

## Sheet1

MINERAL,C,1	FORMULA,C,40	HAR	HAR	SG	LG	SGHI	CRYSTAL,C,1:
andalusite	Al <sub>2</sub> SiO <sub>5</sub>	7.0	7.5	3.1	3.3	orthorhombic	
apatite	Ca <sub>5</sub> (F,Cl,OH)(PO <sub>4</sub> ) <sub>3</sub>	5.0	5.0	3.2	3.2	hexagonal	
augite	(Ca,Na)(Mg,Fe,Al,Ti)(Si,Al) <sub>2</sub> O <sub>6</sub>	5.0	6.0	3.3	3.5	monoclinic	
azurite	Cu <sub>3</sub> (CO <sub>3</sub> ) <sub>2</sub> (OH) <sub>2</sub>	3.5	4.0	3.7	3.9	monoclinic	
barite	BaSO <sub>4</sub>	2.5	3.0	4.5	4.5	orthorhombic	
beryl	Be <sub>3</sub> Al <sub>2</sub> Si <sub>6</sub> O <sub>18</sub>	7.5	8.0	2.6	2.8	hexagonal	
biotite	K(Mg,Fe) <sub>2</sub> (Al,Fe)Si <sub>3</sub> O <sub>10</sub> (OH,F) <sub>2</sub>	2.5	3.0	2.7	3.1	monoclinic	
bornite	Cu <sub>5</sub> FeS <sub>4</sub>	3.0	3.0	4.9	5.3	cubic	
calcite	CaCO <sub>3</sub>	3.0	3.0	2.7	2.7	hexagonal	
chalcocite	Cu <sub>2</sub> S	2.5	3.0	5.7	5.8	orthorhombic	
chalcopyrite	CuFeS <sub>2</sub>	3.5	4.0	4.1	4.3	tetragonal	
chondrodite	(Mg,Fe) <sub>3</sub> (SiO <sub>4</sub> )(OH,F) <sub>2</sub>	6.0	6.5	3.1	3.1	monoclinic	
chrysocolla	(Cu,Al) <sub>2</sub> H <sub>2</sub> Si <sub>2</sub> O <sub>5</sub> (OH) <sub>4</sub> ·nH <sub>2</sub> O	2.0	4.0	2.0	2.2	amorphous	
copper	Cu	2.5	3.0	8.5	9.0	cubic	
corundum	Al <sub>2</sub> O <sub>3</sub>	9.0	9.0	3.9	4.1	hexagonal	
dolomite	CaMg(CO <sub>3</sub> ) <sub>2</sub>	3.5	4.0	2.8	2.9	hexagonal	
epidote	Ca <sub>2</sub> (Al,Fe) <sub>3</sub> Si <sub>3</sub> O <sub>12</sub> (OH)	6.0	7.0	3.3	3.5	monoclinic	
fluorite	CaF <sub>2</sub>	4.0	4.0	3.0	3.3	cubic	
galena	PbS	2.5	2.5	7.2	7.6	cubic	
garnet	A <sub>3</sub> B <sub>2</sub> (SiO <sub>4</sub> ) <sub>3</sub>	6.0	8.0	3.4	4.2	cubic	
goethite	FeO(OH)	5.0	5.5	4.0	4.4	orthorhombic	
gold	Au	2.5	3.0	15.3	19.3	cubic	
graphite	C	1.0	2.0	2.1	2.3	hexagonal	
gypsum	CaSO <sub>4</sub> ·2H <sub>2</sub> O	1.5	2.0	2.3	2.3	monoclinic	
halite	NaCl	2.0	2.5	2.2	2.2	cubic	
hematite	Fe <sub>2</sub> O <sub>3</sub>	5.5	6.5	5.2	5.3	hexagonal	
hornblende	(Ca,Na) <sub>2-3</sub> (Mg,Fe,Al) <sub>5</sub> (Al,Si) <sub>8</sub> O <sub>22</sub> (OH) <sub>2</sub> *	5.0	6.0	2.9	3.4	monoclinic	
kaolinite	Al <sub>2</sub> Si <sub>2</sub> O <sub>5</sub> (OH) <sub>4</sub>	2.0	2.5	2.6	2.6	triclinic	
kyanite	Al <sub>2</sub> SiO <sub>5</sub>	5.0	7.0	3.5	3.7	triclinic	
magnetite	Fe <sub>3</sub> O <sub>4</sub>	5.5	6.5	5.0	5.2	cubic	
malachite	Cu <sub>2</sub> (CO <sub>3</sub> )(OH) <sub>2</sub>	3.5	4.0	3.9	4.0	monoclinic	
microcline	KAlSi <sub>3</sub> O <sub>8</sub>	6.0	6.5	2.5	2.5	triclinic	
molybdenite	MoS <sub>2</sub>	1.0	1.5	4.7	4.8	hexagonal	
muscovite	KAl <sub>2</sub> (AlSi <sub>3</sub> )O <sub>10</sub> (OH) <sub>2</sub>	2.0	2.5	2.8	3.0	monoclinic	
oligoclase	(Na,Ca)AlSi <sub>3</sub> O <sub>8</sub>	6.0	6.5	2.6	2.6	triclinic	
olivine	(Mg,Fe) <sub>2</sub> SiO <sub>4</sub>	6.5	7.0	3.3	3.3	orthorhombic	
opal	SiO <sub>2</sub> ·nH <sub>2</sub> O	5.5	5.5	1.8	2.2	amorphous	
pyrite	FeS <sub>2</sub>	6.0	6.5	5.0	5.2	cubic	
pyrolusite	MnO <sub>2</sub>	2.0	2.5	4.8	4.8	orthorhombic	
pyrrhotite	FeS *	3.5	4.5	4.6	4.6	hexagonal	
quartz	SiO <sub>2</sub>	7.0	7.0	2.6	2.7	hexagonal	
serpentine	Mg <sub>6</sub> (Si <sub>4</sub> O <sub>10</sub> )(OH) <sub>8</sub>	3.0	4.0	2.5	2.6	monoclinic	
silver	Ag	2.5	3.0	9.6	12.0	cubic	
sphalerite	(Zn,Fe)S	3.5	4.0	3.9	4.2	cubic	
staurolite	(Fe,Mg,Zn) <sub>2</sub> Al <sub>9</sub> Si <sub>4</sub> O <sub>23</sub> (OH)	7.0	7.5	3.7	3.8	orthorhombic	
talc	Mg <sub>3</sub> Si <sub>4</sub> O <sub>10</sub> (OH) <sub>2</sub>	1.0	1.0	2.7	2.8	monoclinic	
topaz	Al <sub>2</sub> SiO <sub>4</sub> (F,OH) <sub>2</sub>	8.0	8.0	3.4	3.6	orthorhombic	
tourmaline	(Na,Ca)(Al,Fe,Li,Mg) <sub>3</sub> A <sub>16</sub> (BO <sub>3</sub> ) <sub>3</sub> (Si <sub>6</sub> O <sub>18</sub> )*	7.0	7.5	3.0	3.2	hexagonal	

Sheet1

turquoise	$\text{CuAl}_6(\text{PO}_4)_4(\text{OH})_8 \cdot 5\text{H}_2\text{O}$	5.0	6.0	2.6	2.9	triclinic
wulfenite	$\text{PbMoO}_4$	3.0	3.0	6.3	6.7	tetragonal

Sheet1

HABIT,C,50	CLEAVAGE,C,25	FRACTURE,C,15
granular,massive,usually square cross section	2 good at 90°	uneven
crystalline,massive,usually 6 sided crystals	1 poor	conchoidal
usually prismatic	2 good at 90°	uneven
prismatic, tabular, massive	2 good	conchoidal
platy,tabular,massive,earthy,stalactic masses	3: 2 good at 80°, 1 poor	uneven
6 or 12 sided prisms, massive	1 poor	conchoidal
tabular, foliated	1 perfect	uneven
usually massive	0 none	conchoidal
rhombohedra, prisms, massive	3 perfect at 75°	conchoidal
massive	1 poor	conchoidal
massive	1 poor	conchoidal
usually round grains, massive aggregates	1 poor	uneven
botryoidal or earthy	0 none	conchoidal
octahedra, massive, arborescent	0 none	hackly
rhombohedral,also massive,crude 6-sided crystals	0 none	conchoidal
rhombohedral, massive, granular	3 perfect at 74°	conchoidal
elongated crystals, granular	1 perfect	uneven
cubes etc, also granular	4 perfect	conchoidal
cube, octahedra, massive	3 perfect at 90°	sub-conchoidal
various beads,massive,crystals w/12 diamond faces	0 none	uneven
prisms, tabular, massive, fibrous, earthy	1 perfect	uneven
cubes, usually massive, arborescent	0 none	hackly
usually scaly, massive, granular, earthy	1 perfect	uneven
prisms, stellate, granular, fibrous	3 1 perfect, 2 good	conchoidal
cubes, octahedra, massive, granular	3 perfect at right angles	conchoidal
massive,earthy,rhombohddedral,scaly or fibrous	0 none	uneven
prismatic, bladed, fibrous, massive, granular	2 perfect (56° & 124°)	uneven
earthy	1 perfect	conchoidal
prismatic, bladed	2: 1 perfect, 1 good	splintery
octahedra, massive, granular	4 poor	uneven
usually fibrous masses, granular, earthy	1 perfect	conchoidal
prismatic,granular,blocky	2 good at right angles	uneven
usually foliated, massive	1 perfect	uneven
pseudohexagonal plates, massive	1 perfect	uneven
platy,tabular,blocky,massive	1 perfect	conchoidal
granular,prismatic, tabular	2 poor	conchoidal
reniform, stalactitic, massive	0 none	conchoidal
striated cubes, massive, nodular	0 none	conchoidal
usually fibrous, massive, earthy	2 perfect	uneven
tabular, foliated, massive, granular	0 none	uneven
prismatic,6 sided crystals,massive	0 none	conchoidal
massive, granular, foliated, fibrous	0 none	conchoidal
cube, usually massive arborescent	0 none	hackly
massive cleavage pieces,crystals,rounded edges	6 perfect	uneven
6-sided prisms, often twins	1 poor	conchoidal
usually granular, massive or scaly	1 perfect	uneven
striated prisms or massive	1 perfect	uneven
trigonal prisms, massive	0 none	uneven

Sheet1

usually massive, stalactitic, crusts  
massive, granular, various or flat tabular crystals

0 none  
3 poor

conchoidal  
uneven

Sheet1

TRANS,C,31	COLOR,C,38	LUSTER,C,20
opaque,translucent	white,pink,brown,grey	vitreous
transparent,translucent,opaque	green,blue green,yellow,blue,pink	vitreous
opaque	black,green-black	vitreous
translucent,opaque	deep blue	vitreous
transparent,translucent	colorless,white,yellow,red,green	vitreous
transparent	blue,yellow,green,pink,white,colorless	vitreous
transparent,translucent,opaque	brown,black,green	pearly
opaque	brownish bronze,blue,purple	metallic
transparent,translucent,opaque	colorless,white,tint	vitreous
opaque	lead grey,black tarnish	metallic
opaque	brassy yellow	metallic
translucent	yellow, red-brown	vitreous,resinous
translucent,opaque	blue green,blue,green	vitreous,earthy
opaque	red,brown tarnish	metallic
transparent,translucent,opaque	brown,pink,blue,white,green,red	adamantine,vitreous
transparent,translucent	white,tint	vitreous,pearly
translucent,opaque	yellow green,black green	vitreous
transparent,translucent	purple,colorless,green,yellow,blue,red	vitreous
opaque	grey	metallic
transparent,translucent,opaque	violet,red,yellow,green,black	resinous,vitreous
translucent,opaque	brown,black,yellow,red	adamantine
opaque	yellow-gold	metallic
opaque	black	metallic,dull
transparent,translucent	colorless,white,grey,yellow	pearly
transparent,translucent	colorless,white,tint	vitreous
opaque	tin,steel,red	metallic,earthy
opaque	black,green,brown-black	vitreous
opaque	white,grey,yellow	dull
transparent,translucent,opaque	blue,white	pearly
opaque	steel,brown-black	metallic,dull
transparent,translucent,opaque	green	silky,vitreous
translucent,opaque	white,tint,green	vitreous
opaque	steel grey,blue tint	metallic
transparent,translucent	white,yellow,green,silverish	pearly
translucent,opaque	white,green,red,grey,yellow	vitreous,pearly
transparent,translucent	green,yellow-green	vitreous
translucent,opaque	colorless,white,yellow,red,blue,green	resinous,pearly
opaque	brassy brown,yellow	metallic
opaque	steel,dark-grey,black	mettalic,submetallic
opaque	brassy brown,yellow	metallic
transparent,translucent,opaque	colorless,white,blue,green,yellow,red	vitreous,resinous
translucent,opaque	green,yellow,brown,black,red	resinous,dull
opaque	silver-white	metallic
transparent,translucent	pale yellow,brown,black,red,green	resinous
translucent,opaque	brown,black	vitreous,resinous
transparent,translucent,opaque	green,grey,white	pearly
transparent,translucent,opaque	colorless,yellow,pink,blue,green	vitreous
transparent,translucent,opaque	brown,black,red,pink,green,blue,yellow	vitreous

Sheet1

translucent,opaque  
transparent,translucent

blue,blue green,grey-green  
yellow,red,orange

waxy  
resinous,adamantine

STREAK,C,38	RANOTES,M
white	3
white	4
white,grey	4
pale blue	3
white	3
white	3
white	4
grey,black	2
white	4
dark grey	2
green-black	4
white	3
white,green-white	3
red	1
white	3
white,grey	4
grey	3
white	4
grey	4
white	2
brown,yellow	3
yellow	1
black	2
white	4
white	4
red,red-brown	4
pale: grey,green,brown-black	4
white	4
white	3
black	4
pale green	3
white	4
grey black	2
white	4
white	4
white	4
white	3
green-black	4
black	2
dark grey	3
white	4
white	4
brilliant silver	1
lt yellow,red brown	3
white,grey	3
white	4
white	3
white	3

Sheet1

white,pale green	2
white,pale yellow	2