Classroom Photocopying Permission

Laboratory Safety

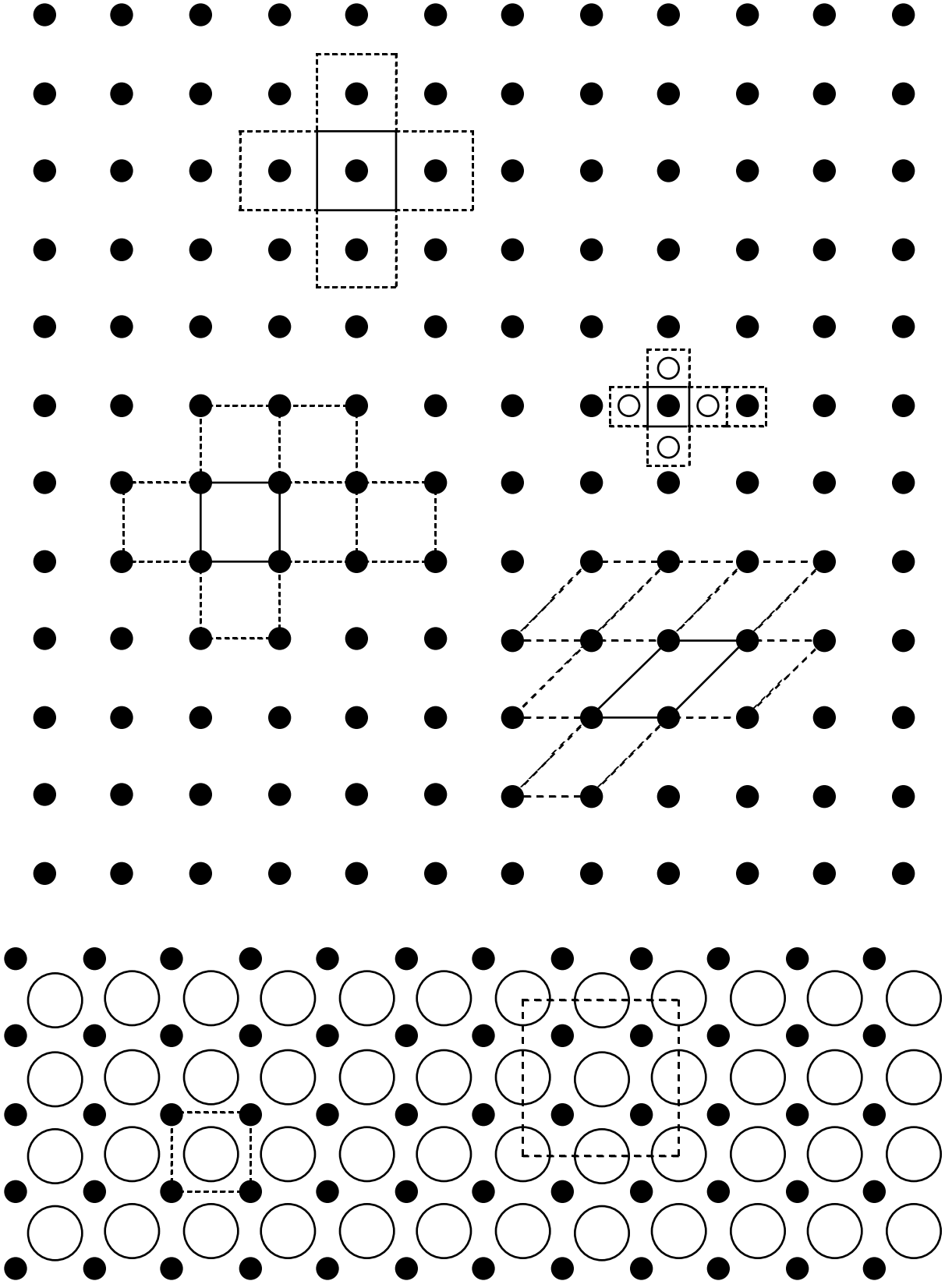
DISCLAIMER

Safety information is included in each chapter of the Companion as a precaution to the readers. Although the materials, safety information, and procedures contained in this book are believed to be reliable, they should serve only as a starting point for laboratory practices. They do not purport to specify minimal legal standards or to represent the policy of the American Chemical Society. No warranty, guarantee, or representation is made by the American Chemical Society, the authors, or the editors as to the accuracy or specificity of the information contained herein, and the American Chemical Society, the authors, and the editors assume no responsibility in connection therewith. The added safety information is intended to provide basic guidelines for safe practices. Therefore, it cannot be assumed that necessary warnings or additional information and measures may not be required. Users of this book and the procedures contained herein should consult the primary literature and other sources of safe laboratory practices for more exhaustive information. See page xxv in the Text 0 Preface file in the Companion Text folder for more information.

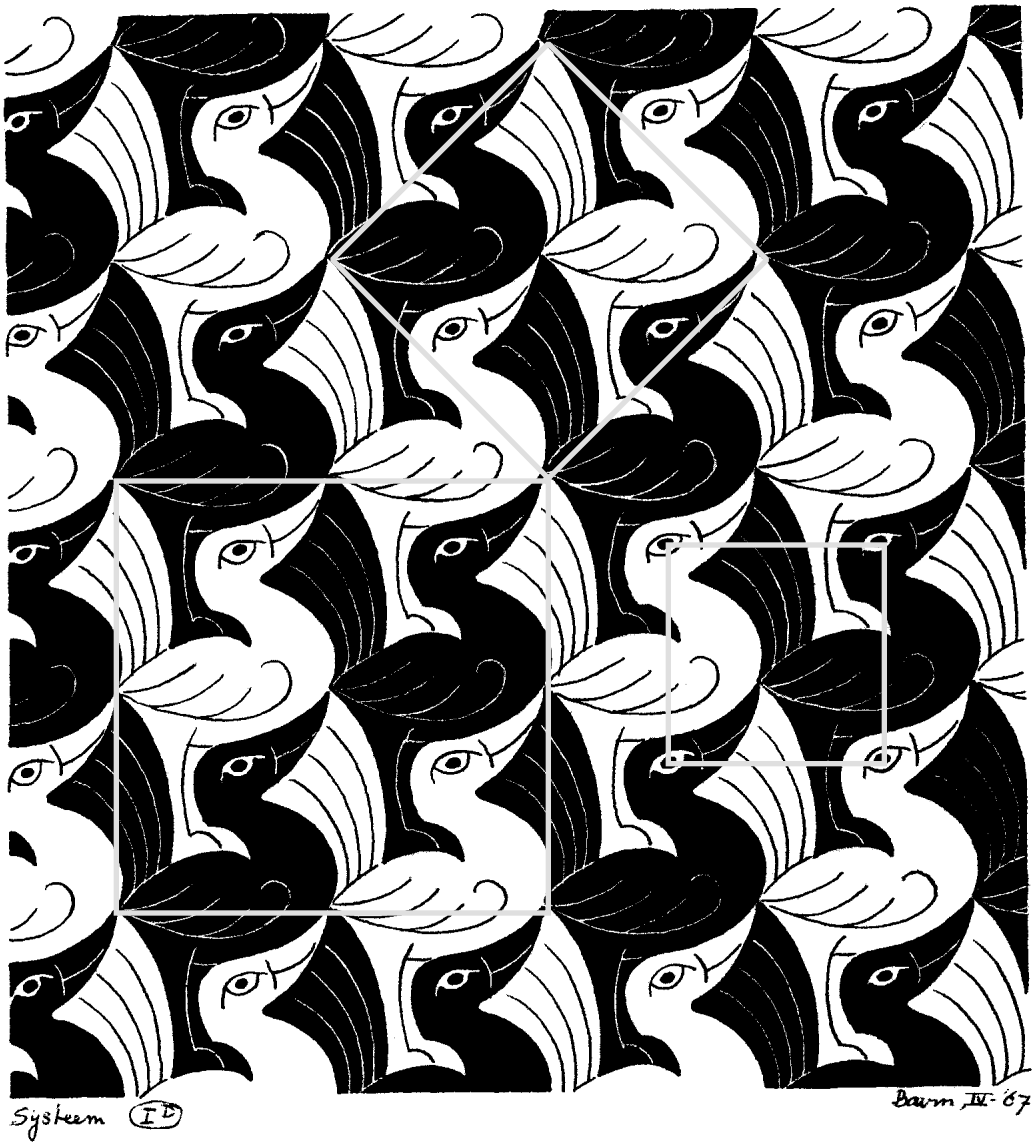
Combinations of Elements

Element Combination	Likely Structure
Nonmetal and nonmetal	Discrete molecule CO_2, PCl_3, NO
Metal and metal	Extended (alloys) CuZn (brass), NiTi
Metal and nonmetal	Extended (salts) NaCl, ZnS, $CaTiO_3$

Unit Cells?



Unit Cells



Structures of Metallic Elements

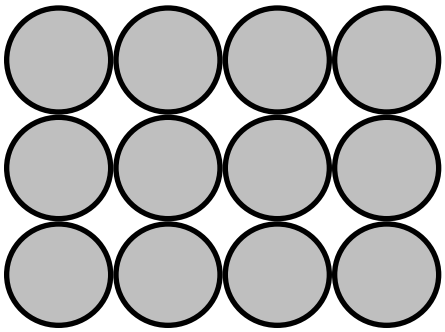
H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac															

Primitive cubic

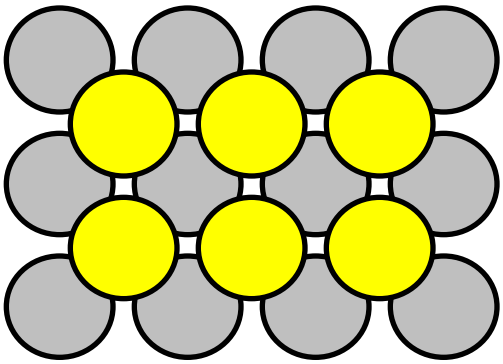
Cubic close packing (Face centered cubic)

Body centered cubic

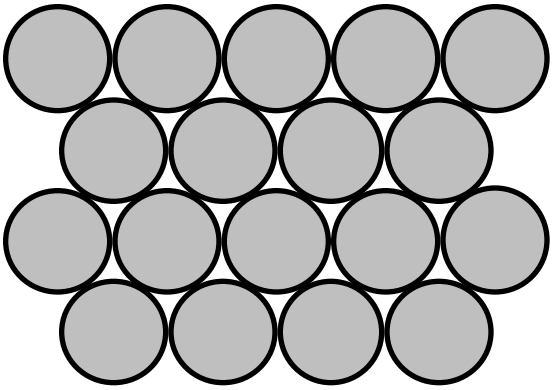
Hexagonal close packing



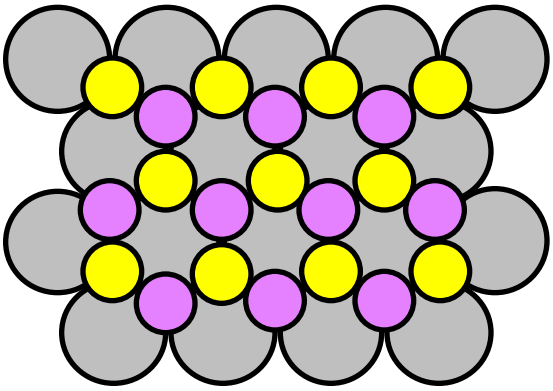
Square Packing



Body Centered Square Packing

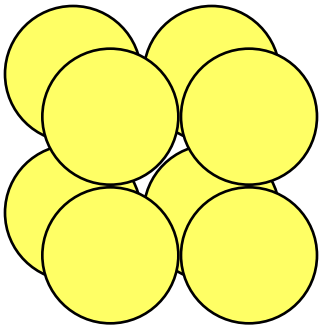


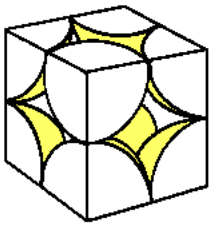
Close Packing



Hexagonal (AB) and Cubic (ABC) Close Packing. Upper layers shown reduced size.

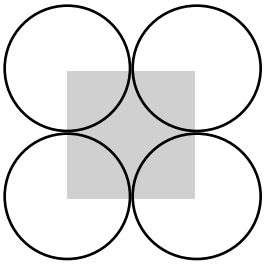
Primitive Cubic





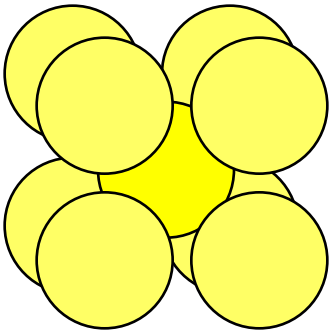
Unit Cell

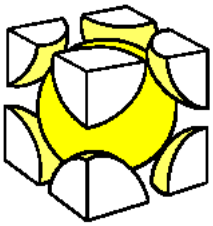
z=0,1



Layer Sequence

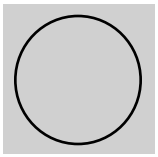
Body-Centered Cubic



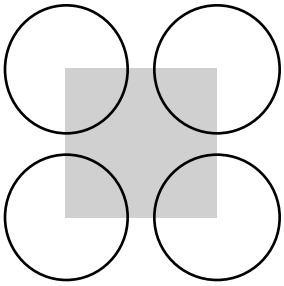


Unit Cell

z=1/2

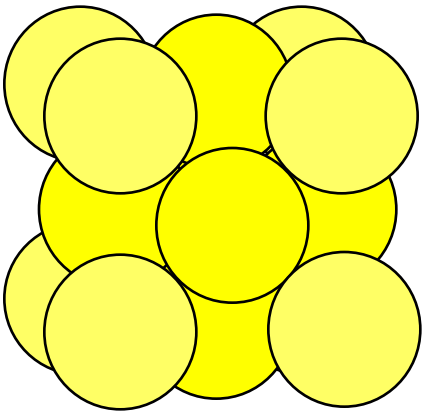


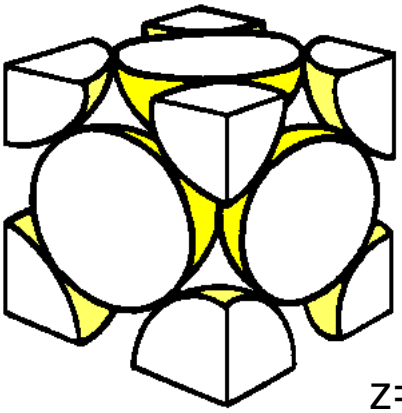
z=0,1



Layer Sequence

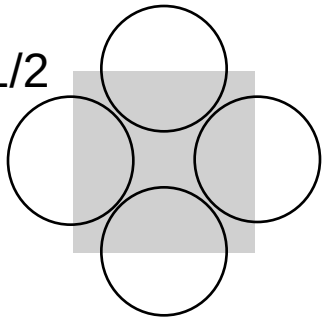
Face-Centered Cubic



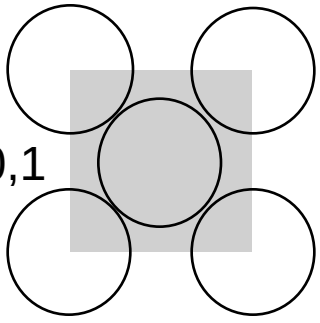


Unit Cell

z=1/2



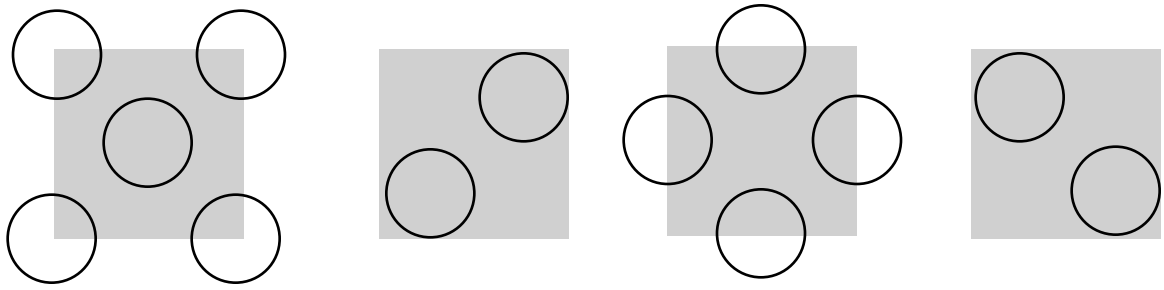
z=0,1



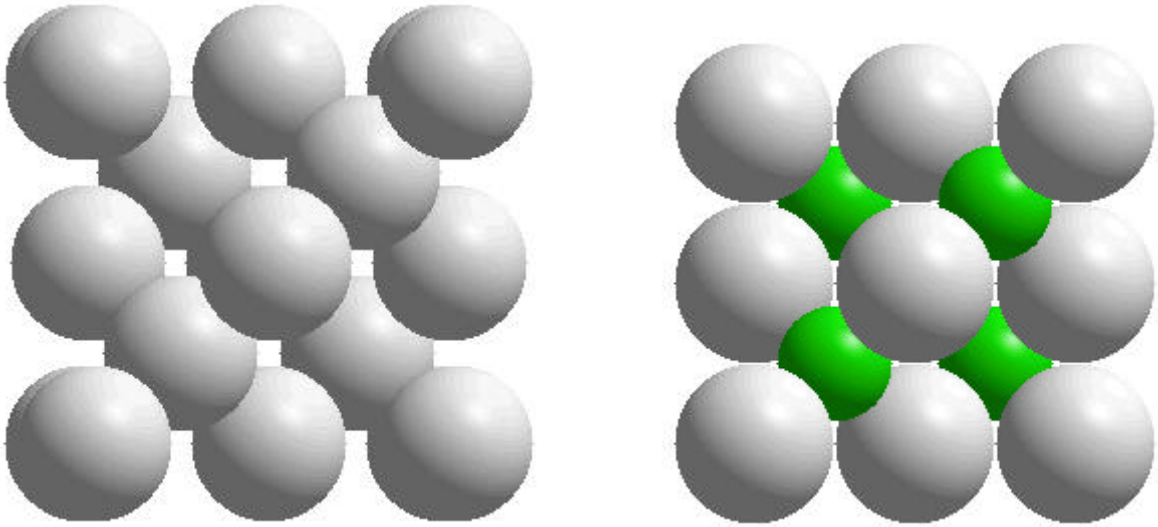
Layer Sequence

Layer Sequences

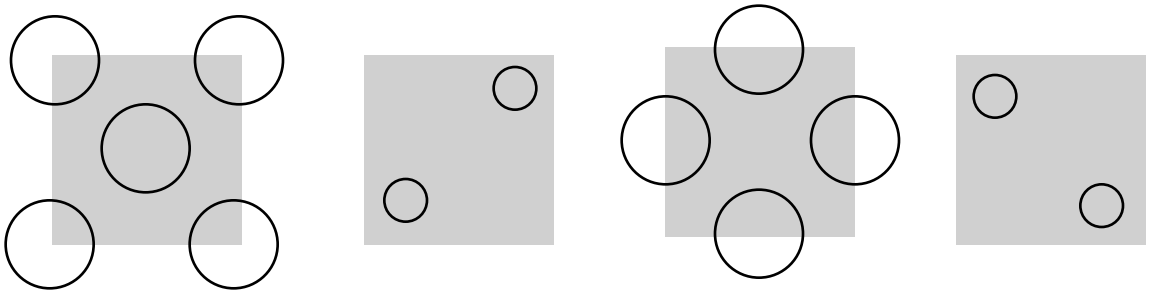
Diamond



z=0 z=1/4 z=1/2 z=3/4

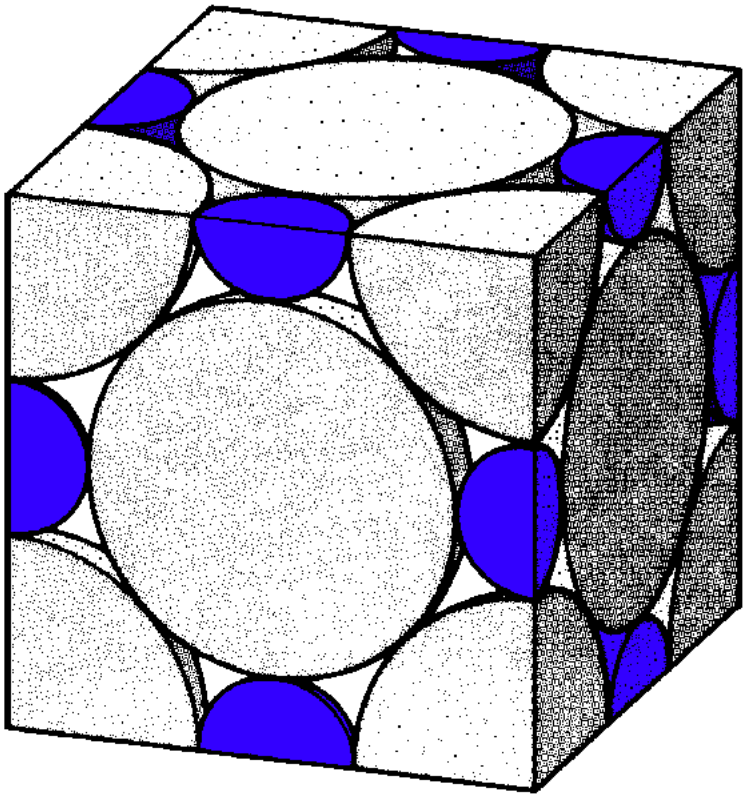


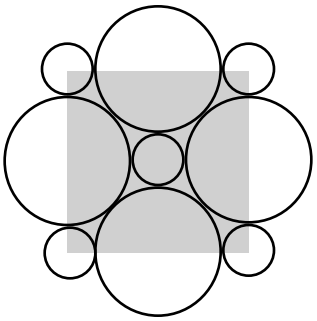
Zinc Blende



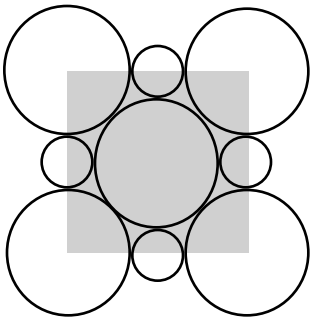
z=0 z=1/4 z=1/2 z=3/4

Stoichiometry in Solids





z=1/2



z=0, 1

Counting ions in the NaCl Unit Cell

8 corners $\times \frac{1}{8}$	12 edges $\times \frac{1}{4}$
6 faces $\times \frac{1}{2}$	1 center $\times$ 1
---	---
4 Cl^- ions	4 Na^+ ions

NaCl has 1:1 stoichiometry!

Primitive Cubic