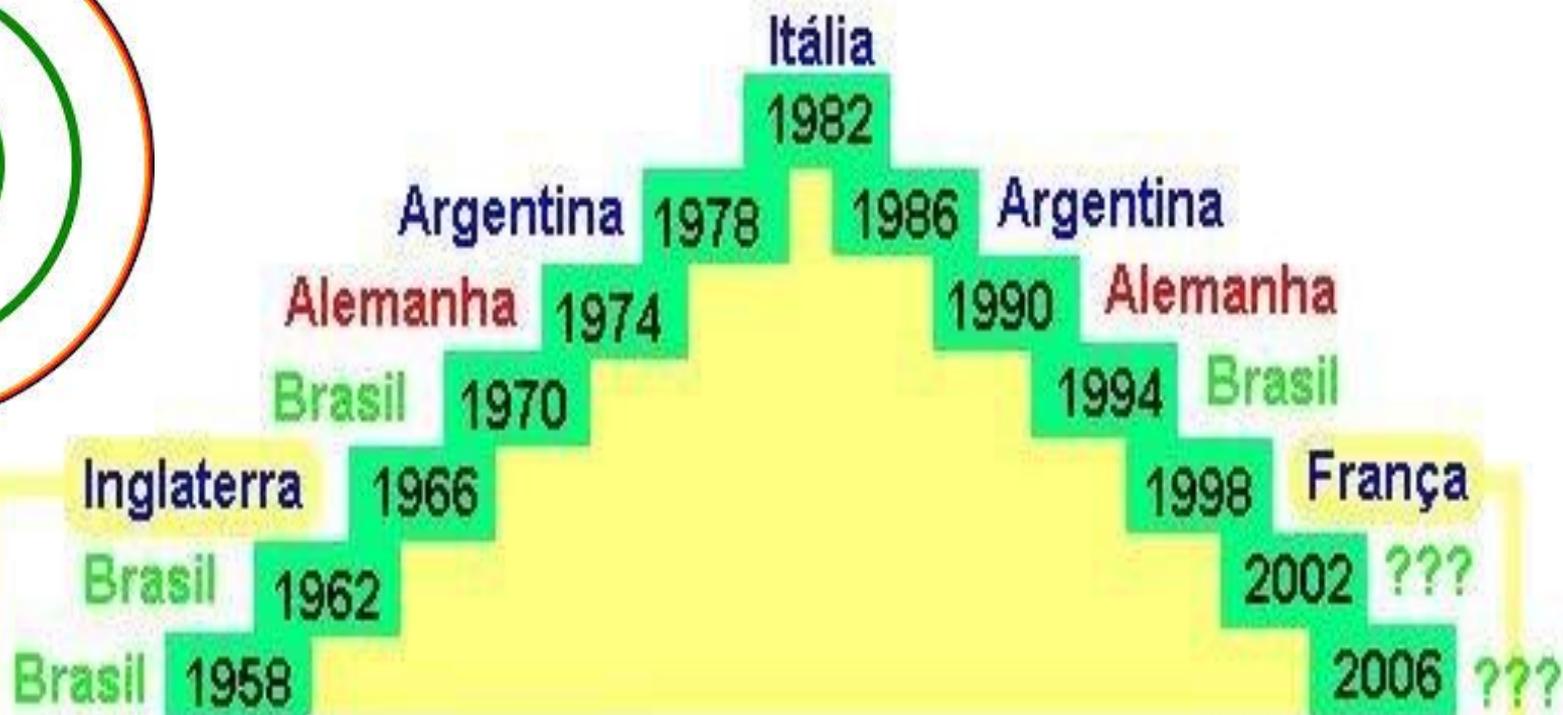
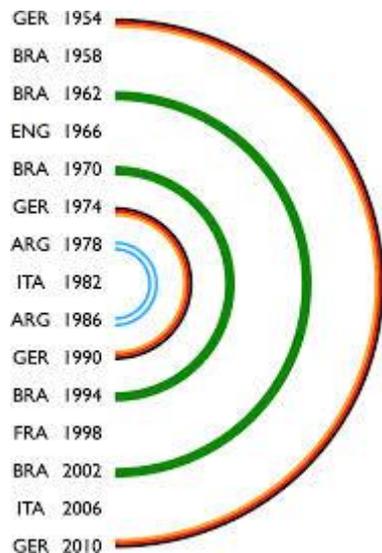
A substância poderá ser usada no controle de materiais radioativos e no tratamento da Aids. O mineral é classificado como heteropolimetalato - compostos que misturam metais e oxigênio. De cor avermelhada, a menezesita forma cristais dodecaédricos (com 12 lados).

Substâncias semelhantes - heteropolimetalatos - já haviam sido sintetizadas em laboratório. Diferentemente de outros heteropolimetalatos, os heteropoliniobatos são básicos em vez de ácidos, o que significa que podem sobreviver muito mais tempo e prosperar nos ambientes básicos de lixo radioativo ou neutros como o sangue. Quando estes compostos capturam um vírus na corrente sanguínea, ele não consegue mais entrar em uma célula para danificá-la.

Esses compostos também podem capturar elementos radioativos, como urânio e tório, removendo-os dos resíduos de instalações nucleares, através de separação de fase. Isso permitirá armazenamento mais fácil e seguro do lixo atômico.

Coletado no final da década de 1970, na cidade de Cajati (SP) em uma rocha denominada carbonatito, a menezesita foi encaminhada pelo engenheiro de minas Luiz Alberto Dias Menezes Filho para identificação somente em maio de 2003. O nome da substância homenageia seu descobridor. O estudo sobre o mineral está sendo preparado e será submetido ao periódico "American Mineralogist" para posterior publicação. (Agência SP Notícias)

08/08/05



Seleção europeia, campeã pela primeira vez jogando em casa, com uma nação estreante terminando em terceiro e com o artilheiro da Copa, Eusébio de Portugal

Seleção europeia, campeã pela primeira vez jogando em casa, com uma nação estreante terminando em terceiro e com o artilheiro da Copa, Suker da Croácia



2006



2002



1998



1994



1990



1986



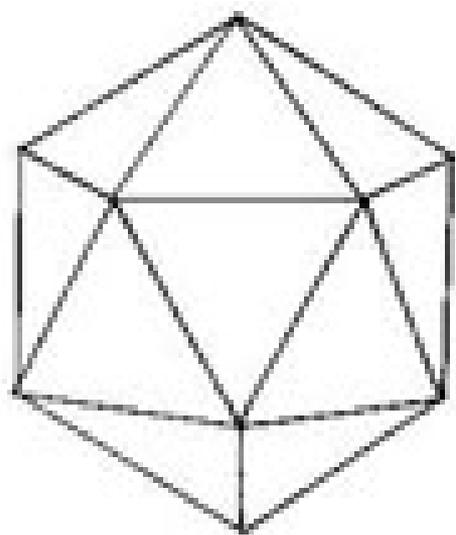
1982



1978



1974

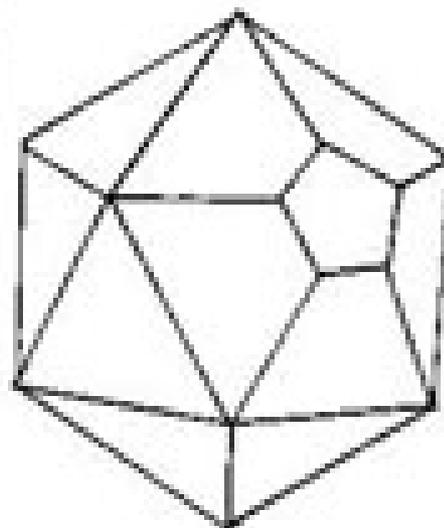
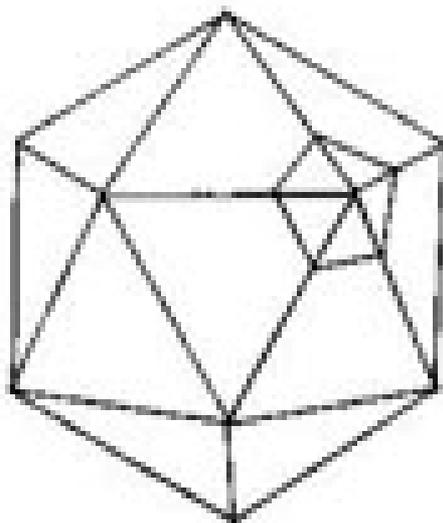


Icosaedro:

12 cantos

20 faces triangulares

30 bordas



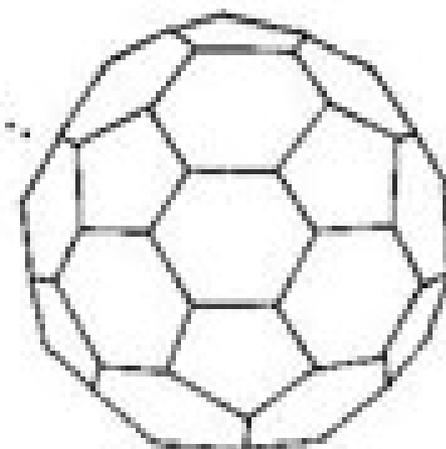
**Icosaedro
Truncado:**

60 cantos

12 pentágonos

20 hexágonos

90 bordas



$\text{♩} = 104$

Two staves of musical notation in 4/4 time. The top staff is in treble clef and the bottom staff is in bass clef. The music consists of eighth and sixteenth notes. A vertical dashed line is drawn through the middle of the piece, and a 'z' symbol is placed above the notes in the second half.

A single staff of musical notation in treble clef showing a melodic line with a series of notes. A vertical dashed line is drawn through the middle of the staff, labeled c'' below it. Several large, overlapping arcs connect notes on either side of the dashed line, illustrating a harmonic or structural relationship.

GRUPO DE JOVENS VALENTES DO REI JESUS CRISTO APRESENTA:

Dia 09/ 02 – Sábado às 20:00 hs

Banda

Verdadeira



e Pr^a Elisângela



Muito louvor, adoração e o mais sólido alimento que é a Palavra de Deus! DEUS preparou esse sábado especialmente pra você. Venha se alegrar conosco! Sua vida nunca mais será a mesma!

IEQ VILA MADEIRA – Pr^a Sônia das Graças e Equipe
Rua Wenceslau Madeira 137-Vila Madeira – Nova Lima

Dia Nacional de Mobilização dos Juizes Federais

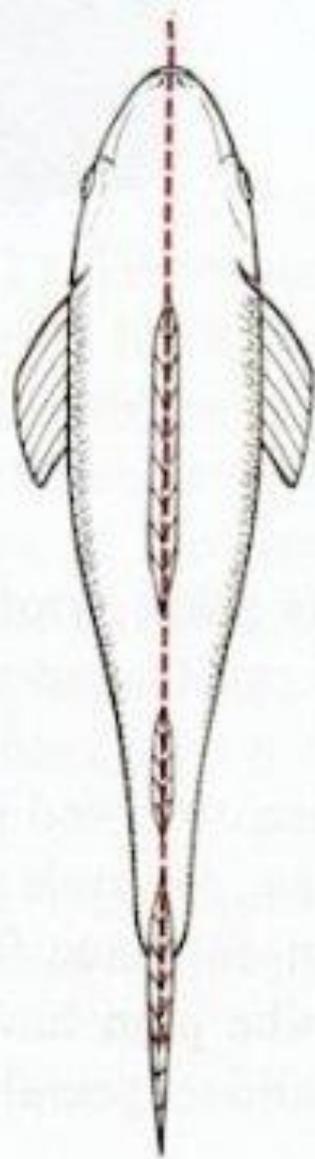
Conciliar é legal:

**A simetria é
Constitucional**

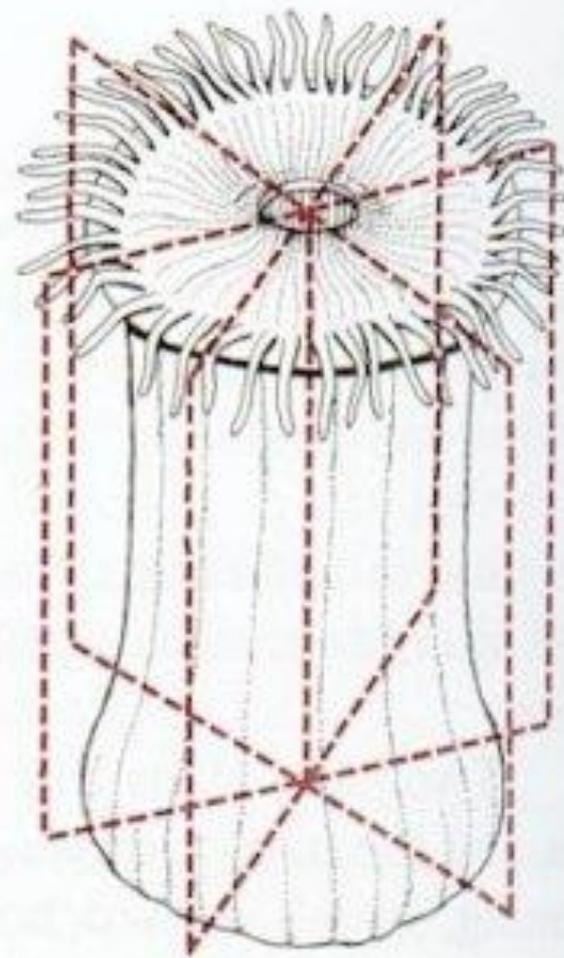




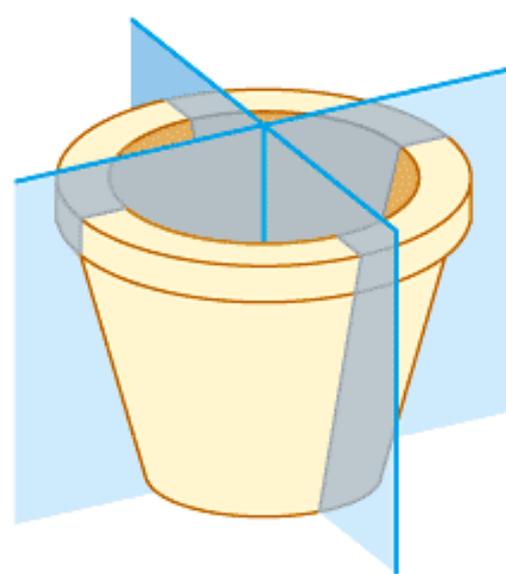
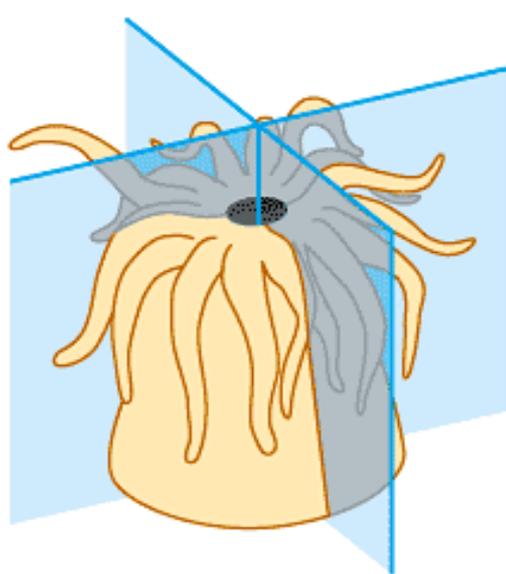




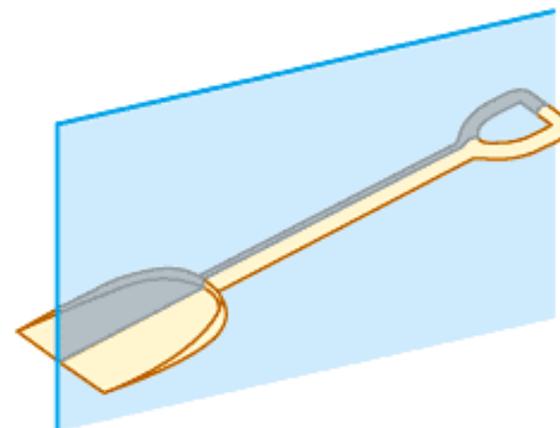
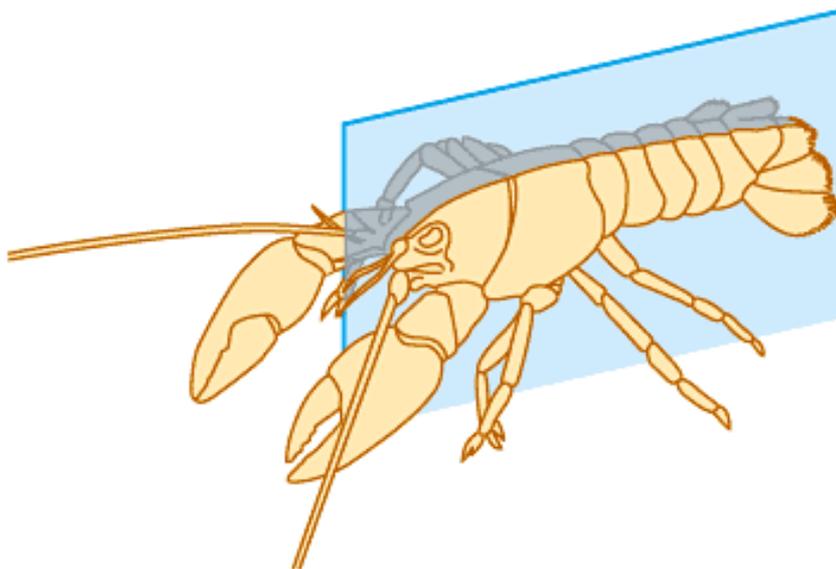
a. Bilateral symmetry



b. Radial symmetry



(a) Radial symmetry



(b) Bilateral symmetry

bilateral symmetry



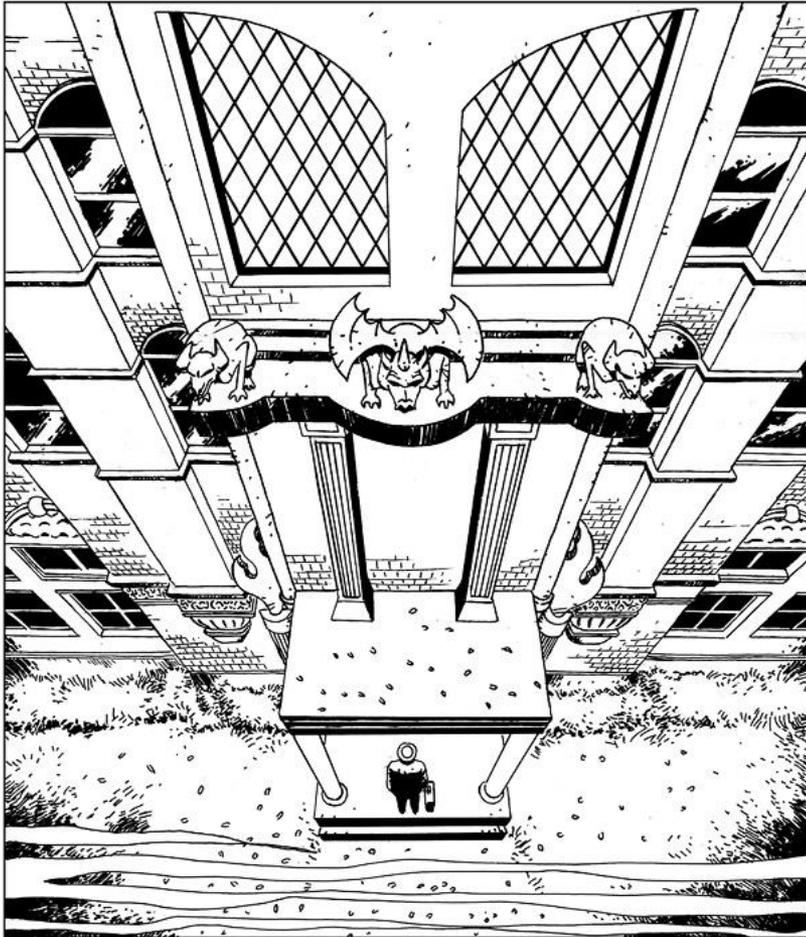
we have it















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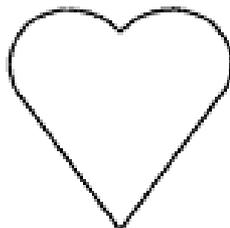
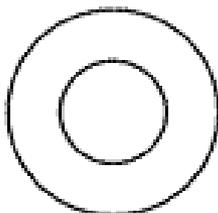
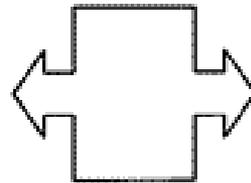
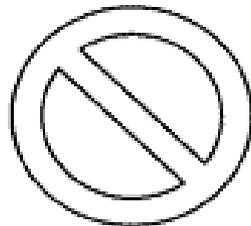
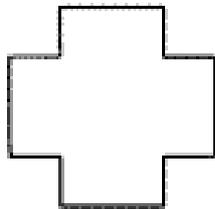
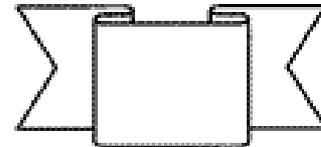
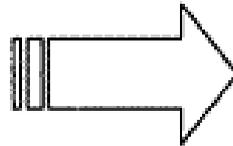
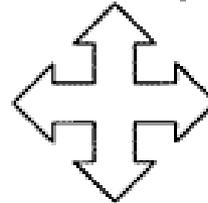
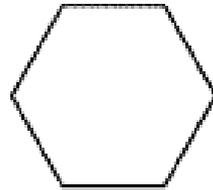
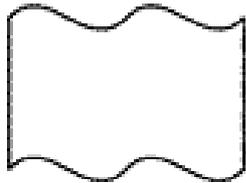
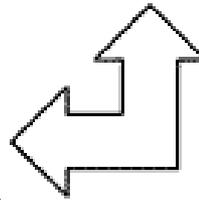
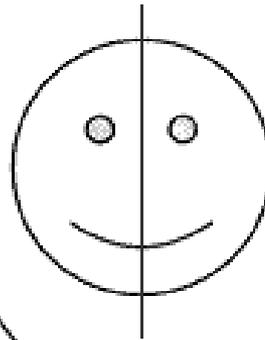
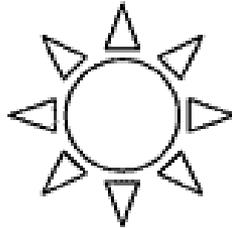
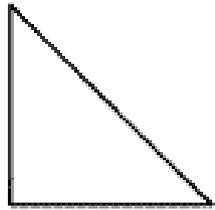


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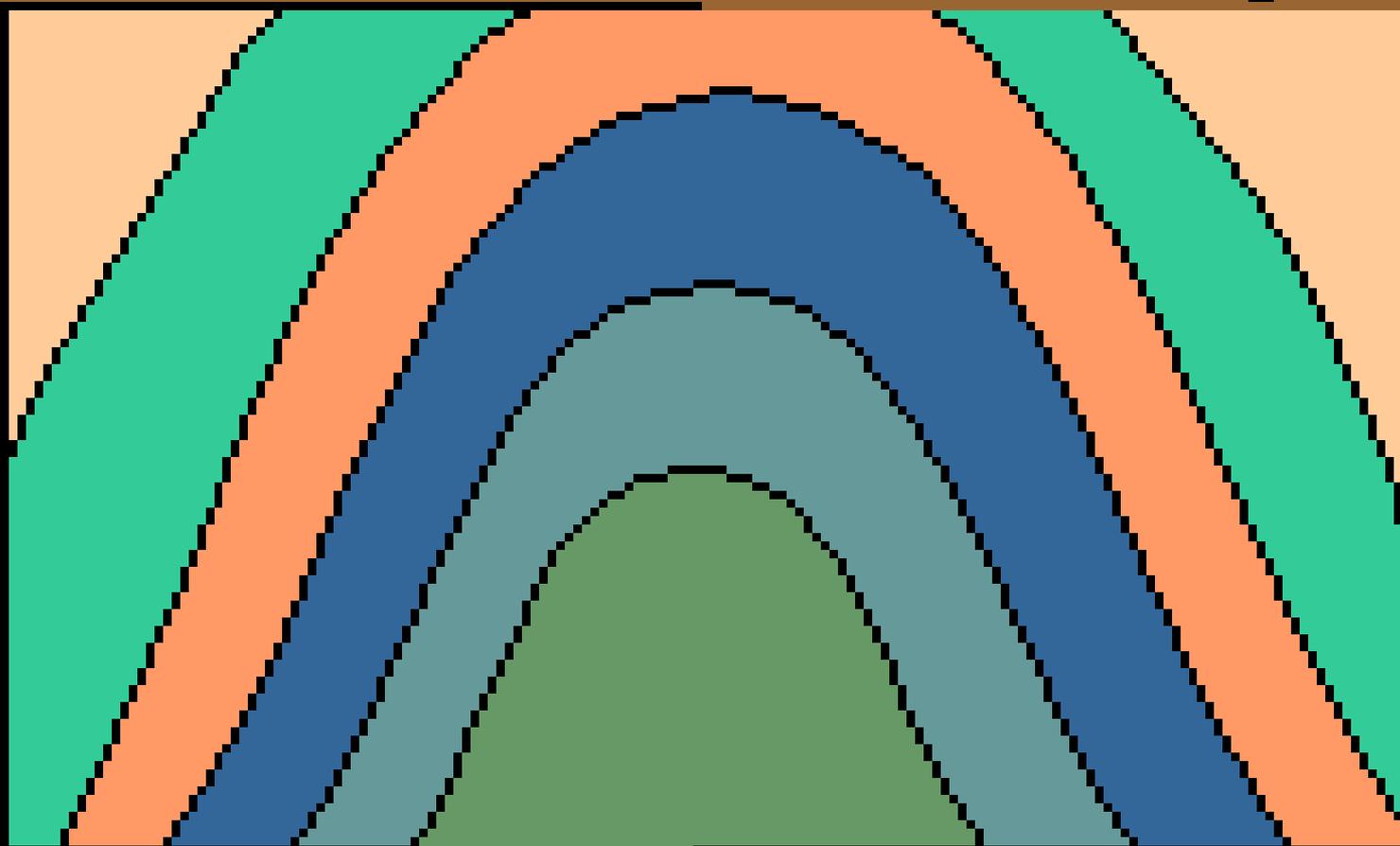
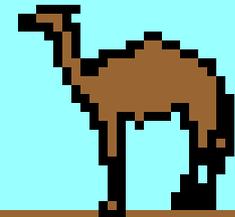


JAGUAR



***Dábale arroz a la zorra el
Abad***

Perfil: Pliegue simétrico







SIMETRIA EXTERNA DOS CRISTAIS

Daniel Atencio

- Mineral: natural, processos geológicos
- - Fórmula química
- - Estrutura cristalina

- Rocha: associação de minerais.
- Minério: mineral ou rocha com valor econômico.

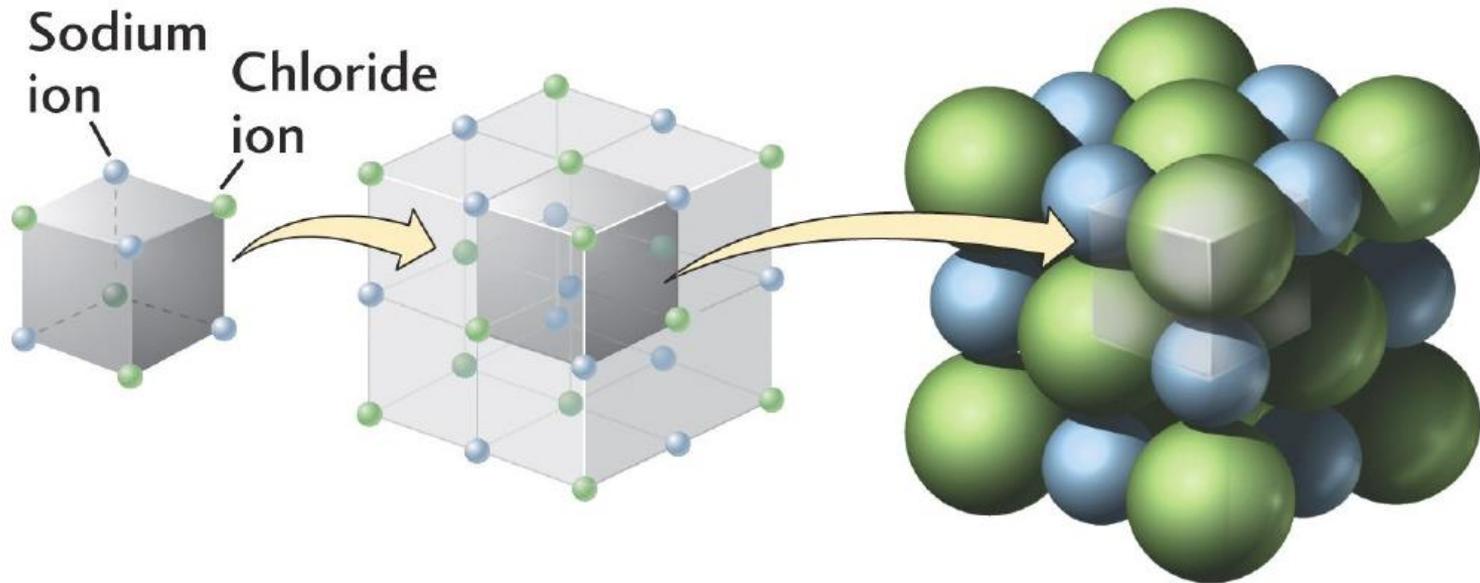


O conceito de espécie mineral (Nickel & Grice, 1998)

- sólido
- ocorre naturalmente
- formado através de processos geológicos
- na Terra ou em corpos extraterrestres
- com composição química e propriedades cristalográficas bem definidas
- merece um nome único.

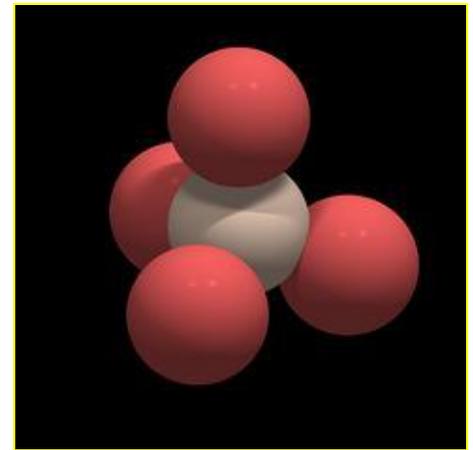
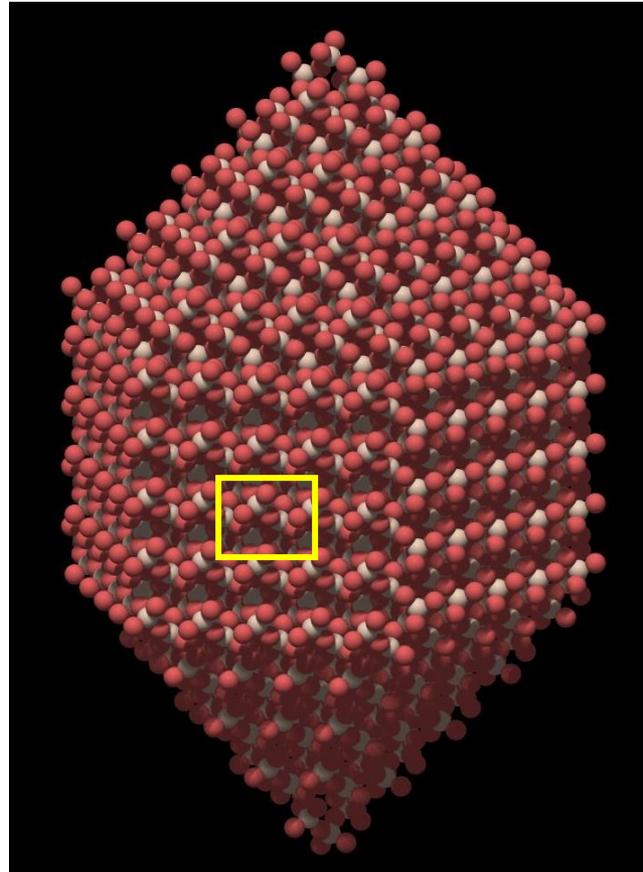
Minerais – estrutura cristalina

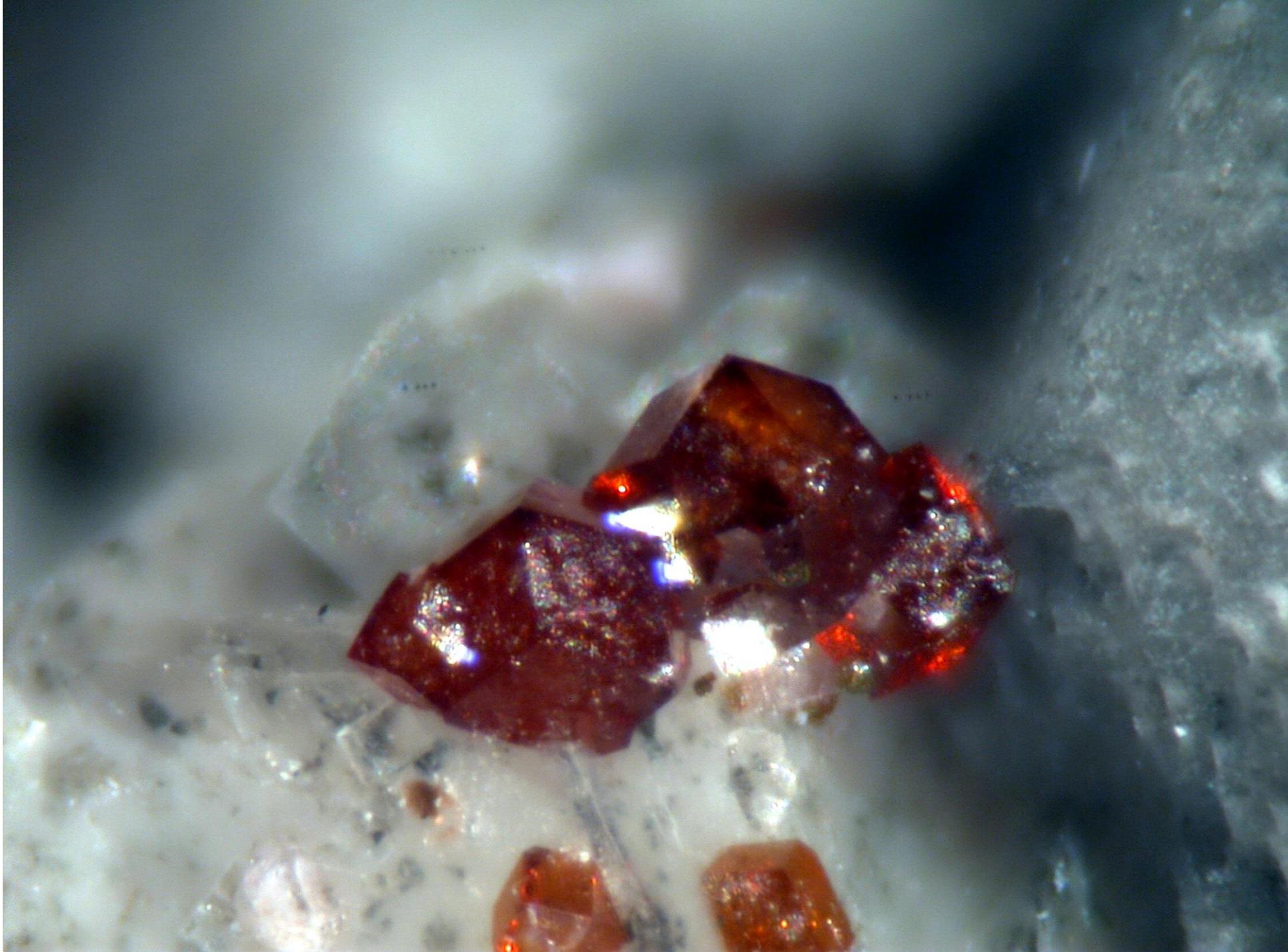
- Modo que os átomos dos elementos químicos são empacotados
- Padrão geométrico que os átomos assumem num sólido

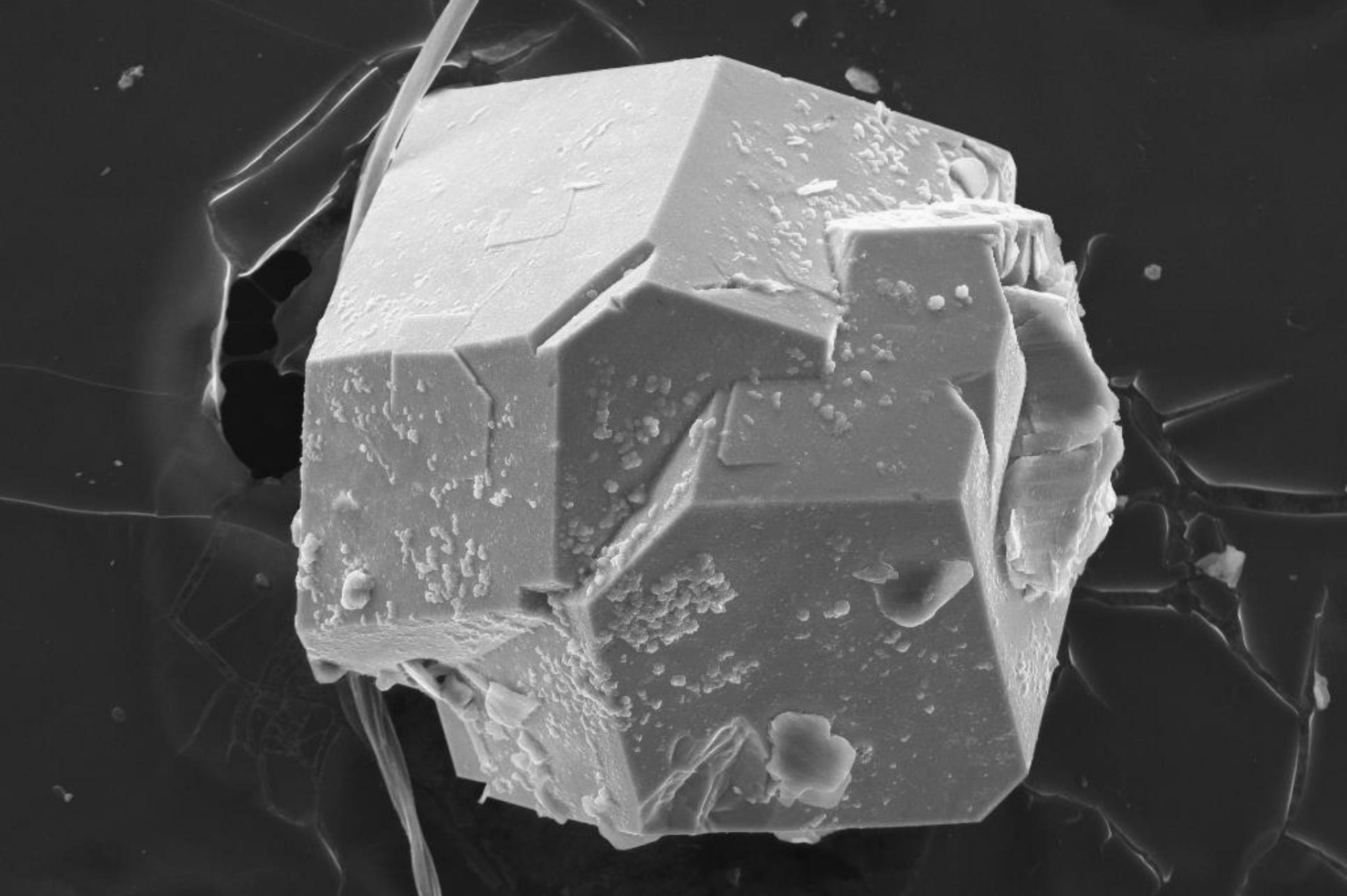


Quartzo

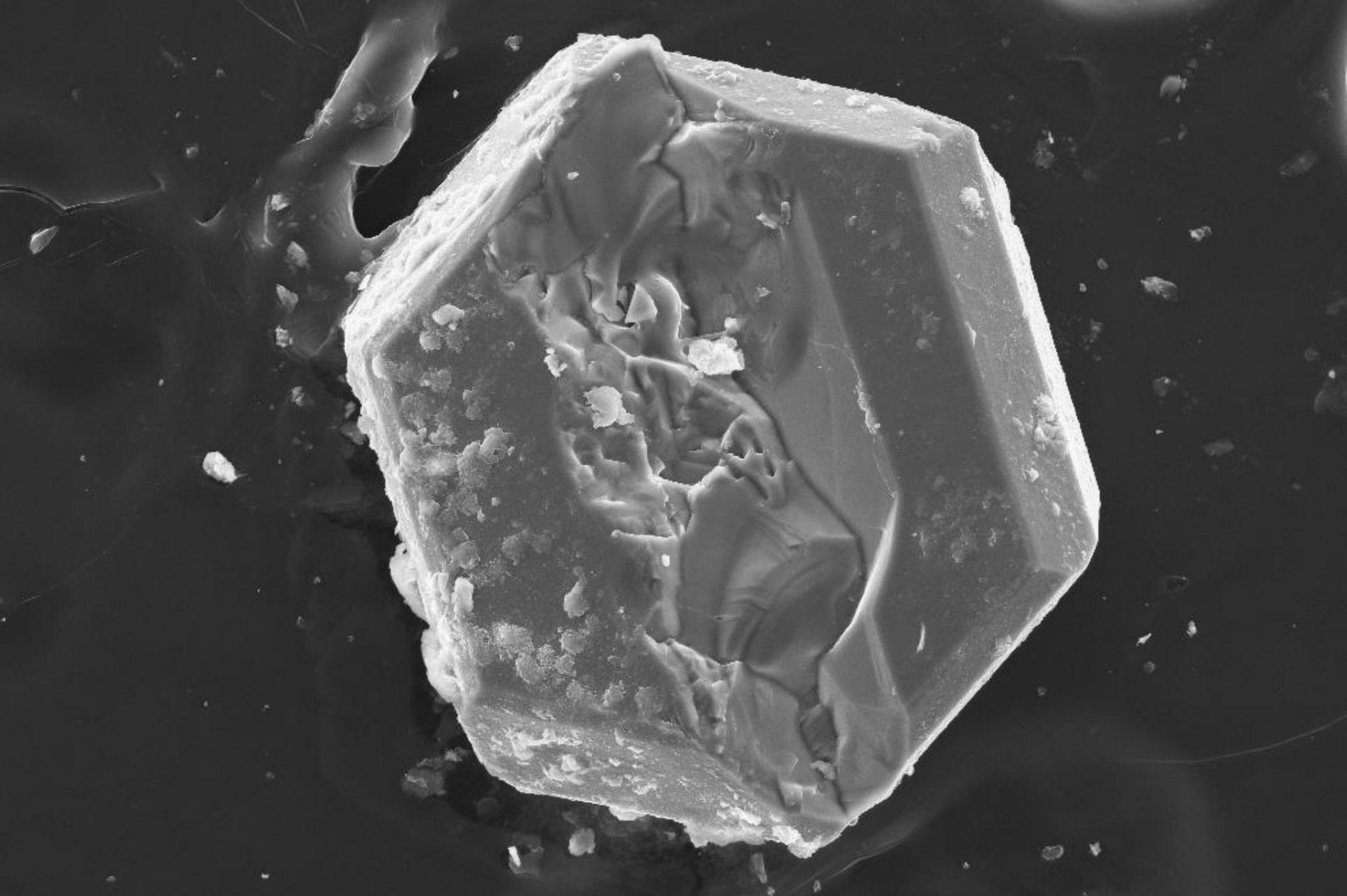
SiO_2







IGc-USP EHT=30.00 kV WD= 25 mm Mag= 700 X 14405
30µm Photo No.=5 Detector= SE1



IGc-USP EHT=30.00 kV
100µm

WD= 25 mm
Photo No.=9

Mag= 600 X
Detector= SE1

3VID305

Elementos de Simetria

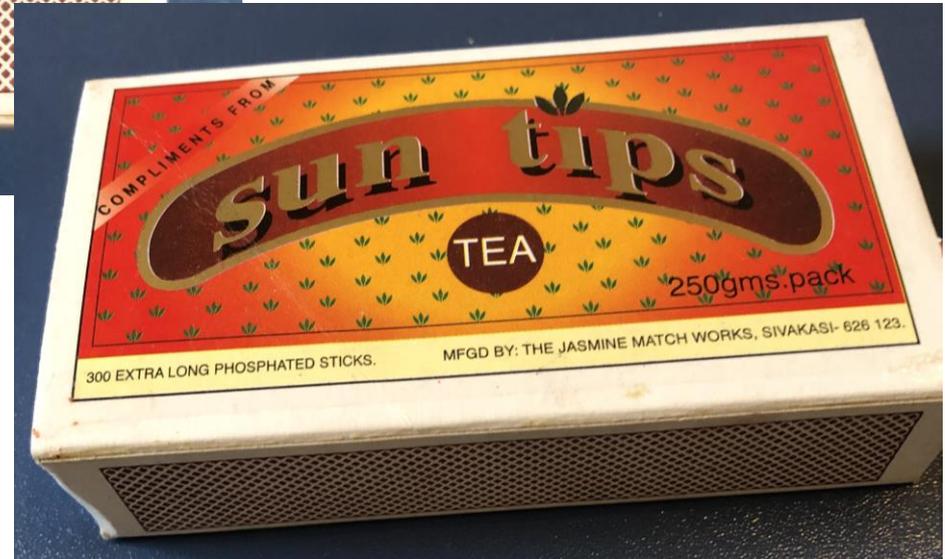
Plano de simetria – m – *reflexão*

Eixos de simetria

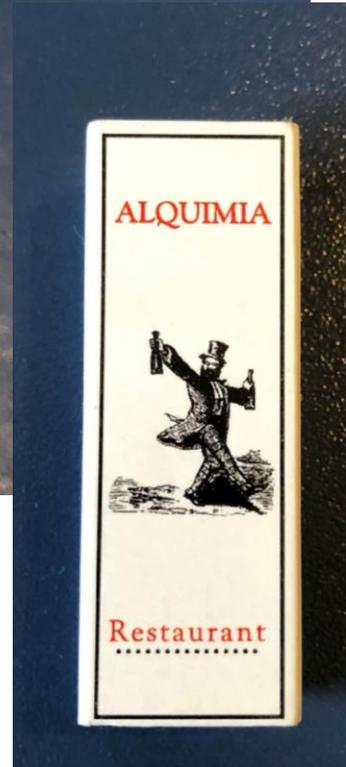
próprios: 1, 2, 3, 4, 6 – *rotação*

impróprios – *rotação + inversão*

Centro de simetria – i – *inversão*



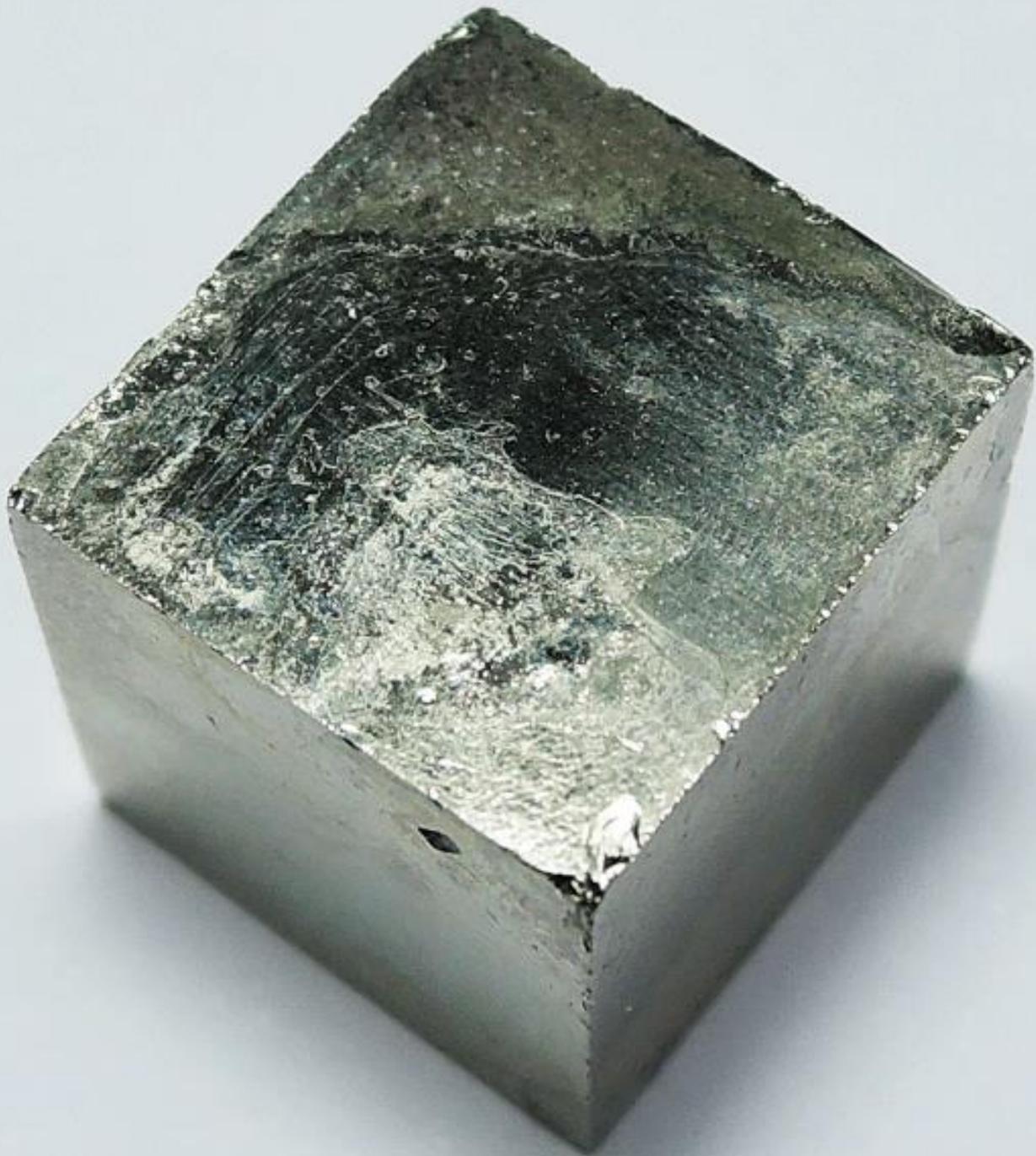




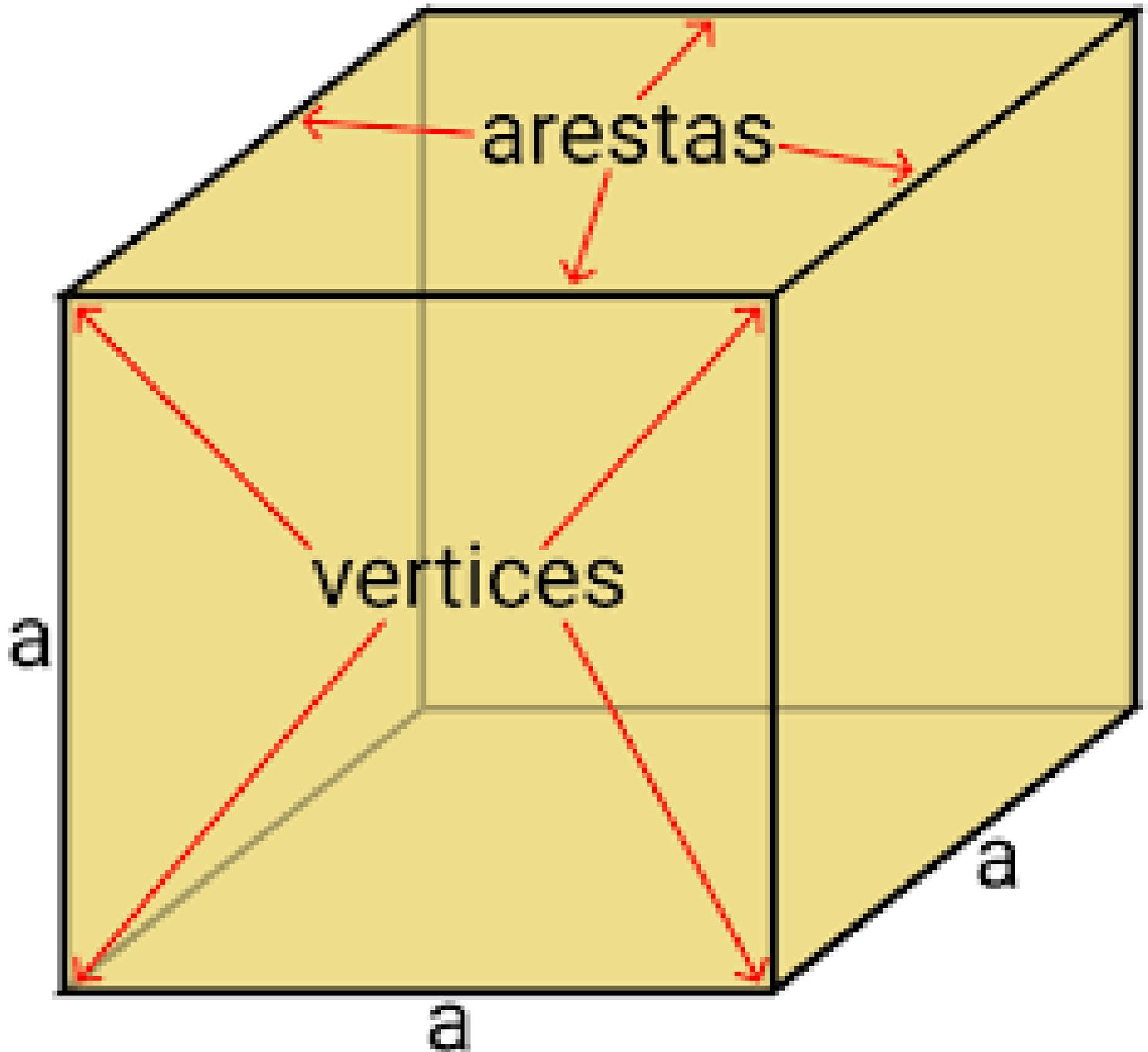




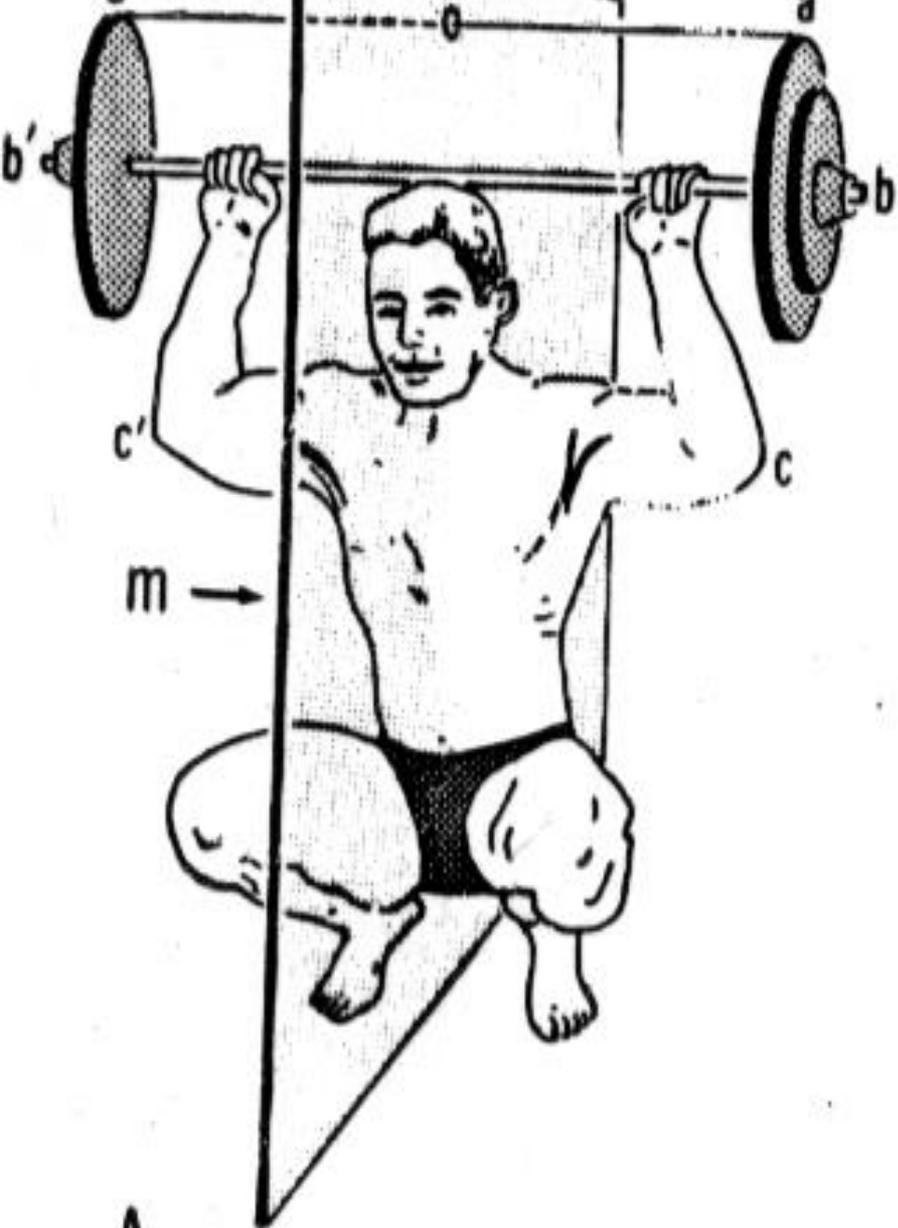
Plano de simetria – m – *reflexão*



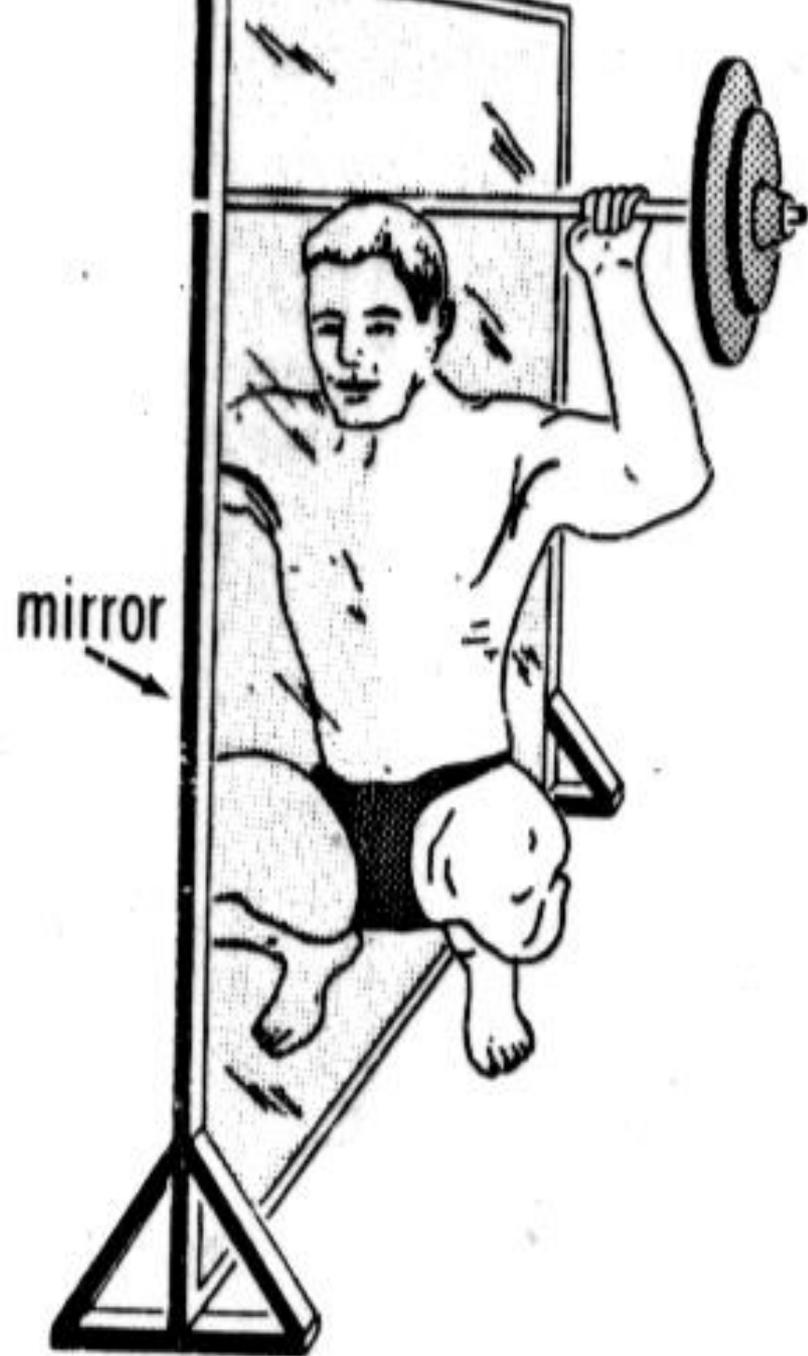




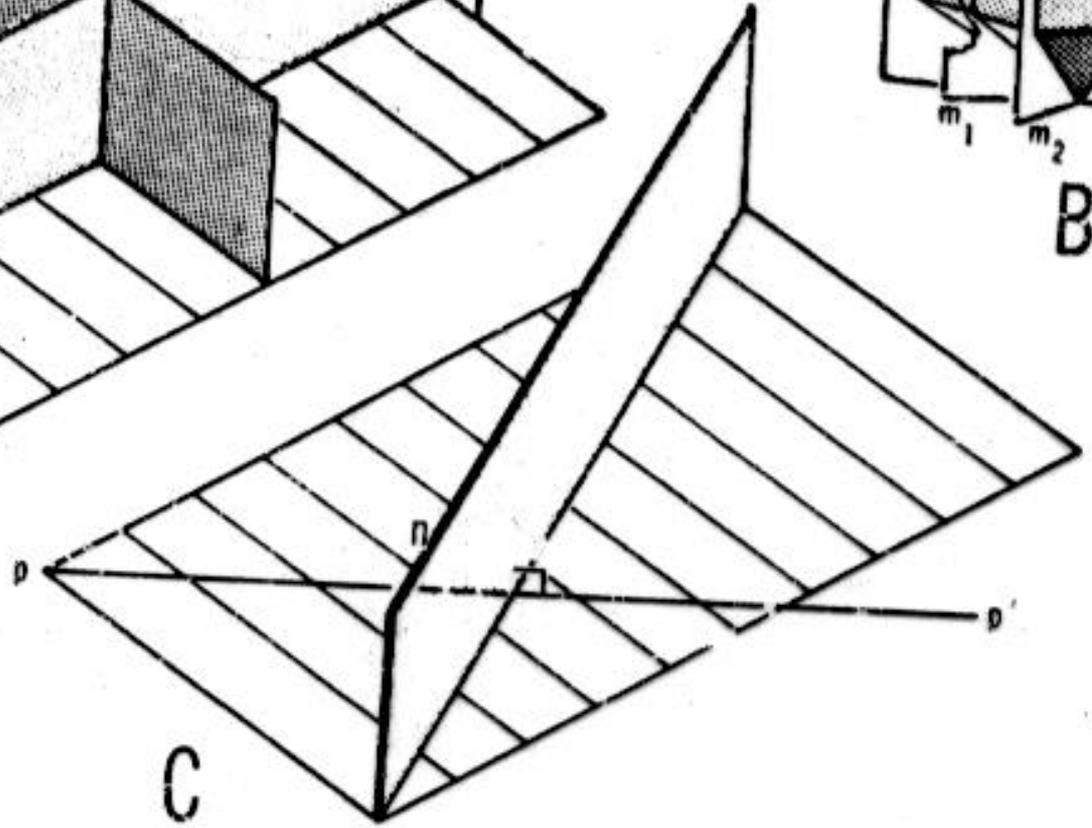
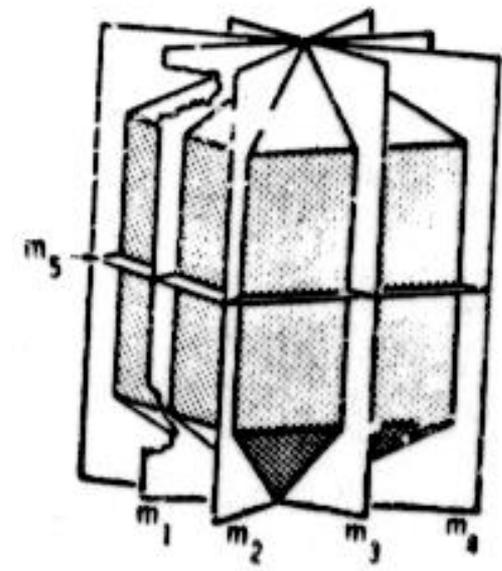
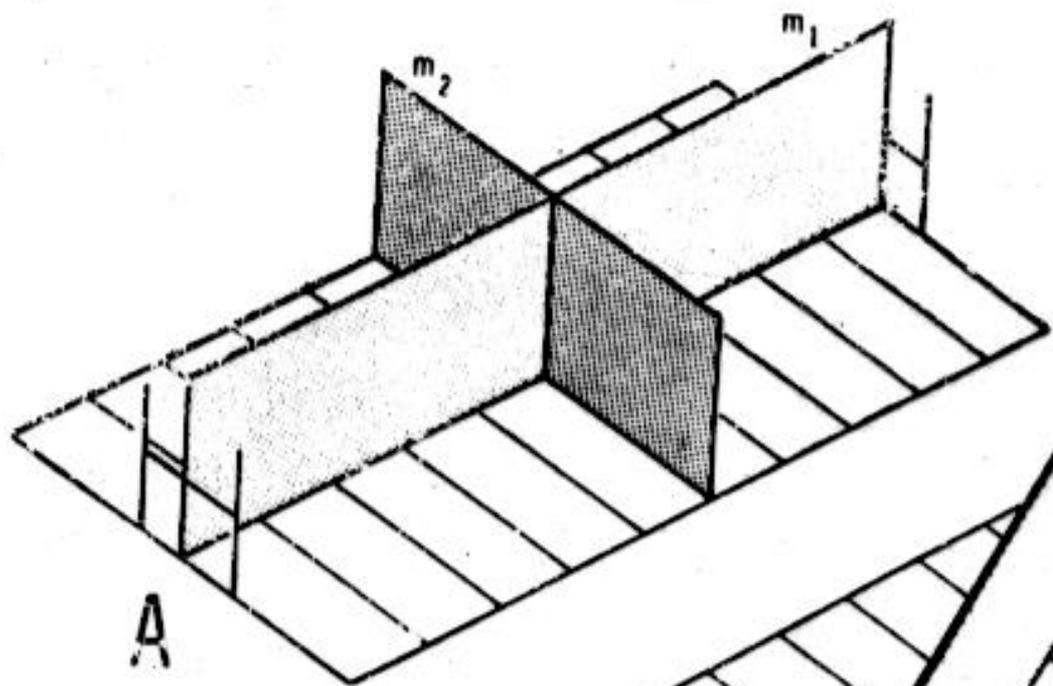




A



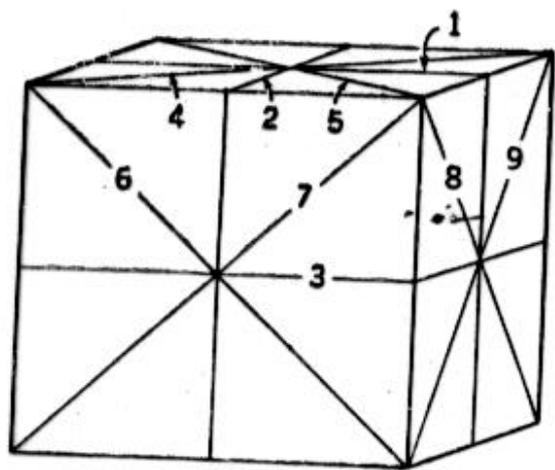
B



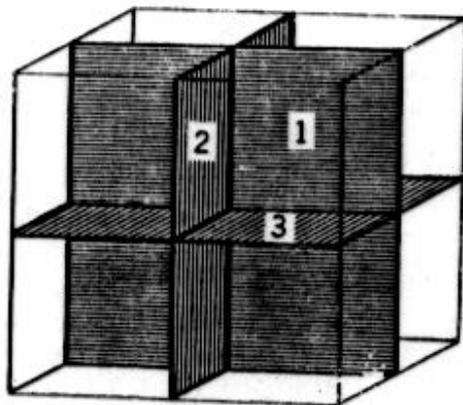
A

B

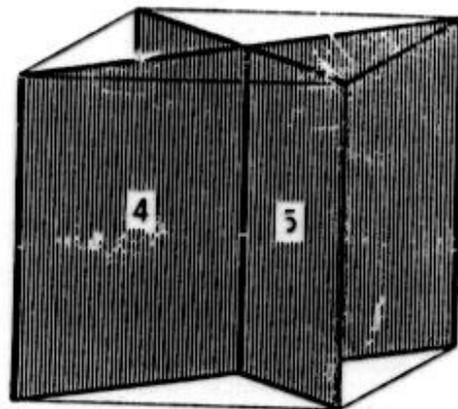
C



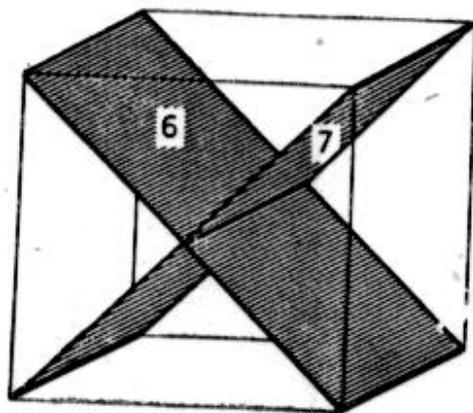
(a)



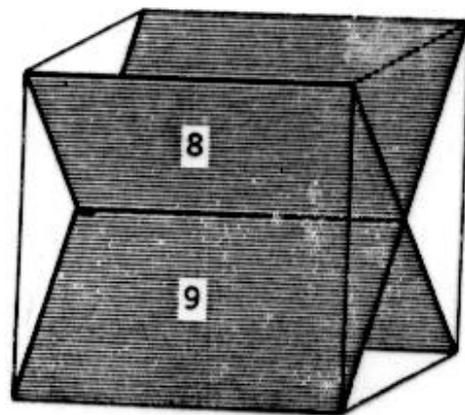
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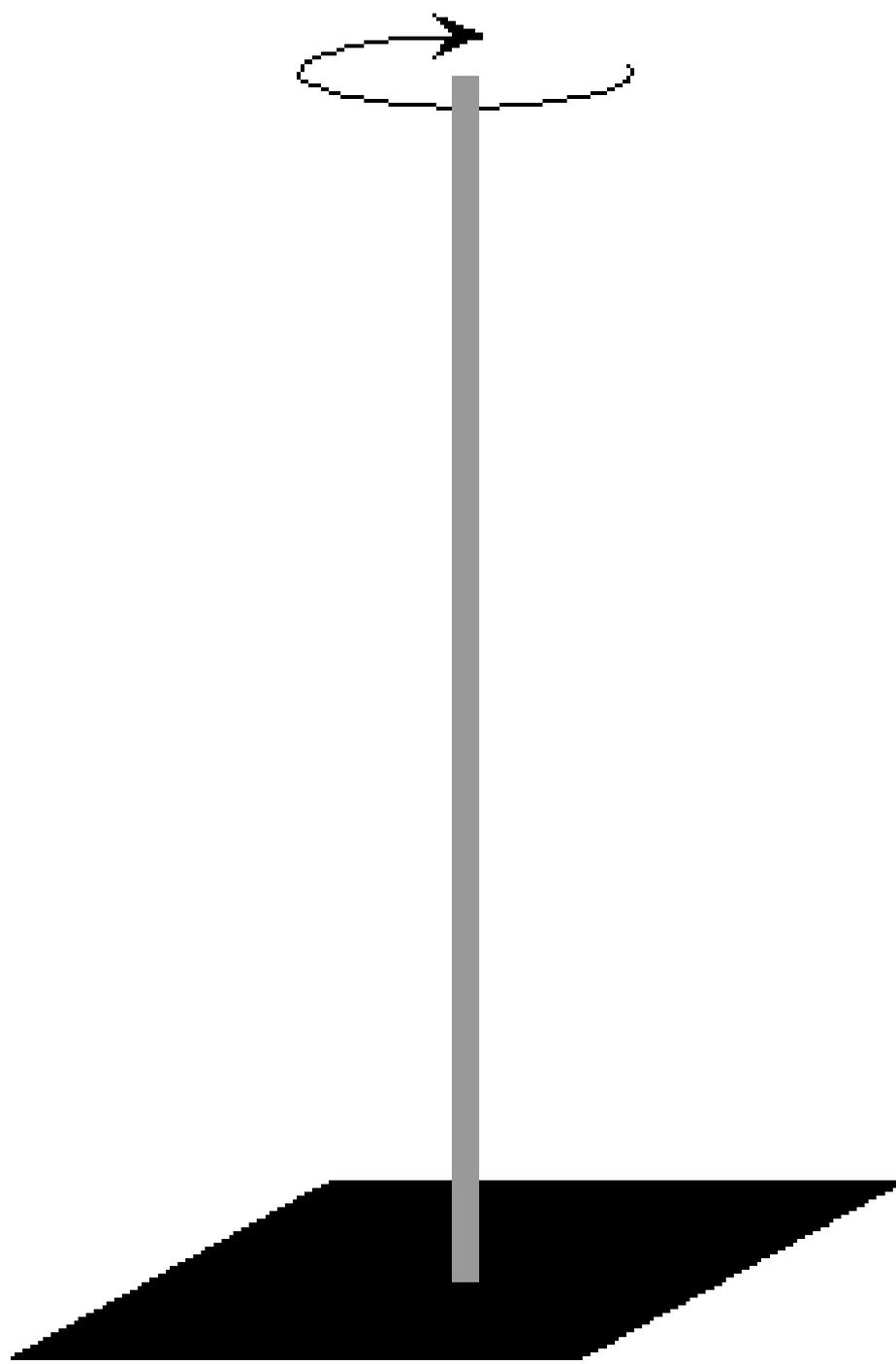
(c)

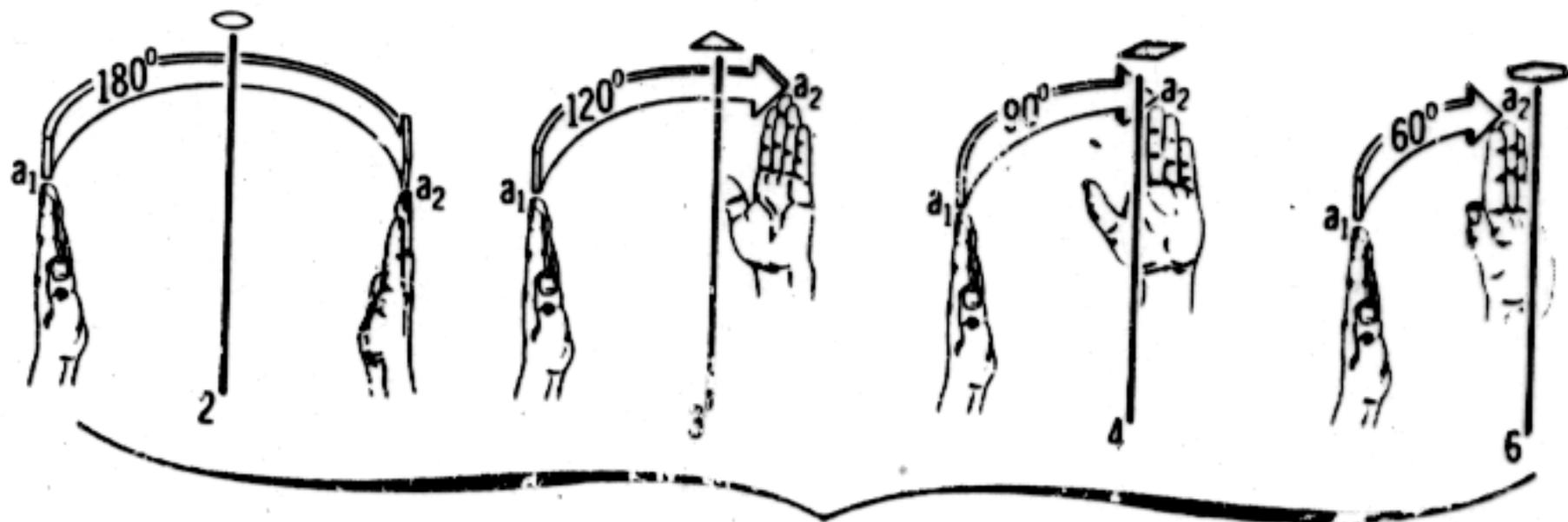


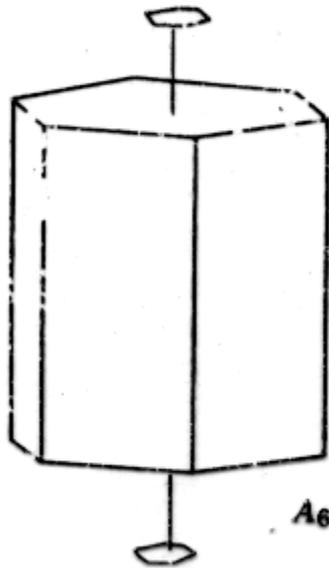
(d)



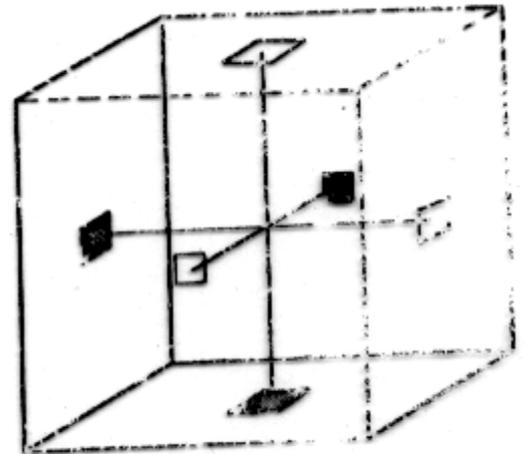
Eixos de simetria
próprios: 1, 2, 3, 4, 6
rotação







46







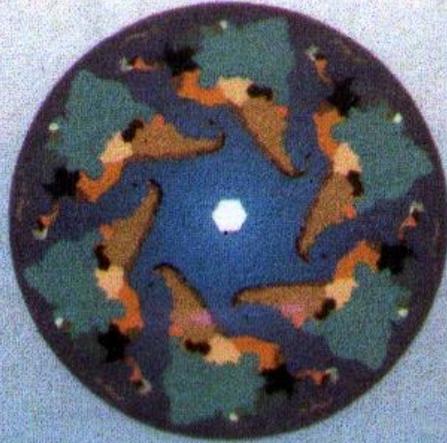
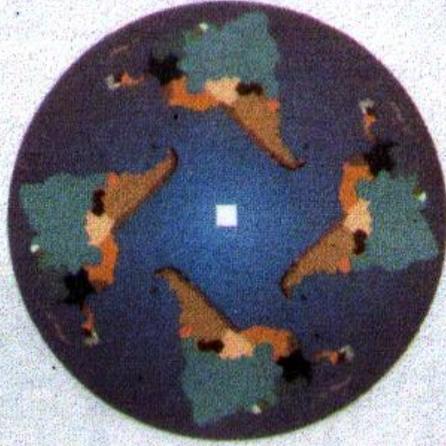
A



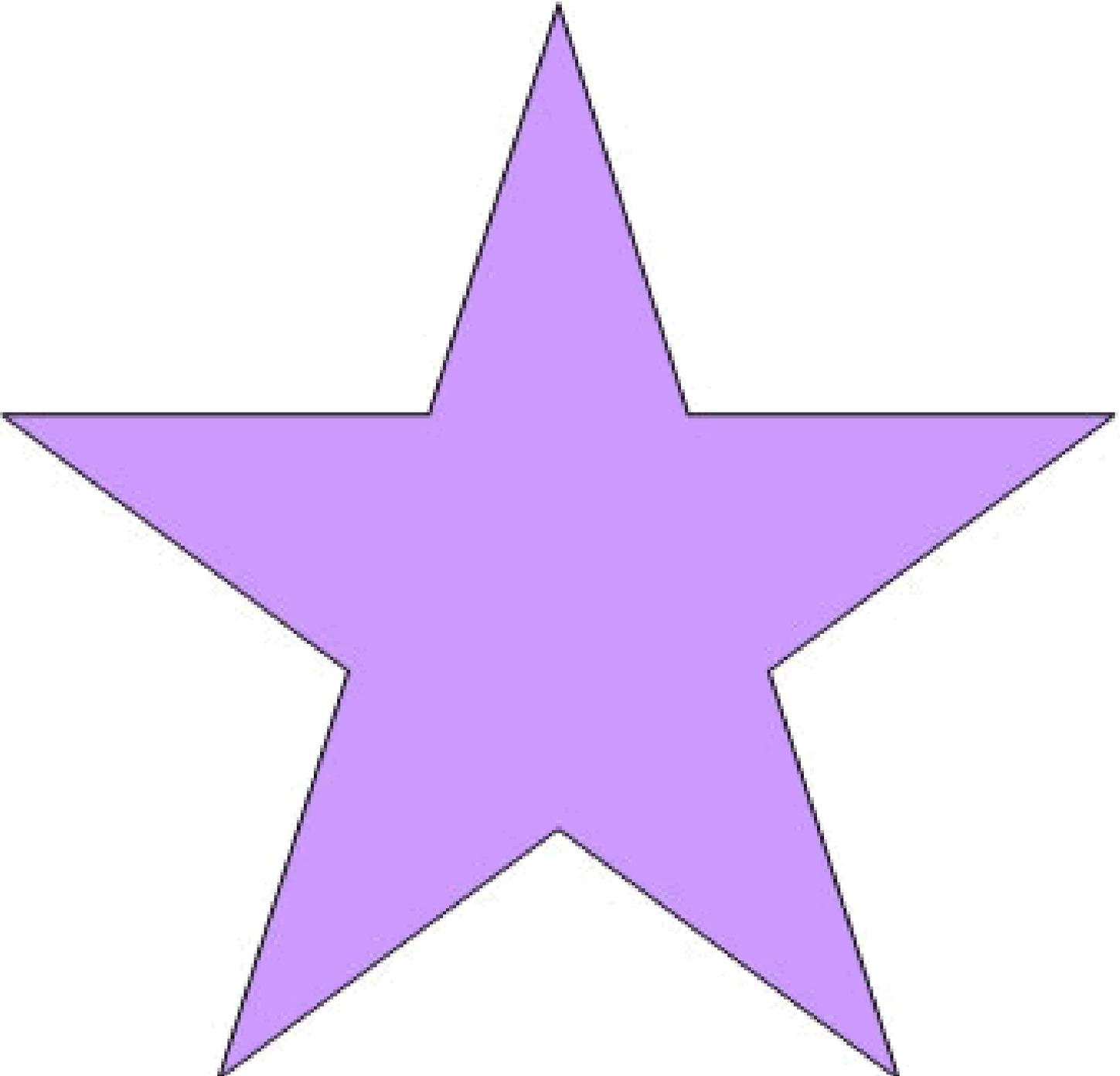
B

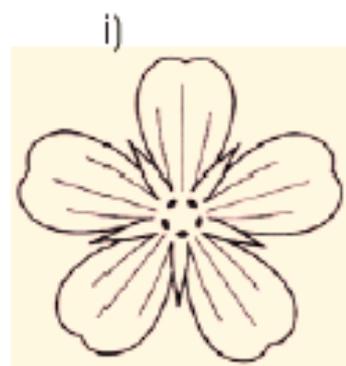
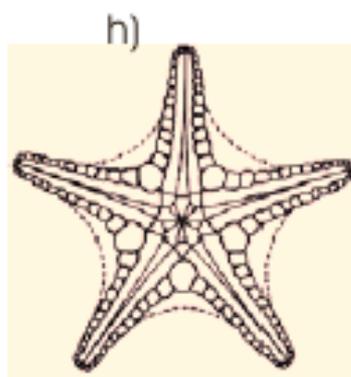
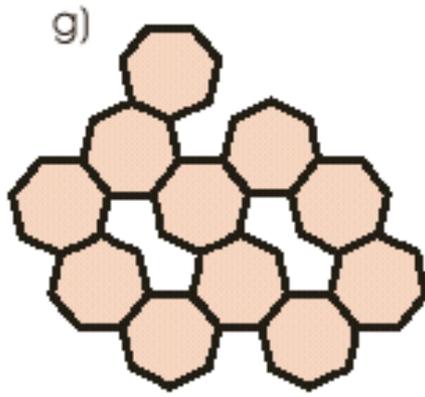
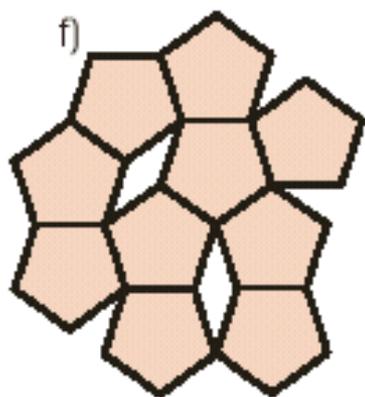
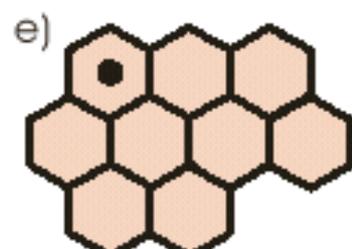
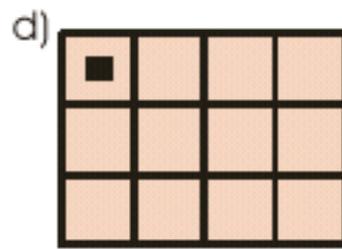
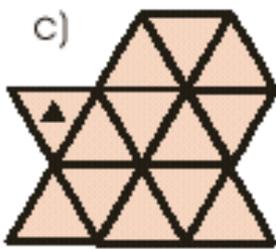
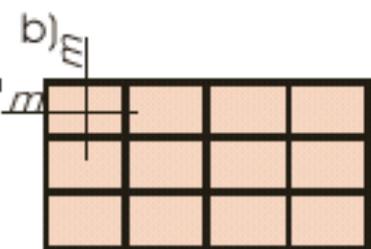
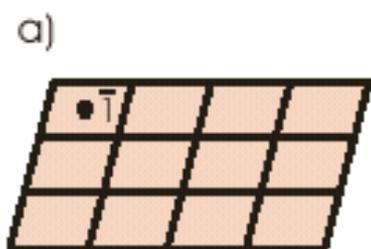


C



Eixos de simetria
próprios: 1, 2, 3, 4, 6
rotação





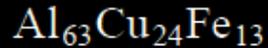
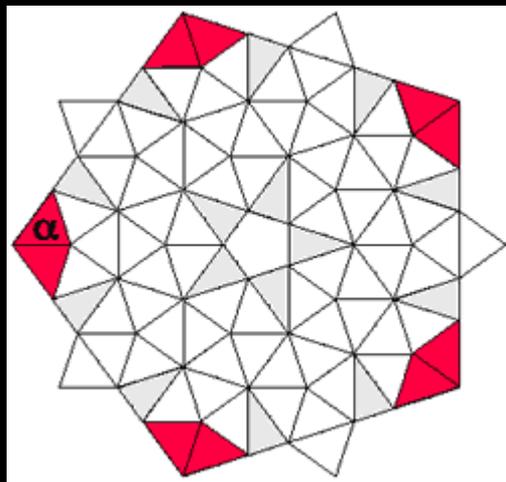
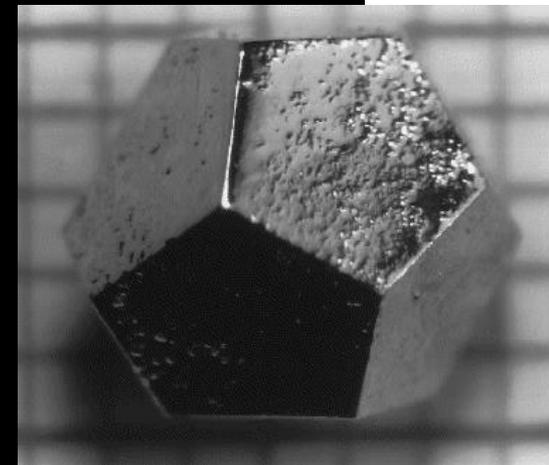
2010-042 ICOSAHEDRITEIcosahedral Space group: $Fm\bar{3}\bar{5}$ a_{6D} 12.64 Å (six-dimensional notation; Steurer and Deloudi, 2009)It is not possible to give three-dimensional unit cell values and Z for this mineral.Luca Bindi^{1*}, Paul J. Steinhardt², Nan Yao³ and Peter J. Lu⁴

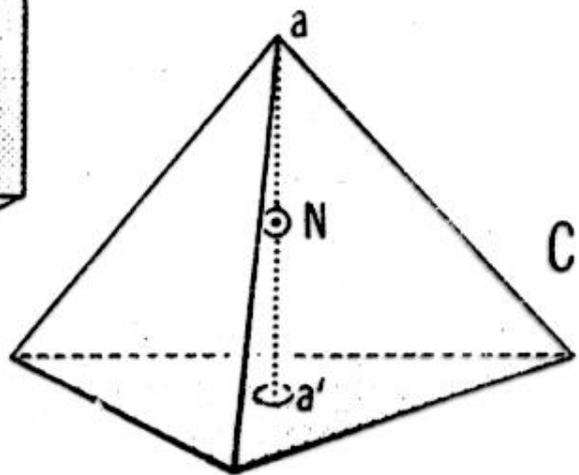
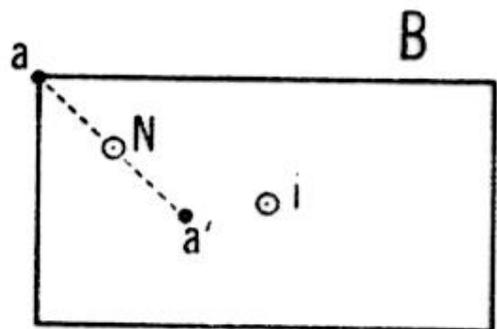
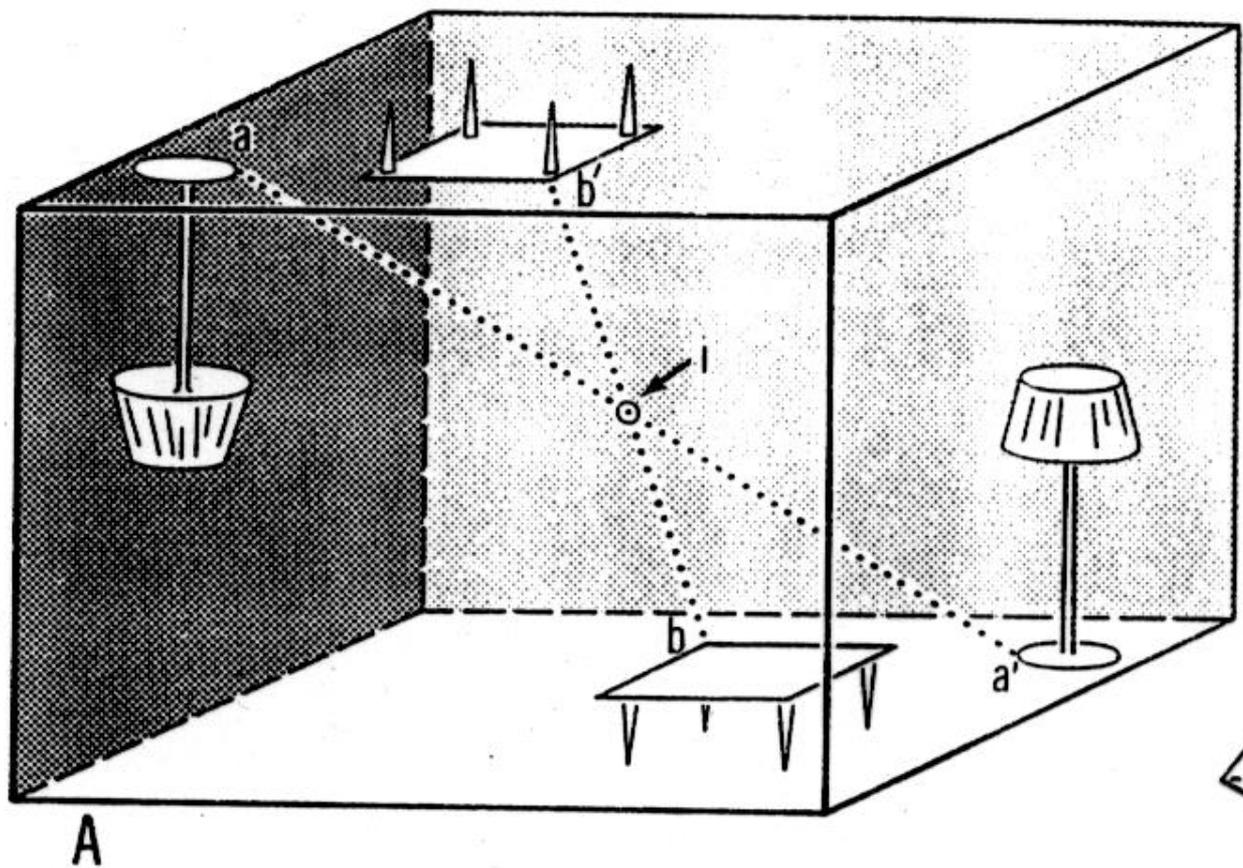
Table 2. X-ray powder-diffraction data for icosahedrite. The pattern was indexed on the basis of six integer indices as conventionally used with quasicrystals (Bancel, 1991; Lu, 2000; Lu *et al.*, 2001).

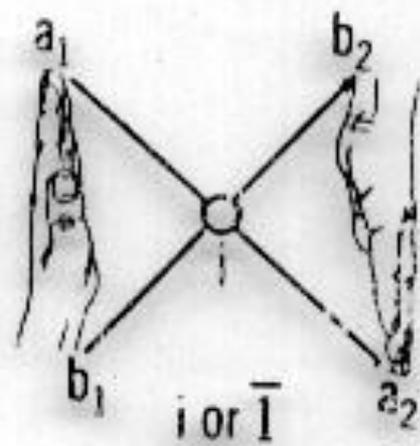
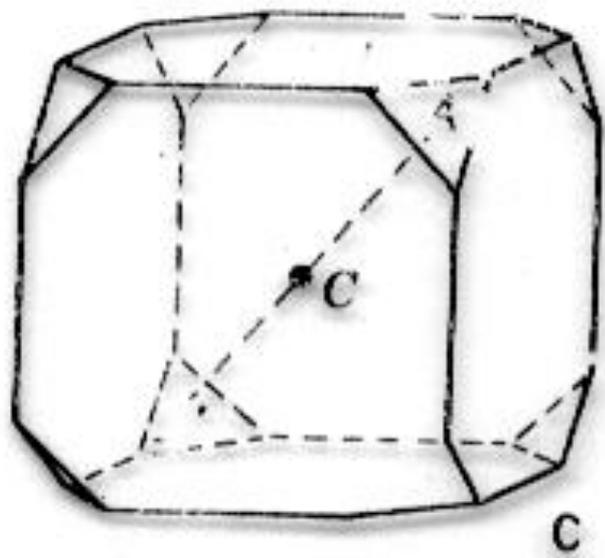


| I | d_{meas} | d_{calc} | $hklmno$ |
|------------|--------------|---------------|------------------------|
| 2 | 8.94 | 8.9443 | 200000 |
| 5 | 5.53 | 5.5216 | 11 $\bar{1}\bar{1}$ 11 |
| 20 | 3.75 | 3.7450 | 200022 |
| 25 | 3.41 | 3.4100 | 31 $\bar{1}\bar{1}$ 11 |
| 20 | 3.24 | 3.2444 | 220022 |
| 5 | 2.799 | 2.7962 | 31 $\bar{1}\bar{1}$ 31 |
| 10 | 2.451 | 2.4522 | 420022 |
| 5 | 2.350 | 2.3505 | 31 $\bar{1}\bar{1}$ 33 |
| 90 | 2.108 | 2.1082 | 42 $\bar{2}\bar{2}$ 22 |
| 100 | 2.006 | 2.0048 | 4 $\bar{2}$ 0042 |
| 5 | 1.728 | 1.7283 | 53 $\bar{1}\bar{2}$ 33 |
| 15 | 1.452 | 1.4528 | 62 $\bar{2}$ 044 |
| 5 | 1.418 | 1.4176 | 62 $\bar{2}\bar{2}$ 44 |
| 30 | 1.238 | 1.2390 | 60 $\bar{4}$ 064 |

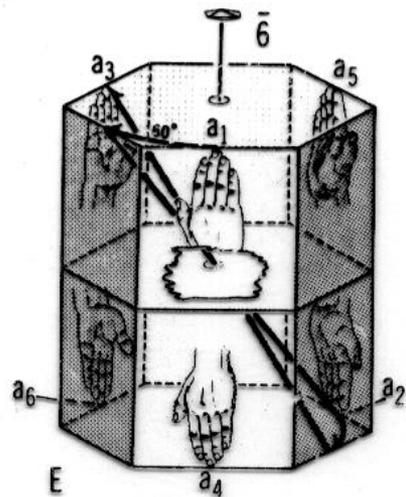
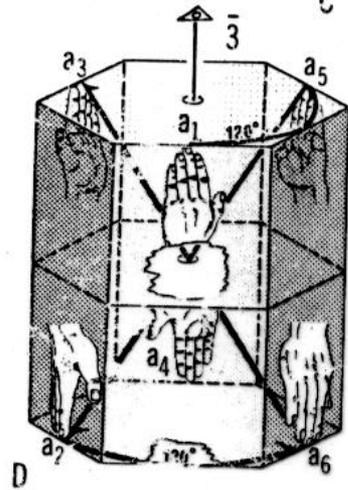
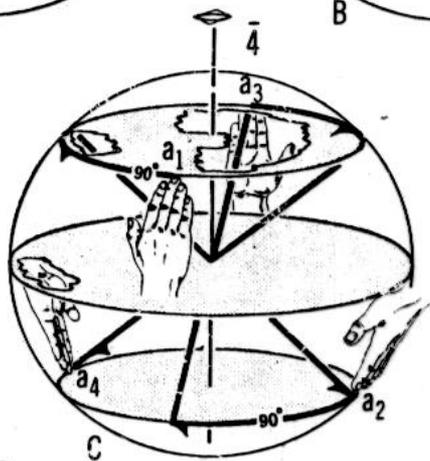
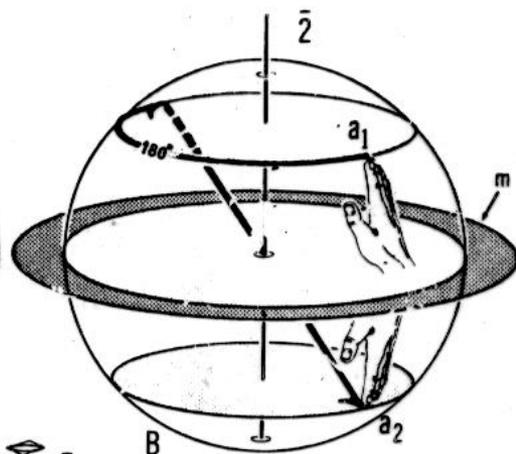
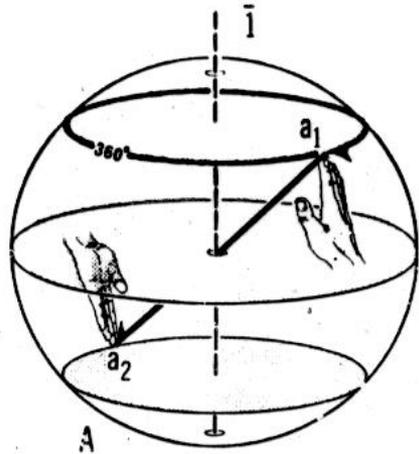


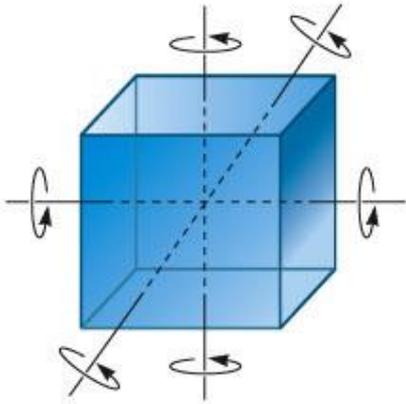
Centro de simetria – i - *inversão*



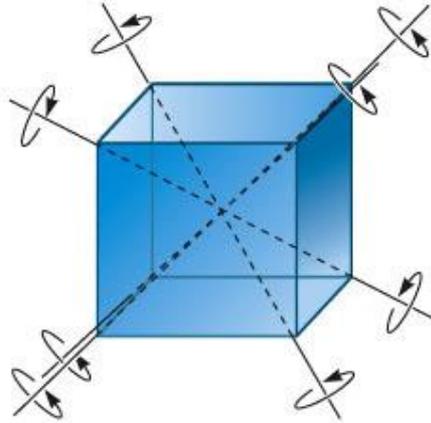


Eixos de simetria
impróprios
rotação + inversão

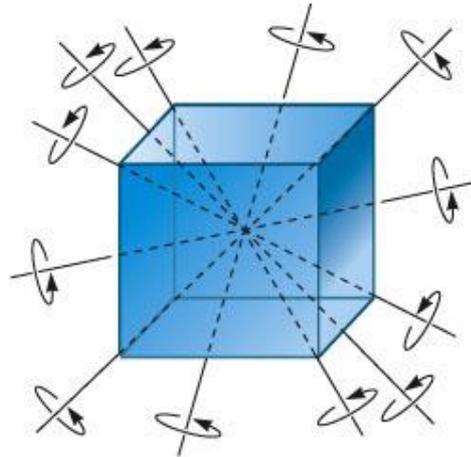




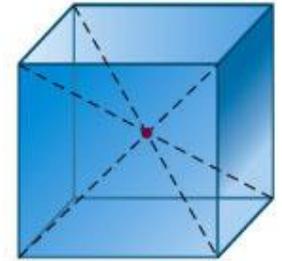
Three 4-fold axes



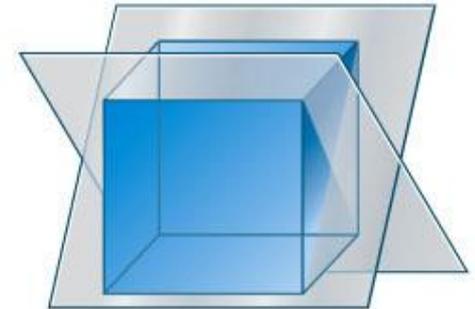
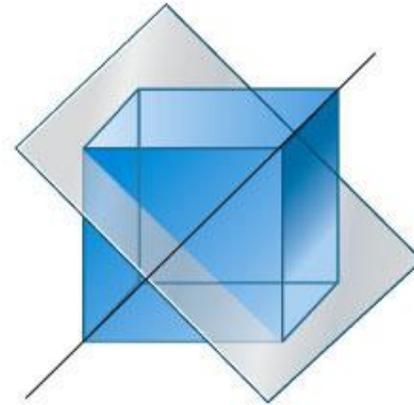
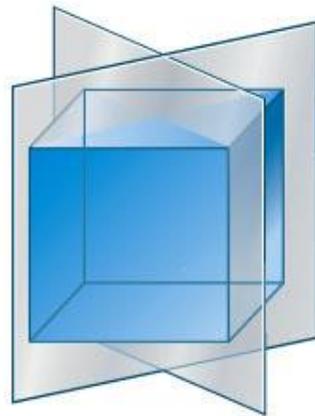
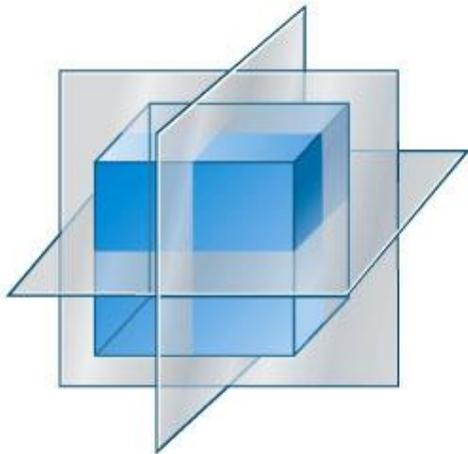
Four 3-fold axes



Six 2-fold axes



Center of inversion



Nine mirror planes

















Crystal Models

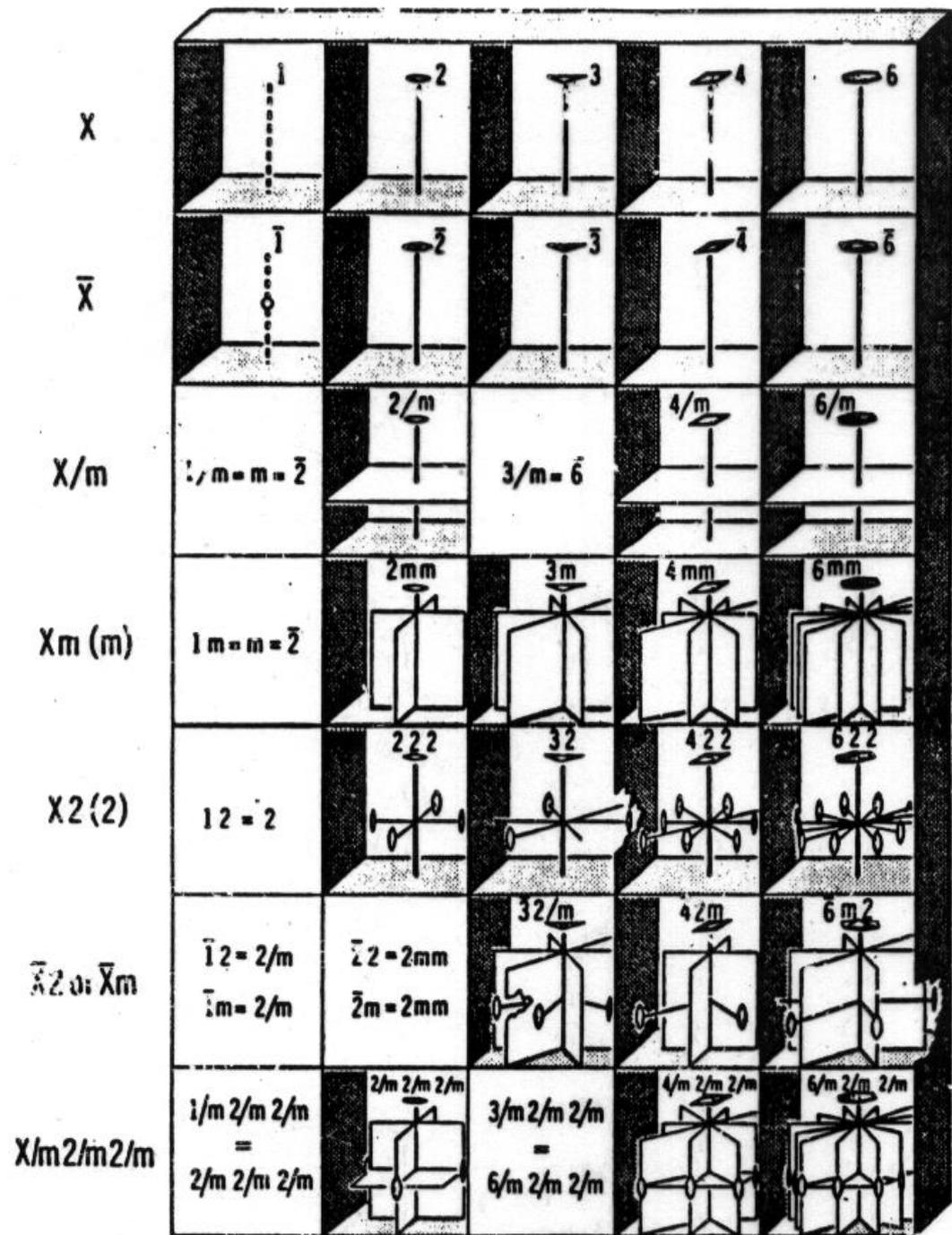
| No. | System | Name | Code | Sample |
|-----|-----------------------------|-----------------------------|-------------|-------------|
| 1 | Cubic | Cube | {100} | Cubic |
| 2 | Orthorhombic | Orthorhombic | {111} | Rhombic |
| 3 | Rhombohedral | Rhombohedral | {110} | Trigonal |
| 4 | Tetrahedral | Tetrahedral | {111} | Tetrahedral |
| 5 | Pentagonal dodecahedral | Pentagonal dodecahedral | {210} | Prism |
| 6 | Tetragonal prismatic | Tetragonal prismatic | {111} | Hexahedron |
| 7 | Tetragonal prism and base | Tetragonal prism and base | {100} {001} | Trigonal |
| 8 | Rhombohedral prismatic | Rhombohedral prismatic | {101} | |
| 9 | Hexagonal prism and base | Hexagonal prism and base | {100} {001} | Hexagonal |
| 10 | Rhombohedral | Rhombohedral | {101} | Octahedron |
| 11 | Rhombohedral prismatic | Rhombohedral prismatic | {111} | Trigonal |
| 12 | Rhombohedral prism and base | Rhombohedral prism and base | {110} {001} | Hexagonal |
| 13 | Monoclinic prismatic | Monoclinic prismatic | {111} {110} | |
| 14 | Monoclinic prism and base | Monoclinic prism and base | {110} {001} | |
| 15 | Trigonal prismatic | Trigonal prismatic | {100} {001} | |



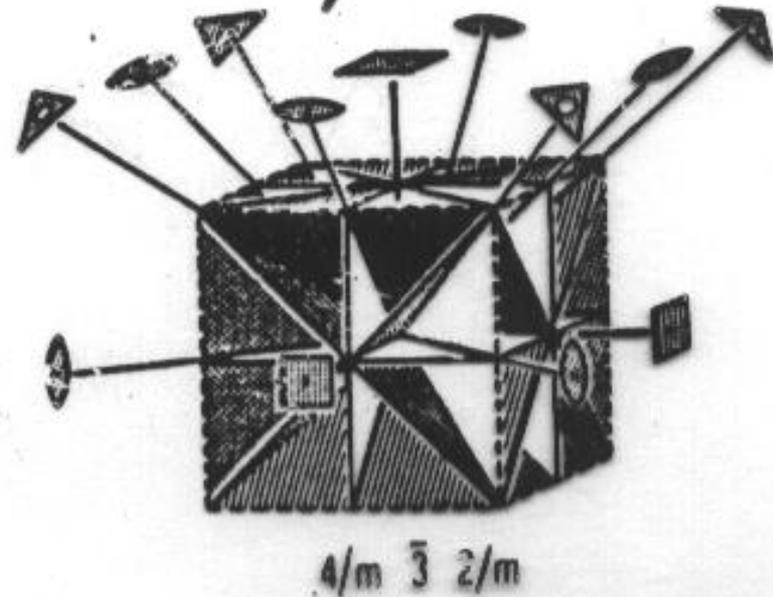
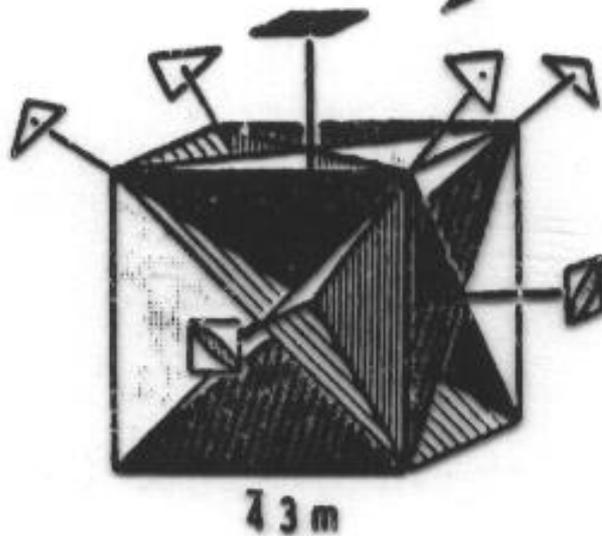
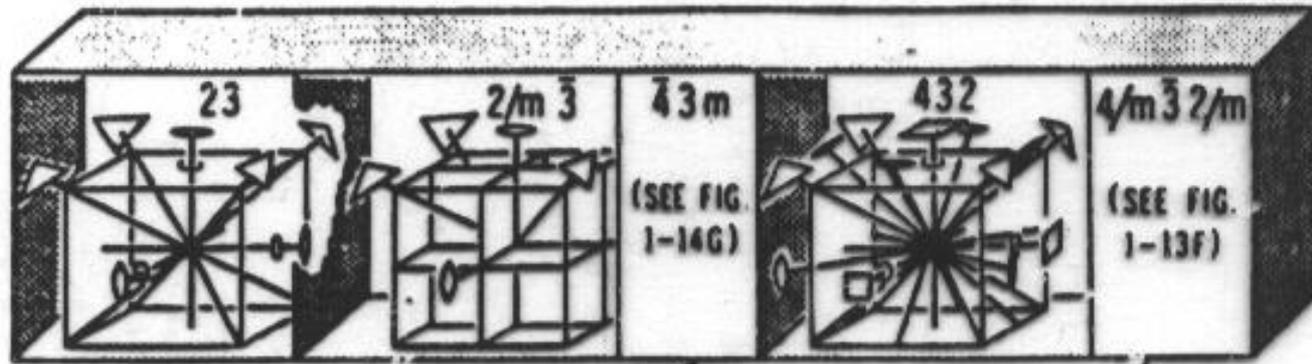
Associações de elementos de
simetria externa:
32 possibilidades
(Grupos Pontuais/Classes de
Simetria).

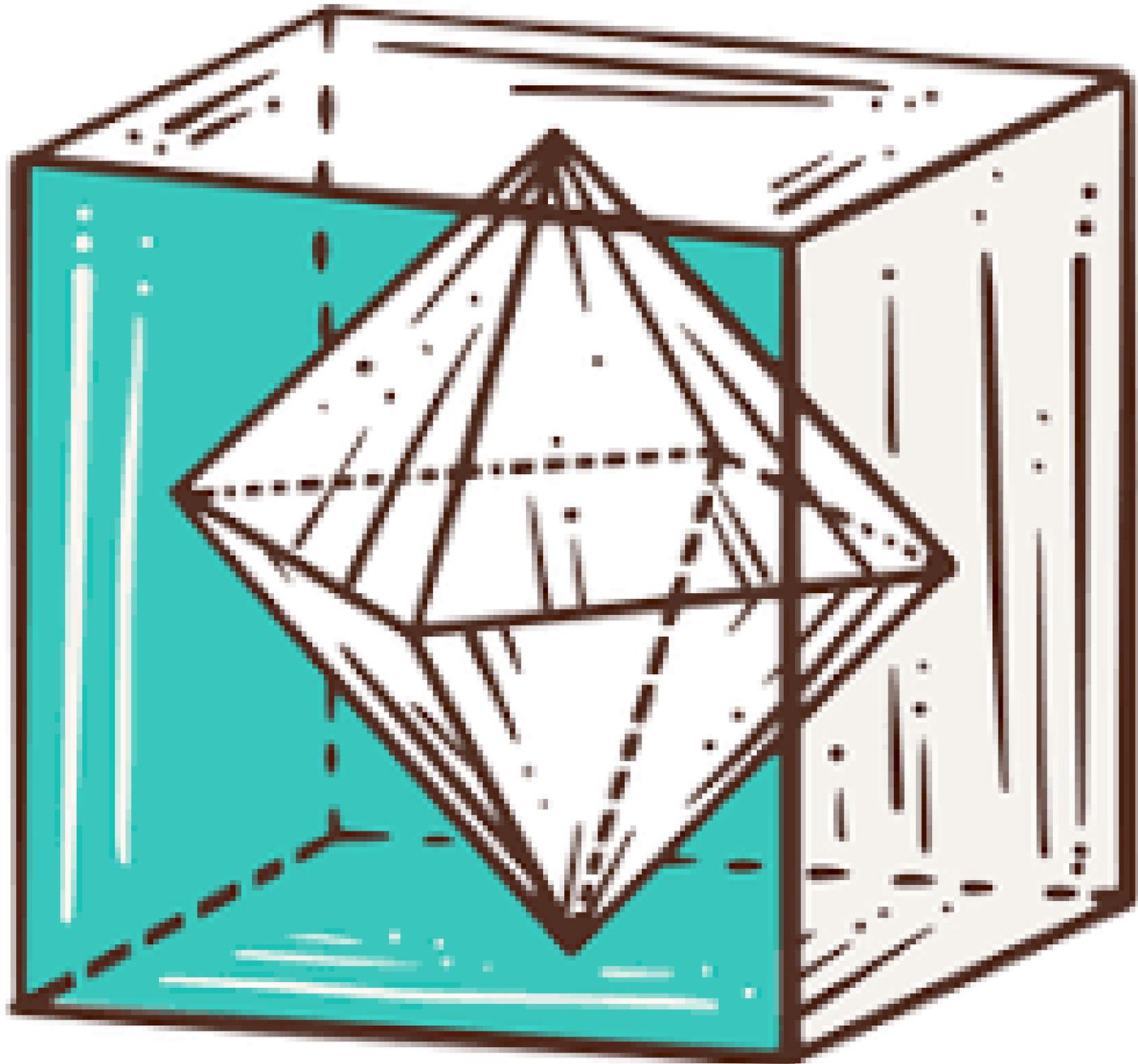
AS 32 CLASSES CRISTALINAS

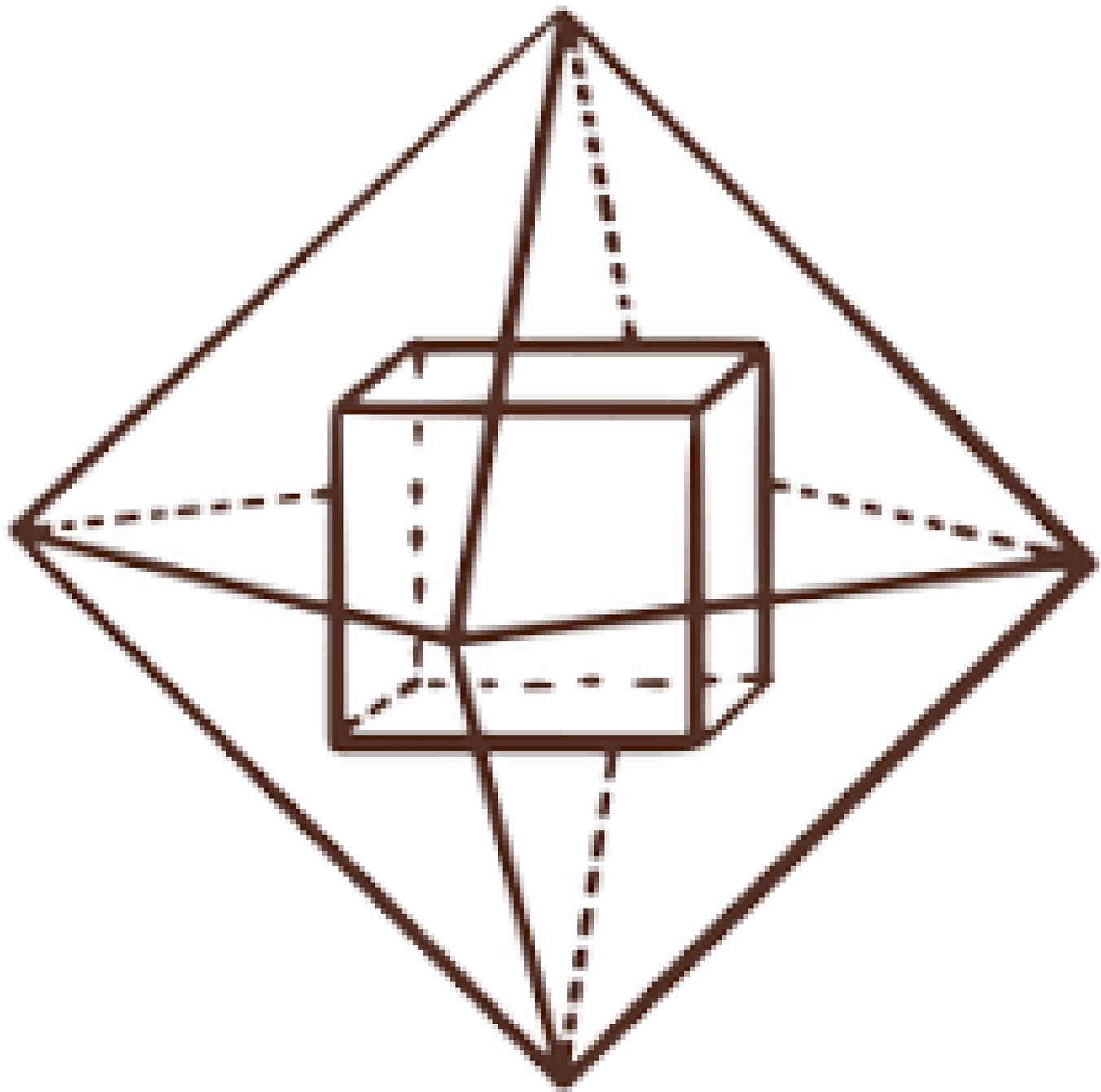
| Sistema Cristalino | Classe Cristalina | Grau de Simetria |
|--------------------------------|-------------------|--------------------------------|
| Triclínico | 1 | Sem simetria |
| | $\bar{1}$ | i |
| Monoclínico | 2 | 1E2 |
| | m | 1m |
| | 2/m | 1E2, 1m, i |
| Ortorrômbico | 222 | 3E2 |
| | mm2 | 1E2, 2m |
| | 2/m2/m2/m | 3E2, 3m, i |
| Tetragonal | 4 | 1E4 |
| | $\bar{4}$ | 1E $\bar{4}$ |
| | 4/m | 1E4, 1m, i |
| | 422 | 1E4, 4E2 |
| | 4mm | 1E4, 4m |
| | $\bar{4}2m$ | 1E $\bar{4}$, 2E2, 2m |
| | 4/m2/m2/m | 1E4, 4E2, 5m, i |
| Trigonal | 3 | 1E3 |
| | $\bar{3}$ | 1E $\bar{3}$ |
| | 32 | 1E3, 3E2 |
| | 3m | 1E3, 3m |
| | $\bar{3}2/m$ | 1E $\bar{3}$, 3E2, 3m, i |
| Hexagonal | 6 | 1E6 |
| | $\bar{6}$ | 1E $\bar{6}$ |
| | 6/m | 1E6, 1m, i |
| | 622 | 1E6, 6E2 |
| | 6mm | 1E6, 6m |
| | $\bar{6}m2$ | 1E $\bar{6}$, 3E2, 3m |
| | 6/m2/m2/m | 1E6, 6E2, 7m, i |
| Isométrico (Cúbico) | 23 | 4E3, 3E2 |
| | 2/m $\bar{3}$ | 4E $\bar{3}$, 3E2, 3m, i |
| | 432 | 4E3, 3E4, 6E2 |
| | $\bar{4}3m$ | 4E3, 3E $\bar{4}$, 6m |
| | 4/m $\bar{3}2/m$ | 4E $\bar{3}$, 3E4, 6E2, 9m, i |



Combinações referíveis ao cubo - guia

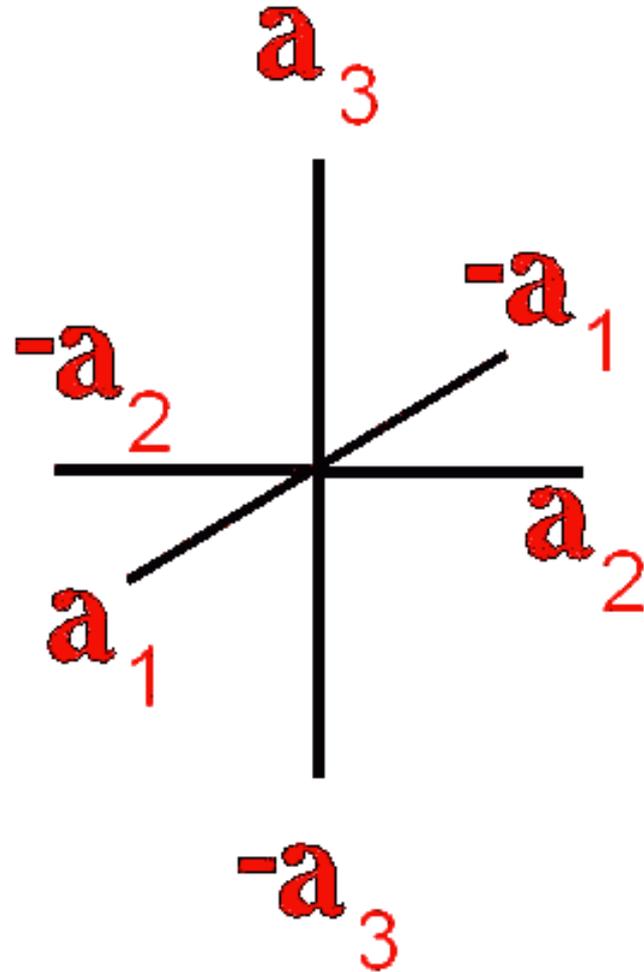




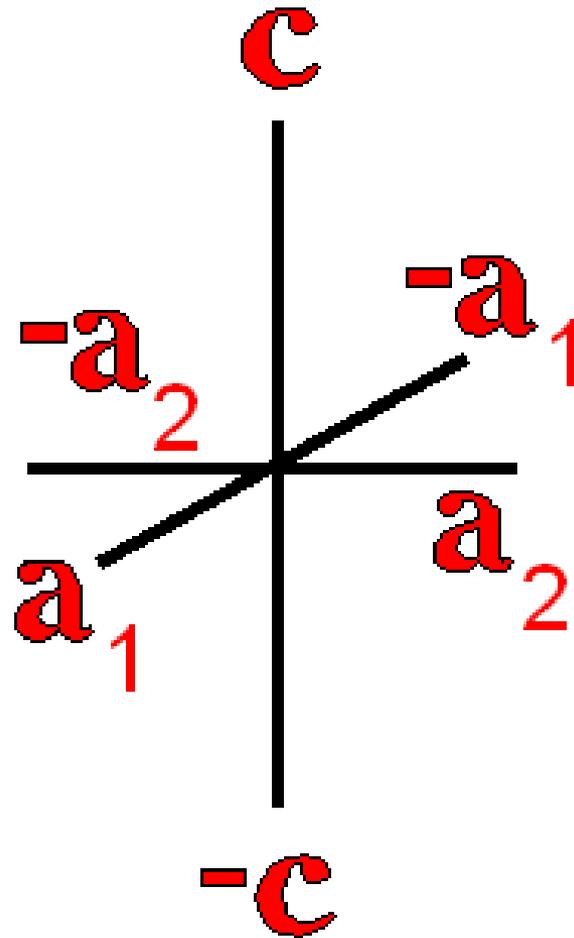


Eixos cristalográficos: orientação espacial

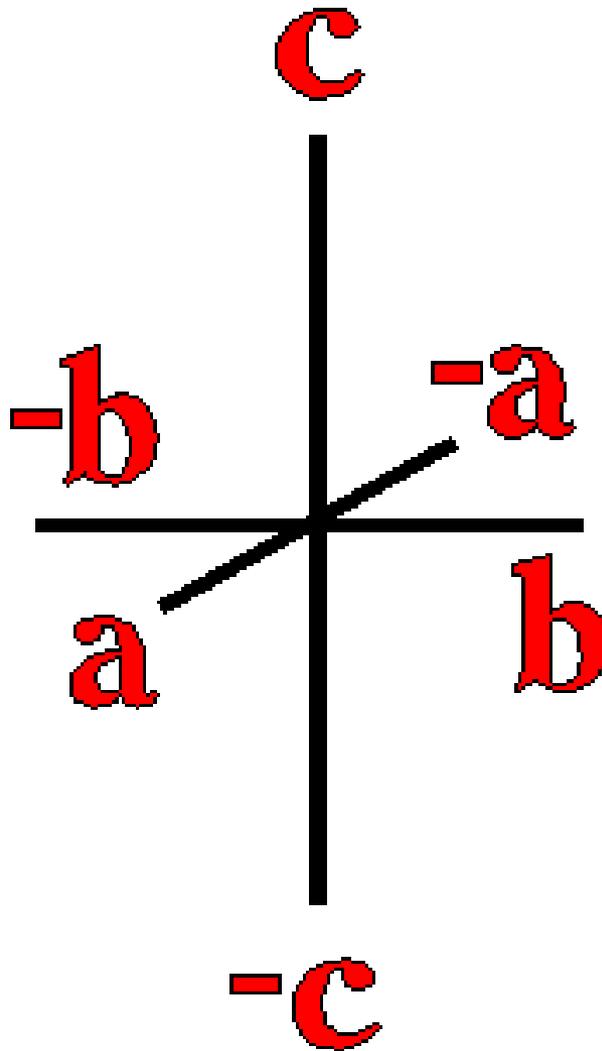
Isométrico



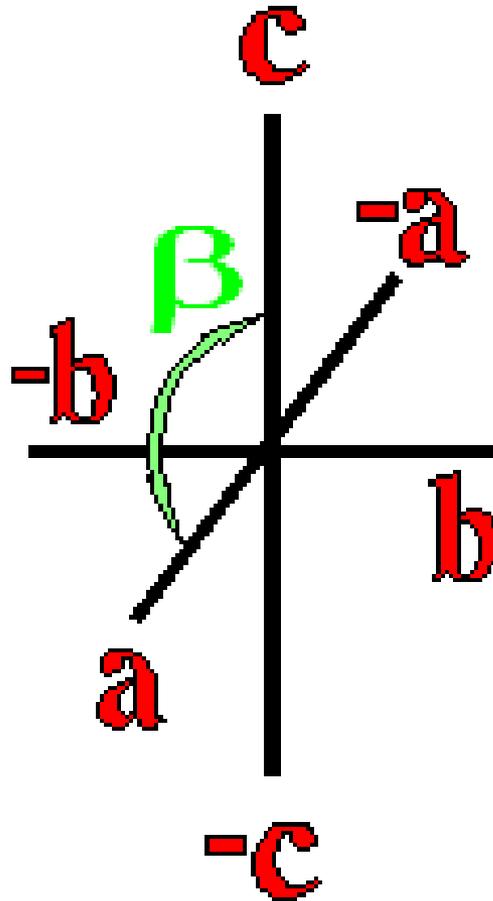
Tetragonal



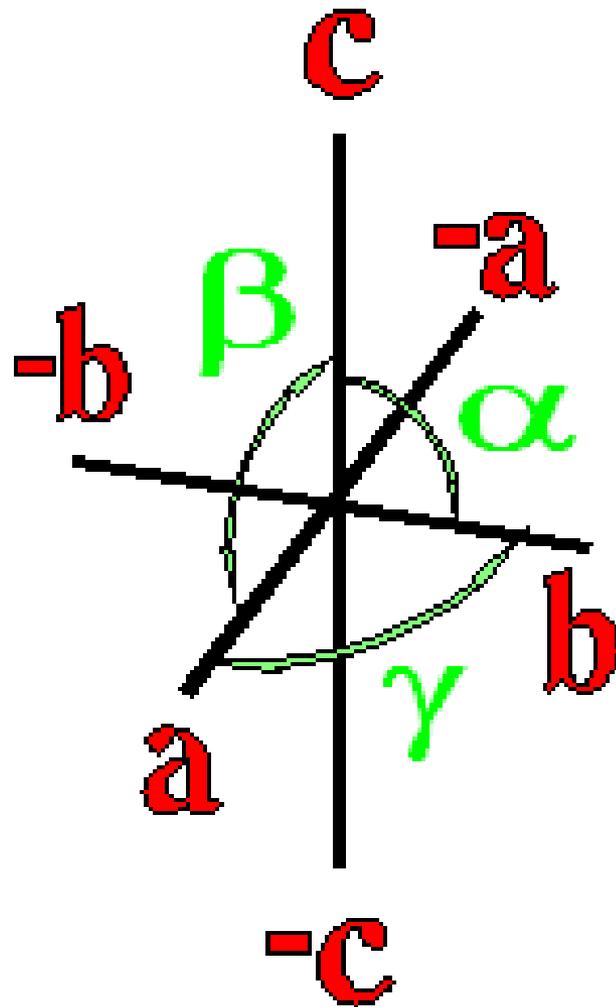
Ortorrômbico



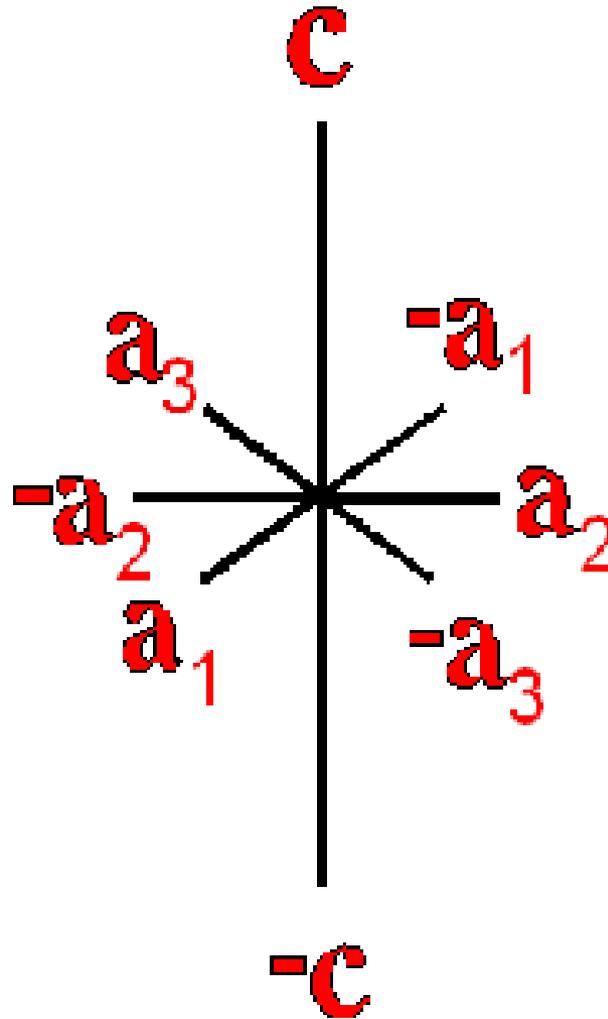
Monoclínico



Triclínico



Trigonal e hexagonal



AS 32 CLASSES CRISTALINAS

| Sistema Cristalino | Classe Cristalina | Grau de Simetria |
|--------------------------------|-------------------|--------------------------------|
| Triclínico | 1 | Sem simetria |
| | $\bar{1}$ | i |
| Monoclínico | 2 | 1E2 |
| | m | 1m |
| | 2/m | 1E2, 1m, i |
| Ortorrômico | 222 | 3E2 |
| | mm2 | 1E2, 2m |
| | 2/m2/m2/m | 3E2, 3m, i |
| Tetragonal | 4 | 1E4 |
| | $\bar{4}$ | 1E $\bar{4}$ |
| | 4/m | 1E4, 1m, i |
| | 422 | 1E4, 4E2 |
| | 4mm | 1E4, 4m |
| | $\bar{4}2m$ | 1E $\bar{4}$, 2E2, 2m |
| | 4/m2/m2/m | 1E4, 4E2, 5m, i |
| Trigonal | 3 | 1E3 |
| | $\bar{3}$ | 1E $\bar{3}$ |
| | 32 | 1E3, 3E2 |
| | 3m | 1E3, 3m |
| | $\bar{3}2/m$ | 1E $\bar{3}$, 3E2, 3m, i |
| Hexagonal | 6 | 1E6 |
| | $\bar{6}$ | 1E $\bar{6}$ |
| | 6/m | 1E6, 1m, i |
| | 622 | 1E6, 6E2 |
| | 6mm | 1E6, 6m |
| | $\bar{6}m2$ | 1E $\bar{6}$, 3E2, 3m |
| | 6/m2/m2/m | 1E6, 6E2, 7m, i |
| Isométrico (Cúbico) | 23 | 4E3, 3E2 |
| | 2/m $\bar{3}$ | 4E $\bar{3}$, 3E2, 3m, i |
| | 432 | 4E3, 3E4, 6E2 |
| | $\bar{4}3m$ | 4E3, 3E $\bar{4}$, 6m |
| | 4/m $\bar{3}2/m$ | 4E $\bar{3}$, 3E4, 6E2, 9m, i |

Símbolos para classes cristalinas

Hermann-
Maugin

| | 1º. | 2º. | 3º. |
|--------------|-----------------|-----------------------|-----------------------------------|
| cúbico | a_1, a_2, a_3 | vértices do cubo-guia | centro das arestas do cubo-guia |
| tetragonal | c | a_1, a_2 | bissetrizes de a_1 e a_2 |
| ortorrômbico | a | b | c |
| monoclínico | b | - | - |
| triclínico | - | - | - |
| hexagonal | c | a_1, a_2, a_3 | bissetrizes de a_1, a_2 e a_3 |
| trigonal | c | a_1, a_2, a_3 | |

AS 32 CLASSES CRISTALINAS

| Sistema Cristalino | Classe Cristalina | Grau de Simetria |
|--------------------------------|-------------------|--------------------------------|
| Triclínico | 1 | Sem simetria |
| | $\bar{1}$ | i |
| Monoclínico | 2 | 1E2 |
| | m | 1m |
| | 2/m | 1E2, 1m, i |
| Ortorrômico | 222 | 3E2 |
| | mm2 | 1E2, 2m |
| | 2/m2/m2/m | 3E2, 3m, i |
| Tetragonal | 4 | 1E4 |
| | $\bar{4}$ | 1E $\bar{4}$ |
| | 4/m | 1E4, 1m, i |
| | 422 | 1E4, 4E2 |
| | 4mm | 1E4, 4m |
| | $\bar{4}2m$ | 1E $\bar{4}$, 2E2, 2m |
| | 4/m2/m2/m | 1E4, 4E2, 5m, i |
| Trigonal | 3 | 1E3 |
| | $\bar{3}$ | 1E $\bar{3}$ |
| | 32 | 1E3, 3E2 |
| | 3m | 1E3, 3m |
| | $\bar{3}2/m$ | 1E $\bar{3}$, 3E2, 3m, i |
| Hexagonal | 6 | 1E6 |
| | $\bar{6}$ | 1E $\bar{6}$ |
| | 6/m | 1E6, 1m, i |
| | 622 | 1E6, 6E2 |
| | 6mm | 1E6, 6m |
| | $\bar{6}m2$ | 1E $\bar{6}$, 3E2, 3m |
| | 6/m2/m2/m | 1E6, 6E2, 7m, i |
| Isométrico (Cúbico) | 23 | 4E3, 3E2 |
| | 2/m $\bar{3}$ | 4E $\bar{3}$, 3E2, 3m, i |
| | 432 | 4E3, 3E4, 6E2 |
| | $\bar{4}3m$ | 4E3, 3E $\bar{4}$, 6m |
| | 4/m $\bar{3}2/m$ | 4E $\bar{3}$, 3E4, 6E2, 9m, i |

Table 1

Distribution of forms in the triclinic, monoclinic, and orthorhombic systems

| Number of faces | Name | Point group | | | | | | | | |
|-----------------|------------|-------------|-----------|---|-----|---------------|-------|---------|---------------------------------------|---------------------------------------|
| | | 1 | $\bar{1}$ | 2 | m | $\frac{2}{m}$ | 2 2 2 | $m m 2$ | $\frac{2}{m} \frac{2}{m} \frac{2}{m}$ | Unique in |
| 1 | pedion | + | | + | + | | | + | | |
| 2 | pinacoid | | + | + | + | + | | + | | + |
| | sphenoid | | | + | + | | | + | | |
| 4 | prism | | | | | + | + | + | | + |
| | disphenoid | | | | | | + | | | 2 2 2 |
| | pyramid | | | | | | | + | | $m m 2$ |
| 8 | dipyramid | | | | | | | | + | $\frac{2}{m} \frac{2}{m} \frac{2}{m}$ |



Fig. 2. Pedion (or monohedron, a form consisting of a single plane surface).



Fig. 3. Pinacoid (a form consisting of a pair of parallel plane surfaces).

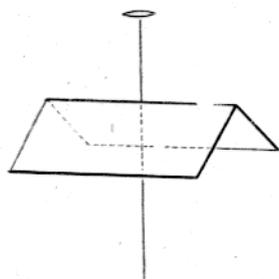


Fig. 4i. Sphenoid (or dihedron) of class 2.

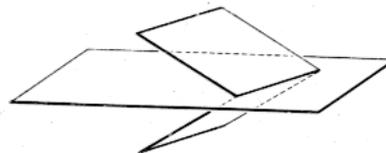


Fig. 4ii. Sphenoid (or dihedron) of class m .

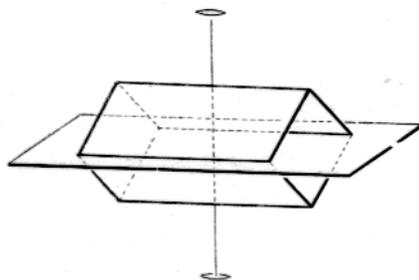


Fig. 5. Prism.

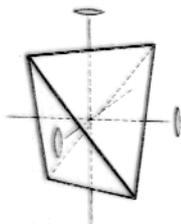


Fig. 6. Rhombic disphenoid.

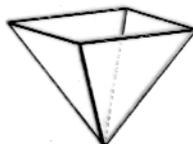


Fig. 7. Rhombic pyramid.

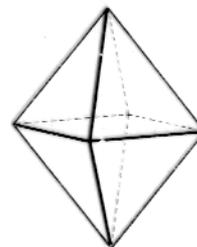


Fig. 8. Rhombic dipyramid.

Table 2
Distribution of forms in the tetragonal system

| Number of faces | Name | Point group | | | | | | Unique in |
|-----------------|--------------------------|-------------|-----------|---------------|-------|-------|-------------|-------------------------------------|
| | | 4 | $\bar{4}$ | $\frac{4}{m}$ | 422 | $4mm$ | $\bar{4}2m$ | |
| 1 | pedion | + | | | | + | | |
| 2 | pinacoid | | + | + | + | | + | + |
| 4 | tetragonal prism | + | + | + | + | + | + | + |
| | tetragonal pyramid | + | | | | + | | |
| | tetragonal disphenoid | | + | | | | + | |
| 8 | ditetragonal prism | | | | + | + | + | + |
| | tetragonal dipyramid | | + | + | | | + | + |
| | tetragonal trapezohedron | | | | + | | | 422 |
| | ditetragonal pyramid | | | | | + | | $4mm$ |
| | tetragonal scalenohedron | | | | | | + | $\bar{4}2m$ |
| 16 | ditetragonal dipyramid | | | | | | + | $\frac{4}{m}\frac{2}{m}\frac{2}{m}$ |

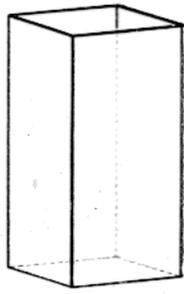


Fig. 9. Tetragonal prism.

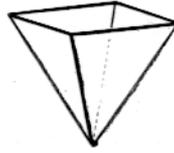


Fig. 10. Tetragonal pyramid.



Fig. 11. Tetragonal disphenoid.

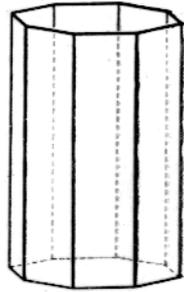


Fig. 12. Ditetragonal prism.

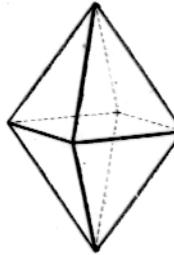


Fig. 13. Tetragonal dipyramid.



Fig. 14. Tetragonal trapezohedron.

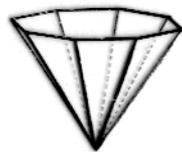


Fig. 15. Ditetragonal pyramid.



Fig. 16. Tetragonal scalenohedron.

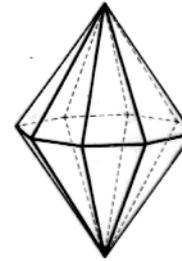


Fig. 17. Ditetragonal dipyramid.

Table 3
Distribution of forms in the hexagonal system

| Number of faces | Name | Point group | | | | | | | | | | | Unique in | | |
|-----------------|-------------------------|-------------|-----------|-----|-----|-----------------------|---|-----------|---------------|-------|-------|---------------|-----------|---------------------------------------|---------------------------------------|
| | | 3 | $\bar{3}$ | 3 2 | 3 m | $\bar{3} \frac{2}{m}$ | 6 | $\bar{6}$ | $\frac{6}{m}$ | 6 2 2 | 6 m m | $\bar{6} m 2$ | | $\frac{6}{m} \frac{2}{m} \frac{2}{m}$ | |
| 1 | pedion | + | | | + | | + | | | | + | | | | |
| 2 | pinacoid | | + | + | | + | | + | + | + | | | + | + | |
| 3 | trigonal prism | + | | + | + | | | + | | | | | | + | |
| | trigonal pyramid | + | | | + | | | | | | | | | | |
| 6 | hexagonal prism | | + | + | + | + | | + | | + | + | + | + | + | |
| | rhombohedron | | + | + | | + | | | | | | | | | |
| | ditrigonal prism | | | + | + | | | | | | | | | + | |
| | trigonal dipyramid | | | + | | | | + | | | | | | + | |
| | hexagonal pyramid | | | | + | | | + | | | + | | | | |
| | trigonal trapezohedron | | | + | | | | | | | | | | | 3 2 |
| | ditrigonal pyramid | | | | + | | | | | | | | | | 3 m |
| 12 | hexagonal dipyramid | | | | | + | | | + | + | | | + | + | |
| | dihexagonal prism | | | | | + | | | | + | + | | | + | |
| | hexagonal scalenohedron | | | | | + | | | | | | | | | $\bar{3} \frac{2}{m}$ |
| | hexagonal trapezohedron | | | | | | | | | + | | | | | 6 2 2 |
| | dihexagonal pyramid | | | | | | | | | | + | | | | 6 m m |
| | ditrigonal dipyramid | | | | | | | | | | | | + | | $\bar{6} m 2$ |
| 24 | dihexagonal dipyramid | | | | | | | | | | | | | + | $\frac{6}{m} \frac{2}{m} \frac{2}{m}$ |



Fig. 18. Trigonal prism.

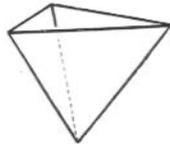


Fig. 19. Trigonal pyramid.

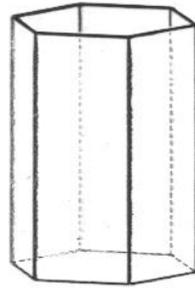


Fig. 20. Hexagonal prism.

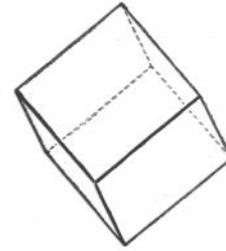


Fig. 21. Rhombohedron.

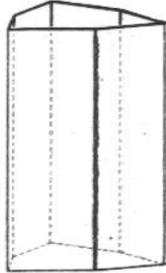


Fig. 22. Ditrigonal prism.

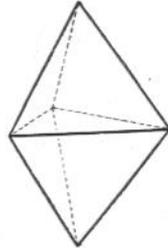


Fig. 23. Trigonal dipyramid.

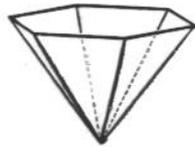


Fig. 24. Hexagonal pyramid.

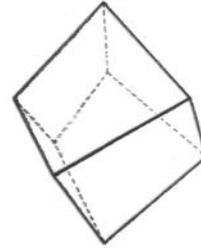


Fig. 25. Trigonal trapezohedron.

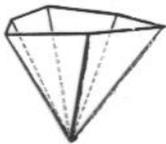


Fig. 26. Ditrigonal pyramid.

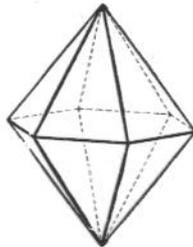


Fig. 27. Hexagonal dipyramid.



Fig. 28. Dihexagonal prism.

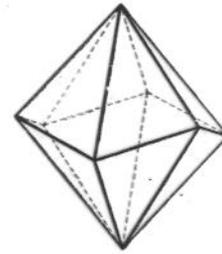


Fig. 29. Hexagonal scalenohedron.

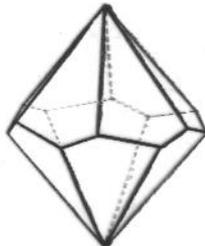


Fig. 30. Hexagonal trapezohedron.

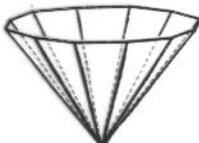


Fig. 31. Dihexagonal pyramid.

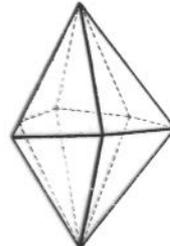


Fig. 32. Ditrigonal dipyramid.

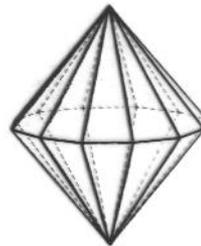


Fig. 33. Dihexagonal dipyramid.

Table 4
Distribution of forms in the isometric system

| Number of faces | Name | Point group | | | | | Unique in |
|-----------------|-----------------|-------------|-----------------------|---------------|-------|-----------------------------------|-----------------------------------|
| | | 2 3 | $\frac{2}{m} \bar{3}$ | $\bar{4} 3 m$ | 4 3 2 | $\frac{4}{m} \bar{3} \frac{2}{m}$ | |
| 4 | tetrahedron | + | | + | | | |
| 6 | cube | + | + | + | + | + | |
| 8 | octahedron | | + | | + | + | |
| 12 | dodecahedron | + | + | + | + | + | |
| | pyritohedron | + | + | | | | |
| | deltohedron | + | | | | | |
| | tristetrahedron | + | | | | | |
| | tetartoid | + | | | | | 2 3 |
| 24 | trisoctahedron | | + | | + | + | |
| | trapezohedron | | + | | + | + | |
| | tetrahexahedron | | | | + | + | |
| | diploid | | + | | | | $\frac{2}{m} \bar{3}$ |
| | hextetrahedron | | | + | | | $\bar{4} 3 m$ |
| | gyroid | | | | + | | 4 3 2 |
| 48 | hexoctahedron | | | | | + | $\frac{4}{m} \bar{3} \frac{2}{m}$ |

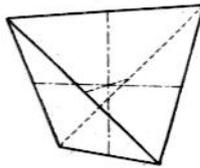


Fig. 34. Tetrahedron.

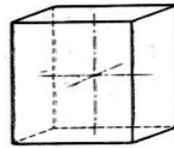


Fig. 35. Cube.

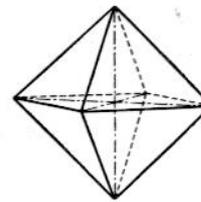


Fig. 36. Octahedron.

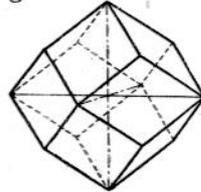


Fig. 37. Dodecahedron.

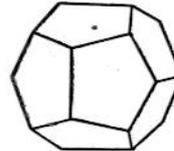


Fig. 38. Pyritohedron.

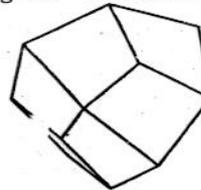


Fig. 39. Deltohedron.

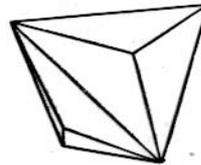


Fig. 40. Tristetrahedron.

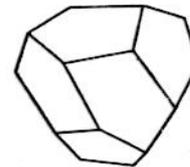


Fig. 41. Tetartoid.

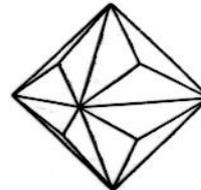


Fig. 42. Trisoctahedron.

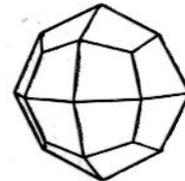


Fig. 43. Trapezohedron.

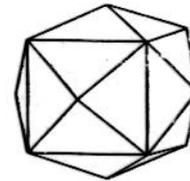


Fig. 44. Tetrahexahedron.

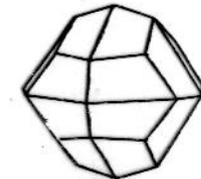


Fig. 45. Diploid.

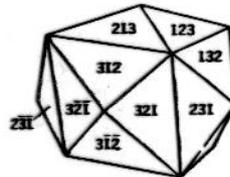


Fig. 46. Hextetrahedron.

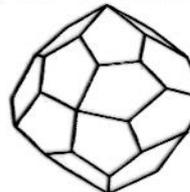


Fig. 47. Gyroid.



Fig. 48. Hexoctahedron.