

Conceptual Chemistry

PRACTICE SHEET

Chapter 2: Elements of Chemistry Melting Points and Densities of the Elements

There is a remarkable degree of organization in the periodic table. As discussed in your textbook, elements within the same atomic group (vertical column) share similar properties. Also, the chemical reactivity of an element can be deduced from its position in the periodic table. Two additional examples of the periodic table's organization are the melting points and densities of the elements.

The periodic table below shows the melting points of nearly all the elements. Note the melting points are not randomly oriented, but, with only a few exceptions, gradually either increase or decrease as you move in any particular direction. This can be clearly illustrated by color coding each element according to its melting point.

Use colored pencils to color in each element according to its melting point. Use the suggested color legend. Color lightly so that symbols and numbers are still visible.

Color	Temperature Range, $^{\circ}\text{C}$	Color	Temperature Range, $^{\circ}\text{C}$
Violet	-273 - -50	Yellow	1400 - 1900
Blue	-50 - 300	Orange	1900 - 2900
Cyan	300 - 700	Red	2900 - 3500
Green	700 - 1400		

Melting Points of the Elements ($^{\circ}\text{C}$)																																		
																	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
H -259																	He -272																	
Li 180	Be 1278															B 2079	C 3550	N -210	O -218	F -219	Ne -248													
Na 97	Mg 648															Al 660	Si 1410	P 44	S 113	Cl -100	Ar -189													
K 63	Ca 839	Sc 1541	Ti 1660	V 1890	Cr 1857	Mn 1244	Fe 1535	Co 1495	Ni 1453	Cu 1083	Zn 419	Ga 30	Ge 937	As 817	Se 217	Br -7	Kr -156																	
Rb 39	Sr 769	Y 1522	Zr 1852	Nb 2468	Mo 2617	Tc 2172	Ru 2310	Rh 1966	Pd 1554	Ag 961	Cd 320	In 156	Sn 231	Sb 630	Te 449	I 113	Xe -111																	
Cs 28	Ba 725	La 921	Hf 2227	Ta 2996	W 3410	Re 3180	Os 3045	Ir 2410	Pt 1772	Au 1064	Hg -38	Tl 303	Pb 327	Bi 271	Po 254	At 302	Rn -71																	
Fr 27	Ra 700	Ac 1050	--	--	--	--	--	--																										

Lanthanides:	Ce 799	Pr 931	Nd 1021	Pm 1168	Sm 1077	Eu 822	Gd 1313	Tb 1356	Dy 1412	Ho 1474	Er 1159	Tm 1545	Yb 819	Lu 1663
Actinides:	Th 1750	Pa 1600	U 1132	Np 640	Pu 641	Am 994	Cm 1340	Bk --	Cf --	Es --	Fm --	Md --	No --	Lr --

- Which elements have the highest melting points?
- Which elements have the lowest melting points?
- Which atomic groups tend to go from higher to lower melting points reading from top to bottom? (Identify each group by its group number.)
- Which atomic groups tend to go from lower to higher melting points reading from top to bottom?

Subodh

The periodic table below shows the densities of nearly all the elements. As with the melting points, the densities of the elements gradually either increase or decrease as you move in any particular direction. Use colored pencils to color in each element according to its density. Shown below is a suggested color legend. Color lightly so that symbols and numbers are still visible. (Note: All gaseous elements are marked with an asterisk and should be the same color. Their densities, which are given in units of g/L, are much less than the densities of non-gaseous elements, which are given in units of g/mL.)

Color	Density (g/mL)	Color	Density (g/mL)
Violet	gaseous elements	Yellow	16 - 12
Blue	5 - 0	Orange	20 - 16
Cyan	8 - 5	Red.	23 - 20
Green	12 - 8		

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
H *	Densities of the Elements (g/mL)																He *	
0.09																	0.18	
Li	Be											B	C	N *	O *	F *	Ne *	
0.5	1.8											2.3	2.0	1.25	1.43	1.70	0.90	
Na	Mg											Al	Si	P	S	Cl *	Ar *	
1.0	1.7											2.7	2.3	1.8	2.1	3.21	1.78	
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br *	Kr *	
0.9	1.6	3.0	4.5	6.1	7.2	7.3	7.8	8.9	8.9	9.0	7.1	6.1	5.3	5.7	4.8	7.59	3.73	
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe *	
1.5	2.5	4.5	6.5	8.5	6.8	11.5	12.4	12.4	12.0	10.5	8.7	7.3	5.7	6.7	6.2	4.9	5.89	
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn *	
1.9	3.5	6.2	13.3	16.6	19.3	21.0	22.6	22.4	21.5	18.9	13.5	11.9	11.4	9.7	9.3	--	9.73	
Fr	Ra	Ac	Unq	Unp	Unh	Uns	Uno	Une										
--	5.0	10.1	--	--	--	--	--	--										

* density of gaseous phase in g/L

Lanthanides:	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
	6.7	6.7	6.8	7.2	7.5	5.2	7.9	8.2	8.6	8.8	9.1	9.3	6.9	9.8

Actinides:	Th	Pa	U	Np	Pu	Am	Cm	8k	Cf	Es	Fm	Md	No	Lr
	11.7	15.4	19.0	20.1	19.8	13.7	13.5	14	--	--	--	--	--	--

- Which elements are the most dense?
- How variable are the densities of the lanthanides compared to the densities of the actinides?
- Which atomic groups tend to go from higher to lower densities, reading from top to bottom? (Identify each group by its group number).
- Which atomic groups tend to go from lower to higher densities, reading from top to bottom?

Surbachi