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the icosahedron is built around the pentagon and the golden section at first glance this may seem absurd since every face of the icosahedron is an equilateral triangle it turns out however that the triangular faces of the icosahedron result from its pentagonal nature icosahedron expansion process becomes its dual the dodecahedron expansion on polyhedra is the process of moving all faces outward from the center of polyhedron and fill the gaps with new faces an expanded polyhedron has all the faces of the original polyhedron all the faces of its dual and new square faces in place of the original there are two objects one convex and one nonconvex that can both be called regular icosahedra each has 30 edges and 20 equilateral triangle faces with five meeting at each of its twelve vertices both have icosahedral symmetry the term regular icosahedron generally refers to the convex variety while the nonconvex form is called a great icosahedron we show that this theory is a special case of an overarching design principle for icosahedral as well as octahedral architectures that can be formulated in terms of the archimedean lattices and an icosahedron shown in figure 17 22 is a regular polyhedron with 20 identical equilateral triangular sides the main characteristics of a quasicrystal structure are that it is a combination of a quasiperiodic lattice and a cluster decorating it an icosahedron is a three dimensional figure made up of only polygons one real life icosahedron example is a 20 sided die also referred to as d20 the 20 sided die above is an example of a regular icosahedron since all of its faces are made up of 20 equilateral triangles an icosahedron shape can also take on a number of different forms icosahedral clusters of atoms are found in the following types of inorganic structures 1 boron derivatives including the borane anion $B_{12}H_{12}^{2-}$ and its derivatives the carboranes $C_2B_{10}H_{12}$ elemental boron certain types of boron rich metal borides such as Mg_2B_{14} and boron carbide 2 alkali metal gallides such as $RbGa_7$ and K_3G in a regular icosahedron all 30 edges are of equal length and have 12 vertices faces the flat surfaces of the icosahedron are called faces in an icosahedron there are 20 faces and each one is an equilateral triangle vertices the points where the faces of the icosahedron meet are called vertices description icosahedral symmetry is a mathematical property of objects indicating that an object has the same symmetries as a regular icosahedron as point group the icosahedral group I_h is the group of symmetries of the icosahedron and dodecahedron having order 120 equivalent to the group direct product $A_5 \times Z_2$ of the alternating group A_5 and cyclic group Z_2 as a compound it can be seen as the compound of an icosahedron and dodecahedron it is one of four compounds constructed from a platonic solid or kepler poinsot solid and its dual it has icosahedral symmetry I_h and the same vertex arrangement as a rhombic triacontahedron virus structures are megadalton nucleoprotein complexes with an exceptional variety of protein protein and protein nucleic acid interactions three dimensional crystal structures of over 70 virus the twofold threefold and fivefold rotational axes present within icosahedral symmetry provide three possible ways to construct such complexes from pairwise combinations of oligomeric building blocks we refer to these architectural types as I_{53} I_{52} and I_{32} fig s1 in mathematics the binary icosahedral group $2I$ or $2_3 5 1$ is a certain nonabelian group of order 120 it is an extension of the icosahedral group I or $2_3 5$ of order 60 by the cyclic group of order 2 and is the preimage of

the icosahedral group under the 2×1 covering homomorphism of the special orthogonal group by the spin group this overview describes the growth in size and complexity of icosahedral viruses from the first early studies of small rna plant viruses and human picornaviruses up to the larger and more complex bacterial phage insect and human disease viruses such as zika hepatitis b adeno and polyoma virus icosahedron icosahedron is one of only five platonic solids this is a regular polyhedron with 12 vertices 30 edges and 20 faces all faces are regular triangles and at every vertex meet five faces and five edges drag the mouse to rotate the icosahedron use the right button to remove and put back individual faces each circle of 5 tetrahedra touch a single vertex in the original icosahedral complex in the first layer of cells hence these circles correspond with the vertices of the icosahedron the topology of 3 dimensional manifolds is far more complex at the quotient of the 3 sphere by the binary icosahedral group the double cover effect in c60 and other icosahedral complexes 1st edition by chancey c c obrien m cm 1997 hardcover ebook subscription services the jahn teller effect in c60 and other icosahedral complexes 1st edition by chancey c c obrien m cm 1997 hardcover budget friendly options 4 now an international group of researchers led by tokyo university of science japan report for the first time a long range magnetic order in qcs with icosahedral symmetry that turn ferromagnetic below certain temperatures this groundbreaking discovery opens doors to future research on these exotic materials

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