

DATA & DEFINITIONS

Material supplied:

• Character disclaimer – page 3	• Grainsize chart – page 9
• Physical constants – page 3	• Movement of sand by fluids – page 9
• Periodic Table of the Elements – page 4	• Biostratigraphy of key fossil organisms – page 10
• Distance to the horizon calculation – page 5	• Mohs hardness scale – page 10
• Types of ammonites – page 5	
• Geological Time Scale 2023 – page 6	
• Igneous Rock classification chart – page 7	
• Palaeocurrent patterns – page 8	

Location and Character name disclaimer

The characters and events portrayed in this paper are fictitious (but fun). Enjoy!

Locations on Earth, and the features they possess, are fictional unless otherwise stated (including those based on actual geography). Locations on other planets are real.

Physical constants and other useful information

Unit or constant	Symbol	Value
Astronomical unit	AU	$1.496 \times 10^{11} \text{ m}$
Light year	Ly	$9.461 \times 10^{15} \text{ m}$
Parsec	pc	$3.261 \text{ light years} = 3.085 \times 10^{16} \text{ m}$
Speed of light	c	$299,792,458 \text{ m/s} \approx 3 \times 10^8 \text{ m/s}$
Universal gravitational constant	G	$6.67 \times 10^{-11} \text{ Nm}^2 \text{ kg}^2$

- Degrees Celsius ($^{\circ}\text{C}$) to Degrees Kelvin (K): $T_{(^{\circ}\text{C})} = T_{(\text{K})} - 273.15$

Periodic Table of the Elements

1	2											18
1	2											18
3	4											10
5	6											8
7	8											6
9	10											4
11	12											2
13	14											18
15	16											16
17	18											14
19	20											12
21	22											10
23	24											8
25	26											6
27	28											4
29	30											2
31	32											18
33	34											16
35	36											14
37	38											12
39	40											10
41	42											8
43	44											6
45	46											4
47	48											2
49	50											18
51	52											16
53	54											14
55	56											12
57-71	72											10
73	74											8
75	76											6
77	78											4
79	80											2
81	82											18
83	84											16
85	86											14
87	88											12
89-103	104											10
105	106											8
107	108											6
109	110											4
111	112											2
113	114											18
115	116											16
117	118											14
119	120											12
121	122											10
123	124											8
125	126											6
127	128											4
129	130											2
131	132											18
133	134											16
135	136											14
137	138											12
139	140											10
141	142											8
143	144											6
145	146											4
147	148											2
149	150											18
151	152											16
153	154											14
155	156											12
157	158											10
159	160											8
161	162											6
163	164											4
165	166											2
167	168											18
169	170											16
171	172											14
173	174											12
175	176											10
177	178											8
179	180											6
181	182											4
183	184											2
185	186											18
187	188											16
189	190											14
191	192											12
193	194											10
195	196											8
197	198											6
199	200											4
201	202											2
203	204											18
205	206											16
207	208											14
209	210											12
211	212											10
213	214											8
215	216											6
217	218											4
219	220											2
221	222											18
223	224											16
225	226											14
227	228											12
229	230											10
231	232											8
233	234											6
235	236											4
237	238											2
239	240											18
241	242											16
243	244											14
245	246											12
247	248											10
249	250											8
251	252											6
253	254											4
255	256											2
257	258											18
259	260											16
261	262											14
263	264											12
265	266											10
267	268											8
269	270											6
271	272											4
273	274											2
275	276											18
277	278											16
279	280											14
281	282											12
283	284											10
285	286											8
287	288											6
289	290											4
291	292											2
293	294											18
295	296											16
297	298											14
299	300											12
301	302											10
303	304											8
305	306											6
307	308											4
309	310											2
311	312											18
313	314											16
315	316											14
317	318											12
319	320											10
321	322											8
323	324											6
325	326											4
327	328											2
329	330											18
331	332											16
333	334											14
335	336											12
337	338											10
339	340											8
341	342											6
343	344											4
345	346											2
347	348											18
349	350											16
351	352											14
353	354											12
355	356											10
357	358											8
359	360											6
361	362											4
363	364											2
365	366											18
367	368											16
369	370											14
371	372											12
373	374											10
375	376											8
377	378											6
379	380											4
381	382											2
383	384											18
385	386											16
387	388											14
389	390											12
391	392											10
393	394											8
395	396											6
397	398											4
399	400											2

Periodic Table of the Elements

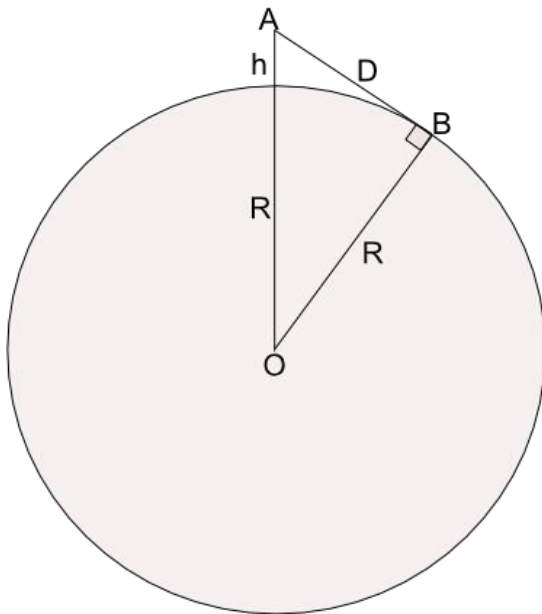
courtesy of <http://sciencenotes.org/category/chemistry/periodic-table-chemistry/>

Australian Science Olympiads

©Australian Science Innovations ABN 81731558309

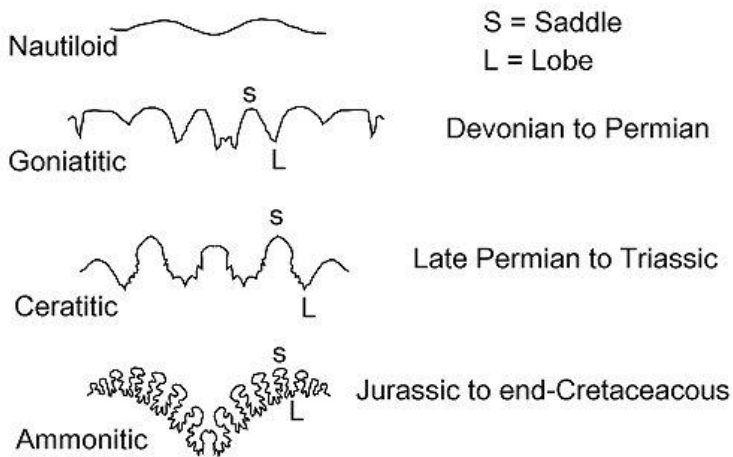
Distance to the horizon calculation

-assuming the Earth is a sphere and there is no atmospheric refraction



Observer at A
 Horizon at B
 h is observers height above sea level
 R is the radius of the sphere - for Earth this is 6371 km
 D is distance A to B

Identifying different types of ammonites by their sutures

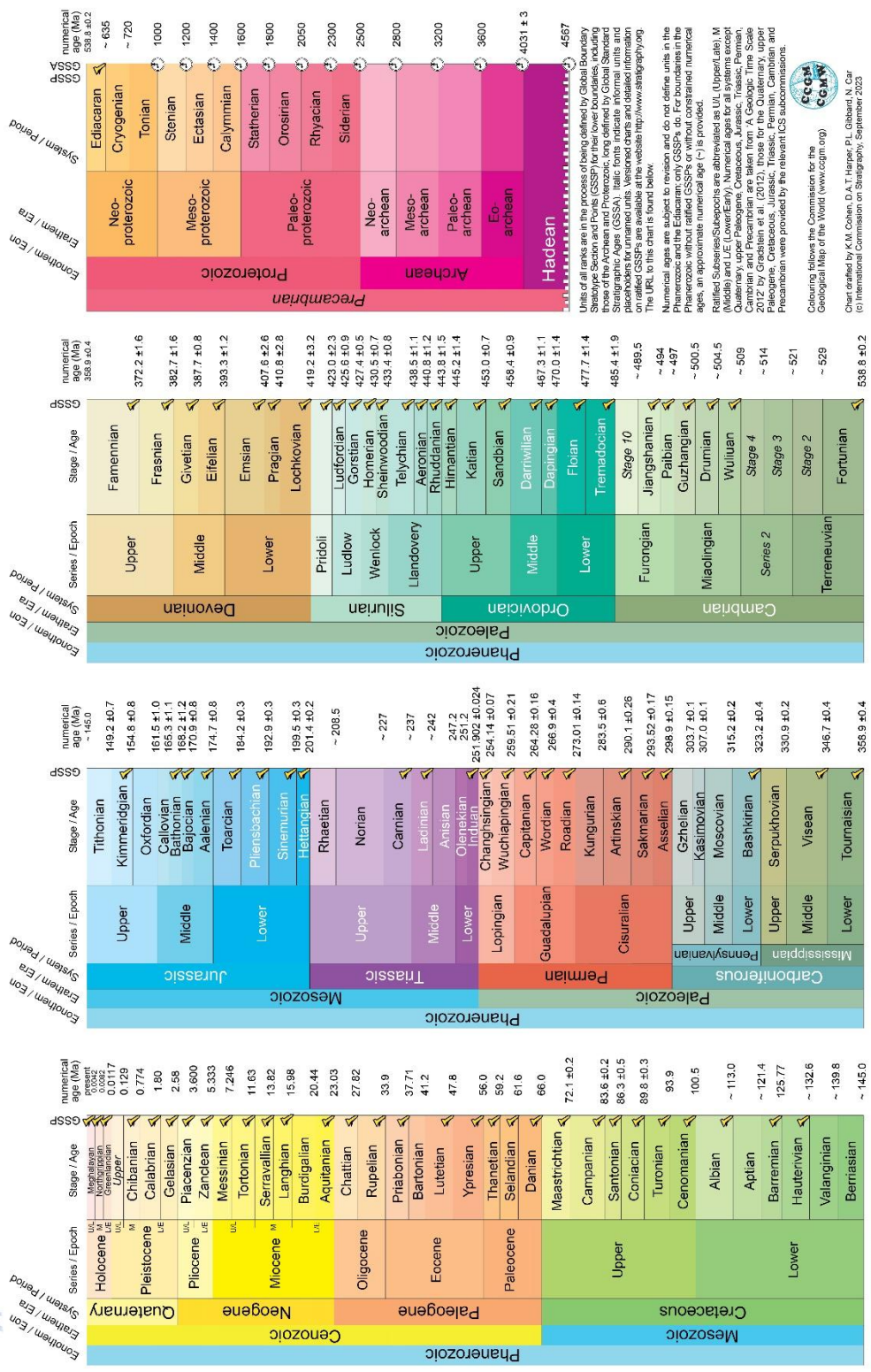


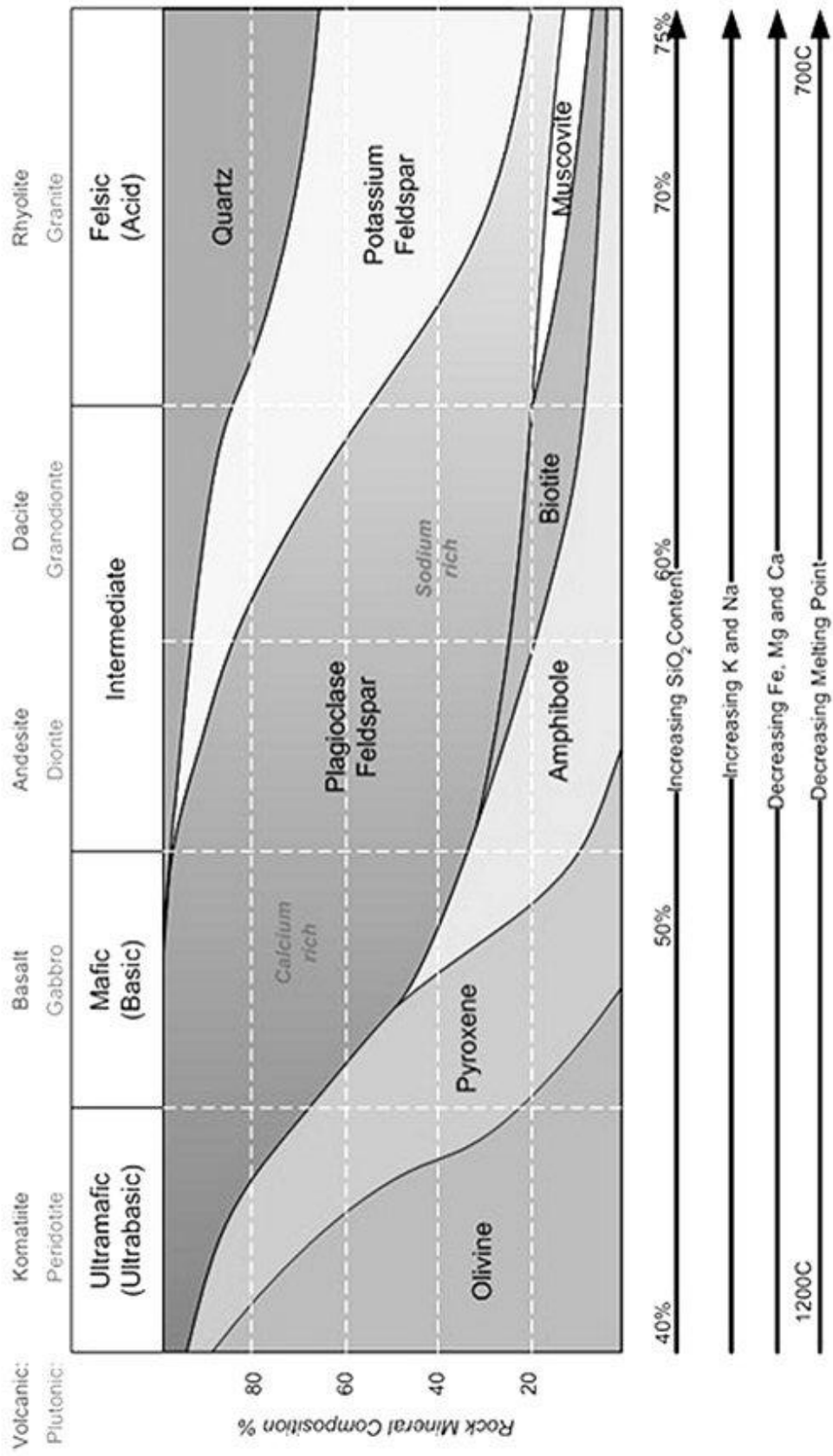
Nautiloids and Ammonites are cephalopod molluscs. Their shells vary from straight to tightly coiled and are divided into chambers by thin dividing walls (septa). Septa vary from very simple curved structures to extremely complex convoluted structures. Suture lines are formed by the intersection of the septa with the outer shell wall. These lines are only visible on external surfaces that have had most of the outer layers worn away to reveal the intersections between the shell wall and the septa.



INTERNATIONAL CHRONOSTRATIGRAPHIC CHART

www.stratigraphy.org International Commission on Stratigraphy v 2023/09

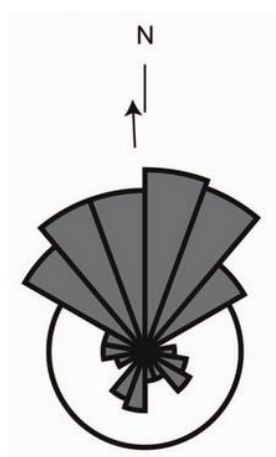




Igneous rock classification chart

Palaeocurrent patterns

The direction of flow of fluids depositing sediments can be determined from characteristic sedimentary structures constructed as the deposits are laid down. These structures include pebble imbrication, cross-lamination, cross-bedding, flute marks and the profile of ripples.

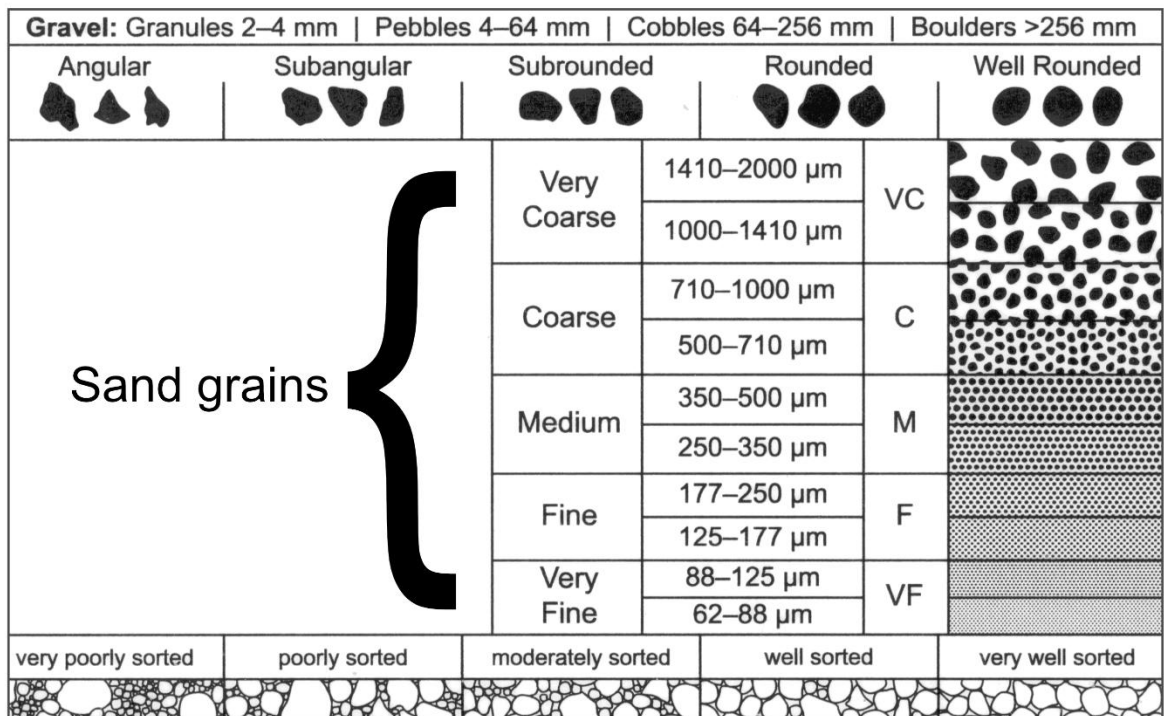


These structures can also be found in ancient sedimentary rocks, enabling the direction of flow at the time, the palaeocurrent, to be measured.

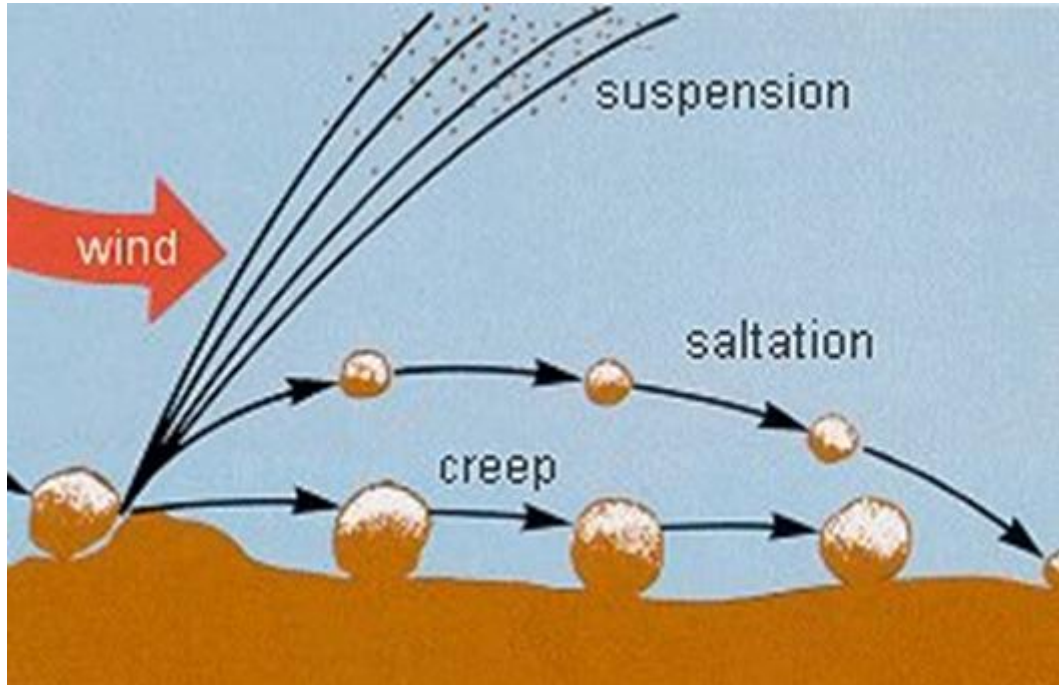
Visual representation of the data using a compass rose enables a quick insight into the nature of the depositional environment for each strata or group of strata. In this type of rose, each wedge represents a 'bin' of data for intervals of 5° to as much as 30°. The radial distance of each wedge is proportional to the frequency of the data in that bin.

When viewed this way patterns do emerge and these patterns are summarised below:

Environment of deposition	Palaeocurrent vector pattern	Regional pattern
River – braided	Unimodal – low variability	Often fan-shaped
River – meandering	Unimodal – high variability	
Wind blown dunes	Unimodal, bimodal or polymodal	Large variations over vast distances
Deltas	Unimodal	Radiating
Shorelines	Mostly bimodal	Mostly on-shore / off-shore
Marine turbidites	Mostly unimodal	Often fan-shaped



Grainsize chart, courtesy of the Geological Survey of NSW



Movement of sand by fluids. Sediments move, driven by fluid motion, by being pushed along or by rolling along the ground (creep), bouncing from one spot on the ground to the next (saltation) or by suspension in the fluid without touching the ground. The transport mode for any given grainsize will vary as the fluid velocity changes. Image source: [https://en.wikipedia.org/wiki/Saltation_\(geology\)](https://en.wikipedia.org/wiki/Saltation_(geology))

Hardness	Example Minerals/materials
1	Talc
2	Gypsum
2.5	Fingernail, pure gold, silver, aluminium
3	Calcite, copper coin
4	Fluorite
4.5	Platinum, iron
5	Apatite, Pyroxene group (5 to 6)
6	Orthoclase feldspar, titanium, <u>spectrolite</u> , Pyroxene group (5 to 6)
6.5	Plagioclase feldspar, steel file, iron pyrite, glass, vitreous pure silica
7	Quartz, amethyst, <u>citrine</u> , agate, olivine, tridymite (high temp quartz)
7.5	Garnet, <u>coesite</u> (high pressure quartz)
8	Hardened steel, topaz, beryl, emerald, aquamarine
9	Corundum, ruby, sapphire
9.5	Carborundum
10	Diamond

Mohs Hardness Scale

