

# Compilation of X-Ray Cross Sections

based on the tables of

W. H. McMaster, N. Kerr Del Grande, J. H. Mallett, and J. H. Hubbell

Lawrence Livermore National Laboratory Report

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This book contains the total x-ray capture cross section as a functions of x-ray energy for most atoms up to  $Z = 94$  (Po, At, Fr, Ra, Ac, Pa, and Np are not included). The cross sections are given in barns/atom,  $\text{cm}^2/\text{gr}$ , and  $\text{cm}^{-1}$ . Though separate listings for the photo, coherent, and incoherent cross sections were given in the original tables of McMaster *et al*, they are not listed here.

The tables in this book were made using a modified form of the subroutine MUCAL written by Pathikrit Bandyopadhyay at the University of Notre Dame, and based on the original tables of McMaster *et al*. A few minor corrections have been made to the original data. The book was created using the  $\text{\TeX}$  typesetting language, and is freely available in PostScript form at:

<http://cars9.uchicago.edu/mcbook/>

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**ATOMIC DATA**

Atomic weight = 1.008 gr/mole

Density = 1.008 gr/cm<sup>3</sup>

1.000 cm<sup>2</sup>/gr = 1.674 barns/atom

**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	0.014
<i>L<sub>I</sub></i>	0.000
<i>L<sub>II</sub></i>	0.000
<i>L<sub>III</sub></i>	0.000

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	0.000
<i>K<sub>α1</sub></i>	0.000
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	12.584	7.517	7.577	
1.500	3.734	2.230	2.248	
2.000	1.788	1.068	1.077	
3.000	0.883	0.528	0.532	
4.000	0.698	0.417	0.420	
5.000	0.649	0.388	0.391	
6.000	0.638	0.381	0.384	
7.000	0.638	0.381	0.384	
8.000	0.643	0.384	0.387	
9.000	0.648	0.387	0.390	
10.000	0.653	0.390	0.393	
12.000	0.661	0.395	0.398	
14.000	0.665	0.397	0.400	
16.000	0.667	0.398	0.401	
18.000	0.666	0.398	0.401	
20.000	0.664	0.397	0.400	
22.000	0.661	0.395	0.398	
24.000	0.657	0.392	0.395	
26.000	0.652	0.390	0.393	
28.000	0.647	0.387	0.390	
30.000	0.642	0.383	0.386	
35.000	0.628	0.375	0.378	
40.000	0.614	0.367	0.370	
45.000	0.600	0.358	0.361	
50.000	0.587	0.351	0.353	
60.000	0.562	0.336	0.338	
70.000	0.540	0.323	0.325	
80.000	0.520	0.311	0.313	
90.000	0.502	0.300	0.303	
100.000	0.486	0.291	0.293	

**ATOMIC DATA**

Atomic weight = 4.003 gr/mole  
Density = 0.000179 gr/cm<sup>3</sup>  
1.000 cm<sup>2</sup>/gr = 6.647 barns/atom

**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	0.025
<i>L<sub>I</sub></i>	0.000
<i>L<sub>II</sub></i>	0.000
<i>L<sub>III</sub></i>	0.000

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	0.000
<i>K<sub>α1</sub></i>	0.000
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	433.257	65.181	0.011635	
1.500	114.243	17.187	0.003068	
2.000	44.474	6.691	0.001194	
3.000	12.460	1.875	0.000335	
4.000	5.636	0.848	0.000151	
5.000	3.418	0.514	0.000092	
6.000	2.501	0.376	0.000067	
7.000	2.059	0.310	0.000055	
8.000	1.821	0.274	0.000049	
9.000	1.682	0.253	0.000045	
10.000	1.597	0.240	0.000043	
12.000	1.503	0.226	0.000040	
14.000	1.456	0.219	0.000039	
16.000	1.428	0.215	0.000038	
18.000	1.408	0.212	0.000038	
20.000	1.392	0.209	0.000037	
22.000	1.378	0.207	0.000037	
24.000	1.364	0.205	0.000037	
26.000	1.351	0.203	0.000036	
28.000	1.338	0.201	0.000036	
30.000	1.326	0.199	0.000036	
35.000	1.294	0.195	0.000035	
40.000	1.263	0.190	0.000034	
45.000	1.233	0.185	0.000033	
50.000	1.204	0.181	0.000032	
60.000	1.150	0.173	0.000031	
70.000	1.102	0.166	0.000030	
80.000	1.058	0.159	0.000028	
90.000	1.019	0.153	0.000027	
100.000	0.984	0.148	0.000026	

**ATOMIC DATA**

Atomic weight = 6.940 gr/mole  
Density = 0.534 gr/cm<sup>3</sup>  
1.000 cm<sup>2</sup>/gr = 11.520 barns/atom

**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	0.055
<i>L<sub>I</sub></i>	0.000
<i>L<sub>II</sub></i>	0.000
<i>L<sub>III</sub></i>	0.000

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	0.000
<i>K<sub>α1</sub></i>	0.000
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	2333.691	202.577	108.176	
1.500	719.981	62.498	33.374	
2.000	301.044	26.132	13.955	
3.000	85.304	7.405	3.954	
4.000	34.944	3.033	1.620	
5.000	17.952	1.558	0.832	
6.000	10.814	0.939	0.501	
7.000	7.340	0.637	0.340	
8.000	5.461	0.474	0.253	
9.000	4.358	0.378	0.202	
10.000	3.669	0.318	0.170	
12.000	2.905	0.252	0.135	
14.000	2.522	0.219	0.117	
16.000	2.306	0.200	0.107	
18.000	2.172	0.189	0.101	
20.000	2.083	0.181	0.097	
22.000	2.020	0.175	0.094	
24.000	1.973	0.171	0.091	
26.000	1.937	0.168	0.090	
28.000	1.907	0.166	0.088	
30.000	1.882	0.163	0.087	
35.000	1.832	0.159	0.085	
40.000	1.792	0.156	0.083	
45.000	1.758	0.153	0.082	
50.000	1.728	0.150	0.080	
60.000	1.674	0.145	0.078	
70.000	1.625	0.141	0.075	
80.000	1.581	0.137	0.073	
90.000	1.541	0.134	0.071	
100.000	1.503	0.130	0.070	

**ATOMIC DATA**

Atomic weight = 9.012 gr/mole

Density = 1.848 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 14.960 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	0.112
<i>L<sub>I</sub></i>	0.000
<i>L<sub>II</sub></i>	0.000
<i>L<sub>III</sub></i>	0.000

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	0.000
<i>K<sub>α1</sub></i>	0.000
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000



## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	8482.535	567.014	1047.843	
1.500	2606.098	174.204	321.930	
2.000	1089.394	72.820	134.572	
3.000	307.157	20.532	37.943	
4.000	123.444	8.252	15.249	
5.000	61.141	4.087	7.553	
6.000	34.904	2.333	4.312	
7.000	22.139	1.480	2.735	
8.000	15.251	1.019	1.884	
9.000	11.231	0.751	1.387	
10.000	8.736	0.584	1.079	
12.000	6.004	0.401	0.742	
14.000	4.663	0.312	0.576	
16.000	3.926	0.262	0.485	
18.000	3.485	0.233	0.430	
20.000	3.201	0.214	0.395	
22.000	3.009	0.201	0.372	
24.000	2.871	0.192	0.355	
26.000	2.769	0.185	0.342	
28.000	2.690	0.180	0.332	
30.000	2.627	0.176	0.324	
35.000	2.512	0.168	0.310	
40.000	2.432	0.163	0.300	
45.000	2.370	0.158	0.293	
50.000	2.319	0.155	0.286	
60.000	2.234	0.149	0.276	
70.000	2.164	0.145	0.267	
80.000	2.102	0.141	0.260	
90.000	2.047	0.137	0.253	
100.000	1.996	0.133	0.247	

**ATOMIC DATA**

Atomic weight = 10.811 gr/mole

Density = 2.340 gr/cm<sup>3</sup>

1.000 cm<sup>2</sup>/gr = 17.950 barns/atom

**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	0.188
<i>L<sub>I</sub></i>	0.000
<i>L<sub>II</sub></i>	0.000
<i>L<sub>III</sub></i>	0.000

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	0.000
<i>K<sub>α1</sub></i>	0.000
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	20972.723	1168.397	2734.048	
1.500	6680.643	372.181	870.903	
2.000	2859.426	159.299	372.761	
3.000	829.028	46.185	108.074	
4.000	337.118	18.781	43.947	
5.000	166.904	9.298	21.758	
6.000	94.223	5.249	12.283	
7.000	58.523	3.260	7.629	
8.000	39.133	2.180	5.101	
9.000	27.772	1.547	3.620	
10.000	20.707	1.154	2.699	
12.000	12.970	0.723	1.691	
14.000	9.190	0.512	1.198	
16.000	7.131	0.397	0.930	
18.000	5.912	0.329	0.771	
20.000	5.141	0.286	0.670	
22.000	4.627	0.258	0.603	
24.000	4.267	0.238	0.556	
26.000	4.006	0.223	0.522	
28.000	3.809	0.212	0.497	
30.000	3.656	0.204	0.477	
35.000	3.392	0.189	0.442	
40.000	3.221	0.179	0.420	
45.000	3.097	0.173	0.404	
50.000	3.001	0.167	0.391	
60.000	2.853	0.159	0.372	
70.000	2.739	0.153	0.357	
80.000	2.644	0.147	0.345	
90.000	2.561	0.143	0.334	
100.000	2.488	0.139	0.324	

**ATOMIC DATA**

Atomic weight = 12.010 gr/mole

Density = 2.250 gr/cm<sup>3</sup>

1.000 cm<sup>2</sup>/gr = 19.940 barns/atom

**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	0.284
<i>L<sub>I</sub></i>	0.000
<i>L<sub>II</sub></i>	0.000
<i>L<sub>III</sub></i>	0.000

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	0.000
<i>K<sub>α1</sub></i>	0.000
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	43833.219	2198.256	4946.075	
1.500	14147.471	709.502	1596.380	
2.000	6124.767	307.160	691.110	
3.000	1806.801	90.612	203.877	
4.000	742.956	37.260	83.834	
5.000	369.947	18.553	41.744	
6.000	208.981	10.480	23.581	
7.000	129.237	6.481	14.583	
8.000	85.625	4.294	9.662	
9.000	59.929	3.005	6.762	
10.000	43.879	2.201	4.951	
12.000	26.223	1.315	2.959	
14.000	17.567	0.881	1.982	
16.000	12.850	0.644	1.450	
18.000	10.065	0.505	1.136	
20.000	8.313	0.417	0.938	
22.000	7.153	0.359	0.807	
24.000	6.351	0.318	0.717	
26.000	5.775	0.290	0.652	
28.000	5.349	0.268	0.604	
30.000	5.024	0.252	0.567	
35.000	4.481	0.225	0.506	
40.000	4.148	0.208	0.468	
45.000	3.923	0.197	0.443	
50.000	3.757	0.188	0.424	
60.000	3.519	0.176	0.397	
70.000	3.349	0.168	0.378	
80.000	3.214	0.161	0.363	
90.000	3.100	0.155	0.350	
100.000	3.002	0.151	0.339	

**ATOMIC DATA**

Atomic weight = 14.008 gr/mole  
 Density = 0.001250 gr/cm<sup>3</sup>  
 1.000 cm<sup>2</sup>/gr = 23.260 barns/atom

**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	0.402
<i>L<sub>I</sub></i>	0.000
<i>L<sub>II</sub></i>	0.000
<i>L<sub>III</sub></i>	0.000

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	0.000
<i>K<sub>α1</sub></i>	0.000
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	78956.195	3394.505	4.243132	
1.500	26105.123	1122.318	1.402898	
2.000	11492.653	494.095	0.617619	
3.000	3467.374	149.070	0.186338	
4.000	1446.114	62.172	0.077715	
5.000	726.487	31.233	0.039042	
6.000	412.348	17.728	0.022160	
7.000	255.309	10.976	0.013720	
8.000	168.800	7.257	0.009071	
9.000	117.527	5.053	0.006316	
10.000	85.348	3.669	0.004587	
12.000	49.768	2.140	0.002675	
14.000	32.239	1.386	0.001733	
16.000	22.663	0.974	0.001218	
18.000	17.007	0.731	0.000914	
20.000	13.457	0.579	0.000723	
22.000	11.115	0.478	0.000597	
24.000	9.505	0.409	0.000511	
26.000	8.360	0.359	0.000449	
28.000	7.519	0.323	0.000404	
30.000	6.886	0.296	0.000370	
35.000	5.852	0.252	0.000314	
40.000	5.245	0.226	0.000282	
45.000	4.852	0.209	0.000261	
50.000	4.577	0.197	0.000246	
60.000	4.208	0.181	0.000226	
70.000	3.962	0.170	0.000213	
80.000	3.778	0.162	0.000203	
90.000	3.629	0.156	0.000195	
100.000	3.503	0.151	0.000188	

**ATOMIC DATA**

Atomic weight = 16.000 gr/mole  
Density = 0.001429 gr/cm<sup>3</sup>  
1.000 cm<sup>2</sup>/gr = 26.570 barns/atom

**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	0.537
<i>L<sub>I</sub></i>	0.000
<i>L<sub>II</sub></i>	0.000
<i>L<sub>III</sub></i>	0.000

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	0.000
<i>K<sub>α1</sub></i>	0.000
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000



## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	122161.625	4597.728	6.570153	
1.500	41708.105	1569.744	2.243165	
2.000	18762.010	706.135	1.009067	
3.000	5823.478	219.175	0.313201	
4.000	2473.609	93.098	0.133037	
5.000	1258.528	47.366	0.067687	
6.000	720.725	27.126	0.038762	
7.000	448.952	16.897	0.024146	
8.000	297.923	11.213	0.016023	
9.000	207.758	7.819	0.011174	
10.000	150.824	5.676	0.008112	
12.000	87.428	3.290	0.004702	
14.000	55.945	2.106	0.003009	
16.000	38.643	1.454	0.002078	
18.000	28.379	1.068	0.001526	
20.000	21.914	0.825	0.001179	
22.000	17.641	0.664	0.000949	
24.000	14.700	0.553	0.000791	
26.000	12.606	0.474	0.000678	
28.000	11.071	0.417	0.000595	
30.000	9.917	0.373	0.000533	
35.000	8.040	0.303	0.000432	
40.000	6.952	0.262	0.000374	
45.000	6.258	0.236	0.000337	
50.000	5.782	0.218	0.000311	
60.000	5.168	0.194	0.000278	
70.000	4.778	0.180	0.000257	
80.000	4.498	0.169	0.000242	
90.000	4.281	0.161	0.000230	
100.000	4.103	0.154	0.000221	

**ATOMIC DATA**

Atomic weight = 19.000 gr/mole  
Density = 1.108 gr/cm<sup>3</sup>  
1.000 cm<sup>2</sup>/gr = 31.550 barns/atom

**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	0.686
<i>L<sub>I</sub></i>	0.000
<i>L<sub>II</sub></i>	0.000
<i>L<sub>III</sub></i>	0.000

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	0.000
<i>K<sub>α1</sub></i>	0.000
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	179218.984	5680.475	6293.967	
1.500	64220.957	2035.530	2255.367	
2.000	29739.201	942.605	1044.407	
3.000	9548.021	302.631	335.316	
4.000	4133.840	131.025	145.176	
5.000	2128.402	67.461	74.747	
6.000	1228.189	38.928	43.133	
7.000	768.648	24.363	26.994	
8.000	511.327	16.207	17.957	
9.000	356.803	11.309	12.531	
10.000	258.780	8.202	9.088	
12.000	149.103	4.726	5.236	
14.000	94.372	2.991	3.314	
16.000	64.204	2.035	2.255	
18.000	46.280	1.467	1.625	
20.000	34.985	1.109	1.229	
22.000	27.522	0.872	0.967	
24.000	22.394	0.710	0.786	
26.000	18.751	0.594	0.659	
28.000	16.090	0.510	0.565	
30.000	14.096	0.447	0.495	
35.000	10.881	0.345	0.382	
40.000	9.048	0.287	0.318	
45.000	7.906	0.251	0.278	
50.000	7.141	0.226	0.251	
60.000	6.191	0.196	0.217	
70.000	5.622	0.178	0.197	
80.000	5.233	0.166	0.184	
90.000	4.943	0.157	0.174	
100.000	4.712	0.149	0.165	

**ATOMIC DATA**

Atomic weight = 20.183 gr/mole

Density = 0.000900 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 33.510 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	0.867
<i>L<sub>I</sub></i>	0.000
<i>L<sub>II</sub></i>	0.000
<i>L<sub>III</sub></i>	0.000

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	0.000
<i>K<sub>α1</sub></i>	0.000
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000

**10****NEON****Ne****TOTAL CROSS SECTIONS**

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	254871.906	7605.847	6.845262	
1.500	91022.164	2716.269	2.444642	
2.000	42210.055	1259.626	1.133663	
3.000	13641.747	407.095	0.366385	
4.000	5950.086	177.562	0.159805	
5.000	3084.783	92.056	0.082850	
6.000	1791.026	53.448	0.048103	
7.000	1126.857	33.627	0.030265	
8.000	752.976	22.470	0.020223	
9.000	527.343	15.737	0.014163	
10.000	383.552	11.446	0.010301	
12.000	221.709	6.616	0.005955	
14.000	140.336	4.188	0.003769	
16.000	95.190	2.841	0.002557	
18.000	68.216	2.036	0.001832	
20.000	51.138	1.526	0.001373	
22.000	39.810	1.188	0.001069	
24.000	32.000	0.955	0.000859	
26.000	26.440	0.789	0.000710	
28.000	22.370	0.668	0.000601	
30.000	19.320	0.577	0.000519	
35.000	14.401	0.430	0.000387	
40.000	11.610	0.346	0.000312	
45.000	9.886	0.295	0.000266	
50.000	8.746	0.261	0.000235	
60.000	7.366	0.220	0.000198	
70.000	6.570	0.196	0.000176	
80.000	6.048	0.180	0.000162	
90.000	5.673	0.169	0.000152	
100.000	5.385	0.161	0.000145	

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**SODIUM**

Na

**ATOMIC DATA**

Atomic weight = 22.997 gr/mole

Density = 0.970 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 38.190 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	1.072
<i>L<sub>I</sub></i>	0.000
<i>L<sub>II</sub></i>	0.000
<i>L<sub>III</sub></i>	0.000

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	1.067
<i>K<sub>α1</sub></i>	1.041
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	27939.746	731.599	709.651	
1.041	25218.490	660.343	640.533	$K_{\alpha 1}$
1.067	23672.936	619.873	601.276	$K_{\beta 1}$
1.071	23446.637	613.947	595.529	
1.073	273323.969	7156.952	6942.243	$K$ edge
1.500	123550.078	3235.142	3138.088	
2.000	59803.953	1565.958	1518.980	
3.000	20237.162	529.907	514.010	
4.000	9034.268	236.561	229.464	
5.000	4745.191	124.252	120.525	
6.000	2775.854	72.685	70.505	
7.000	1753.761	45.922	44.544	
8.000	1174.135	30.745	29.822	
9.000	822.562	21.539	20.893	
10.000	597.730	15.651	15.182	
12.000	343.921	9.006	8.735	
14.000	216.058	5.657	5.488	
16.000	145.108	3.800	3.686	
18.000	102.760	2.691	2.610	
20.000	75.996	1.990	1.930	
22.000	58.286	1.526	1.480	
24.000	46.113	1.207	1.171	
26.000	37.476	0.981	0.952	
28.000	31.179	0.816	0.792	
30.000	26.479	0.693	0.673	
35.000	18.963	0.497	0.482	
40.000	14.761	0.387	0.375	
45.000	12.211	0.320	0.310	
50.000	10.560	0.277	0.268	
60.000	8.626	0.226	0.219	
70.000	7.567	0.198	0.192	
80.000	6.908	0.181	0.175	
90.000	6.455	0.169	0.164	
100.000	6.120	0.160	0.155	

**ATOMIC DATA**

Atomic weight = 24.320 gr/mole

Density = 1.740 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 40.380 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	1.305
<i>L<sub>I</sub></i>	0.063
<i>L<sub>II</sub></i>	0.050
<i>L<sub>III</sub></i>	0.049

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	1.297
<i>K<sub>α1</sub></i>	1.254
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000



## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	40096.531	992.980	1727.785	
1.254	21105.178	522.664	909.436	$K_{\alpha 1}$
1.297	19221.586	476.017	828.270	$K_{\beta 1}$
1.304	18937.828	468.990	816.043	
1.306	217802.484	5393.821	9385.248	$K$ edge
1.500	158018.484	3913.286	6809.117	
2.000	78581.859	1946.059	3386.143	
3.000	27458.486	680.002	1183.204	
4.000	12490.023	309.312	538.203	
5.000	6641.585	164.477	286.190	
6.000	3918.767	97.047	168.862	
7.000	2491.238	61.695	107.349	
8.000	1675.421	41.491	72.195	
9.000	1177.575	29.162	50.742	
10.000	857.650	21.239	36.957	
12.000	494.568	12.248	21.311	
14.000	310.621	7.692	13.385	
16.000	208.146	5.155	8.969	
18.000	146.810	3.636	6.326	
20.000	107.971	2.674	4.653	
22.000	82.236	2.037	3.544	
24.000	64.534	1.598	2.781	
26.000	51.970	1.287	2.239	
28.000	42.809	1.060	1.845	
30.000	35.975	0.891	1.550	
35.000	25.061	0.621	1.080	
40.000	18.981	0.470	0.818	
45.000	15.313	0.379	0.660	
50.000	12.954	0.321	0.558	
60.000	10.227	0.253	0.441	
70.000	8.770	0.217	0.378	
80.000	7.888	0.195	0.340	
90.000	7.301	0.181	0.315	
100.000	6.878	0.170	0.296	

**ATOMIC DATA**

Atomic weight = 26.970 gr/mole

Density = 2.720 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 44.780 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	1.560
<i>L<sub>I</sub></i>	0.087
<i>L<sub>II</sub></i>	0.073
<i>L<sub>III</sub></i>	0.072

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	1.553
<i>K<sub>α1</sub></i>	1.487
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	52683.207	1176.490	3200.052	
1.487	18033.143	402.705	1095.358	$K_{\alpha 1}$
1.500	17625.273	393.597	1070.584	
1.553	16092.455	359.367	977.478	$K_{\beta 1}$
1.559	15931.124	355.764	967.679	
1.561	189669.500	4235.585	11520.792	$K$ edge
2.000	103252.289	2305.768	6271.689	
3.000	36135.766	806.962	2194.937	
4.000	16535.189	369.254	1004.371	
5.000	8851.937	197.676	537.679	
6.000	5256.894	117.394	319.311	
7.000	3361.693	75.071	204.194	
8.000	2272.669	50.752	138.045	
9.000	1604.614	35.833	97.466	
10.000	1173.190	26.199	71.261	
12.000	680.471	15.196	41.333	
14.000	428.866	9.577	26.050	
16.000	287.769	6.426	17.479	
18.000	202.848	4.530	12.321	
20.000	148.833	3.324	9.040	
22.000	112.911	2.521	6.858	
24.000	88.131	1.968	5.353	
26.000	70.504	1.574	4.282	
28.000	57.632	1.287	3.501	
30.000	48.019	1.072	2.917	
35.000	32.661	0.729	1.984	
40.000	24.118	0.539	1.465	
45.000	18.982	0.424	1.153	
50.000	15.700	0.351	0.954	
60.000	11.950	0.267	0.726	
70.000	9.988	0.223	0.607	
80.000	8.831	0.197	0.536	
90.000	8.080	0.180	0.491	
100.000	7.555	0.169	0.459	

**ATOMIC DATA**

Atomic weight = 28.086 gr/mole

Density = 2.330 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 46.630 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	1.839
<i>L<sub>I</sub></i>	0.118
<i>L<sub>II</sub></i>	0.100
<i>L<sub>III</sub></i>	0.099

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	1.832
<i>K<sub>α1</sub></i>	1.740
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	74968.727	1607.736	3746.024	
1.500	25314.721	542.885	1264.922	
1.740	17204.680	368.962	859.680	$K_{\alpha 1}$
1.832	15067.938	323.138	752.912	$K_{\beta 1}$
1.838	14942.041	320.438	746.621	
1.840	154636.203	3316.239	7726.835	$K$ edge
2.000	127032.266	2724.260	6347.526	
3.000	46474.129	996.657	2322.211	
4.000	21765.867	466.778	1087.593	
5.000	11815.099	253.380	590.375	
6.000	7079.655	151.826	353.755	
7.000	4554.688	97.677	227.588	
8.000	3092.088	66.311	154.505	
9.000	2189.582	46.957	109.409	
10.000	1604.189	34.403	80.158	
12.000	932.659	20.001	46.603	
14.000	588.279	12.616	29.395	
16.000	394.631	8.463	19.719	
18.000	277.875	5.959	13.885	
20.000	203.517	4.365	10.169	
22.000	154.022	3.303	7.696	
24.000	119.855	2.570	5.989	
26.000	95.536	2.049	4.774	
28.000	77.769	1.668	3.886	
30.000	64.494	1.383	3.223	
35.000	43.271	0.928	2.162	
40.000	31.453	0.675	1.572	
45.000	24.342	0.522	1.216	
50.000	19.795	0.425	0.989	
60.000	14.600	0.313	0.730	
70.000	11.887	0.255	0.594	
80.000	10.294	0.221	0.514	
90.000	9.270	0.199	0.463	
100.000	8.562	0.184	0.428	

**ATOMIC DATA**

Atomic weight = 30.975 gr/mole

Density = 1.820 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 51.430 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	2.149
<i>L<sub>I</sub></i>	0.153
<i>L<sub>II</sub></i>	0.136
<i>L<sub>III</sub></i>	0.135

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	2.136
<i>K<sub>α1</sub></i>	2.015
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	103950.172	2021.197	3678.579	
1.500	33240.098	646.317	1176.297	
2.000	15599.799	303.321	552.044	
2.015	15305.315	297.595	541.623	$K_{\alpha 1}$
2.136	13203.680	256.731	467.251	$K_{\beta 1}$
2.148	13018.911	253.138	460.712	
2.150	128291.047	2494.479	4539.952	$K$ edge
3.000	57334.043	1114.798	2028.932	
4.000	27388.932	532.548	969.237	
5.000	15067.744	292.976	533.216	
6.000	9116.510	177.261	322.614	
7.000	5908.146	114.877	209.077	
8.000	4033.737	78.432	142.745	
9.000	2869.201	55.788	101.535	
10.000	2109.612	41.019	74.655	
12.000	1232.763	23.970	43.625	
14.000	779.972	15.166	27.602	
16.000	524.052	10.190	18.545	
18.000	369.143	7.178	13.063	
20.000	270.188	5.254	9.561	
22.000	204.165	3.970	7.225	
24.000	158.503	3.082	5.609	
26.000	125.955	2.449	4.457	
28.000	102.151	1.986	3.615	
30.000	84.351	1.640	2.985	
35.000	55.869	1.086	1.977	
40.000	40.004	0.778	1.416	
45.000	30.465	0.592	1.078	
50.000	24.373	0.474	0.863	
60.000	17.435	0.339	0.617	
70.000	13.837	0.269	0.490	
80.000	11.744	0.228	0.416	
90.000	10.413	0.202	0.368	
100.000	9.505	0.185	0.336	

**ATOMIC DATA**

Atomic weight = 32.066 gr/mole

Density = 2.000 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 53.240 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	2.472
<i>L<sub>I</sub></i>	0.193
<i>L<sub>II</sub></i>	0.164
<i>L<sub>III</sub></i>	0.162

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	2.464
<i>K<sub>α1</sub></i>	2.308
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000



## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	135788.703	2550.501	5101.003	
1.500	45812.758	860.495	1720.990	
2.000	20822.336	391.103	782.206	
2.308	13991.959	262.809	525.618	$K_{\alpha 1}$
2.464	11657.557	218.962	437.925	$K_{\beta 1}$
2.471	11565.470	217.233	434.465	
2.473	118100.953	2218.275	4436.550	$K$ edge
3.000	72535.344	1362.422	2724.844	
4.000	34178.586	641.972	1283.944	
5.000	18692.488	351.099	702.197	
6.000	11286.248	211.988	423.976	
7.000	7314.194	137.382	274.763	
8.000	4999.412	93.903	187.807	
9.000	3562.489	66.914	133.828	
10.000	2625.033	49.306	98.611	
12.000	1541.290	28.950	57.900	
14.000	979.841	18.404	36.808	
16.000	661.247	12.420	24.840	
18.000	467.586	8.783	17.565	
20.000	343.349	6.449	12.898	
22.000	260.111	4.886	9.771	
24.000	202.311	3.800	7.600	
26.000	160.954	3.023	6.046	
28.000	130.597	2.453	4.906	
30.000	107.818	2.025	4.050	
35.000	71.184	1.337	2.674	
40.000	50.636	0.951	1.902	
45.000	38.211	0.718	1.435	
50.000	30.240	0.568	1.136	
60.000	21.121	0.397	0.793	
70.000	16.376	0.308	0.615	
80.000	13.617	0.256	0.512	
90.000	11.870	0.223	0.446	
100.000	10.685	0.201	0.401	

**ATOMIC DATA**

Atomic weight = 35.457 gr/mole

Density = 1.560 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 58.870 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	2.822
<i>L<sub>I</sub></i>	0.238
<i>L<sub>II</sub></i>	0.202
<i>L<sub>III</sub></i>	0.200

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	2.815
<i>K<sub>α1</sub></i>	2.622
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	163380.812	2775.281	4329.439	
1.500	59056.031	1003.160	1564.930	
2.000	27381.424	465.117	725.582	
2.622	12838.576	218.084	340.210	$K_{\alpha 1}$
2.815	10470.833	177.864	277.467	$K_{\beta 1}$
2.821	10406.698	176.774	275.768	
2.823	97428.094	1654.970	2581.753	$K$ edge
3.000	84332.250	1432.517	2234.726	
4.000	41552.547	705.836	1101.104	
5.000	23374.512	397.053	619.403	
6.000	14385.088	244.353	381.191	
7.000	9449.301	160.511	250.398	
8.000	6522.746	110.799	172.847	
9.000	4682.073	79.532	124.071	
10.000	3468.910	58.925	91.923	
12.000	2051.303	34.845	54.358	
14.000	1308.914	22.234	34.685	
16.000	884.632	15.027	23.442	
18.000	625.499	10.625	16.575	
20.000	458.737	7.792	12.156	
22.000	346.784	5.891	9.189	
24.000	268.956	4.569	7.127	
26.000	213.238	3.622	5.651	
28.000	172.337	2.927	4.567	
30.000	141.655	2.406	3.754	
35.000	92.366	1.569	2.448	
40.000	64.793	1.101	1.717	
45.000	48.176	0.818	1.277	
50.000	37.558	0.638	0.995	
60.000	25.486	0.433	0.675	
70.000	19.266	0.327	0.511	
80.000	15.688	0.266	0.416	
90.000	13.448	0.228	0.356	
100.000	11.948	0.203	0.317	

**ATOMIC DATA**

Atomic weight = 39.944 gr/mole

Density = 0.001784 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 66.320 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	3.202
<i>L<sub>I</sub></i>	0.287
<i>L<sub>II</sub></i>	0.251
<i>L<sub>III</sub></i>	0.248

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	3.192
<i>K<sub>α1</sub></i>	2.957
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	218945.016	3301.342	5.889595	
1.500	74522.602	1123.682	2.004649	
2.000	34226.734	516.085	0.920695	
2.957	11703.436	176.469	0.314821	$K_{\alpha 1}$
3.000	11245.492	169.564	0.302502	
3.192	9471.206	142.811	0.254774	$K_{\beta 1}$
3.201	9397.613	141.701	0.252795	
3.203	91717.555	1382.955	2.467191	$K$ edge
4.000	52350.422	789.361	1.408220	
5.000	29192.910	440.183	0.785286	
6.000	17860.637	269.310	0.480449	
7.000	11683.789	176.173	0.314293	
8.000	8040.840	121.243	0.216298	
9.000	5758.728	86.832	0.154909	
10.000	4259.237	64.223	0.114573	
12.000	2512.620	37.886	0.067589	
14.000	1600.797	24.137	0.043061	
16.000	1080.725	16.296	0.029071	
18.000	763.496	11.512	0.020538	
20.000	559.512	8.437	0.015051	
22.000	422.637	6.373	0.011369	
24.000	327.507	4.938	0.008810	
26.000	259.409	3.911	0.006978	
28.000	209.419	3.158	0.005633	
30.000	171.915	2.592	0.004624	
35.000	111.652	1.684	0.003003	
40.000	77.923	1.175	0.002096	
45.000	57.587	0.868	0.001549	
50.000	44.590	0.672	0.001199	
60.000	29.813	0.450	0.000802	
70.000	22.205	0.335	0.000597	
80.000	17.840	0.269	0.000480	
90.000	15.117	0.228	0.000407	
100.000	13.302	0.201	0.000358	

**ATOMIC DATA**

Atomic weight = 39.102 gr/mole

Density = 0.862 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 64.930 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	3.607
<i>L<sub>I</sub></i>	0.341
<i>L<sub>II</sub></i>	0.297
<i>L<sub>III</sub></i>	0.295

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	3.589
<i>K<sub>α1</sub></i>	3.313
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	265208.531	4084.530	3520.865	
1.500	93356.055	1437.795	1239.380	
2.000	43629.223	671.942	579.214	
3.000	14552.472	224.126	193.196	
3.313	11076.772	170.596	147.053	$K_{\alpha 1}$
3.589	8879.444	136.754	117.882	$K_{\beta 1}$
3.606	8764.004	134.976	116.349	
3.608	76268.344	1174.624	1012.526	$K$ edge
4.000	59442.367	915.484	789.147	
5.000	34035.391	524.186	451.848	
6.000	21210.375	326.665	281.585	
7.000	14063.183	216.590	186.701	
8.000	9777.308	150.582	129.802	
9.000	7057.683	108.697	93.697	
10.000	5252.332	80.892	69.729	
12.000	3126.002	48.144	41.500	
14.000	2002.914	30.847	26.590	
16.000	1357.038	20.900	18.016	
18.000	960.702	14.796	12.754	
20.000	704.718	10.854	9.356	
22.000	532.384	8.199	7.068	
24.000	412.314	6.350	5.474	
26.000	326.206	5.024	4.331	
28.000	262.912	4.049	3.490	
30.000	215.385	3.317	2.859	
35.000	138.957	2.140	1.845	
40.000	96.181	1.481	1.277	
45.000	70.418	1.085	0.935	
50.000	53.982	0.831	0.717	
60.000	35.364	0.545	0.469	
70.000	25.846	0.398	0.343	
80.000	20.430	0.315	0.271	
90.000	17.084	0.263	0.227	
100.000	14.877	0.229	0.198	

**ATOMIC DATA**

Atomic weight = 40.080 gr/mole

Density = 1.550 gr/cm<sup>3</sup>

1.000 cm<sup>2</sup>/gr = 66.550 barns/atom

**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	4.038
<i>L<sub>I</sub></i>	0.400
<i>L<sub>II</sub></i>	0.350
<i>L<sub>III</sub></i>	0.346

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	4.012
<i>K<sub>α1</sub></i>	3.691
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000



## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	329315.438	4948.391	7670.006	
1.500	115468.195	1735.059	2689.342	
2.000	53919.199	810.206	1255.819	
3.000	18009.828	270.621	419.463	
3.691	10185.358	153.048	237.225	$K_{\alpha 1}$
4.000	8153.319	122.514	189.897	
4.012	8085.876	121.501	188.326	$K_{\beta 1}$
4.037	7947.774	119.426	185.110	
4.039	71138.156	1068.943	1656.862	$K$ edge
5.000	41009.980	616.228	955.154	
6.000	25306.262	380.259	589.402	
7.000	16690.082	250.790	388.725	
8.000	11574.203	173.917	269.572	
9.000	8348.185	125.442	194.436	
10.000	6214.956	93.388	144.751	
12.000	3709.060	55.733	86.387	
14.000	2386.303	35.857	55.579	
16.000	1624.318	24.407	37.832	
18.000	1155.369	17.361	26.909	
20.000	851.396	12.793	19.830	
22.000	645.947	9.706	15.045	
24.000	502.218	7.546	11.697	
26.000	398.717	5.991	9.286	
28.000	322.328	4.843	7.507	
30.000	264.740	3.978	6.166	
35.000	171.555	2.578	3.996	
40.000	118.943	1.787	2.770	
45.000	87.012	1.307	2.027	
50.000	66.506	0.999	1.549	
60.000	43.105	0.648	1.004	
70.000	31.051	0.467	0.723	
80.000	24.163	0.363	0.563	
90.000	19.904	0.299	0.464	
100.000	17.100	0.257	0.398	

**ATOMIC DATA**

Atomic weight = 44.960 gr/mole

Density = 2.992 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 74.650 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	4.493
<i>L<sub>I</sub></i>	0.463
<i>L<sub>II</sub></i>	0.404
<i>L<sub>III</sub></i>	0.399

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	4.460
<i>K<sub>α1</sub></i>	4.090
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	398411.375	5337.058	15968.478	
1.500	146050.922	1956.476	5853.776	
2.000	69215.312	927.198	2774.176	
3.000	23049.537	308.768	923.834	
4.000	10237.867	137.145	410.338	
4.090	9605.373	128.672	384.987	$K_{\alpha 1}$
4.460	7484.536	100.262	299.983	$K_{\beta 1}$
4.492	7331.323	98.209	293.842	
4.494	61676.043	826.203	2471.999	$K$ edge
5.000	47485.422	636.107	1903.234	
6.000	29984.088	401.662	1201.774	
7.000	20086.549	269.076	805.076	
8.000	14081.871	188.639	564.407	
9.000	10235.059	137.107	410.225	
10.000	7660.996	102.626	307.056	
12.000	4601.113	61.636	184.414	
14.000	2967.846	39.757	118.952	
16.000	2020.821	27.071	80.995	
18.000	1435.830	19.234	57.549	
20.000	1055.947	14.145	42.323	
22.000	799.039	10.704	32.026	
24.000	619.359	8.297	24.824	
26.000	490.083	6.565	19.643	
28.000	394.794	5.289	15.823	
30.000	323.072	4.328	12.949	
35.000	207.375	2.778	8.312	
40.000	142.391	1.907	5.707	
45.000	103.166	1.382	4.135	
50.000	78.113	1.046	3.131	
60.000	49.734	0.666	1.993	
70.000	35.260	0.472	1.413	
80.000	27.065	0.363	1.085	
90.000	22.041	0.295	0.883	
100.000	18.759	0.251	0.752	

**ATOMIC DATA**

Atomic weight = 47.900 gr/mole

Density = 4.540 gr/cm<sup>3</sup>

1.000 cm<sup>2</sup>/gr = 79.530 barns/atom

**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	4.965
<i>L<sub>I</sub></i>	0.531
<i>L<sub>II</sub></i>	0.461
<i>L<sub>III</sub></i>	0.454

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	4.931
<i>K<sub>α1</sub></i>	4.510
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	492756.469	6195.856	28129.189	
1.500	173707.125	2184.171	9916.137	
2.000	81386.016	1023.337	4645.951	
3.000	27285.270	343.081	1557.590	
4.000	12371.317	155.555	706.221	
4.510	8865.401	111.472	506.085	$K_{\alpha 1}$
4.931	6912.064	86.911	394.578	$K_{\beta 1}$
4.964	6784.444	85.307	387.293	
4.966	56626.383	712.013	3232.538	$K$ edge
5.000	55660.832	699.872	3177.420	
6.000	34918.020	439.055	1993.308	
7.000	23316.248	293.176	1331.017	
8.000	16325.589	205.276	931.952	
9.000	11865.744	149.198	677.360	
10.000	8888.666	111.765	507.413	
12.000	5354.441	67.326	305.660	
14.000	3467.341	43.598	197.934	
16.000	2370.969	29.812	135.348	
18.000	1691.815	21.273	96.578	
20.000	1249.333	15.709	71.319	
22.000	949.045	11.933	54.177	
24.000	738.275	9.283	42.145	
26.000	586.089	7.369	33.457	
28.000	473.519	5.954	27.031	
30.000	388.501	4.885	22.178	
35.000	250.620	3.151	14.307	
40.000	172.589	2.170	9.852	
45.000	125.171	1.574	7.145	
50.000	94.703	1.191	5.406	
60.000	59.947	0.754	3.422	
70.000	42.080	0.529	2.402	
80.000	31.909	0.401	1.822	
90.000	25.653	0.323	1.464	
100.000	21.560	0.271	1.231	

**ATOMIC DATA**

Atomic weight = 50.942 gr/mole

Density = 6.110 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 84.590 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	5.465
<i>L<sub>I</sub></i>	0.604
<i>L<sub>II</sub></i>	0.520
<i>L<sub>III</sub></i>	0.512

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	5.427
<i>K<sub>α1</sub></i>	4.952
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	569010.250	6726.685	41100.047	
1.500	203342.484	2403.860	14687.583	
2.000	95987.164	1134.734	6933.226	
3.000	32418.385	383.241	2341.605	
4.000	14740.581	174.259	1064.723	
4.952	8144.627	96.284	588.293	$K_{\alpha 1}$
5.000	7928.042	93.723	572.648	
5.427	6302.771	74.510	455.254	$K_{\beta 1}$
5.464	6183.798	73.103	446.660	
5.466	52922.301	625.633	3822.618	$K$ edge
6.000	41399.887	489.418	2990.345	
7.000	27427.250	324.238	1981.091	
8.000	19097.117	225.761	1379.399	
9.000	13824.434	163.429	998.549	
10.000	10325.698	122.068	745.833	
12.000	6197.363	73.264	447.640	
14.000	4005.772	47.355	289.340	
16.000	2737.004	32.356	197.696	
18.000	1952.718	23.085	141.046	
20.000	1442.345	17.051	104.182	
22.000	1096.172	12.959	79.177	
24.000	853.222	10.087	61.629	
26.000	677.765	8.012	48.955	
28.000	547.926	6.477	39.577	
30.000	449.808	5.318	32.490	
35.000	290.492	3.434	20.982	
40.000	200.141	2.366	14.456	
45.000	145.114	1.716	10.482	
50.000	109.681	1.297	7.922	
60.000	69.146	0.817	4.994	
70.000	48.236	0.570	3.484	
80.000	36.302	0.429	2.622	
90.000	28.949	0.342	2.091	
100.000	24.135	0.285	1.743	

**ATOMIC DATA**

Atomic weight = 51.996 gr/mole

Density = 7.190 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 86.340 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	5.989
<i>L<sub>I</sub></i>	0.682
<i>L<sub>II</sub></i>	0.584
<i>L<sub>III</sub></i>	0.574

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	5.946
<i>K<sub>α1</sub></i>	5.414
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000



## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	675917.062	7828.551	56287.281	
1.500	239986.500	2779.552	19984.979	
2.000	112860.523	1307.164	9398.508	
3.000	37959.695	439.654	3161.110	
4.000	17222.729	199.476	1434.230	
5.000	9250.957	107.146	770.377	
5.414	7401.153	85.721	616.334	$K_{\alpha 1}$
5.946	5685.463	65.850	473.459	$K_{\beta 1}$
5.988	5573.778	64.556	464.159	
5.990	47574.168	551.010	3961.759	$K$ edge
6.000	47367.637	548.618	3944.560	
7.000	31567.738	365.621	2628.817	
8.000	22087.514	255.820	1839.347	
9.000	16054.759	185.948	1336.967	
10.000	12033.508	139.374	1002.096	
12.000	7263.263	84.124	604.851	
14.000	4715.244	54.613	392.664	
16.000	3232.850	37.443	269.217	
18.000	2312.810	26.787	192.600	
20.000	1712.071	19.829	142.573	
22.000	1303.433	15.097	108.544	
24.000	1015.936	11.767	84.603	
26.000	807.860	9.357	67.275	
28.000	653.593	7.570	54.428	
30.000	536.822	6.218	44.704	
35.000	346.779	4.016	28.878	
40.000	238.699	2.765	19.878	
45.000	172.734	2.001	14.384	
50.000	130.189	1.508	10.842	
60.000	81.444	0.943	6.782	
70.000	56.271	0.652	4.686	
80.000	41.903	0.485	3.489	
90.000	33.057	0.383	2.753	
100.000	27.276	0.316	2.271	

**ATOMIC DATA**

Atomic weight = 54.940 gr/mole

Density = 7.420 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 91.220 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	6.540
<i>L<sub>I</sub></i>	0.754
<i>L<sub>II</sub></i>	0.650
<i>L<sub>III</sub></i>	0.639

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	6.490
<i>K<sub>α1</sub></i>	5.898
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	787241.938	8630.146	64035.684	
1.500	281344.281	3084.239	22885.053	
2.000	132823.922	1456.083	10804.139	
3.000	44866.137	491.845	3649.493	
4.000	20398.855	223.623	1659.280	
5.000	10967.660	120.233	892.129	
5.898	6898.268	75.622	561.118	$K_{\alpha 1}$
6.000	6572.906	72.056	534.652	
6.490	5266.538	57.734	428.390	$K_{\beta 1}$
6.539	5155.749	56.520	419.378	
6.541	42997.789	471.364	3497.518	$K$ edge
7.000	35967.391	394.293	2925.653	
8.000	25208.398	276.347	2050.497	
9.000	18349.451	201.156	1492.578	
10.000	13770.385	150.958	1120.108	
12.000	8328.420	91.300	677.449	
14.000	5415.354	59.366	440.495	
16.000	3717.630	40.755	302.399	
18.000	2662.407	29.187	216.565	
20.000	1972.539	21.624	160.450	
22.000	1502.763	16.474	122.237	
24.000	1171.932	12.847	95.327	
26.000	932.287	10.220	75.834	
28.000	754.479	8.271	61.371	
30.000	619.793	6.794	50.415	
35.000	400.375	4.389	32.567	
40.000	275.427	3.019	22.404	
45.000	199.088	2.183	16.194	
50.000	149.812	1.642	12.186	
60.000	93.307	1.023	7.590	
70.000	64.107	0.703	5.215	
80.000	47.439	0.520	3.859	
90.000	37.181	0.408	3.024	
100.000	30.482	0.334	2.479	

**ATOMIC DATA**

Atomic weight = 55.850 gr/mole

Density = 7.860 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 92.740 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	7.112
<i>L<sub>I</sub></i>	0.842
<i>L<sub>II</sub></i>	0.720
<i>L<sub>III</sub></i>	0.707

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	7.057
<i>K<sub>α1</sub></i>	6.403
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	864405.750	9320.744	73261.047	
1.500	320723.000	3458.303	27182.262	
2.000	154493.422	1665.877	13093.793	
3.000	53193.742	573.579	4508.333	
4.000	24352.785	262.592	2063.973	
5.000	13112.896	141.394	1111.358	
6.000	7847.981	84.623	665.141	
6.403	6525.847	70.367	553.086	$K_{\alpha 1}$
7.000	5061.644	54.579	428.990	
7.057	4945.697	53.329	419.163	$K_{\beta 1}$
7.111	4839.098	52.179	410.128	
7.113	37807.750	407.675	3204.323	$K$ edge
8.000	28037.604	302.325	2376.273	
9.000	20654.646	222.716	1750.545	
10.000	15639.531	168.638	1325.498	
12.000	9570.565	103.198	811.135	
14.000	6263.273	67.536	530.832	
16.000	4313.429	46.511	365.576	
18.000	3092.389	33.345	262.089	
20.000	2290.306	24.696	194.111	
22.000	1742.551	18.790	147.687	
24.000	1356.224	14.624	114.944	
26.000	1076.236	11.605	91.214	
28.000	868.538	9.365	73.611	
30.000	711.333	7.670	60.288	
35.000	455.783	4.915	38.629	
40.000	310.911	3.352	26.351	
45.000	222.871	2.403	18.889	
50.000	166.366	1.794	14.100	
60.000	102.100	1.101	8.653	
70.000	69.266	0.747	5.870	
80.000	50.723	0.547	4.299	
90.000	39.422	0.425	3.341	
100.000	32.108	0.346	2.721	

**ATOMIC DATA**

Atomic weight = 58.933 gr/mole

Density = 8.900 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 97.850 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	7.709
<i>L<sub>I</sub></i>	0.929
<i>L<sub>II</sub></i>	0.793
<i>L<sub>III</sub></i>	0.778

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	7.649
<i>K<sub>α1</sub></i>	6.930
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1056040.750	10792.445	96052.758	
1.500	377133.094	3854.196	34302.344	
2.000	178598.469	1825.227	16244.521	
3.000	60892.258	622.302	5538.488	
4.000	27960.760	285.751	2543.186	
5.000	15174.553	155.080	1380.210	
6.000	9171.934	93.735	834.238	
6.930	6148.065	62.832	559.201	$K_{\alpha 1}$
7.000	5978.578	61.099	543.785	
7.649	4670.721	47.733	424.828	$K_{\beta 1}$
7.708	4571.771	46.722	415.828	
7.710	36948.352	377.602	3360.657	$K$ edge
8.000	33580.703	343.186	3054.351	
9.000	24672.125	252.142	2244.066	
10.000	18647.516	190.572	1696.095	
12.000	11389.089	116.393	1035.901	
14.000	7449.505	76.132	677.574	
16.000	5132.040	52.448	466.787	
18.000	3682.341	37.633	334.929	
20.000	2730.354	27.903	248.341	
22.000	2080.087	21.258	189.195	
24.000	1621.196	16.568	147.457	
26.000	1288.339	13.166	117.182	
28.000	1041.172	10.640	94.700	
30.000	853.877	8.726	77.665	
35.000	548.777	5.608	49.914	
40.000	375.227	3.835	34.129	
45.000	269.391	2.753	24.503	
50.000	201.231	2.057	18.303	
60.000	123.356	1.261	11.220	
70.000	83.334	0.852	7.580	
80.000	60.618	0.619	5.514	
90.000	46.719	0.477	4.249	
100.000	37.696	0.385	3.429	

**ATOMIC DATA**

Atomic weight = 58.690 gr/mole

Density = 8.900 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 97.450 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	8.333
<i>L<sub>I</sub></i>	1.012
<i>L<sub>II</sub></i>	0.872
<i>L<sub>III</sub></i>	0.855

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	8.264
<i>K<sub>α1</sub></i>	7.477
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000



## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	446.050	4.577	40.737	
1.011	447.109	4.588	40.834	
1.013	1147537.625	11775.656	104803.336	<i>L<sub>I</sub></i> edge
1.500	427364.000	4385.470	39030.680	
2.000	203763.719	2090.957	18609.514	
3.000	70089.836	719.239	6401.227	
4.000	32365.480	332.124	2955.903	
5.000	17632.516	180.939	1610.358	
6.000	10686.139	109.658	975.953	
7.000	6978.468	71.611	637.336	
7.477	5812.275	59.644	530.829	<i>K<sub>α1</sub></i>
8.000	4816.803	49.428	439.913	
8.264	4400.838	45.160	401.924	<i>K<sub>β1</sub></i>
8.332	4301.609	44.142	392.861	
8.334	32592.506	334.454	2976.637	<i>K</i> edge
9.000	26869.762	275.729	2453.985	
10.000	20532.512	210.698	1875.211	
12.000	12747.640	130.812	1164.228	
14.000	8433.900	86.546	770.259	
16.000	5857.866	60.112	534.992	
18.000	4228.139	43.388	386.151	
20.000	3148.630	32.310	287.561	
22.000	2406.270	24.692	219.762	
24.000	1879.591	19.288	171.661	
26.000	1495.945	15.351	136.623	
28.000	1210.099	12.418	110.517	
30.000	992.909	10.189	90.681	
35.000	637.970	6.547	58.265	
40.000	435.439	4.468	39.768	
45.000	311.746	3.199	28.471	
50.000	232.052	2.381	21.193	
60.000	141.058	1.447	12.883	
70.000	94.401	0.969	8.622	
80.000	68.009	0.698	6.211	
90.000	51.924	0.533	4.742	
100.000	41.527	0.426	3.793	

**ATOMIC DATA**

Atomic weight = 63.540 gr/mole

Density = 8.940 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 105.500 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	8.979
<i>L<sub>I</sub></i>	1.100
<i>L<sub>II</sub></i>	0.952
<i>L<sub>III</sub></i>	0.932

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	8.904
<i>K<sub>α1</sub></i>	8.047
<i>L<sub>β1</sub></i>	0.000
<i>L<sub>α1</sub></i>	0.000

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	486.364	4.610	41.214	
1.099	497.404	4.715	42.150	
1.101	1196365.000	11339.952	101379.172	<i>L<sub>I</sub></i> edge
1.500	532340.000	5045.877	45110.137	
2.000	247906.703	2349.827	21007.449	
3.000	83006.398	786.791	7033.907	
4.000	37773.773	358.045	3200.924	
5.000	20400.740	193.372	1728.745	
6.000	12297.911	116.568	1042.117	
7.000	8004.907	75.876	678.330	
8.000	5514.979	52.275	467.336	
8.047	5425.528	51.427	459.756	<i>K<sub>α1</sub></i>
8.904	4090.232	38.770	346.604	<i>K<sub>β1</sub></i>
8.978	3996.826	37.885	338.688	
8.980	30478.346	288.894	2582.715	<i>K</i> edge
9.000	30306.621	287.267	2568.163	
10.000	23138.133	219.319	1960.710	
12.000	14363.441	136.146	1217.148	
14.000	9513.881	90.179	806.200	
16.000	6620.119	62.750	560.984	
18.000	4788.805	45.392	405.800	
20.000	3574.575	33.882	302.907	
22.000	2738.396	25.956	232.050	
24.000	2144.175	20.324	181.696	
26.000	1710.543	16.214	144.950	
28.000	1386.836	13.145	117.520	
30.000	1140.395	10.809	96.636	
35.000	736.340	6.980	62.397	
40.000	504.655	4.783	42.764	
45.000	362.495	3.436	30.718	
50.000	270.502	2.564	22.922	
60.000	164.870	1.563	13.971	
70.000	110.323	1.046	9.349	
80.000	79.284	0.752	6.718	
90.000	60.274	0.571	5.108	
100.000	47.937	0.454	4.062	

**ATOMIC DATA**

Atomic weight = 65.380 gr/mole

Density = 7.140 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 108.600 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	9.659
<i>L<sub>I</sub></i>	1.196
<i>L<sub>II</sub></i>	1.044
<i>L<sub>III</sub></i>	1.021

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	9.571
<i>K<sub>α1</sub></i>	8.638
<i>L<sub>β1</sub></i>	1.032
<i>L<sub>α1</sub></i>	1.009

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	173258.500	1595.382	11391.028	
1.009	171580.516	1579.931	11280.708	$L_{\alpha 1}$
1.020	169549.047	1561.225	11147.147	
1.022	959240.688	8832.787	63066.102	$L_{III}$ edge
1.032	949003.688	8738.524	62393.059	$L_{\beta 1}$
1.043	937981.750	8637.033	61668.414	
1.045	1319553.375	12150.584	86755.164	$L_{II}$ edge
1.195	1138236.625	10481.000	74834.344	
1.197	1035030.438	9530.667	68048.961	$L_I$ edge
1.500	570812.250	5256.098	37528.539	
2.000	266368.125	2452.745	17512.600	
3.000	90457.500	832.942	5947.206	
4.000	41907.453	385.888	2755.241	
5.000	23049.111	212.239	1515.384	
6.000	14140.137	130.204	929.655	
7.000	9357.549	86.165	615.220	
8.000	6547.391	60.289	430.464	
8.638	5334.424	49.120	350.716	$K_{\alpha 1}$
9.000	4781.137	44.025	314.340	
9.571	4058.402	37.370	266.823	$K_{\beta 1}$
9.658	3961.813	36.481	260.473	
9.660	28853.930	265.690	1897.026	$K$ edge
10.000	26430.445	243.374	1737.692	
12.000	16505.975	151.989	1085.199	
14.000	10973.441	101.045	721.458	
16.000	7652.913	70.469	503.147	
18.000	5543.118	51.042	364.437	
20.000	4140.355	38.125	272.211	
22.000	3172.483	29.213	208.578	
24.000	2483.764	22.871	163.297	
26.000	1980.735	18.239	130.225	
28.000	1605.021	14.779	105.523	
30.000	1318.905	12.145	86.713	
35.000	849.781	7.825	55.870	
40.000	580.925	5.349	38.193	
45.000	416.119	3.832	27.358	
50.000	309.603	2.851	20.355	
60.000	187.534	1.727	12.330	
70.000	124.686	1.148	8.198	
80.000	89.031	0.820	5.853	
90.000	67.258	0.619	4.422	
100.000	53.170	0.490	3.496	

**ATOMIC DATA**

Atomic weight = 69.720 gr/mole

Density = 5.903 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 115.800 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	10.367
<i>L<sub>I</sub></i>	1.302
<i>L<sub>II</sub></i>	1.142
<i>L<sub>III</sub></i>	1.115

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	10.263
<i>K<sub>α1</sub></i>	9.251
<i>L<sub>β1</sub></i>	1.122
<i>L<sub>α1</sub></i>	1.096

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	212533.828	1835.353	10834.086	
1.096	166267.734	1435.818	8475.634	$L_{\alpha 1}$
1.114	159165.562	1374.487	8113.595	
1.116	895725.250	7735.105	45660.328	$L_{III}$ edge
1.122	882908.812	7624.428	45007.000	$L_{\beta 1}$
1.141	843945.500	7287.958	43020.812	
1.143	1184148.250	10225.805	60362.926	$L_{II}$ edge
1.301	836092.500	7220.142	42620.500	
1.303	985562.875	8510.905	50239.875	$L_I$ edge
1.500	684060.188	5907.255	34870.527	
2.000	321483.438	2776.195	16387.881	
3.000	108735.875	938.997	5542.900	
4.000	49734.969	429.490	2535.281	
5.000	26931.977	232.573	1372.880	
6.000	16255.381	140.375	828.631	
7.000	10584.766	91.406	539.567	
8.000	7290.665	62.959	371.648	
9.000	5244.269	45.287	267.331	
9.251	4855.664	41.931	247.521	$K_{\alpha 1}$
10.000	3904.803	33.720	199.051	
10.263	3631.111	31.357	185.099	$K_{\beta 1}$
10.366	3531.023	30.492	179.997	
10.368	24915.229	215.157	1270.074	$K$ edge
12.000	17400.287	150.262	886.994	
14.000	11774.660	101.681	600.223	
16.000	8319.481	71.844	424.092	
18.000	6085.513	52.552	310.214	
20.000	4579.944	39.550	233.466	
22.000	3529.948	30.483	179.942	
24.000	2776.335	23.975	141.526	
26.000	2222.040	19.189	113.270	
28.000	1805.645	15.593	92.044	
30.000	1487.037	12.841	75.803	
35.000	961.466	8.303	49.012	
40.000	658.264	5.684	33.556	
45.000	471.608	4.073	24.041	
50.000	350.637	3.028	17.874	
60.000	211.714	1.828	10.792	
70.000	140.115	1.210	7.142	
80.000	99.510	0.859	5.073	
90.000	74.746	0.645	3.810	
100.000	58.749	0.507	2.995	

**ATOMIC DATA**

Atomic weight = 72.590 gr/mole

Density = 5.323 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 120.500 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	11.104
<i>L<sub>I</sub></i>	1.414
<i>L<sub>II</sub></i>	1.249
<i>L<sub>III</sub></i>	1.218

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	10.981
<i>K<sub>α1</sub></i>	9.885
<i>L<sub>β1</sub></i>	1.216
<i>L<sub>α1</sub></i>	1.186



## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	246557.109	2046.117	10891.481	
1.186	160372.656	1330.893	7084.346	$L_{\alpha 1}$
1.216	150585.953	1249.676	6652.025	$L_{\beta 1}$
1.217	150274.375	1247.090	6638.261	
1.219	850838.250	7060.898	37585.160	$L_{III}$ edge
1.248	801723.375	6653.306	35415.547	
1.250	1125617.250	9341.222	49723.324	$L_{II}$ edge
1.413	825572.250	6851.222	36469.055	
1.415	931607.562	7731.183	41153.086	$L_I$ edge
1.500	795538.750	6601.981	35142.348	
2.000	364528.219	3025.130	16102.770	
3.000	120819.102	1002.648	5337.096	
4.000	55067.523	456.992	2432.568	
5.000	29921.365	248.310	1321.755	
6.000	18180.656	150.877	803.117	
7.000	11936.908	99.061	527.304	
8.000	8296.706	68.852	366.501	
9.000	6023.898	49.991	266.101	
9.885	4671.437	38.767	206.357	$K_{\alpha 1}$
10.000	4527.444	37.572	199.997	
10.981	3515.846	29.177	155.310	$K_{\beta 1}$
11.103	3412.616	28.320	150.750	
11.105	23475.875	194.821	1037.030	$K$ edge
12.000	19346.621	160.553	854.623	
14.000	13056.854	108.356	576.777	
16.000	9210.096	76.432	406.849	
18.000	6730.210	55.852	297.302	
20.000	5062.306	42.011	223.624	
22.000	3900.739	32.371	172.312	
24.000	3067.848	25.459	135.520	
26.000	2455.621	20.379	108.475	
28.000	1995.887	16.563	88.167	
30.000	1644.180	13.645	72.630	
35.000	1063.997	8.830	47.001	
40.000	729.129	6.051	32.209	
45.000	522.808	4.339	23.095	
50.000	388.958	3.228	17.182	
60.000	235.003	1.950	10.381	
70.000	155.477	1.290	6.868	
80.000	110.283	0.915	4.872	
90.000	82.667	0.686	3.652	
100.000	64.801	0.538	2.863	

**ATOMIC DATA**

Atomic weight = 74.920 gr/mole

Density = 5.730 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 124.400 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	11.868
<i>L<sub>I</sub></i>	1.530
<i>L<sub>II</sub></i>	1.360
<i>L<sub>III</sub></i>	1.325

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	11.725
<i>K<sub>α1</sub></i>	10.543
<i>L<sub>β1</sub></i>	1.317
<i>L<sub>α1</sub></i>	1.282

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	279598.688	2247.578	12878.621	
1.282	153841.406	1236.667	7086.104	$L_{\alpha 1}$
1.317	144198.938	1159.155	6641.960	$L_{\beta 1}$
1.324	142373.984	1144.485	6557.901	
1.326	689103.312	5539.416	31740.852	$L_{III}$ edge
1.359	649441.562	5220.591	29913.988	
1.361	912210.562	7332.882	42017.414	$L_{II}$ edge
1.500	721496.188	5799.809	33232.902	
1.529	688935.875	5538.070	31733.139	
1.531	783475.812	6298.037	36087.754	$L_I$ edge
2.000	394222.094	3168.988	18158.301	
3.000	136233.641	1095.126	6275.070	
4.000	63203.207	508.064	2911.209	
5.000	34579.250	277.968	1592.758	
6.000	21035.539	169.096	968.920	
7.000	13782.171	110.789	634.822	
8.000	9539.996	76.688	439.423	
9.000	6889.696	55.383	317.347	
10.000	5146.621	41.372	237.059	
10.543	4445.219	35.733	204.752	$K_{\alpha 1}$
11.725	3311.210	26.617	152.518	$K_{\beta 1}$
11.867	3202.565	25.744	147.514	
11.869	21861.797	175.738	1006.978	$K$ edge
12.000	21285.699	171.107	980.443	
14.000	14526.724	116.774	669.117	
16.000	10330.359	83.041	475.828	
18.000	7594.371	61.048	349.805	
20.000	5738.179	46.127	264.307	
22.000	4436.668	35.665	204.358	
24.000	3498.368	28.122	161.139	
26.000	2805.662	22.554	129.232	
28.000	2283.658	18.357	105.188	
30.000	1883.169	15.138	86.741	
35.000	1220.167	9.808	56.202	
40.000	836.084	6.721	38.511	
45.000	598.925	4.815	27.587	
50.000	444.887	3.576	20.492	
60.000	267.614	2.151	12.327	
70.000	176.085	1.415	8.111	
80.000	124.138	0.998	5.718	
90.000	92.454	0.743	4.259	
100.000	71.998	0.579	3.316	

**ATOMIC DATA**

Atomic weight = 78.960 gr/mole

Density = 4.790 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 131.100 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	12.658
<i>L<sub>I</sub></i>	1.653
<i>L<sub>II</sub></i>	1.477
<i>L<sub>III</sub></i>	1.436

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	12.495
<i>K<sub>α1</sub></i>	11.221
<i>L<sub>β1</sub></i>	1.379
<i>L<sub>α1</sub></i>	1.419

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	320952.688	2448.152	11726.646	
1.379	148952.188	1136.172	5442.265	$L_{\beta 1}$
1.419	139128.797	1061.242	5083.348	$L_{\alpha 1}$
1.435	135456.891	1033.233	4949.188	
1.437	616855.750	4705.230	22538.055	$L_{III}$ edge
1.476	578540.375	4412.970	21138.125	
1.478	812823.938	6200.030	29698.143	$L_{II}$ edge
1.500	784558.688	5984.429	28665.414	
1.652	622617.375	4749.179	22748.566	
1.654	712857.938	5437.513	26045.686	$L_I$ edge
2.000	442334.062	3374.020	16161.557	
3.000	155856.516	1188.837	5694.528	
4.000	72915.211	556.180	2664.103	
5.000	40027.242	305.318	1462.475	
6.000	24366.449	185.862	890.277	
7.000	15950.543	121.667	582.785	
8.000	11020.616	84.063	402.660	
9.000	7939.434	60.560	290.083	
10.000	5913.845	45.109	216.074	
11.221	4281.142	32.656	156.420	$K_{\alpha 1}$
12.000	3545.334	27.043	129.536	
12.495	3164.438	24.138	115.619	$K_{\beta 1}$
12.657	3051.844	23.279	111.505	
12.659	19897.080	151.770	726.979	$K$ edge
14.000	15644.331	119.331	571.597	
16.000	11272.299	85.982	411.856	
18.000	8376.719	63.896	306.060	
20.000	6386.587	48.715	233.347	
22.000	4975.780	37.954	181.800	
24.000	3949.103	30.123	144.288	
26.000	3184.971	24.294	116.369	
28.000	2605.029	19.871	95.180	
30.000	2157.290	16.455	78.821	
35.000	1409.538	10.752	51.500	
40.000	971.627	7.411	35.500	
45.000	698.929	5.331	25.537	
50.000	520.607	3.971	19.021	
60.000	313.884	2.394	11.468	
70.000	206.339	1.574	7.539	
80.000	144.989	1.106	5.297	
90.000	107.443	0.820	3.926	
100.000	83.152	0.634	3.038	

**ATOMIC DATA**

Atomic weight = 79.920 gr/mole

Density = 3.120 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 132.700 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	13.474
<i>L<sub>I</sub></i>	1.782
<i>L<sub>II</sub></i>	1.596
<i>L<sub>III</sub></i>	1.550

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	13.290
<i>K<sub>α1</sub></i>	11.923
<i>L<sub>β1</sub></i>	1.526
<i>L<sub>α1</sub></i>	1.480

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	349025.281	2630.183	8206.171	
1.480	137917.062	1039.315	3242.662	$L_{\alpha 1}$
1.500	133608.250	1006.844	3141.354	
1.526	128288.609	966.757	3016.281	$L_{\beta 1}$
1.549	123831.359	933.168	2911.483	
1.551	560031.438	4220.282	13167.280	$L_{III}$ edge
1.595	524045.469	3949.099	12321.189	
1.597	736415.250	5549.475	17314.359	$L_{II}$ edge
1.781	568404.000	4283.376	13364.133	
1.783	648633.688	4887.971	15250.468	$L_I$ edge
2.000	484697.875	3652.584	11396.062	
3.000	170144.406	1282.173	4000.381	
4.000	79613.023	599.947	1871.836	
5.000	43779.168	329.911	1029.322	
6.000	26714.564	201.315	628.104	
7.000	17535.010	132.140	412.278	
8.000	12149.508	91.556	285.655	
9.000	8777.423	66.145	206.372	
10.000	6556.172	49.406	154.147	
11.923	4022.489	30.313	94.575	$K_{\alpha 1}$
12.000	3951.124	29.775	92.898	
13.290	2974.229	22.413	69.929	$K_{\beta 1}$
13.473	2863.206	21.577	67.319	
13.475	18846.322	142.022	443.109	$K$ edge
14.000	17188.428	129.528	404.129	
16.000	12381.926	93.308	291.120	
18.000	9200.704	69.335	216.324	
20.000	7015.113	52.864	164.937	
22.000	5466.100	41.191	128.517	
24.000	4338.949	32.697	102.016	
26.000	3500.040	26.376	82.292	
28.000	2863.310	21.577	67.321	
30.000	2371.670	17.872	55.762	
35.000	1550.385	11.683	36.452	
40.000	1069.166	8.057	25.138	
45.000	769.325	5.797	18.088	
50.000	573.135	4.319	13.475	
60.000	345.504	2.604	8.123	
70.000	226.946	1.710	5.336	
80.000	159.245	1.200	3.744	
90.000	117.777	0.888	2.769	
100.000	90.929	0.685	2.138	

**ATOMIC DATA**

Atomic weight = 83.800 gr/mole

Density = 0.003740 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 139.100 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	14.322
<i>L<sub>I</sub></i>	1.920
<i>L<sub>II</sub></i>	1.726
<i>L<sub>III</sub></i>	1.675

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	14.112
<i>K<sub>α1</sub></i>	12.648
<i>L<sub>β1</sub></i>	1.638
<i>L<sub>α1</sub></i>	1.587



## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	396875.125	2853.164	10.670834	
1.500	159235.969	1144.759	4.281398	
1.587	140274.391	1008.443	3.771576	$L_{\alpha 1}$
1.638	130647.539	939.235	3.512738	$L_{\beta 1}$
1.674	124418.500	894.454	3.345257	
1.676	515035.719	3702.629	13.847833	$L_{III}$ edge
1.725	482605.594	3469.487	12.975880	
1.727	678387.188	4876.975	18.239885	$L_{II}$ edge
1.919	534714.312	3844.100	14.376934	
1.921	597362.188	4294.480	16.061356	$L_I$ edge
2.000	539259.562	3876.776	14.499143	
3.000	189747.094	1364.106	5.101755	
4.000	88995.062	639.792	2.392822	
5.000	49044.930	352.588	1.318677	
6.000	29986.746	215.577	0.806258	
7.000	19717.684	141.752	0.530152	
8.000	13683.556	98.372	0.367912	
9.000	9899.783	71.170	0.266177	
10.000	7403.927	53.227	0.199070	
12.000	4471.606	32.147	0.120229	
12.648	3865.373	27.788	0.103929	$K_{\alpha 1}$
14.000	2917.246	20.972	0.078436	
14.112	2853.545	20.514	0.076724	$K_{\beta 1}$
14.321	2739.650	19.696	0.073661	
14.323	18168.312	130.613	0.488494	$K$ edge
16.000	13780.040	99.066	0.370506	
18.000	10202.846	73.349	0.274325	
20.000	7757.121	55.767	0.208567	
22.000	6030.486	43.354	0.162142	
24.000	4778.094	34.350	0.128469	
26.000	3848.420	27.667	0.103473	
28.000	3144.345	22.605	0.084542	
30.000	2601.718	18.704	0.069953	
35.000	1697.438	12.203	0.045639	
40.000	1169.023	8.404	0.031432	
45.000	840.385	6.042	0.022596	
50.000	625.624	4.498	0.016821	
60.000	376.721	2.708	0.010129	
70.000	247.186	1.777	0.006646	
80.000	173.236	1.245	0.004658	
90.000	127.937	0.920	0.003440	
100.000	98.604	0.709	0.002651	

**ATOMIC DATA**

Atomic weight = 85.480 gr/mole

Density = 1.532 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 141.900 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	15.200
<i>L<sub>I</sub></i>	2.065
<i>L<sub>II</sub></i>	1.863
<i>L<sub>III</sub></i>	1.805

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	14.960
<i>K<sub>α1</sub></i>	13.394
<i>L<sub>β1</sub></i>	1.752
<i>L<sub>α1</sub></i>	1.694

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	455874.594	3212.647	4921.775	
1.500	173738.641	1224.374	1875.741	
1.694	130157.273	917.247	1405.222	$L_{\alpha 1}$
1.752	120166.039	846.836	1297.353	$L_{\beta 1}$
1.804	112113.633	790.089	1210.416	
1.806	469703.312	3310.101	5071.075	$L_{III}$ edge
1.862	436737.125	3077.781	4715.161	
1.864	613907.750	4326.341	6627.954	$L_{II}$ edge
2.000	519033.656	3657.743	5603.662	
2.064	481492.156	3393.179	5198.351	
2.066	548189.188	3863.208	5918.435	$L_I$ edge
3.000	210886.750	1486.165	2276.804	
4.000	99247.750	699.420	1071.512	
5.000	54783.781	386.073	591.464	
6.000	33517.070	236.202	361.862	
7.000	22040.189	155.322	237.953	
8.000	15290.328	107.754	165.080	
9.000	11055.876	77.913	119.363	
10.000	8262.329	58.226	89.203	
12.000	4980.883	35.101	53.775	
13.394	3668.119	25.850	39.602	$K_{\alpha 1}$
14.000	3242.702	22.852	35.009	
14.960	2695.605	18.997	29.103	$K_{\beta 1}$
15.199	2579.170	18.176	27.846	
15.201	16593.799	116.940	179.152	$K$ edge
16.000	14654.078	103.270	158.210	
18.000	10950.962	77.174	118.230	
20.000	8387.852	59.111	90.558	
22.000	6560.215	46.231	70.826	
24.000	5223.607	36.812	56.396	
26.000	4224.567	29.771	45.610	
28.000	3463.531	24.408	37.393	
30.000	2874.074	20.254	31.029	
35.000	1885.200	13.285	20.353	
40.000	1302.851	9.181	14.066	
45.000	938.631	6.615	10.134	
50.000	699.634	4.930	7.553	
60.000	421.527	2.971	4.551	
70.000	276.275	1.947	2.983	
80.000	193.195	1.361	2.086	
90.000	142.264	1.003	1.536	
100.000	109.282	0.770	1.180	

**ATOMIC DATA**

Atomic weight = 87.620 gr/mole

Density = 2.540 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 145.500 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	16.105
<i>L<sub>I</sub></i>	2.216
<i>L<sub>II</sub></i>	2.007
<i>L<sub>III</sub></i>	1.940

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	15.834
<i>K<sub>α1</sub></i>	14.164
<i>L<sub>β1</sub></i>	1.872
<i>L<sub>α1</sub></i>	1.806

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	517993.125	3560.090	9042.629	
1.500	198993.516	1367.653	3473.839	
1.806	128527.984	883.354	2243.719	$L_{\alpha 1}$
1.872	118124.516	811.852	2062.105	$L_{\beta 1}$
1.939	108753.102	747.444	1898.508	
1.941	421432.094	2896.440	7356.959	$L_{III}$ edge
2.000	392653.000	2698.646	6854.561	
2.006	389884.781	2679.621	6806.236	
2.008	548117.812	3767.133	9568.517	$L_{II}$ edge
2.215	434696.688	2987.606	7588.520	
2.217	496940.469	3415.398	8675.112	$L_I$ edge
3.000	232147.984	1595.519	4052.618	
4.000	110292.461	758.024	1925.380	
5.000	61110.926	420.006	1066.816	
6.000	37416.902	257.161	653.189	
7.000	24580.680	168.939	429.106	
8.000	17017.926	116.962	297.083	
9.000	12271.566	84.341	214.225	
10.000	9141.927	62.831	159.591	
12.000	5472.493	37.612	95.534	
14.000	3536.339	24.305	61.734	
14.164	3421.328	23.514	59.726	$K_{\alpha 1}$
15.834	2492.510	17.131	43.512	$K_{\beta 1}$
16.000	2419.676	16.630	42.240	
16.104	2375.502	16.326	41.469	
16.106	15662.850	107.648	273.427	$K$ edge
18.000	11869.870	81.580	207.213	
20.000	9080.064	62.406	158.511	
22.000	7097.430	48.780	123.900	
24.000	5650.806	38.837	98.646	
26.000	4571.177	31.417	79.799	
28.000	3749.550	25.770	65.456	
30.000	3113.490	21.399	54.352	
35.000	2046.575	14.066	35.727	
40.000	1417.768	9.744	24.750	
45.000	1023.882	7.037	17.874	
50.000	764.915	5.257	13.353	
60.000	462.648	3.180	8.076	
70.000	304.080	2.090	5.308	
80.000	213.006	1.464	3.718	
90.000	156.964	1.079	2.740	
100.000	120.552	0.829	2.104	

**ATOMIC DATA**

Atomic weight = 88.905 gr/mole

Density = 4.405 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 147.600 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	17.080
<i>L<sub>I</sub></i>	2.373
<i>L<sub>II</sub></i>	2.156
<i>L<sub>III</sub></i>	2.080

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	16.736
<i>K<sub>α1</sub></i>	14.957
<i>L<sub>β1</sub></i>	1.996
<i>L<sub>α1</sub></i>	1.922

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	584557.125	3960.414	17445.625	
1.500	218691.000	1481.646	6526.652	
1.922	120058.375	813.404	3583.043	$L_{\alpha 1}$
1.996	109590.133	742.481	3270.627	$L_{\beta 1}$
2.000	109061.727	738.901	3254.857	
2.079	99327.016	672.947	2964.333	
2.081	397423.406	2692.570	11860.773	$L_{III}$ edge
2.155	365111.719	2473.656	10896.458	
2.157	513310.500	3477.713	15319.328	$L_{II}$ edge
2.372	407567.062	2761.294	12163.502	
2.374	466122.594	3158.012	13911.044	$L_I$ edge
3.000	256195.438	1735.741	7645.941	
4.000	121270.688	821.617	3619.223	
5.000	67291.336	455.903	2008.254	
6.000	41363.223	280.239	1234.451	
7.000	27314.844	185.060	815.189	
8.000	19021.840	128.874	567.691	
9.000	13801.266	93.505	411.887	
10.000	10346.038	70.095	308.769	
12.000	6270.323	42.482	187.133	
14.000	4099.822	27.777	122.356	
14.957	3416.007	23.144	101.948	$K_{\alpha 1}$
16.000	2836.068	19.215	84.640	
16.736	2505.061	16.972	74.761	$K_{\beta 1}$
17.079	2368.708	16.048	70.692	
17.081	15185.975	102.886	453.213	$K$ edge
18.000	13320.191	90.245	397.530	
20.000	10193.568	69.062	304.219	
22.000	7968.353	53.986	237.809	
24.000	6343.165	42.975	189.307	
26.000	5129.553	34.753	153.087	
28.000	4205.642	28.494	125.514	
30.000	3490.305	23.647	104.165	
35.000	2290.542	15.519	68.359	
40.000	1583.871	10.731	47.269	
45.000	1141.634	7.735	34.071	
50.000	851.202	5.767	25.403	
60.000	512.792	3.474	15.304	
70.000	335.703	2.274	10.019	
80.000	234.234	1.587	6.991	
90.000	171.937	1.165	5.131	
100.000	131.545	0.891	3.926	

**ATOMIC DATA**

Atomic weight = 91.220 gr/mole

Density = 6.530 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 151.500 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	17.998
<i>L<sub>I</sub></i>	2.532
<i>L<sub>II</sub></i>	2.307
<i>L<sub>III</sub></i>	2.223

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	17.666
<i>K<sub>α1</sub></i>	15.774
<i>L<sub>β1</sub></i>	2.124
<i>L<sub>α1</sub></i>	2.042



## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	695056.250	4587.830	29958.531	
1.500	252679.094	1667.849	10891.053	
2.000	123465.578	814.954	5321.652	
2.042	117251.648	773.938	5053.817	$L_{\alpha 1}$
2.124	106328.820	701.840	4583.018	$L_{\beta 1}$
2.222	95066.867	627.504	4097.602	
2.224	374563.906	2472.369	16144.570	$L_{III}$ edge
2.306	342191.688	2258.691	14749.253	
2.308	481095.000	3175.544	20736.307	$L_{II}$ edge
2.531	382108.781	2522.170	16469.771	
2.533	440289.312	2906.200	18977.486	$L_I$ edge
3.000	285172.562	1882.327	12291.597	
4.000	134764.531	889.535	5808.663	
5.000	74652.875	492.758	3217.711	
6.000	45812.574	302.393	1974.628	
7.000	30204.775	199.371	1301.896	
8.000	21002.107	138.628	905.239	
9.000	15215.579	100.433	655.827	
10.000	11390.102	75.182	490.940	
12.000	6884.616	45.443	296.743	
14.000	4490.253	29.639	193.540	
15.774	3223.813	21.279	138.954	$K_{\alpha 1}$
16.000	3098.895	20.455	133.570	
17.666	2353.571	15.535	101.444	$K_{\beta 1}$
17.997	2235.364	14.755	96.349	
17.999	14065.639	92.842	606.262	$K$ edge
18.000	14063.720	92.830	606.179	
20.000	10848.333	71.606	467.588	
22.000	8534.198	56.331	367.844	
24.000	6828.569	45.073	294.327	
26.000	5545.245	36.602	239.013	
28.000	4562.097	30.113	196.637	
30.000	3796.836	25.062	163.652	
35.000	2504.373	16.531	107.944	
40.000	1737.067	11.466	74.872	
45.000	1254.245	8.279	54.061	
50.000	935.940	6.178	40.341	
60.000	563.756	3.721	24.299	
70.000	368.457	2.432	15.881	
80.000	256.435	1.693	11.053	
90.000	187.654	1.239	8.088	
100.000	143.082	0.944	6.167	

**ATOMIC DATA**

Atomic weight = 92.906 gr/mole

Density = 8.570 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 154.300 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	18.986
<i>L<sub>I</sub></i>	2.698
<i>L<sub>II</sub></i>	2.465
<i>L<sub>III</sub></i>	2.371

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	18.621
<i>K<sub>α1</sub></i>	16.614
<i>L<sub>β1</sub></i>	2.257
<i>L<sub>α1</sub></i>	2.166

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	762469.625	4941.475	42348.441	
1.500	277239.812	1796.758	15398.218	
2.000	135475.312	877.999	7524.455	
2.166	111135.898	720.259	6172.616	$L_{\alpha 1}$
2.257	100346.914	650.336	5573.383	$L_{\beta 1}$
2.370	88898.820	576.143	4937.543	
2.372	332290.719	2153.537	18455.809	$L_{III}$ edge
2.464	302194.062	1958.484	16784.205	
2.466	424864.531	2753.497	23597.465	$L_{II}$ edge
2.697	339763.594	2201.968	18870.861	
2.699	395966.938	2566.215	21992.459	$L_I$ edge
3.000	304521.219	1973.566	16913.459	
4.000	146863.734	951.806	8156.981	
5.000	82214.406	532.822	4566.283	
6.000	50713.707	328.670	2816.698	
7.000	33501.602	217.120	1860.718	
8.000	23292.568	150.956	1293.696	
9.000	16850.818	109.208	935.914	
10.000	12584.596	81.559	698.963	
12.000	7558.010	48.983	419.781	
14.000	4891.858	31.704	271.699	
16.000	3348.507	21.701	185.980	
16.614	3008.220	19.496	167.080	$K_{\alpha 1}$
18.000	2394.256	15.517	132.980	
18.621	2173.582	14.087	120.723	$K_{\beta 1}$
18.985	2056.857	13.330	114.240	
18.987	13575.316	87.980	753.989	$K$ edge
20.000	11926.217	77.292	662.396	
22.000	9374.498	60.755	520.670	
24.000	7498.835	48.599	416.494	
26.000	6090.178	39.470	338.255	
28.000	5012.301	32.484	278.389	
30.000	4173.927	27.051	231.825	
35.000	2758.492	17.877	153.210	
40.000	1917.726	12.429	106.513	
45.000	1387.942	8.995	77.088	
50.000	1038.028	6.727	57.653	
60.000	627.659	4.068	34.861	
70.000	411.373	2.666	22.848	
80.000	286.788	1.859	15.929	
90.000	209.997	1.361	11.663	
100.000	160.064	1.037	8.890	

**ATOMIC DATA**

Atomic weight = 95.950 gr/mole

Density = 10.220 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 159.300 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	19.999
<i>L<sub>I</sub></i>	2.866
<i>L<sub>II</sub></i>	2.625
<i>L<sub>III</sub></i>	2.520

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	19.607
<i>K<sub>α1</sub></i>	17.478
<i>L<sub>β1</sub></i>	2.395
<i>L<sub>α1</sub></i>	2.293

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	853972.250	5360.780	54787.172	
1.500	312551.656	1962.032	20051.965	
2.000	153418.969	963.082	9842.698	
2.293	109489.320	687.315	7024.362	$L_{\alpha 1}$
2.395	98354.453	617.417	6309.997	$L_{\beta 1}$
2.519	86858.953	545.254	5572.495	
2.521	316076.312	1984.158	20278.092	$L_{III}$ edge
2.624	286217.500	1796.720	18362.479	
2.626	402426.062	2526.215	25817.918	$L_{II}$ edge
2.865	324257.875	2035.517	20802.984	
2.867	375123.031	2354.821	24066.273	$L_I$ edge
3.000	334728.344	2101.245	21474.725	
4.000	160760.250	1009.167	10313.684	
5.000	89903.023	564.363	5767.790	
6.000	55489.684	348.334	3559.979	
7.000	36711.094	230.453	2355.225	
8.000	25574.875	160.545	1640.774	
9.000	18544.246	116.411	1189.719	
10.000	13883.168	87.151	890.684	
12.000	8380.225	52.607	537.639	
14.000	5451.324	34.220	349.733	
16.000	3749.415	23.537	240.546	
17.478	2925.253	18.363	187.672	$K_{\alpha 1}$
18.000	2692.976	16.905	172.770	
19.607	2117.411	13.292	135.844	$K_{\beta 1}$
19.998	2003.072	12.574	128.508	
20.000	12910.367	81.044	828.273	$K$ edge
20.000	12910.367	81.044	828.273	
22.000	10139.842	63.652	650.528	
24.000	8109.010	50.904	520.239	
26.000	6586.748	41.348	422.577	
28.000	5423.438	34.045	347.944	
30.000	4519.315	28.370	289.940	
35.000	2993.532	18.792	192.052	
40.000	2086.746	13.099	133.877	
45.000	1514.529	9.507	97.166	
50.000	1135.841	7.130	72.871	
60.000	690.277	4.333	44.285	
70.000	454.284	2.852	29.145	
80.000	317.689	1.994	20.382	
90.000	233.110	1.463	14.955	
100.000	177.881	1.117	11.412	

**ATOMIC DATA**

Atomic weight = 99.000 gr/mole

Density = 11.500 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 164.400 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	21.045
<i>L<sub>I</sub></i>	3.043
<i>L<sub>II</sub></i>	2.793
<i>L<sub>III</sub></i>	2.677

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	20.585
<i>K<sub>α1</sub></i>	18.410
<i>L<sub>β1</sub></i>	2.538
<i>L<sub>α1</sub></i>	2.424

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	937142.000	5700.377	65554.336	
1.500	348193.094	2117.963	24356.574	
2.000	172723.547	1050.630	12082.244	
2.424	108241.055	658.401	7571.607	$L_{\alpha 1}$
2.538	96819.711	588.928	6772.668	$L_{\beta 1}$
2.676	85156.078	517.981	5956.782	
2.678	302747.250	1841.528	21177.576	$L_{III}$ edge
2.792	273463.688	1663.405	19129.152	
2.794	384521.250	2338.937	26897.777	$L_{II}$ edge
3.000	323208.062	1965.986	22608.838	
3.042	312421.969	1900.377	21854.336	
3.044	357508.031	2174.623	25008.166	$L_I$ edge
4.000	176857.125	1075.773	12371.393	
5.000	98527.812	599.318	6892.153	
6.000	60702.340	369.236	4246.210	
7.000	40133.871	244.123	2807.418	
8.000	27961.926	170.085	1955.974	
9.000	20286.537	123.397	1419.070	
10.000	15200.848	92.463	1063.320	
12.000	9196.664	55.941	643.319	
14.000	5998.173	36.485	419.580	
16.000	4136.730	25.163	289.370	
18.000	2979.046	18.121	208.388	
18.410	2797.716	17.018	195.704	$K_{\alpha 1}$
20.000	2220.795	13.508	155.348	
20.585	2049.371	12.466	143.356	$K_{\beta 1}$
21.044	1927.277	11.723	134.816	
21.046	12105.152	73.632	846.772	$K$ edge
22.000	10844.284	65.963	758.572	
24.000	8713.667	53.003	609.533	
26.000	7102.927	43.205	496.859	
28.000	5863.613	35.667	410.168	
30.000	4895.162	29.776	342.423	
35.000	3250.063	19.769	227.346	
40.000	2266.005	13.783	158.510	
45.000	1642.861	9.993	114.920	
50.000	1229.823	7.481	86.028	
60.000	743.786	4.524	52.029	
70.000	486.872	2.962	34.057	
80.000	338.666	2.060	23.690	
90.000	247.259	1.504	17.296	
100.000	187.820	1.142	13.138	

**ATOMIC DATA**

Atomic weight = 101.070 gr/mole

Density = 12.410 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 167.800 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	22.117
<i>L<sub>I</sub></i>	3.224
<i>L<sub>II</sub></i>	2.967
<i>L<sub>III</sub></i>	2.838

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	21.655
<i>K<sub>α1</sub></i>	19.278
<i>L<sub>β1</sub></i>	2.683
<i>L<sub>α1</sub></i>	2.558



## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1065456.625	6349.562	78798.070	
1.500	390514.031	2327.259	28881.281	
2.000	191847.078	1143.308	14188.451	
2.558	104637.328	623.584	7738.672	$L_{\alpha 1}$
2.683	93058.586	554.580	6882.342	$L_{\beta 1}$
2.837	81139.594	483.549	6000.848	
2.839	275473.156	1641.676	20373.193	$L_{III}$ edge
2.966	247220.938	1473.307	18283.740	
2.968	347597.125	2071.497	25707.271	$L_{II}$ edge
3.000	338493.781	2017.245	25034.016	
3.223	283469.656	1689.330	20964.590	
3.225	327882.844	1954.010	24249.262	$L_I$ edge
4.000	190193.516	1133.454	14066.159	
5.000	107005.922	637.699	7913.847	
6.000	66352.992	395.429	4907.274	
7.000	44060.629	262.578	3258.596	
8.000	30787.363	183.477	2276.944	
9.000	22379.189	133.368	1655.100	
10.000	16788.740	100.052	1241.646	
12.000	10166.102	60.585	751.855	
14.000	6627.384	39.496	490.142	
16.000	4564.770	27.204	337.597	
18.000	3281.292	19.555	242.675	
19.278	2706.413	16.129	200.158	$K_{\alpha 1}$
20.000	2440.777	14.546	180.513	
21.655	1952.076	11.633	144.370	$K_{\beta 1}$
22.000	1867.280	11.128	138.099	
22.116	1839.895	10.965	136.073	
22.118	11468.982	68.349	848.213	$K$ edge
24.000	9358.518	55.772	692.129	
26.000	7642.827	45.547	565.241	
28.000	6319.448	37.661	467.368	
30.000	5283.050	31.484	390.719	
35.000	3517.219	20.961	260.123	
40.000	2457.107	14.643	181.720	
45.000	1783.933	10.631	131.934	
50.000	1336.760	7.966	98.863	
60.000	809.332	4.823	59.856	
70.000	529.872	3.158	39.188	
80.000	368.399	2.195	27.246	
90.000	268.698	1.601	19.872	
100.000	203.816	1.215	15.074	

**ATOMIC DATA**

Atomic weight = 102.910 gr/mole

Density = 12.440 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 170.900 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	23.220
<i>L<sub>I</sub></i>	3.412
<i>L<sub>II</sub></i>	3.146
<i>L<sub>III</sub></i>	3.003

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	22.721
<i>K<sub>α1</sub></i>	20.214
<i>L<sub>β1</sub></i>	2.834
<i>L<sub>α1</sub></i>	2.696

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1241464.375	7264.274	90367.562	
1.500	431234.375	2523.314	31390.027	
2.000	203951.734	1193.398	14845.872	
2.696	94010.625	550.091	6843.137	$L_{\alpha 1}$
2.834	82627.180	483.483	6014.524	$L_{\beta 1}$
3.000	71331.266	417.386	5192.282	
3.002	71208.625	416.668	5183.354	
3.004	261701.469	1531.313	19049.539	$L_{III}$ edge
3.145	232239.188	1358.919	16904.947	
3.147	326500.000	1910.474	23766.297	$L_{II}$ edge
3.411	264681.906	1548.753	19266.488	
3.413	310584.312	1817.345	22607.775	$L_I$ edge
4.000	207593.375	1214.707	15110.951	
5.000	116765.898	683.241	8499.519	
6.000	72420.102	423.757	5271.539	
7.000	48111.277	281.517	3502.073	
8.000	33637.645	196.826	2448.521	
9.000	24467.260	143.167	1780.999	
10.000	18368.027	107.478	1337.029	
12.000	11138.088	65.173	810.754	
14.000	7270.858	42.545	529.254	
16.000	5014.223	29.340	364.991	
18.000	3608.406	21.114	262.660	
20.000	2686.738	15.721	195.571	
20.214	2607.822	15.259	189.826	$K_{\alpha 1}$
22.000	2057.178	12.037	149.744	
22.721	1879.527	10.998	136.813	$K_{\beta 1}$
23.219	1768.822	10.350	128.755	
23.221	10627.218	62.184	773.567	$K$ edge
24.000	9803.939	57.367	713.640	
26.000	8042.632	47.060	585.432	
28.000	6675.869	39.063	485.944	
30.000	5599.882	32.767	407.622	
35.000	3753.387	21.962	273.213	
40.000	2635.155	15.419	191.816	
45.000	1920.349	11.237	139.784	
50.000	1443.042	8.444	105.041	
60.000	876.931	5.131	63.833	
70.000	575.247	3.366	41.873	
80.000	400.242	2.342	29.134	
90.000	291.885	1.708	21.247	
100.000	221.228	1.294	16.103	

**ATOMIC DATA**

Atomic weight = 106.400 gr/mole

Density = 12.160 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 176.700 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	24.350
<i>L<sub>I</sub></i>	3.605
<i>L<sub>II</sub></i>	3.330
<i>L<sub>III</sub></i>	3.173

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	23.816
<i>K<sub>α1</sub></i>	21.175
<i>L<sub>β1</sub></i>	2.990
<i>L<sub>α1</sub></i>	2.838

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1382995.625	7826.800	95173.891	
1.500	488377.094	2763.877	33608.746	
2.000	233657.312	1322.339	16079.644	
2.838	95611.219	541.094	6579.697	$L_{\alpha 1}$
2.990	83723.305	473.816	5761.604	$L_{\beta 1}$
3.000	83015.336	469.809	5712.883	
3.172	72047.406	407.739	4958.101	
3.174	242142.656	1370.360	16663.580	$L_{III}$ edge
3.329	214297.750	1212.777	14747.372	
3.331	301265.938	1704.957	20732.279	$L_{II}$ edge
3.604	246167.375	1393.137	16940.551	
3.606	288436.969	1632.354	19849.426	$L_I$ edge
4.000	222447.641	1258.900	15308.225	
5.000	126083.188	713.544	8676.692	
6.000	78603.664	444.842	5409.285	
7.000	52406.680	296.586	3606.481	
8.000	36733.246	207.885	2527.879	
9.000	26766.094	151.478	1841.968	
10.000	20118.119	113.855	1384.473	
12.000	12214.684	69.127	840.580	
14.000	7975.418	45.135	548.846	
16.000	5497.693	31.113	378.336	
18.000	3952.823	22.370	272.022	
20.000	2939.673	16.637	202.300	
21.175	2503.202	14.166	172.263	$K_{\alpha 1}$
22.000	2247.680	12.720	154.679	
23.816	1797.526	10.173	123.701	$K_{\beta 1}$
24.000	1758.970	9.955	121.047	
24.349	1688.868	9.558	116.223	
24.351	10731.117	60.731	738.485	$K$ edge
26.000	9051.378	51.225	622.891	
28.000	7452.503	42.176	512.860	
30.000	6208.835	35.138	427.275	
35.000	4108.388	23.251	282.728	
40.000	2859.531	16.183	196.785	
45.000	2071.601	11.724	142.562	
50.000	1550.442	8.774	106.697	
60.000	937.936	5.308	64.546	
70.000	614.140	3.476	42.263	
80.000	427.105	2.417	29.392	
90.000	311.530	1.763	21.439	
100.000	236.215	1.337	16.256	

**ATOMIC DATA**

Atomic weight = 107.880 gr/mole

Density = 10.500 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 179.100 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	25.514
<i>L<sub>I</sub></i>	3.806
<i>L<sub>II</sub></i>	3.524
<i>L<sub>III</sub></i>	3.351

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	24.942
<i>K<sub>α1</sub></i>	22.162
<i>L<sub>β1</sub></i>	3.151
<i>L<sub>α1</sub></i>	2.984

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1422427.500	7942.085	83391.891	
1.500	521197.906	2910.094	30555.990	
2.000	255945.875	1429.067	15005.201	
2.984	95532.109	533.401	5600.710	$L_{\alpha 1}$
3.000	94285.867	526.443	5527.647	
3.151	83580.617	466.670	4900.036	$L_{\beta 1}$
3.350	71929.070	401.614	4216.947	
3.352	229061.609	1278.959	13429.072	$L_{III}$ edge
3.523	202564.984	1131.016	11875.669	
3.525	284778.969	1590.056	16695.584	$L_{II}$ edge
3.805	235734.391	1316.217	13820.273	
3.807	272074.094	1519.118	15950.742	$L_I$ edge
4.000	240147.266	1340.856	14078.985	
5.000	135869.812	758.625	7965.566	
6.000	84674.516	472.778	4964.167	
7.000	56480.770	315.359	3311.268	
8.000	39627.227	221.258	2323.204	
9.000	28911.705	161.428	1694.991	
10.000	21762.754	121.512	1275.873	
12.000	13256.020	74.015	777.154	
14.000	8684.572	48.490	509.146	
16.000	6006.532	33.537	352.142	
18.000	4332.568	24.191	254.003	
20.000	3231.900	18.045	189.475	
22.000	2478.154	13.837	145.285	
22.162	2427.991	13.557	142.345	$K_{\alpha 1}$
24.000	1944.450	10.857	113.996	
24.942	1746.657	9.752	102.400	$K_{\beta 1}$
25.513	1639.938	9.157	96.144	
25.515	9882.542	55.179	579.378	$K$ edge
26.000	9424.876	52.624	552.547	
28.000	7809.531	43.604	457.845	
30.000	6543.136	36.533	383.601	
35.000	4380.326	24.457	256.803	
40.000	3076.353	17.177	180.356	
45.000	2244.476	12.532	131.586	
50.000	1689.267	9.432	99.036	
60.000	1030.154	5.752	60.394	
70.000	677.914	3.785	39.744	
80.000	472.835	2.640	27.721	
90.000	345.363	1.928	20.247	
100.000	261.929	1.462	15.356	

**ATOMIC DATA**

Atomic weight = 112.410 gr/mole

Density = 8.650 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 186.600 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	26.711
<i>L<sub>I</sub></i>	4.018
<i>L<sub>II</sub></i>	3.727
<i>L<sub>III</sub></i>	3.537

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	26.093
<i>K<sub>α1</sub></i>	23.172
<i>L<sub>β1</sub></i>	3.316
<i>L<sub>α1</sub></i>	3.133



## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1706844.875	9147.078	79122.227	
1.500	613556.062	3288.082	28441.906	
2.000	297204.688	1592.737	13777.172	
3.000	107372.211	575.414	4977.329	
3.133	96325.898	516.216	4465.268	$L_{\alpha 1}$
3.316	83579.359	447.907	3874.391	$L_{\beta 1}$
3.536	71191.906	381.521	3300.160	
3.538	228477.797	1224.425	10591.279	$L_{III}$ edge
3.726	200560.922	1074.817	9297.170	
3.728	281965.375	1511.068	13070.741	$L_{II}$ edge
4.000	236126.344	1265.414	10945.835	
4.017	233617.438	1251.969	10829.532	
4.019	268328.062	1437.985	12438.572	$L_I$ edge
5.000	151600.984	812.438	7027.591	
6.000	93645.914	501.854	4341.035	
7.000	62101.809	332.807	2878.781	
8.000	43404.043	232.605	2012.031	
9.000	31589.457	169.290	1464.356	
10.000	23743.400	127.242	1100.645	
12.000	14448.672	77.431	669.780	
14.000	9472.765	50.765	439.118	
16.000	6562.835	35.171	304.226	
18.000	4744.645	25.427	219.942	
20.000	3548.542	19.017	164.496	
22.000	2728.525	14.622	126.483	
23.172	2364.933	12.674	109.628	$K_{\alpha 1}$
24.000	2146.997	11.506	99.526	
26.000	1722.778	9.232	79.861	
26.093	1705.961	9.142	79.081	$K_{\beta 1}$
26.710	1599.921	8.574	74.166	
26.712	9522.111	51.030	441.405	$K$ edge
28.000	8464.202	45.360	392.365	
30.000	7109.586	38.101	329.571	
35.000	4780.024	25.616	221.582	
40.000	3364.911	18.033	155.983	
45.000	2457.687	13.171	113.928	
50.000	1850.254	9.916	85.770	
60.000	1127.304	6.041	52.257	
70.000	740.382	3.968	34.321	
80.000	515.128	2.761	23.879	
90.000	375.241	2.011	17.395	
100.000	283.803	1.521	13.156	

**ATOMIC DATA**

Atomic weight = 114.820 gr/mole

Density = 7.280 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 190.700 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	27.940
<i>L<sub>I</sub></i>	4.238
<i>L<sub>II</sub></i>	3.938
<i>L<sub>III</sub></i>	3.730

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	27.274
<i>K<sub>α1</sub></i>	24.207
<i>L<sub>β1</sub></i>	3.487
<i>L<sub>α1</sub></i>	3.287

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1815618.500	9520.811	69311.500	
1.500	661548.750	3469.055	25254.721	
2.000	323519.188	1696.482	12350.393	
3.000	118427.656	621.016	4520.993	
3.287	94504.242	495.565	3607.713	$L_{\alpha 1}$
3.487	81692.055	428.380	3118.606	$L_{\beta 1}$
3.729	69246.164	363.116	2643.482	
3.731	222561.266	1167.075	8496.309	$L_{III}$ edge
3.937	194753.312	1021.255	7434.736	
3.939	273807.500	1435.802	10452.642	$L_{II}$ edge
4.000	263544.188	1381.983	10060.838	
4.237	228411.188	1197.751	8719.631	
4.239	258885.078	1357.552	9882.976	$L_I$ edge
5.000	166498.547	873.091	6356.106	
6.000	101984.523	534.790	3893.274	
7.000	67241.539	352.604	2566.956	
8.000	46808.031	245.454	1786.903	
9.000	33972.438	178.146	1296.903	
10.000	25486.510	133.647	972.951	
12.000	15479.539	81.172	590.934	
14.000	10145.110	53.199	387.291	
16.000	7032.998	36.880	268.486	
18.000	5090.763	26.695	194.341	
20.000	3813.507	19.997	145.581	
22.000	2937.634	15.404	112.145	
24.000	2316.081	12.145	88.417	
24.207	2262.442	11.864	86.369	$K_{\alpha 1}$
26.000	1862.217	9.765	71.090	
27.274	1635.178	8.575	62.423	$K_{\beta 1}$
27.939	1531.719	8.032	58.474	
27.941	8749.539	45.881	334.015	$K$ edge
28.000	8704.921	45.647	332.312	
30.000	7355.268	38.570	280.788	
35.000	5005.802	26.250	191.097	
40.000	3557.040	18.653	135.791	
45.000	2617.246	13.724	99.914	
50.000	1982.002	10.393	75.663	
60.000	1217.978	6.387	46.496	
70.000	804.447	4.218	30.710	
80.000	561.719	2.946	21.444	
90.000	410.054	2.150	15.654	
100.000	310.452	1.628	11.852	

**ATOMIC DATA**

Atomic weight = 118.690 gr/mole

Density = 5.760 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 197.100 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	29.200
<i>L<sub>I</sub></i>	4.465
<i>L<sub>II</sub></i>	4.156
<i>L<sub>III</sub></i>	3.929

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	28.483
<i>K<sub>α1</sub></i>	25.270
<i>L<sub>β1</sub></i>	3.662
<i>L<sub>α1</sub></i>	3.444

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	2100230.750	10655.660	61376.605	
1.500	742599.250	3767.627	21701.531	
2.000	355487.375	1803.589	10388.672	
3.000	126283.422	640.707	3690.474	
3.444	88910.398	451.093	2598.295	$L_{\alpha 1}$
3.662	76088.570	386.040	2223.593	$L_{\beta 1}$
3.928	63703.602	323.204	1861.658	
3.930	192335.891	975.829	5620.775	$L_{III}$ edge
4.000	183850.531	932.778	5372.801	
4.155	166831.562	846.431	4875.443	
4.157	234490.547	1189.703	6852.692	$L_{II}$ edge
4.464	195422.344	991.488	5710.973	
4.466	227882.516	1156.177	6659.581	$L_I$ edge
5.000	171185.781	868.522	5002.689	
6.000	107270.203	544.242	3134.837	
7.000	71873.930	364.657	2100.425	
8.000	50616.117	256.804	1479.193	
9.000	37046.531	187.958	1082.638	
10.000	27962.197	141.868	817.160	
12.000	17107.578	86.796	499.947	
14.000	11245.729	57.056	328.642	
16.000	7798.007	39.564	227.887	
18.000	5635.807	28.594	164.699	
20.000	4210.150	21.360	123.036	
22.000	3231.541	16.395	94.438	
24.000	2537.216	12.873	74.147	
25.270	2198.190	11.153	64.239	$K_{\alpha 1}$
26.000	2030.765	10.303	59.347	
28.000	1652.562	8.384	48.294	
28.483	1575.848	7.995	46.052	$K_{\beta 1}$
29.199	1470.821	7.462	42.983	
29.201	8665.760	43.966	253.246	$K$ edge
30.000	8092.923	41.060	236.506	
35.000	5446.622	27.634	159.171	
40.000	3839.271	19.479	112.198	
45.000	2808.190	14.248	82.066	
50.000	2117.146	10.741	61.871	
60.000	1293.223	6.561	37.793	
70.000	851.052	4.318	24.871	
80.000	592.925	3.008	17.327	
90.000	432.210	2.193	12.631	
100.000	326.909	1.659	9.554	

**ATOMIC DATA**

Atomic weight = 121.760 gr/mole

Density = 6.691 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 202.200 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	30.491
<i>L<sub>I</sub></i>	4.698
<i>L<sub>II</sub></i>	4.381
<i>L<sub>III</sub></i>	4.132

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	29.723
<i>K<sub>α1</sub></i>	26.357
<i>L<sub>β1</sub></i>	3.843
<i>L<sub>α1</sub></i>	3.605

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	2251568.250	11135.353	74506.641	
1.500	800046.688	3956.710	26474.344	
2.000	384310.938	1900.648	12717.233	
3.000	137165.062	678.363	4538.929	
3.605	86172.875	426.176	2851.547	$L_{\alpha 1}$
3.843	73331.352	362.667	2426.608	$L_{\beta 1}$
4.000	66290.055	327.844	2193.604	
4.131	61121.746	302.284	2022.580	
4.133	177185.797	876.290	5863.255	$L_{III}$ edge
4.380	152879.391	756.080	5058.932	
4.382	214853.594	1062.580	7109.720	$L_{II}$ edge
4.697	180061.547	890.512	5958.417	
4.699	211096.719	1044.000	6985.401	$L_I$ edge
5.000	180982.062	895.065	5988.877	
6.000	114498.578	566.264	3788.872	
7.000	77227.977	381.939	2555.551	
8.000	54641.215	270.234	1808.132	
9.000	40124.160	198.438	1327.749	
10.000	30354.146	150.119	1004.449	
12.000	18616.617	92.070	616.042	
14.000	12245.137	60.560	405.204	
16.000	8486.328	41.970	280.821	
18.000	6125.221	30.293	202.690	
20.000	4567.440	22.589	151.141	
22.000	3498.213	17.301	115.759	
24.000	2740.033	13.551	90.670	
26.000	2187.535	10.819	72.388	
26.357	2105.127	10.411	69.661	$K_{\alpha 1}$
28.000	1775.454	8.781	58.752	
29.723	1500.577	7.421	49.656	$K_{\beta 1}$
30.000	1461.885	7.230	48.375	
30.490	1396.698	6.908	46.218	
30.492	8044.100	39.783	266.187	$K$ edge
35.000	5796.867	28.669	191.824	
40.000	4171.007	20.628	138.023	
45.000	3093.545	15.299	102.369	
50.000	2354.151	11.643	77.901	
60.000	1452.275	7.182	48.057	
70.000	958.440	4.740	31.716	
80.000	667.020	3.299	22.072	
90.000	484.610	2.397	16.036	
100.000	364.870	1.805	12.074	

**ATOMIC DATA**

Atomic weight = 127.600 gr/mole

Density = 6.240 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 211.900 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	31.813
<i>L<sub>I</sub></i>	4.939
<i>L<sub>II</sub></i>	4.612
<i>L<sub>III</sub></i>	4.341

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	30.993
<i>K<sub>α1</sub></i>	27.471
<i>L<sub>β1</sub></i>	4.029
<i>L<sub>α1</sub></i>	3.769



## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1388.599	6.553	40.891	
1.005	1391.189	6.565	40.968	
1.007	2410478.250	11375.547	70983.406	<i>M</i> edge
1.500	875936.938	4133.728	25794.461	
2.000	422217.094	1992.530	12433.387	
3.000	151395.781	714.468	4458.281	
3.769	85215.375	402.149	2509.410	<i>L</i> <sub><math>\alpha</math>1</sub>
4.000	73389.570	346.341	2161.165	
4.029	72071.047	340.118	2122.338	<i>L</i> <sub><math>\beta</math>1</sub>
4.340	59812.539	282.268	1761.351	
4.342	175676.047	829.052	5173.282	<i>L</i> <sub>III</sub> edge
4.611	150895.562	712.107	4443.550	
4.613	212070.062	1000.803	6245.008	<i>L</i> <sub>II</sub> edge
4.938	178484.391	842.305	5255.982	
4.940	206232.922	973.256	6073.117	<i>L</i> <sub>I</sub> edge
5.000	199940.422	943.560	5887.816	
6.000	124848.758	589.187	3676.528	
7.000	83489.680	394.005	2458.592	
8.000	58741.598	277.214	1729.814	
9.000	42983.000	202.846	1265.757	
10.000	32450.215	153.139	955.589	
12.000	19880.205	93.819	585.429	
14.000	13095.145	61.799	385.624	
16.000	9102.313	42.956	268.044	
18.000	6595.329	31.125	194.218	
20.000	4939.787	23.312	145.466	
22.000	3801.337	17.939	111.941	
24.000	2992.028	14.120	88.109	
26.000	2400.497	11.328	70.689	
27.471	2063.250	9.737	60.758	<i>K</i> <sub><math>\alpha</math>1</sub>
28.000	1957.830	9.239	57.654	
30.000	1619.784	7.644	47.699	
30.993	1481.337	6.991	43.622	<i>K</i> <sub><math>\beta</math>1</sub>
31.812	1379.126	6.508	40.612	
31.814	7764.774	36.644	228.656	<i>K</i> edge
35.000	6113.860	28.853	180.040	
40.000	4346.075	20.510	127.983	
45.000	3197.830	15.091	94.169	
50.000	2421.075	11.426	71.295	
60.000	1486.310	7.014	43.769	
70.000	980.233	4.626	28.866	
80.000	683.216	3.224	20.119	
90.000	497.680	2.349	14.656	
100.000	375.879	1.774	11.069	

**ATOMIC DATA**

Atomic weight = 126.910 gr/mole

Density = 4.940 gr/cm<sup>3</sup>

1.000 cm<sup>2</sup>/gr = 210.700 barns/atom

**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	33.169
<i>L<sub>I</sub></i>	5.188
<i>L<sub>II</sub></i>	4.852
<i>L<sub>III</sub></i>	4.557

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	32.292
<i>K<sub>α1</sub></i>	28.610
<i>L<sub>β1</sub></i>	4.220
<i>L<sub>α1</sub></i>	3.937

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1444.539	6.856	33.868	
1.071	1479.847	7.023	34.696	
1.073	2138103.750	10147.621	50129.250	<i>M</i> edge
1.500	931940.500	4423.068	21849.959	
2.000	457174.094	2169.787	10718.747	
3.000	167990.766	797.298	3938.654	
3.937	86112.047	408.695	2018.954	<i>L</i> <sub><math>\alpha</math>1</sub>
4.000	82823.820	393.089	1941.859	
4.220	72638.906	344.750	1703.067	<i>L</i> <sub><math>\beta</math>1</sub>
4.556	60220.145	285.810	1411.901	
4.558	169628.938	805.073	3977.062	<i>L</i> <sub>III</sub> edge
4.851	145451.484	690.325	3410.206	
4.853	204416.125	970.176	4792.670	<i>L</i> <sub>II</sub> edge
5.000	189883.000	901.201	4451.932	
5.187	173414.328	823.039	4065.813	
5.189	196742.297	933.756	4612.752	<i>L</i> <sub>I</sub> edge
6.000	134008.203	636.014	3141.910	
7.000	88986.836	422.339	2086.355	
8.000	62330.082	295.824	1461.370	
9.000	45485.844	215.880	1066.446	
10.000	34290.582	162.746	803.965	
12.000	21001.129	99.673	492.385	
14.000	13859.037	65.776	324.934	
16.000	9663.316	45.863	226.563	
18.000	7028.982	33.360	164.799	
20.000	5287.363	25.094	123.966	
22.000	4087.409	19.399	95.832	
24.000	3232.266	15.341	75.783	
26.000	2605.439	12.366	61.086	
28.000	2134.884	10.132	50.054	
28.610	2014.914	9.563	47.241	<i>K</i> <sub><math>\alpha</math>1</sub>
30.000	1774.348	8.421	41.601	
32.292	1457.399	6.917	34.170	<i>K</i> <sub><math>\beta</math>1</sub>
33.168	1357.027	6.441	31.816	
33.170	7581.890	35.984	177.762	<i>K</i> edge
35.000	6626.544	31.450	155.364	
40.000	4716.033	22.383	110.570	
45.000	3474.569	16.491	81.464	
50.000	2634.077	12.502	61.758	
60.000	1621.083	7.694	38.007	
70.000	1071.333	5.085	25.118	
80.000	747.900	3.550	17.535	
90.000	545.398	2.589	12.787	
100.000	412.174	1.956	9.664	

**ATOMIC DATA**

Atomic weight = 131.300 gr/mole

Density = 0.005900 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 218.000 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	34.582
<i>L<sub>I</sub></i>	5.452
<i>L<sub>II</sub></i>	5.100
<i>L<sub>III</sub></i>	4.781

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	33.644
<i>K<sub>α1</sub></i>	29.802
<i>L<sub>β1</sub></i>	4.422
<i>L<sub>α1</sub></i>	4.111

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1504.259	6.900	0.040712	
1.142	1570.062	7.202	0.042493	
1.144	1851406.375	8492.689	50.106873	<i>M</i> edge
1.500	953947.000	4375.904	25.817833	
2.000	472172.531	2165.929	12.778982	
3.000	175689.094	805.913	4.754889	
4.000	87381.484	400.832	2.364912	
4.111	81777.922	375.128	2.213256	<i>L</i> <sub><math>\alpha</math>1</sub>
4.422	68553.117	314.464	1.855337	<i>L</i> <sub><math>\beta</math>1</sub>
4.780	56803.941	260.569	1.537354	
4.782	161155.594	739.246	4.361551	<i>L</i> <sub>III</sub> edge
5.000	144565.891	663.146	3.912563	
5.099	137822.922	632.215	3.730070	
5.101	193680.625	888.443	5.241815	<i>L</i> <sub>II</sub> edge
5.451	164729.391	755.639	4.458272	
5.453	187230.109	858.854	5.067237	<i>L</i> <sub>I</sub> edge
6.000	145987.219	669.666	3.951030	
7.000	97458.070	447.055	2.637627	
8.000	68484.977	314.151	1.853492	
9.000	50067.504	229.667	1.355038	
10.000	37773.777	173.274	1.022318	
12.000	23122.359	106.066	0.625789	
14.000	15224.357	69.837	0.412035	
16.000	10580.426	48.534	0.286351	
18.000	7666.080	35.166	0.207476	
20.000	5742.036	26.340	0.155404	
22.000	4419.094	20.271	0.119599	
24.000	3478.626	15.957	0.094146	
26.000	2791.175	12.804	0.075541	
28.000	2276.649	10.443	0.061616	
29.802	1918.202	8.799	0.051915	<i>K</i> <sub><math>\alpha</math>1</sub>
30.000	1883.651	8.641	0.050980	
33.644	1375.942	6.312	0.037239	<i>K</i> <sub><math>\beta</math>1</sub>
34.581	1276.454	5.855	0.034546	
34.583	7001.596	32.117	0.189493	<i>K</i> edge
35.000	6797.670	31.182	0.183974	
40.000	4867.426	22.328	0.131733	
45.000	3601.769	16.522	0.097479	
50.000	2739.119	12.565	0.074132	
60.000	1692.398	7.763	0.045803	
70.000	1120.741	5.141	0.030332	
80.000	783.120	3.592	0.021195	
90.000	571.232	2.620	0.015460	
100.000	431.634	1.980	0.011682	

**ATOMIC DATA**

Atomic weight = 132.910 gr/mole

Density = 1.873 gr/cm<sup>3</sup>

1.000 cm<sup>2</sup>/gr = 220.700 barns/atom

**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	35.985
<i>L<sub>I</sub></i>	5.713
<i>L<sub>II</sub></i>	5.359
<i>L<sub>III</sub></i>	5.012

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	34.984
<i>K<sub>α1</sub></i>	30.970
<i>L<sub>β1</sub></i>	4.620
<i>L<sub>α1</sub></i>	4.286

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1535.135	6.956	13.028	
1.217	1630.324	7.387	13.836	
1.219	1925779.375	8725.779	16343.384	<i>M</i> edge
1.500	1139802.375	5164.487	9673.085	
2.000	551110.750	2497.104	4677.075	
3.000	198386.766	898.898	1683.636	
4.000	96381.508	436.708	817.955	
4.286	81089.289	367.419	688.175	<i>L</i> <sub><math>\alpha</math>1</sub>
4.620	67229.117	304.618	570.549	<i>L</i> <sub><math>\beta</math>1</sub>
5.000	55202.793	250.126	468.486	
5.011	54901.441	248.760	465.928	
5.013	153966.078	697.626	1306.654	<i>L</i> <sub>III</sub> edge
5.358	130224.727	590.053	1105.170	
5.360	182981.094	829.094	1552.894	<i>L</i> <sub>II</sub> edge
5.712	155886.906	706.329	1322.955	
5.714	177918.156	806.154	1509.926	<i>L</i> <sub>I</sub> edge
6.000	156370.109	708.519	1327.056	
7.000	103899.227	470.771	881.755	
8.000	72800.758	329.863	617.833	
9.000	53135.770	240.760	450.944	
10.000	40058.930	181.509	339.965	
12.000	24528.746	111.141	208.166	
14.000	16179.488	73.310	137.309	
16.000	11274.243	51.084	95.680	
18.000	8194.747	37.131	69.546	
20.000	6159.286	27.908	52.272	
22.000	4757.330	21.556	40.374	
24.000	3758.599	17.030	31.898	
26.000	3026.839	13.715	25.688	
28.000	2477.763	11.227	21.028	
30.000	2057.266	9.322	17.459	
30.970	1888.431	8.557	16.026	<i>K</i> <sub><math>\alpha</math>1</sub>
34.984	1361.918	6.171	11.558	<i>K</i> <sub><math>\beta</math>1</sub>
35.000	1360.254	6.163	11.544	
35.984	1263.149	5.723	10.720	
35.986	6780.399	30.722	57.543	<i>K</i> edge
40.000	5197.742	23.551	44.111	
45.000	3844.441	17.419	32.626	
50.000	2922.927	13.244	24.806	
60.000	1805.672	8.182	15.324	
70.000	1195.818	5.418	10.148	
80.000	835.670	3.786	7.092	
90.000	609.615	2.762	5.174	
100.000	460.645	2.087	3.909	

**ATOMIC DATA**

Atomic weight = 137.360 gr/mole

Density = 3.500 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 228.100 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	37.441
<i>L<sub>I</sub></i>	5.987
<i>L<sub>II</sub></i>	5.624
<i>L<sub>III</sub></i>	5.247

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	36.376
<i>K<sub>α1</sub></i>	32.191
<i>L<sub>β1</sub></i>	4.828
<i>L<sub>α1</sub></i>	4.467



## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1571.355	6.889	24.111	
1.292	1691.689	7.416	25.958	
1.294	1838815.125	8061.443	28215.049	<i>M</i> edge
1.500	1259719.125	5522.662	19329.314	
2.000	603466.500	2645.623	9259.679	
3.000	214396.891	939.925	3289.737	
4.000	103189.430	452.387	1583.354	
4.467	78011.453	342.005	1197.019	<i>L</i> <sub>α1</sub>
4.828	64096.891	281.003	983.512	<i>L</i> <sub>β1</sub>
5.000	58675.484	257.236	900.325	
5.246	51982.176	227.892	797.622	
5.248	145260.766	636.829	2228.903	<i>L</i> <sub>III</sub> edge
5.623	121842.938	534.165	1869.576	
5.625	171180.859	750.464	2626.624	<i>L</i> <sub>II</sub> edge
5.986	146067.578	640.366	2241.282	
5.988	167399.719	733.887	2568.606	<i>L</i> <sub>I</sub> edge
6.000	166517.906	730.021	2555.075	
7.000	110783.289	485.679	1699.875	
8.000	77736.414	340.800	1192.799	
9.000	56824.918	249.123	871.930	
10.000	42907.215	188.107	658.375	
12.000	26355.084	115.542	404.396	
14.000	17437.082	76.445	267.557	
16.000	12185.858	53.423	186.982	
18.000	8881.710	38.938	136.282	
20.000	6692.882	29.342	102.697	
22.000	5182.016	22.718	79.514	
24.000	4103.428	17.990	62.964	
26.000	3311.544	14.518	50.813	
28.000	2716.190	11.908	41.678	
30.000	2259.386	9.905	34.668	
32.191	1872.777	8.210	28.736	<i>K</i> <sub>α1</sub>
35.000	1499.955	6.576	23.016	
36.376	1354.517	5.938	20.784	<i>K</i> <sub>β1</sub>
37.440	1255.264	5.503	19.261	
37.442	6582.267	28.857	100.999	<i>K</i> edge
40.000	5590.250	24.508	85.778	
45.000	4155.555	18.218	63.763	
50.000	3170.561	13.900	48.650	
60.000	1966.568	8.622	30.175	
70.000	1304.411	5.719	20.015	
80.000	911.659	3.997	13.989	
90.000	664.524	2.913	10.197	
100.000	501.455	2.198	7.694	

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## LANTHANUM

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## ATOMIC DATA

Atomic weight = 138.920 gr/mole

Density = 6.150 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 230.700 barns/atom

## ABSORPTION EDGES

EDGE	ENERGY(KeV)
<i>K</i>	38.925
<i>L<sub>I</sub></i>	6.267
<i>L<sub>II</sub></i>	5.891
<i>L<sub>III</sub></i>	5.483

## FLUORESCENT ENERGIES

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	37.799
<i>K<sub>α1</sub></i>	33.440
<i>L<sub>β1</sub></i>	5.043
<i>L<sub>α1</sub></i>	4.651

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1630.912	7.069	43.477	
1.362	1768.073	7.664	47.133	
1.364	1768286.500	7664.875	47138.977	<i>M</i> edge
1.500	1383779.500	5998.177	36888.793	
2.000	659147.250	2857.162	17571.547	
3.000	232293.219	1006.906	6192.472	
4.000	111154.633	481.815	2963.160	
4.651	75644.812	327.893	2016.539	<i>L</i> <sub><math>\alpha</math>1</sub>
5.000	62917.148	272.723	1677.245	
5.043	61561.500	266.847	1641.106	<i>L</i> <sub><math>\beta</math>1</sub>
5.482	49797.852	215.855	1327.511	
5.484	133139.953	577.113	3549.245	<i>L</i> <sub>III</sub> edge
5.890	110852.867	480.507	2955.115	
5.892	155704.453	674.922	4150.769	<i>L</i> <sub>II</sub> edge
6.000	148605.047	644.148	3961.513	
6.266	132936.391	576.231	3543.818	
6.268	154688.453	670.518	4123.685	<i>L</i> <sub>I</sub> edge
7.000	116606.781	505.448	3108.503	
8.000	82628.141	358.163	2202.701	
9.000	60827.309	263.664	1621.534	
10.000	46160.676	200.090	1230.551	
12.000	28520.113	123.624	760.289	
14.000	18910.475	81.970	504.115	
16.000	13213.317	57.275	352.241	
18.000	9614.206	41.674	256.296	
20.000	7225.096	31.318	192.607	
22.000	5574.903	24.165	148.616	
24.000	4397.301	19.061	117.223	
26.000	3533.719	15.317	94.202	
28.000	2885.575	12.508	76.924	
30.000	2389.345	10.357	63.695	
33.440	1775.800	7.697	47.339	<i>K</i> <sub><math>\alpha</math>1</sub>
35.000	1567.933	6.796	41.798	
37.799	1271.336	5.511	33.891	<i>K</i> <sub><math>\beta</math>1</sub>
38.924	1173.859	5.088	31.293	
38.926	6377.955	27.646	170.024	<i>K</i> edge
40.000	5958.664	25.829	158.846	
45.000	4422.639	19.171	117.899	
50.000	3371.363	14.614	89.874	
60.000	2089.880	9.059	55.712	
70.000	1386.536	6.010	36.962	
80.000	969.632	4.203	25.848	
90.000	707.277	3.066	18.855	
100.000	534.076	2.315	14.237	

**ATOMIC DATA**

Atomic weight = 140.130 gr/mole

Density = 6.670 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 232.700 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	40.444
<i>L<sub>I</sub></i>	6.549
<i>L<sub>II</sub></i>	6.165
<i>L<sub>III</sub></i>	5.724

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	39.255
<i>K<sub>α1</sub></i>	34.717
<i>L<sub>β1</sub></i>	5.262
<i>L<sub>α1</sub></i>	4.840

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1709.714	7.347	49.006	
1.433	1867.307	8.025	53.524	
1.435	1686176.375	7246.138	48331.742	<i>M</i> edge
1.500	1504156.125	6463.928	43114.402	
2.000	716684.000	3079.863	20542.684	
3.000	252647.688	1085.723	7241.771	
4.000	120908.461	519.589	3465.662	
4.840	74344.141	319.485	2130.964	<i>L</i> <sub><math>\alpha</math>1</sub>
5.000	68437.992	294.104	1961.673	
5.262	60103.594	258.288	1722.780	<i>L</i> <sub><math>\beta</math>1</sub>
5.723	48565.480	208.704	1392.057	
5.725	130707.688	561.700	3746.542	<i>L</i> <sub>III</sub> edge
6.000	115894.102	498.041	3321.932	
6.164	108155.383	464.785	3100.114	
6.166	151903.250	652.786	4354.081	<i>L</i> <sub>II</sub> edge
6.548	130181.047	559.437	3731.447	
6.550	150432.828	646.467	4311.934	<i>L</i> <sub>I</sub> edge
7.000	126571.211	543.924	3627.976	
8.000	89325.852	383.867	2560.393	
9.000	65585.758	281.847	1879.918	
10.000	49692.711	213.548	1424.368	
12.000	30669.078	131.797	879.084	
14.000	20349.689	87.450	583.294	
16.000	14244.307	61.213	408.292	
18.000	10389.755	44.649	297.807	
20.000	7830.228	33.649	224.442	
22.000	6060.568	26.045	173.717	
24.000	4795.854	20.610	137.466	
26.000	3866.701	16.617	110.833	
28.000	3167.910	13.614	90.803	
30.000	2631.708	11.309	75.434	
34.717	1778.836	7.644	50.988	<i>K</i> <sub><math>\alpha</math>1</sub>
35.000	1740.604	7.480	49.892	
39.255	1281.419	5.507	36.730	<i>K</i> <sub><math>\beta</math>1</sub>
40.000	1218.894	5.238	34.938	
40.443	1183.723	5.087	33.930	
40.445	6281.884	26.996	180.061	<i>K</i> edge
45.000	4799.695	20.626	137.576	
50.000	3661.224	15.734	104.944	
60.000	2269.411	9.753	65.049	
70.000	1503.952	6.463	43.109	
80.000	1049.988	4.512	30.096	
90.000	764.399	3.285	21.910	
100.000	576.010	2.475	16.510	

**ATOMIC DATA**

Atomic weight = 140.920 gr/mole

Density = 6.769 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 234.000 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	41.991
<i>L<sub>I</sub></i>	6.835
<i>L<sub>II</sub></i>	6.441
<i>L<sub>III</sub></i>	5.965

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	40.746
<i>K<sub>α1</sub></i>	36.023
<i>L<sub>β1</sub></i>	5.489
<i>L<sub>α1</sub></i>	5.034

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1781.033	7.611	51.521	
1.500	1952.861	8.346	56.491	
1.507	1953.651	8.349	56.514	
1.509	1593355.875	6809.213	46091.562	<i>M</i> edge
2.000	773312.250	3304.753	22369.875	
3.000	273767.406	1169.946	7919.366	
4.000	131391.766	561.503	3800.816	
5.000	74527.922	318.495	2155.895	
5.034	73258.531	313.071	2119.175	<i>L</i> <sub><math>\alpha</math>1</sub>
5.489	58843.879	251.470	1702.198	<i>L</i> <sub><math>\beta</math>1</sub>
5.964	47712.352	203.899	1380.192	
5.966	126405.945	540.196	3656.589	<i>L</i> <sub>III</sub> edge
6.000	124585.312	532.416	3603.923	
6.440	104000.305	444.446	3008.453	
6.442	146051.625	624.152	4224.887	<i>L</i> <sub>II</sub> edge
6.834	125583.961	536.684	3632.811	
6.836	143428.891	612.944	4149.018	<i>L</i> <sub>I</sub> edge
7.000	134772.359	575.950	3898.607	
8.000	94815.461	405.194	2742.760	
9.000	69432.625	296.721	2008.502	
10.000	52488.633	224.310	1518.357	
12.000	32275.838	137.931	933.654	
14.000	21354.500	91.259	617.729	
16.000	14913.279	63.732	431.402	
18.000	10857.196	46.398	314.070	
20.000	8169.664	34.913	236.327	
22.000	6314.919	26.987	182.674	
24.000	4991.483	21.331	144.390	
26.000	4020.523	17.182	116.303	
28.000	3291.168	14.065	95.205	
30.000	2732.106	11.676	79.033	
35.000	1804.379	7.711	52.196	
36.023	1670.168	7.137	48.314	<i>K</i> <sub><math>\alpha</math>1</sub>
40.000	1262.208	5.394	36.512	
40.746	1201.556	5.135	34.758	<i>K</i> <sub><math>\beta</math>1</sub>
41.990	1109.153	4.740	32.085	
41.992	5803.378	24.801	167.876	<i>K</i> edge
45.000	4877.972	20.846	141.107	
50.000	3730.351	15.942	107.909	
60.000	2324.740	9.935	67.249	
70.000	1548.823	6.619	44.803	
80.000	1086.687	4.644	31.435	
90.000	794.680	3.396	22.988	
100.000	601.223	2.569	17.392	

**ATOMIC DATA**

Atomic weight = 144.270 gr/mole

Density = 6.960 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 239.600 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	43.569
<i>L<sub>I</sub></i>	7.126
<i>L<sub>II</sub></i>	6.722
<i>L<sub>III</sub></i>	6.208

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	42.269
<i>K<sub>α1</sub></i>	37.359
<i>L<sub>β1</sub></i>	5.956
<i>L<sub>α1</sub></i>	5.431



## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1853.355	7.735	53.837	
1.500	2031.037	8.477	58.998	
1.574	2038.047	8.506	59.202	
1.576	1554430.250	6487.605	45153.734	<i>M</i> edge
2.000	839551.812	3503.972	24387.648	
3.000	294877.906	1230.709	8565.735	
4.000	140727.062	587.342	4087.898	
5.000	79473.430	331.692	2308.577	
5.431	64353.020	268.585	1869.353	<i>L</i> <sub><math>\alpha</math>1</sub>
5.956	50875.914	212.337	1477.865	<i>L</i> <sub><math>\beta</math>1</sub>
6.000	49932.430	208.399	1450.458	
6.207	45808.109	191.186	1330.653	
6.209	119789.305	499.955	3479.689	<i>L</i> <sub>III</sub> edge
6.721	97719.844	407.846	2838.606	
6.723	137203.500	572.636	3985.544	<i>L</i> <sub>II</sub> edge
7.000	123658.656	516.105	3592.088	
7.125	118152.062	493.122	3432.130	
7.127	137241.156	572.793	3986.638	<i>L</i> <sub>I</sub> edge
8.000	101662.102	424.299	2953.123	
9.000	74720.141	311.854	2170.501	
10.000	56635.898	236.377	1645.183	
12.000	34937.293	145.815	1014.873	
14.000	23145.684	96.601	672.345	
16.000	16166.005	67.471	469.597	
18.000	11761.167	49.087	341.643	
20.000	8839.053	36.891	256.760	
22.000	6821.423	28.470	198.152	
24.000	5381.816	22.462	156.333	
26.000	4326.086	18.055	125.666	
28.000	3533.633	14.748	102.646	
30.000	2926.794	12.215	85.019	
35.000	1921.792	8.021	55.825	
37.359	1609.064	6.716	46.741	<i>K</i> <sub><math>\alpha</math>1</sub>
40.000	1336.551	5.578	38.825	
42.269	1151.001	4.804	33.435	<i>K</i> <sub><math>\beta</math>1</sub>
43.568	1060.604	4.427	30.809	
43.570	5628.108	23.490	163.488	<i>K</i> edge
45.000	5185.830	21.644	150.640	
50.000	3960.465	16.529	115.045	
60.000	2464.870	10.287	71.601	
70.000	1641.675	6.852	47.688	
80.000	1152.058	4.808	33.465	
90.000	842.836	3.518	24.483	
100.000	637.966	2.663	18.532	

**ATOMIC DATA**

Atomic weight = 147.000 gr/mole

Density = 6.782 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 244.100 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	45.184
<i>L<sub>I</sub></i>	7.428
<i>L<sub>II</sub></i>	7.013
<i>L<sub>III</sub></i>	6.460

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	43.945
<i>K<sub>α1</sub></i>	38.649
<i>L<sub>β1</sub></i>	6.206
<i>L<sub>α1</sub></i>	5.636

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	5461275.500	22373.107	151734.406	
1.500	1907921.625	7816.147	53009.113	
1.650	1490162.875	6104.723	41402.230	
1.652	1485490.125	6085.580	41272.402	<i>M</i> edge
2.000	905153.125	3708.124	25148.498	
3.000	317085.938	1299.000	8809.819	
4.000	151034.156	618.739	4196.287	
5.000	85162.352	348.883	2366.125	
5.636	62692.602	256.832	1741.832	<i>L</i> <sub>α1</sub>
6.000	53437.066	218.915	1484.679	
6.206	49031.348	200.866	1362.272	<i>L</i> <sub>β1</sub>
6.459	44288.230	181.435	1230.491	
6.461	117449.555	481.153	3263.183	<i>L</i> <sub>III</sub> edge
7.000	95549.016	391.434	2654.705	
7.012	95128.625	389.712	2643.025	
7.014	133553.562	547.126	3710.611	<i>L</i> <sub>II</sub> edge
7.427	115226.289	472.045	3201.412	
7.429	132412.328	542.451	3678.904	<i>L</i> <sub>I</sub> edge
8.000	108937.008	446.280	3026.673	
9.000	79775.961	326.817	2216.471	
10.000	60303.621	247.045	1675.457	
12.000	37068.875	151.859	1029.910	
14.000	24513.230	100.423	681.068	
16.000	17108.756	70.089	475.344	
18.000	12447.100	50.992	345.826	
20.000	9359.260	38.342	260.035	
22.000	7229.002	29.615	200.848	
24.000	5709.604	23.390	158.634	
26.000	4595.344	18.826	127.676	
28.000	3758.723	15.398	104.431	
30.000	3117.730	12.772	86.622	
35.000	2054.875	8.418	57.092	
38.649	1573.136	6.445	43.708	<i>K</i> <sub>α1</sub>
40.000	1434.469	5.877	39.855	
43.945	1115.298	4.569	30.987	<i>K</i> <sub>β1</sub>
45.000	1046.968	4.289	29.089	
45.183	1035.717	4.243	28.776	
45.185	5431.009	22.249	150.894	<i>K</i> edge
50.000	4196.779	17.193	116.602	
60.000	2616.499	10.719	72.696	
70.000	1744.151	7.145	48.459	
80.000	1224.355	5.016	34.017	
90.000	895.691	3.669	24.886	
100.000	677.782	2.777	18.831	

**ATOMIC DATA**

Atomic weight = 150.350 gr/mole

Density = 7.536 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 249.600 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	46.835
<i>L<sub>I</sub></i>	7.737
<i>L<sub>II</sub></i>	7.312
<i>L<sub>III</sub></i>	6.717

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	45.400
<i>K<sub>α1</sub></i>	40.124
<i>L<sub>β1</sub></i>	6.456
<i>L<sub>α1</sub></i>	5.846

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	5960557.000	23880.436	179962.969	
1.500	2067945.375	8285.037	62436.039	
1.728	1429408.250	5726.796	43157.133	
1.730	1424246.875	5706.117	43001.297	<i>M</i> edge
2.000	975647.062	3908.842	29457.035	
3.000	339394.938	1359.755	10247.116	
4.000	160854.500	644.449	4856.568	
5.000	90348.258	361.972	2727.822	
5.846	60414.887	242.047	1824.065	<i>L</i> <sub><math>\alpha</math>1</sub>
6.000	56511.949	226.410	1706.226	
6.456	46832.691	187.631	1413.987	<i>L</i> <sub><math>\beta</math>1</sub>
6.716	42329.766	169.590	1278.033	
6.718	111241.078	445.677	3358.625	<i>L</i> <sub>III</sub> edge
7.000	99995.219	400.622	3019.086	
7.311	89345.891	357.956	2697.559	
7.313	125406.016	502.428	3786.297	<i>L</i> <sub>II</sub> edge
7.736	108374.570	434.193	3272.078	
7.738	125306.180	502.028	3783.282	<i>L</i> <sub>I</sub> edge
8.000	114829.633	460.055	3466.971	
9.000	84250.008	337.540	2543.702	
10.000	63798.797	255.604	1926.233	
12.000	39345.664	157.635	1187.936	
14.000	26095.412	104.549	787.881	
16.000	18261.557	73.163	551.359	
18.000	13318.022	53.357	402.102	
20.000	10036.363	40.210	303.021	
22.000	7767.789	31.121	234.527	
24.000	6146.662	24.626	185.582	
26.000	4955.672	19.854	149.623	
28.000	4059.925	16.266	122.578	
30.000	3372.541	13.512	101.825	
35.000	2229.984	8.934	67.328	
40.000	1560.809	6.253	47.124	
40.124	1547.993	6.202	46.737	<i>K</i> <sub><math>\alpha</math>1</sub>
45.000	1141.598	4.574	34.467	
45.400	1115.189	4.468	33.670	<i>K</i> <sub><math>\beta</math>1</sub>
46.834	1027.267	4.116	31.016	
46.836	5274.139	21.130	159.238	<i>K</i> edge
50.000	4457.188	17.857	134.573	
60.000	2769.652	11.096	83.622	
70.000	1842.364	7.381	55.625	
80.000	1291.519	5.174	38.994	
90.000	943.949	3.782	28.500	
100.000	713.838	2.860	21.552	

**ATOMIC DATA**

Atomic weight = 152.000 gr/mole

Density = 5.259 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 252.400 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	48.520
<i>L<sub>I</sub></i>	8.052
<i>L<sub>II</sub></i>	7.618
<i>L<sub>III</sub></i>	6.977

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	47.027
<i>K<sub>α1</sub></i>	41.529
<i>L<sub>β1</sub></i>	6.714
<i>L<sub>α1</sub></i>	6.059

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	6624926.500	26247.729	138036.797	
1.500	2278379.250	9026.859	47472.250	
1.799	1412225.000	5595.187	29425.084	
1.801	1408102.875	5578.854	29339.195	<i>M</i> edge
2.000	1068871.875	4234.833	22270.986	
3.000	368541.375	1460.148	7678.918	
4.000	173563.484	687.652	3616.364	
5.000	97005.430	384.332	2021.203	
6.000	60430.801	239.425	1259.135	
6.059	58918.871	233.435	1227.632	<i>L</i> <sub>α1</sub>
6.714	45186.785	179.028	941.511	<i>L</i> <sub>β1</sub>
6.976	40938.230	162.196	852.988	
6.978	109200.617	432.649	2275.301	<i>L</i> <sub>III</sub> edge
7.000	108306.055	429.105	2256.662	
7.617	86862.820	344.147	1809.871	
7.619	121907.406	482.993	2540.060	<i>L</i> <sub>II</sub> edge
8.000	107294.156	425.096	2235.578	
8.051	105525.250	418.087	2198.721	
8.053	121738.062	482.322	2536.531	<i>L</i> <sub>I</sub> edge
9.000	90634.336	359.090	1888.455	
10.000	68481.484	271.321	1426.878	
12.000	42105.492	166.820	877.309	
14.000	27875.926	110.443	580.822	
16.000	19488.414	77.212	406.060	
18.000	14206.588	56.286	296.008	
20.000	10705.380	42.414	223.057	
22.000	8287.369	32.834	172.675	
24.000	6560.457	25.992	136.694	
26.000	5292.172	20.967	110.268	
28.000	4338.396	17.189	90.395	
30.000	3606.435	14.289	75.144	
35.000	2389.298	9.466	49.783	
40.000	1675.709	6.639	34.915	
41.529	1517.403	6.012	31.617	<i>K</i> <sub>α1</sub>
45.000	1228.058	4.866	25.588	
47.027	1093.986	4.334	22.794	<i>K</i> <sub>β1</sub>
48.519	1008.160	3.994	21.006	
48.521	5082.848	20.138	105.906	<i>K</i> edge
50.000	4707.501	18.651	98.085	
60.000	2937.231	11.637	61.200	
70.000	1959.342	7.763	40.825	
80.000	1376.177	5.452	28.674	
90.000	1007.131	3.990	20.985	
100.000	762.240	3.020	15.882	

**ATOMIC DATA**

Atomic weight = 157.260 gr/mole

Density = 7.950 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 261.100 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	50.240
<i>L<sub>I</sub></i>	8.376
<i>L<sub>II</sub></i>	7.931
<i>L<sub>III</sub></i>	7.243

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	48.718
<i>K<sub>α1</sub></i>	42.983
<i>L<sub>β1</sub></i>	6.979
<i>L<sub>α1</sub></i>	6.275



## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	6688897.000	25618.143	203664.219	
1.500	2325118.750	8905.089	70795.453	
1.881	1289430.000	4938.453	39260.695	
1.883	1285866.625	4924.805	39152.199	<i>M</i> edge
2.000	1099103.750	4209.513	33465.625	
3.000	383021.531	1466.953	11662.279	
4.000	181736.656	696.042	5533.537	
5.000	102155.141	391.249	3110.430	
6.000	63930.469	244.851	1946.562	
6.275	56992.711	218.279	1735.320	<i>L</i> <sub><math>\alpha</math>1</sub>
6.979	43421.559	166.302	1322.104	<i>L</i> <sub><math>\beta</math>1</sub>
7.000	43089.703	165.031	1312.000	
7.242	39509.965	151.321	1203.003	
7.244	104471.117	400.119	3180.947	<i>L</i> <sub>III</sub> edge
7.930	82683.922	316.675	2517.569	
7.932	116023.531	444.364	3532.696	<i>L</i> <sub>II</sub> edge
8.000	113485.969	434.646	3455.432	
8.375	100790.664	386.023	3068.885	
8.377	115894.641	443.871	3528.772	<i>L</i> <sub>I</sub> edge
9.000	95837.977	367.055	2918.084	
10.000	72459.539	277.516	2206.255	
12.000	44601.871	170.823	1358.042	
14.000	29557.531	113.204	899.971	
16.000	20681.828	79.210	629.722	
18.000	15088.007	57.786	459.401	
20.000	11377.286	43.574	346.417	
22.000	8812.834	33.753	268.334	
24.000	6980.231	26.734	212.535	
26.000	5633.545	21.576	171.531	
28.000	4620.282	17.695	140.679	
30.000	3842.281	14.716	116.990	
35.000	2547.625	9.757	77.570	
40.000	1787.825	6.847	54.436	
42.983	1478.746	5.664	45.025	<i>K</i> <sub><math>\alpha</math>1</sub>
45.000	1310.770	5.020	39.910	
48.718	1064.835	4.078	32.422	<i>K</i> <sub><math>\beta</math>1</sub>
50.000	995.136	3.811	30.300	
50.239	982.862	3.764	29.926	
50.241	5005.914	19.172	152.421	<i>K</i> edge
60.000	3181.087	12.183	96.858	
70.000	2127.700	8.149	64.784	
80.000	1495.377	5.727	45.531	
90.000	1093.708	4.189	33.301	
100.000	826.637	3.166	25.170	

**ATOMIC DATA**

Atomic weight = 158.930 gr/mole

Density = 8.272 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 263.900 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	51.996
<i>L<sub>I</sub></i>	8.708
<i>L<sub>II</sub></i>	8.252
<i>L<sub>III</sub></i>	7.515

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	50.391
<i>K<sub>α1</sub></i>	44.470
<i>L<sub>β1</sub></i>	7.249
<i>L<sub>α1</sub></i>	6.495

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	7583837.500	28737.543	237716.969	
1.500	2602151.500	9860.370	81564.984	
1.966	1275062.750	4831.613	39967.109	
1.968	1271269.500	4817.240	39848.207	<i>M</i> edge
2.000	1218363.375	4616.762	38189.855	
3.000	419059.406	1587.948	13135.505	
4.000	196991.969	746.464	6174.754	
5.000	109933.164	416.571	3445.878	
6.000	68394.672	259.169	2143.845	
6.495	55681.410	210.994	1745.345	<i>L</i> <sub><math>\alpha</math>1</sub>
7.000	45871.590	173.822	1437.854	
7.249	41910.523	158.812	1313.694	<i>L</i> <sub><math>\beta</math>1</sub>
7.514	38201.840	144.759	1197.445	
7.516	101350.938	384.051	3176.866	<i>L</i> <sub>III</sub> edge
8.000	86084.086	326.200	2698.324	
8.251	79404.930	300.890	2488.964	
8.253	111399.344	422.127	3491.836	<i>L</i> <sub>II</sub> edge
8.707	96813.375	366.856	3034.635	
8.709	111936.453	424.162	3508.671	<i>L</i> <sub>I</sub> edge
9.000	102625.633	388.881	3216.822	
10.000	77651.547	294.246	2434.004	
12.000	47851.836	181.326	1499.926	
14.000	31735.008	120.254	994.740	
16.000	22216.242	84.184	696.373	
18.000	16212.308	61.434	508.178	
20.000	12227.088	46.332	383.261	
22.000	9471.682	35.891	296.892	
24.000	7501.937	28.427	235.150	
26.000	6054.098	22.941	189.767	
28.000	4964.514	18.812	155.614	
30.000	4127.816	15.642	129.387	
35.000	2735.332	10.365	85.740	
40.000	1918.128	7.268	60.124	
44.470	1449.653	5.493	45.440	<i>K</i> <sub><math>\alpha</math>1</sub>
45.000	1405.105	5.324	44.043	
50.000	1065.759	4.038	33.406	
50.391	1044.293	3.957	32.734	<i>K</i> <sub><math>\beta</math>1</sub>
51.995	962.361	3.647	30.165	
51.997	4687.251	17.761	146.923	<i>K</i> edge
60.000	3244.117	12.293	101.688	
70.000	2170.444	8.224	68.033	
80.000	1527.704	5.789	47.886	
90.000	1119.733	4.243	35.098	
100.000	848.354	3.215	26.592	

## ATOMIC DATA

Atomic weight = 162.510 gr/mole

Density = 8.536 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 269.800 barns/atom

## ABSORPTION EDGES

EDGE	ENERGY(KeV)
<i>K</i>	53.789
<i>L<sub>I</sub></i>	9.047
<i>L<sub>II</sub></i>	8.581
<i>L<sub>III</sub></i>	7.790

## FLUORESCENT ENERGIES

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	52.178
<i>K<sub>α1</sub></i>	45.985
<i>L<sub>β1</sub></i>	7.528
<i>L<sub>α1</sub></i>	6.720

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	8223568.000	30480.238	260179.328	
1.500	2807336.250	10405.250	88819.211	
2.000	1310066.000	4855.693	41448.199	
2.045	1235112.000	4577.880	39076.785	
2.047	1231919.750	4566.048	38975.789	<i>M</i> edge
3.000	448284.125	1661.542	14182.927	
4.000	209952.734	778.179	6642.538	
5.000	116828.094	433.017	3696.237	
6.000	72512.359	268.763	2294.164	
6.720	53970.277	200.038	1707.525	<i>L</i> <sub><math>\alpha</math>1</sub>
7.000	48535.793	179.895	1535.588	
7.528	40189.070	148.959	1271.512	<i>L</i> <sub><math>\beta</math>1</sub>
7.789	36793.246	136.372	1164.074	
7.791	322126.125	1193.944	10191.508	<i>L</i> <sub>III</sub> edge
8.000	300339.406	1113.193	9502.214	
8.580	249584.344	925.072	7896.413	
8.582	351203.844	1301.719	11111.476	<i>L</i> <sub>II</sub> edge
9.000	309667.844	1147.768	9797.350	
9.046	305517.938	1132.387	9666.054	
9.048	107868.391	399.809	3412.767	<i>L</i> <sub>I</sub> edge
10.000	82575.508	306.062	2612.545	
12.000	50703.824	187.931	1604.180	
14.000	33551.109	124.355	1061.499	
16.000	23455.684	86.937	742.097	
18.000	17103.830	63.394	541.135	
20.000	12895.192	47.795	407.981	
22.000	9988.978	37.024	316.034	
24.000	7913.232	29.330	250.361	
26.000	6388.357	23.678	202.116	
28.000	5241.188	19.426	165.822	
30.000	4360.389	16.162	137.955	
35.000	2894.382	10.728	91.573	
40.000	2033.481	7.537	64.336	
45.000	1492.458	5.532	47.219	
45.985	1410.320	5.227	44.620	<i>K</i> <sub><math>\alpha</math>1</sub>
50.000	1134.123	4.204	35.882	
52.178	1015.561	3.764	32.131	<i>K</i> <sub><math>\beta</math>1</sub>
53.788	938.960	3.480	29.707	
53.790	4529.716	16.789	143.312	<i>K</i> edge
60.000	3420.279	12.677	108.212	
70.000	2289.838	8.487	72.446	
80.000	1612.632	5.977	51.021	
90.000	1182.495	4.383	37.412	
100.000	896.191	3.322	28.354	

**67****HOLMIUM****Ho****ATOMIC DATA**

Atomic weight = 164.940 gr/mole

Density = 8.803 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 273.900 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	55.618
<i>L<sub>I</sub></i>	9.395
<i>L<sub>II</sub></i>	8.919
<i>L<sub>III</sub></i>	8.071

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	53.934
<i>K<sub>α1</sub></i>	47.528
<i>L<sub>β1</sub></i>	7.810
<i>L<sub>α1</sub></i>	6.948

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	9011365.000	32900.203	289620.500	
1.500	3043767.000	11112.694	97825.055	
2.000	1409712.375	5146.814	45307.406	
2.126	1197248.625	4371.116	38478.934	
2.128	1194242.125	4360.139	38382.309	<i>M</i> edge
3.000	477265.312	1742.480	15339.054	
4.000	221842.125	809.938	7129.888	
5.000	122725.383	448.066	3944.329	
6.000	75813.336	276.792	2436.600	
6.948	51544.102	188.186	1656.600	<i>L</i> <sub><math>\alpha</math>1</sub>
7.000	50545.469	184.540	1624.505	
7.810	37945.602	138.538	1219.552	<i>L</i> <sub><math>\beta</math>1</sub>
8.000	35636.371	130.107	1145.334	
8.070	34835.109	127.182	1119.582	
8.072	97211.172	354.915	3124.315	<i>L</i> <sub>III</sub> edge
8.918	74628.859	272.468	2398.532	
8.920	104668.992	382.143	3364.006	<i>L</i> <sub>II</sub> edge
9.000	102213.750	373.179	3285.096	
9.394	91213.102	333.016	2931.541	
9.396	104814.758	382.675	3368.691	<i>L</i> <sub>I</sub> edge
10.000	88541.719	323.263	2845.684	
12.000	54079.469	197.442	1738.085	
14.000	35681.184	130.271	1146.774	
16.000	24911.217	90.950	800.633	
18.000	18159.633	66.300	583.641	
20.000	13696.862	50.007	440.210	
22.000	10619.775	38.772	341.314	
24.000	8423.749	30.755	270.735	
26.000	6810.994	24.867	218.902	
28.000	5597.581	20.437	179.903	
30.000	4665.538	17.034	149.948	
35.000	3112.302	11.363	100.028	
40.000	2197.749	8.024	70.634	
45.000	1621.120	5.919	52.102	
47.528	1408.968	5.144	45.283	<i>K</i> <sub><math>\alpha</math>1</sub>
50.000	1237.816	4.519	39.783	
53.934	1021.320	3.729	32.825	<i>K</i> <sub><math>\beta</math>1</sub>
55.617	945.106	3.451	30.375	
55.619	4438.878	16.206	142.663	<i>K</i> edge
60.000	3670.493	13.401	117.968	
70.000	2477.029	9.044	79.610	
80.000	1751.866	6.396	56.304	
90.000	1287.008	4.699	41.364	
100.000	975.743	3.562	31.360	

**ATOMIC DATA**

Atomic weight = 167.270 gr/mole

Density = 9.051 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 277.700 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	57.486
<i>L<sub>I</sub></i>	9.752
<i>L<sub>II</sub></i>	9.265
<i>L<sub>III</sub></i>	8.358

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	55.690
<i>K<sub>α1</sub></i>	49.099
<i>L<sub>β1</sub></i>	8.103
<i>L<sub>α1</sub></i>	7.181



## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	9503696.000	34222.887	309751.344	
1.500	3214226.750	11574.457	104760.406	
2.000	1490014.000	5365.553	48563.613	
2.211	1139899.375	4104.787	37152.426	
2.213	1137151.875	4094.893	37062.875	<i>M</i> edge
3.000	505079.094	1818.794	16461.902	
4.000	234966.156	846.115	7658.187	
5.000	130063.836	468.361	4239.135	
6.000	80382.750	289.459	2619.893	
7.000	53610.211	193.051	1747.303	
7.181	50141.285	180.559	1634.241	<i>L</i> <sub><math>\alpha</math>1</sub>
8.000	37807.070	136.144	1232.235	
8.103	36566.289	131.676	1191.795	<i>L</i> <sub><math>\beta</math>1</sub>
8.357	33740.105	121.498	1099.682	
8.359	96326.719	346.873	3139.550	<i>L</i> <sub>III</sub> edge
9.000	79201.250	285.204	2581.385	
9.264	73365.555	264.190	2391.183	
9.266	102888.875	370.504	3353.429	<i>L</i> <sub>II</sub> edge
9.751	89858.398	323.581	2928.730	
9.753	102680.266	369.752	3346.629	<i>L</i> <sub>I</sub> edge
10.000	95881.984	345.272	3125.055	
12.000	58224.539	209.667	1897.696	
14.000	38224.891	137.648	1245.853	
16.000	26570.482	95.681	866.004	
18.000	19293.793	69.477	628.837	
20.000	14501.275	52.219	472.636	
22.000	11207.639	40.359	365.287	
24.000	8864.144	31.920	288.907	
26.000	7147.858	25.739	232.968	
28.000	5859.860	21.101	190.989	
30.000	4872.899	17.547	158.821	
35.000	3234.060	11.646	105.407	
40.000	2273.802	8.188	74.109	
45.000	1670.927	6.017	54.460	
49.099	1332.785	4.799	43.439	<i>K</i> <sub><math>\alpha</math>1</sub>
50.000	1271.677	4.579	41.447	
55.690	964.631	3.474	31.440	<i>K</i> <sub><math>\beta</math>1</sub>
57.485	889.853	3.204	29.003	
57.487	4275.075	15.395	139.336	<i>K</i> edge
60.000	3827.486	13.783	124.748	
70.000	2561.462	9.224	83.485	
80.000	1803.782	6.495	58.790	
90.000	1322.725	4.763	43.111	
100.000	1002.547	3.610	32.676	

**ATOMIC DATA**

Atomic weight = 168.940 gr/mole

Density = 9.332 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 280.500 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	59.390
<i>L<sub>I</sub></i>	10.116
<i>L<sub>II</sub></i>	9.618
<i>L<sub>III</sub></i>	8.648

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	57.576
<i>K<sub>α1</sub></i>	50.730
<i>L<sub>β1</sub></i>	8.103
<i>L<sub>α1</sub></i>	7.181

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	10088270.000	35965.312	335628.281	
1.500	3407655.000	12148.503	113369.828	
2.000	1578257.250	5626.585	52507.297	
2.306	1078656.875	3845.479	35886.008	
2.308	1076161.000	3836.581	35802.973	<i>M</i> edge
3.000	534295.625	1904.797	17775.568	
4.000	248320.000	885.276	8261.398	
5.000	137349.953	489.661	4569.518	
6.000	84830.523	302.426	2822.240	
7.000	56544.477	201.585	1881.187	
7.181	52880.672	188.523	1759.296	<i>L</i> <sub><math>\alpha</math>1</sub>
8.000	39856.258	142.090	1325.984	
8.103	38546.340	137.420	1282.404	<i>L</i> <sub><math>\beta</math>1</sub>
8.647	32537.150	115.997	1082.484	
8.649	87325.297	311.320	2905.240	<i>L</i> <sub>III</sub> edge
9.000	78586.805	280.167	2614.517	
9.617	65931.414	235.050	2193.483	
9.619	92412.742	329.457	3074.494	<i>L</i> <sub>II</sub> edge
10.000	83356.430	297.171	2773.198	
10.115	80864.656	288.288	2690.299	
10.117	93895.422	334.743	3123.822	<i>L</i> <sub>I</sub> edge
12.000	59781.031	213.123	1988.865	
14.000	39735.719	141.660	1321.974	
16.000	27884.184	99.409	927.683	
18.000	20398.520	72.722	678.642	
20.000	15421.880	54.980	513.073	
22.000	11975.111	42.692	398.402	
24.000	9506.759	33.892	316.282	
26.000	7689.149	27.412	255.812	
28.000	6318.800	22.527	210.221	
30.000	5264.588	18.769	175.148	
35.000	3504.913	12.495	116.606	
40.000	2467.698	8.797	82.098	
45.000	1813.852	6.466	60.345	
50.000	1379.661	4.919	45.900	
50.730	1328.899	4.738	44.211	<i>K</i> <sub><math>\alpha</math>1</sub>
57.576	959.693	3.421	31.928	<i>K</i> <sub><math>\beta</math>1</sub>
59.389	886.682	3.161	29.499	
59.391	4143.062	14.770	137.836	<i>K</i> edge
60.000	4034.501	14.383	134.224	
70.000	2695.005	9.608	89.661	
80.000	1895.601	6.758	63.065	
90.000	1388.998	4.952	46.211	
100.000	1052.238	3.751	35.007	

**ATOMIC DATA**

Atomic weight = 173.040 gr/mole

Density = 6.977 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 287.300 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	61.332
<i>L<sub>I</sub></i>	10.488
<i>L<sub>II</sub></i>	9.978
<i>L<sub>III</sub></i>	8.943

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	59.352
<i>K<sub>α1</sub></i>	52.360
<i>L<sub>β1</sub></i>	8.401
<i>L<sub>α1</sub></i>	7.414

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1102653.250	3837.986	26777.627	
1.500	418051.844	1455.106	10152.272	
2.000	210815.078	733.780	5119.585	
2.397	137370.219	478.142	3335.998	
2.399	1024295.188	3565.246	24874.723	<i>M</i> edge
3.000	564100.938	1963.456	13699.034	
4.000	262280.188	912.914	6369.401	
5.000	145112.297	505.090	3524.012	
6.000	89642.406	312.017	2176.941	
7.000	59760.090	208.006	1451.257	
7.414	51402.152	178.915	1248.287	<i>L</i> <sub><math>\alpha</math>1</sub>
8.000	42126.723	146.630	1023.036	
8.401	37078.418	129.058	900.439	<i>L</i> <sub><math>\beta</math>1</sub>
8.942	31516.711	109.700	765.375	
8.944	78918.125	274.689	1916.505	<i>L</i> <sub>III</sub> edge
9.000	77625.195	270.189	1885.106	
9.977	59111.199	205.747	1435.499	
9.979	82801.367	288.205	2010.808	<i>L</i> <sub>II</sub> edge
10.000	82341.125	286.603	1999.631	
10.487	72590.383	252.664	1762.837	
10.489	85584.625	297.893	2078.399	<i>L</i> <sub>I</sub> edge
12.000	60674.684	211.189	1473.468	
14.000	40816.152	142.068	991.209	
16.000	28895.320	100.575	701.715	
18.000	21276.568	74.057	516.696	
20.000	16164.069	56.262	392.540	
22.000	12596.754	43.845	305.909	
24.000	10026.648	34.900	243.494	
26.000	8124.862	28.280	197.310	
28.000	6685.340	23.270	162.352	
30.000	5574.337	19.402	135.371	
35.000	3712.523	12.922	90.158	
40.000	2610.811	9.087	63.403	
45.000	1914.935	6.665	46.504	
50.000	1452.531	5.056	35.274	
52.360	1287.532	4.481	31.267	<i>K</i> <sub><math>\alpha</math>1</sub>
59.352	929.347	3.235	22.569	<i>K</i> <sub><math>\beta</math>1</sub>
60.000	903.595	3.145	21.944	
61.331	853.792	2.972	20.734	
61.333	3862.716	13.445	93.805	<i>K</i> edge
70.000	2803.401	9.758	68.080	
80.000	2013.666	7.009	48.901	
90.000	1497.255	5.211	36.360	
100.000	1145.861	3.988	27.827	

**ATOMIC DATA**

Atomic weight = 174.990 gr/mole

Density = 9.842 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 290.600 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	63.314
<i>L<sub>I</sub></i>	10.870
<i>L<sub>II</sub></i>	10.349
<i>L<sub>III</sub></i>	9.244

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	61.282
<i>K<sub>α1</sub></i>	54.063
<i>L<sub>β1</sub></i>	8.708
<i>L<sub>α1</sub></i>	7.654

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1182715.625	4069.909	40056.047	
1.500	447488.438	1539.878	15155.476	
2.000	225303.281	775.304	7630.540	
2.491	133912.406	460.814	4535.327	
2.493	976449.000	3360.114	33070.238	<i>M</i> edge
3.000	596485.750	2052.601	20201.695	
4.000	277772.250	955.858	9407.552	
5.000	153860.938	529.460	5210.940	
6.000	95130.867	327.360	3221.879	
7.000	63463.035	218.386	2149.357	
7.654	50237.902	172.876	1701.450	<i>L</i> <sub><math>\alpha</math>1</sub>
8.000	44761.773	154.032	1515.985	
8.708	35892.078	123.510	1215.588	<i>L</i> <sub><math>\beta</math>1</sub>
9.000	32944.457	113.367	1115.758	
9.243	30743.812	105.794	1041.227	
9.245	78307.109	269.467	2652.094	<i>L</i> <sub>III</sub> edge
10.000	63654.980	219.047	2155.858	
10.348	58165.891	200.158	1969.954	
10.350	81471.750	280.357	2759.274	<i>L</i> <sub>II</sub> edge
10.869	71582.977	246.328	2424.362	
10.871	83770.156	288.266	2837.116	<i>L</i> <sub>I</sub> edge
12.000	64860.715	223.196	2196.694	
14.000	43462.418	149.561	1471.979	
16.000	30692.422	105.617	1039.487	
18.000	22565.801	77.652	764.255	
20.000	17129.566	58.946	580.142	
22.000	13345.052	45.922	451.968	
24.000	10622.969	36.555	359.777	
26.000	8611.058	29.632	291.638	
28.000	7089.373	24.396	240.102	
30.000	5915.483	20.356	200.345	
35.000	3948.699	13.588	133.734	
40.000	2784.268	9.581	94.297	
45.000	2047.874	7.047	69.357	
50.000	1557.726	5.360	52.757	
54.063	1272.981	4.381	43.113	<i>K</i> <sub><math>\alpha</math>1</sub>
60.000	974.195	3.352	32.994	
61.282	922.990	3.176	31.260	<i>K</i> <sub><math>\beta</math>1</sub>
63.313	849.428	2.923	28.768	
63.315	3865.226	13.301	130.907	<i>K</i> edge
70.000	2975.168	10.238	100.763	
80.000	2096.415	7.214	71.001	
90.000	1538.311	5.294	52.099	
100.000	1166.611	4.014	39.511	

**ATOMIC DATA**

Atomic weight = 178.500 gr/mole

Density = 13.300 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 296.400 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	65.351
<i>L<sub>I</sub></i>	11.272
<i>L<sub>II</sub></i>	10.739
<i>L<sub>III</sub></i>	9.561

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	63.209
<i>K<sub>α1</sub></i>	55.757
<i>L<sub>β1</sub></i>	9.021
<i>L<sub>α1</sub></i>	7.898



## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1272785.000	4294.146	57112.148	
1.500	477632.594	1611.446	21432.232	
2.000	239068.828	806.575	10727.448	
2.601	127629.328	430.598	5726.957	
2.603	920033.188	3104.026	41283.543	<i>M</i> edge
3.000	631313.375	2129.937	28328.166	
4.000	294720.562	994.334	13224.641	
5.000	163551.078	551.792	7338.831	
6.000	101268.211	341.661	4544.086	
7.000	67635.453	228.190	3034.924	
7.898	49370.879	166.568	2215.360	<i>L</i> <sub><math>\alpha</math>1</sub>
8.000	47749.566	161.098	2142.609	
9.000	35170.742	118.660	1578.174	
9.021	34959.086	117.946	1568.677	<i>L</i> <sub><math>\beta</math>1</sub>
9.560	30086.117	101.505	1350.018	
9.562	70698.289	238.523	3172.359	<i>L</i> <sub>III</sub> edge
10.000	62848.934	212.041	2820.145	
10.738	52135.633	175.896	2339.419	
10.740	72976.836	246.211	3274.602	<i>L</i> <sub>II</sub> edge
11.271	64268.926	216.832	2883.862	
11.273	76316.930	257.480	3424.478	<i>L</i> <sub>I</sub> edge
12.000	65465.340	220.868	2937.547	
14.000	44672.797	150.718	2004.549	
16.000	31944.992	107.777	1433.429	
18.000	23688.928	79.922	1062.965	
20.000	18085.080	61.016	811.510	
22.000	14140.021	47.706	634.488	
24.000	11277.979	38.050	506.063	
26.000	9148.662	30.866	410.517	
28.000	7530.142	25.405	337.891	
30.000	6276.952	21.177	281.658	
35.000	4169.512	14.067	187.093	
40.000	2919.207	9.849	130.990	
45.000	2129.368	7.184	95.549	
50.000	1605.314	5.416	72.033	
55.757	1198.948	4.045	53.799	<i>K</i> <sub><math>\alpha</math>1</sub>
60.000	985.693	3.326	44.230	
63.209	858.055	2.895	38.502	<i>K</i> <sub><math>\beta</math>1</sub>
65.350	785.457	2.650	35.245	
65.352	3683.415	12.427	165.281	<i>K</i> edge
70.000	3099.229	10.456	139.068	
80.000	2205.245	7.440	98.953	
90.000	1627.059	5.489	73.009	
100.000	1237.254	4.174	55.518	

**ATOMIC DATA**

Atomic weight = 180.950 gr/mole

Density = 16.600 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 300.500 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	67.414
<i>L<sub>I</sub></i>	11.680
<i>L<sub>II</sub></i>	11.136
<i>L<sub>III</sub></i>	9.881

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	65.210
<i>K<sub>α1</sub></i>	57.524
<i>L<sub>β1</sub></i>	9.341
<i>L<sub>α1</sub></i>	8.145

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1373826.500	4571.802	75891.914	
1.500	506420.375	1685.259	27975.303	
2.000	250291.484	832.917	13826.418	
2.702	120471.883	400.905	6655.020	
2.704	855844.000	2848.067	47277.906	<i>M</i> edge
3.000	649752.688	2162.239	35893.160	
4.000	303392.469	1009.626	16759.783	
5.000	168391.484	560.371	9302.159	
6.000	104279.828	347.021	5760.550	
7.000	69655.398	231.798	3847.852	
8.000	49181.090	163.664	2716.826	
8.145	46937.133	156.197	2592.867	<i>L</i> <sub><math>\alpha</math>1</sub>
9.000	36228.867	120.562	2001.328	
9.341	32905.551	109.503	1817.744	<i>L</i> <sub><math>\beta</math>1</sub>
9.880	28468.199	94.736	1572.619	
9.882	71805.484	238.953	3966.626	<i>L</i> <sub>III</sub> edge
10.000	69599.688	231.613	3844.775	
11.135	52483.250	174.653	2899.241	
11.137	73469.953	244.492	4058.573	<i>L</i> <sub>II</sub> edge
11.679	64829.695	215.739	3581.274	
11.681	75989.266	252.876	4197.743	<i>L</i> <sub>I</sub> edge
12.000	70904.375	235.955	3916.847	
14.000	47651.941	158.576	2632.354	
16.000	33723.379	112.224	1862.922	
18.000	24833.590	82.641	1371.839	
20.000	18873.102	62.806	1042.574	
22.000	14715.968	48.972	812.929	
24.000	11721.411	39.006	647.506	
26.000	9505.439	31.632	525.093	
28.000	7827.741	26.049	432.414	
30.000	6532.467	21.739	360.862	
35.000	4360.167	14.510	240.861	
40.000	3072.802	10.226	169.745	
45.000	2258.266	7.515	124.749	
50.000	1716.022	5.711	94.795	
57.524	1193.362	3.971	65.923	<i>K</i> <sub><math>\alpha</math>1</sub>
60.000	1070.584	3.563	59.140	
65.210	864.832	2.878	47.774	<i>K</i> <sub><math>\beta</math>1</sub>
67.413	794.604	2.644	43.895	
67.415	3453.216	11.492	190.760	<i>K</i> edge
70.000	3144.636	10.465	173.714	
80.000	2247.755	7.480	124.169	
90.000	1665.577	5.543	92.009	
100.000	1271.571	4.232	70.243	

**ATOMIC DATA**

Atomic weight = 183.920 gr/mole

Density = 19.300 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 305.400 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	69.524
<i>L<sub>I</sub></i>	12.098
<i>L<sub>II</sub></i>	11.542
<i>L<sub>III</sub></i>	10.204

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	67.233
<i>K<sub>α1</sub></i>	59.310
<i>L<sub>β1</sub></i>	9.670
<i>L<sub>α1</sub></i>	8.396

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1404841.125	4600.004	88780.070	
1.500	549318.250	1798.685	34714.609	
2.000	282933.906	926.437	17880.236	
2.817	129145.828	422.874	8161.475	
2.819	777365.312	2545.401	49126.230	<i>M</i> edge
3.000	661361.062	2165.557	41795.246	
4.000	313689.094	1027.142	19823.836	
5.000	176214.844	576.997	11136.039	
6.000	110188.945	360.802	6963.479	
7.000	74198.680	242.956	4689.045	
8.000	52749.062	172.721	3333.520	
8.396	46639.379	152.716	2947.413	<i>L</i> <sub>α1</sub>
9.000	39087.309	127.987	2470.154	
9.670	32579.645	106.679	2058.897	<i>L</i> <sub>β1</sub>
10.000	29926.807	97.992	1891.249	
10.203	28444.186	93.137	1797.553	
10.205	72203.453	236.423	4562.956	<i>L</i> <sub>III</sub> edge
11.541	52613.785	172.278	3324.971	
11.543	73657.820	241.185	4654.865	<i>L</i> <sub>II</sub> edge
12.000	66637.555	218.198	4211.214	
12.097	65268.367	213.714	4124.687	
12.099	75740.195	248.003	4786.463	<i>L</i> <sub>I</sub> edge
14.000	51936.363	170.060	3282.160	
16.000	36701.938	120.177	2319.409	
18.000	26981.051	88.347	1705.089	
20.000	20467.260	67.018	1293.445	
22.000	15928.104	52.155	1006.589	
24.000	12661.756	41.460	800.170	
26.000	10247.438	33.554	647.595	
28.000	8421.880	27.577	532.227	
30.000	7014.288	22.968	443.274	
35.000	4658.965	15.255	294.427	
40.000	3268.059	10.701	206.528	
45.000	2391.119	7.829	151.109	
50.000	1809.365	5.925	114.344	
59.310	1154.623	3.781	72.967	<i>K</i> <sub>α1</sub>
60.000	1120.204	3.668	70.792	
67.233	832.973	2.727	52.640	<i>K</i> <sub>β1</sub>
69.523	763.899	2.501	48.275	
69.525	3364.630	11.017	212.631	<i>K</i> edge
70.000	3309.041	10.835	209.118	
80.000	2378.452	7.788	150.308	
90.000	1769.299	5.793	111.812	
100.000	1354.419	4.435	85.594	

**ATOMIC DATA**

Atomic weight = 186.200 gr/mole

Density = 21.020 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 309.200 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	71.676
<i>L<sub>I</sub></i>	12.525
<i>L<sub>II</sub></i>	11.957
<i>L<sub>III</sub></i>	10.534

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	69.298
<i>K<sub>α1</sub></i>	61.131
<i>L<sub>β1</sub></i>	10.008
<i>L<sub>α1</sub></i>	8.651

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1530207.250	4948.924	104026.375	
1.500	591625.438	1913.407	40219.812	
2.000	302276.531	977.608	20549.330	
2.930	124812.547	403.663	8484.992	
2.932	757160.812	2448.773	51473.223	<i>M</i> edge
3.000	713102.375	2306.282	48478.047	
4.000	336455.219	1088.147	22872.861	
5.000	188227.094	608.755	12796.033	
6.000	117302.016	379.373	7974.413	
7.000	78761.469	254.727	5354.354	
8.000	55853.008	180.637	3796.993	
8.651	45696.609	147.790	3106.542	<i>L</i> <sub><math>\alpha</math>1</sub>
9.000	41296.180	133.558	2807.392	
10.000	31555.719	102.056	2145.217	
10.008	31491.510	101.848	2140.852	<i>L</i> <sub><math>\beta</math>1</sub>
10.533	27648.850	89.421	1879.621	
10.535	71647.727	231.720	4870.748	<i>L</i> <sub>III</sub> edge
11.956	51627.293	166.971	3509.721	
11.958	72270.828	233.735	4913.107	<i>L</i> <sub>II</sub> edge
12.000	71615.586	231.616	4868.562	
12.524	64092.305	207.284	4357.116	
12.526	73487.867	237.671	4995.844	<i>L</i> <sub>I</sub> edge
14.000	54705.699	176.927	3718.997	
16.000	38395.137	124.176	2610.174	
18.000	28104.811	90.895	1910.618	
20.000	21267.133	68.781	1445.780	
22.000	16531.902	53.467	1123.870	
24.000	13140.061	42.497	893.286	
26.000	10641.277	34.416	723.414	
28.000	8756.194	28.319	595.263	
30.000	7304.862	23.625	496.598	
35.000	4878.755	15.779	331.667	
40.000	3445.089	11.142	234.204	
45.000	2538.865	8.211	172.597	
50.000	1935.402	6.259	131.572	
60.000	1215.722	3.932	82.647	
61.131	1159.645	3.750	78.835	<i>K</i> <sub><math>\alpha</math>1</sub>
69.298	846.503	2.738	57.547	<i>K</i> <sub><math>\beta</math>1</sub>
70.000	825.517	2.670	56.120	
71.675	778.398	2.517	52.917	
71.677	3234.082	10.460	219.859	<i>K</i> edge
80.000	2496.007	8.072	169.683	
90.000	1876.490	6.069	127.567	
100.000	1446.163	4.677	98.313	

**ATOMIC DATA**

Atomic weight = 190.200 gr/mole

Density = 22.500 gr/cm<sup>3</sup>

1.000 cm<sup>2</sup>/gr = 315.800 barns/atom

**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	73.872
<i>L<sub>I</sub></i>	12.964
<i>L<sub>II</sub></i>	12.384
<i>L<sub>III</sub></i>	10.871

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	71.404
<i>K<sub>α1</sub></i>	62.991
<i>L<sub>β1</sub></i>	10.354
<i>L<sub>α1</sub></i>	8.910



## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1593112.750	5044.689	113505.508	
1.500	649991.875	2058.239	46310.379	
2.000	344851.156	1091.992	24569.826	
3.000	141978.312	449.583	10115.618	
3.049	137058.688	434.005	9765.106	
3.051	723716.188	2291.692	51563.062	<i>M</i> edge
4.000	356129.750	1127.707	25373.400	
5.000	198896.609	629.818	14170.911	
6.000	123776.594	391.946	8818.789	
7.000	83008.047	262.850	5914.126	
8.000	58801.746	186.199	4189.485	
8.910	44570.160	141.134	3175.518	<i>L</i> <sub><math>\alpha</math>1</sub>
9.000	43435.031	137.540	3094.643	
10.000	33161.559	105.008	2362.682	
10.354	30341.891	96.079	2161.788	<i>L</i> <sub><math>\beta</math>1</sub>
10.870	26803.098	84.874	1909.657	
10.872	65674.727	207.963	4679.168	<i>L</i> <sub>III</sub> edge
12.000	50834.012	160.969	3621.803	
12.383	46859.211	148.383	3338.608	
12.385	65554.305	207.582	4670.589	<i>L</i> <sub>II</sub> edge
12.963	58219.484	184.356	4148.000	
12.965	68002.367	215.334	4845.007	<i>L</i> <sub>I</sub> edge
14.000	55846.637	176.842	3978.940	
16.000	39611.180	125.431	2822.203	
18.000	29225.322	92.544	2082.235	
20.000	22247.744	70.449	1585.099	
22.000	17372.525	55.011	1237.751	
24.000	13855.114	43.873	987.144	
26.000	11248.451	35.619	801.425	
28.000	9272.377	29.362	660.635	
30.000	7744.902	24.525	551.806	
35.000	5178.669	16.399	368.968	
40.000	3654.347	11.572	260.364	
45.000	2688.022	8.512	191.515	
50.000	2043.684	6.471	145.608	
60.000	1275.272	4.038	90.860	
62.991	1125.410	3.564	80.183	<i>K</i> <sub><math>\alpha</math>1</sub>
70.000	859.565	2.722	61.242	
71.404	817.291	2.588	58.230	<i>K</i> <sub><math>\beta</math>1</sub>
73.871	749.935	2.375	53.431	
73.873	3273.042	10.364	233.196	<i>K</i> edge
80.000	2656.363	8.412	189.260	
90.000	1950.593	6.177	138.975	
100.000	1480.413	4.688	105.476	

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## IRIDIUM

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## ATOMIC DATA

Atomic weight = 192.200 gr/mole

Density = 22.420 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 319.100 barns/atom

## ABSORPTION EDGES

EDGE	ENERGY(KeV)
<i>K</i>	76.112
<i>L<sub>I</sub></i>	13.424
<i>L<sub>II</sub></i>	12.824
<i>L<sub>III</sub></i>	11.215

## FLUORESCENT ENERGIES

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	73.549
<i>K<sub>α1</sub></i>	64.886
<i>L<sub>β1</sub></i>	10.706
<i>L<sub>α1</sub></i>	9.173

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1696050.500	5315.106	119164.688	
1.500	642918.875	2014.788	45171.547	
2.000	323927.438	1015.128	22759.176	
3.000	124250.430	389.378	8729.849	
3.171	109108.625	341.926	7665.983	
3.173	701523.062	2198.443	49289.086	<i>M</i> edge
4.000	381058.188	1194.165	26773.188	
5.000	212000.359	664.370	14895.168	
6.000	131513.250	412.138	9240.135	
7.000	87958.852	275.647	6179.998	
8.000	62162.902	194.807	4367.572	
9.000	45822.812	143.600	3219.516	
9.173	43623.602	136.708	3064.999	<i>L</i> <sub><math>\alpha</math>1</sub>
10.000	34919.812	109.432	2453.470	
10.706	29303.865	91.833	2058.893	<i>L</i> <sub><math>\beta</math>1</sub>
11.214	26019.885	81.541	1828.160	
11.216	60196.676	188.645	4229.425	<i>L</i> <sub>III</sub> edge
12.000	50468.324	158.158	3545.910	
12.823	42458.750	133.058	2983.156	
12.825	59356.000	186.011	4170.359	<i>L</i> <sub>II</sub> edge
13.423	52687.301	165.112	3701.815	
13.425	63184.473	198.008	4439.348	<i>L</i> <sub>I</sub> edge
14.000	57025.898	178.709	4006.646	
16.000	41027.184	128.572	2882.574	
18.000	30581.629	95.837	2148.668	
20.000	23451.551	73.493	1647.708	
22.000	18407.123	57.684	1293.286	
24.000	14731.393	46.165	1035.029	
26.000	11985.943	37.562	842.134	
28.000	9891.667	30.999	694.990	
30.000	8264.872	25.901	580.691	
35.000	5516.332	17.287	387.578	
40.000	3875.761	12.146	272.311	
45.000	2834.200	8.882	199.131	
50.000	2140.236	6.707	150.373	
60.000	1315.789	4.123	92.447	
64.886	1068.231	3.348	75.054	<i>K</i> <sub><math>\alpha</math>1</sub>
70.000	873.467	2.737	61.370	
73.549	766.455	2.402	53.851	<i>K</i> <sub><math>\beta</math>1</sub>
76.111	700.365	2.195	49.208	
76.113	3092.750	9.692	217.297	<i>K</i> edge
80.000	2721.227	8.528	191.194	
90.000	2009.112	6.296	141.160	
100.000	1531.177	4.798	107.581	

**ATOMIC DATA**

Atomic weight = 195.090 gr/mole

Density = 21.370 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 323.900 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	78.395
<i>L<sub>I</sub></i>	13.892
<i>L<sub>II</sub></i>	13.273
<i>L<sub>III</sub></i>	11.564

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	75.736
<i>K<sub>α1</sub></i>	66.820
<i>L<sub>β1</sub></i>	11.069
<i>L<sub>α1</sub></i>	9.441

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1758735.125	5429.871	116036.344	
1.500	681201.000	2103.121	44943.707	
2.000	348431.750	1075.739	22988.537	
3.000	136420.188	421.180	9000.616	
3.296	109934.445	339.409	7253.162	
3.298	704756.312	2175.845	46497.816	<i>M</i> edge
4.000	418315.531	1291.496	27599.270	
5.000	229200.844	707.628	15122.021	
6.000	140426.812	433.550	9264.962	
7.000	92944.383	286.954	6132.206	
8.000	65099.684	200.987	4295.092	
9.000	47613.527	147.001	3141.405	
9.441	41949.203	129.513	2767.689	<i>L</i> <sub><math>\alpha</math>1</sub>
10.000	36034.570	111.252	2377.458	
11.069	27579.342	85.148	1819.607	<i>L</i> <sub><math>\beta</math>1</sub>
11.563	24593.893	75.931	1622.635	
11.565	62483.434	192.910	4122.479	<i>L</i> <sub>III</sub> edge
12.000	56600.949	174.748	3734.370	
13.272	43234.137	133.480	2852.465	
13.274	60451.609	186.637	3988.425	<i>L</i> <sub>II</sub> edge
13.891	53514.625	165.220	3530.743	
13.893	63378.074	195.672	4181.505	<i>L</i> <sub>I</sub> edge
14.000	62140.969	191.852	4099.884	
16.000	44049.770	135.998	2906.279	
18.000	32468.893	100.244	2142.205	
20.000	24687.082	76.218	1628.783	
22.000	19250.863	59.435	1270.117	
24.000	15330.314	47.330	1011.451	
26.000	12426.648	38.366	819.875	
28.000	10227.090	31.575	674.754	
30.000	8528.310	26.330	562.674	
35.000	5678.848	17.533	374.674	
40.000	3990.777	12.321	263.300	
45.000	2923.656	9.026	192.894	
50.000	2214.151	6.836	146.083	
60.000	1371.456	4.234	90.485	
66.820	1035.744	3.198	68.335	<i>K</i> <sub><math>\alpha</math>1</sub>
70.000	918.116	2.835	60.575	
75.736	749.428	2.314	49.445	<i>K</i> <sub><math>\beta</math>1</sub>
78.394	686.049	2.118	45.264	
78.396	2997.751	9.255	197.783	<i>K</i> edge
80.000	2843.223	8.778	187.588	
90.000	2089.221	6.450	137.841	
100.000	1585.968	4.896	104.638	

**ATOMIC DATA**

Atomic weight = 197.200 gr/mole

Density = 19.370 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 327.400 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	80.723
<i>L<sub>I</sub></i>	14.353
<i>L<sub>II</sub></i>	13.733
<i>L<sub>III</sub></i>	11.918

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	77.968
<i>K<sub>α1</sub></i>	68.779
<i>L<sub>β1</sub></i>	11.439
<i>L<sub>α1</sub></i>	9.711

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GOLD

Au

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	1869797.875	5711.050	110623.055	
1.500	729988.188	2229.652	43188.371	
2.000	375437.125	1146.723	22212.027	
3.000	148064.562	452.244	8759.960	
3.424	109597.117	334.750	6484.106	
3.426	599568.062	1831.301	35472.309	<i>M</i> edge
4.000	403023.625	1230.982	23844.129	
5.000	227711.188	695.514	13472.102	
6.000	143033.781	436.878	8462.323	
7.000	96664.594	295.249	5718.978	
8.000	68923.406	210.517	4077.723	
9.000	51197.051	156.375	3028.977	
9.711	42280.781	129.141	2501.462	<i>L</i> <sub>α1</sub>
10.000	39277.887	119.969	2323.802	
11.439	28048.143	85.669	1659.415	<i>L</i> <sub>β1</sub>
11.917	25323.537	77.347	1498.219	
11.919	59784.008	182.602	3537.008	<i>L</i> <sub>III</sub> edge
12.000	58763.324	179.485	3476.621	
13.732	41728.332	127.454	2468.778	
13.734	58334.582	178.175	3451.255	<i>L</i> <sub>II</sub> edge
14.000	55552.324	169.677	3286.648	
14.352	52147.930	159.279	3085.234	
14.354	60271.996	184.093	3565.879	<i>L</i> <sub>I</sub> edge
16.000	45598.871	139.276	2697.771	
18.000	33649.047	102.777	1990.782	
20.000	25614.002	78.235	1515.404	
22.000	19996.734	61.077	1183.069	
24.000	15942.463	48.694	943.206	
26.000	12937.322	39.515	765.412	
28.000	10659.005	32.557	630.620	
30.000	8897.915	27.178	526.428	
35.000	5939.847	18.142	351.420	
40.000	4183.806	12.779	247.527	
45.000	3071.504	9.382	181.720	
50.000	2330.539	7.118	137.882	
60.000	1448.237	4.423	85.682	
68.779	1017.048	3.106	60.172	<i>K</i> <sub>α1</sub>
70.000	972.014	2.969	57.507	
77.968	737.703	2.253	43.645	<i>K</i> <sub>β1</sub>
80.000	691.033	2.111	40.884	
80.722	675.474	2.063	39.963	
80.724	2834.277	8.657	167.685	<i>K</i> edge
90.000	2174.433	6.642	128.646	
100.000	1675.791	5.118	99.145	

**ATOMIC DATA**

Atomic weight = 200.610 gr/mole

Density = 13.546 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 333.100 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	83.103
<i>L<sub>I</sub></i>	14.846
<i>L<sub>II</sub></i>	14.209
<i>L<sub>III</sub></i>	12.284

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	80.258
<i>K<sub>α1</sub></i>	70.821
<i>L<sub>β1</sub></i>	11.823
<i>L<sub>α1</sub></i>	9.987



## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	2024712.125	6078.391	82337.883	
1.500	789758.500	2370.935	32116.686	
2.000	405867.062	1218.454	16505.178	
3.000	159842.922	479.865	6500.247	
3.561	108162.023	324.713	4398.567	
3.563	587659.562	1764.214	23898.037	<i>M</i> edge
4.000	435368.344	1307.020	17704.891	
5.000	244399.609	733.712	9938.868	
6.000	152705.031	458.436	6209.974	
7.000	102738.898	308.433	4178.028	
8.000	72971.070	219.067	2967.475	
9.000	54019.223	162.171	2196.771	
9.987	41454.203	124.450	1685.796	<i>L</i> <sub><math>\alpha</math>1</sub>
10.000	41317.469	124.039	1680.235	
11.823	27040.387	81.178	1099.637	<i>L</i> <sub><math>\beta</math>1</sub>
12.000	26045.557	78.191	1059.181	
12.283	24559.439	73.730	998.746	
12.285	57022.895	171.189	2318.919	<i>L</i> <sub>III</sub> edge
14.000	40778.980	122.423	1658.337	
14.208	39267.016	117.884	1596.851	
14.210	54870.078	164.726	2231.372	<i>L</i> <sub>II</sub> edge
14.845	49031.496	147.198	1993.938	
14.847	57527.027	172.702	2339.421	<i>L</i> <sub>I</sub> edge
16.000	47637.297	143.012	1937.240	
18.000	35341.414	106.099	1437.210	
20.000	27017.939	81.111	1098.724	
22.000	21166.406	63.544	860.763	
24.000	16923.131	50.805	688.204	
26.000	13765.275	41.325	559.785	
28.000	11362.976	34.113	462.092	
30.000	9500.575	28.522	386.355	
35.000	6359.851	19.093	258.633	
40.000	4486.716	13.470	182.459	
45.000	3296.316	9.896	134.050	
50.000	2501.462	7.510	101.726	
60.000	1552.990	4.662	63.155	
70.000	1040.271	3.123	42.304	
70.821	1009.358	3.030	41.047	<i>K</i> <sub><math>\alpha</math>1</sub>
80.000	737.665	2.215	29.998	
80.258	731.615	2.196	29.752	<i>K</i> <sub><math>\beta</math>1</sub>
83.102	669.393	2.010	27.222	
83.104	2869.848	8.616	116.707	<i>K</i> edge
90.000	2300.720	6.907	93.562	
100.000	1723.023	5.173	70.069	

**ATOMIC DATA**

Atomic weight = 204.390 gr/mole

Density = 11.860 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 339.400 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	85.528
<i>L<sub>I</sub></i>	15.344
<i>L<sub>II</sub></i>	14.698
<i>L<sub>III</sub></i>	12.657

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	82.558
<i>K<sub>α1</sub></i>	72.860
<i>L<sub>β1</sub></i>	12.210
<i>L<sub>α1</sub></i>	10.266

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	2081770.000	6133.677	72745.406	
1.500	832709.500	2453.475	29098.217	
2.000	435562.719	1283.332	15220.312	
3.000	175737.984	517.790	6140.991	
3.699	110396.852	325.271	3857.710	
3.701	561953.750	1655.727	19636.922	<i>M</i> edge
4.000	459106.312	1352.700	16043.020	
5.000	257171.172	757.723	8986.594	
6.000	160399.734	472.598	5605.011	
7.000	107752.844	317.480	3765.317	
8.000	76431.531	225.196	2670.825	
9.000	56515.160	166.515	1974.867	
10.000	43181.484	127.229	1508.935	
10.266	40387.230	118.996	1411.292	<i>L</i> <sub><math>\alpha</math>1</sub>
12.000	27171.654	80.058	949.487	
12.210	26004.551	76.619	908.703	<i>L</i> <sub><math>\beta</math>1</sub>
12.656	23750.086	69.977	829.923	
12.658	57282.309	168.775	2001.674	<i>L</i> <sub>III</sub> edge
14.000	44186.031	130.189	1544.037	
14.697	38995.164	114.894	1362.648	
14.699	54491.684	160.553	1904.158	<i>L</i> <sub>II</sub> edge
15.343	48778.957	143.721	1704.533	
15.345	56509.031	166.497	1974.653	<i>L</i> <sub>I</sub> edge
16.000	50719.992	149.440	1772.360	
18.000	37387.297	110.157	1306.462	
20.000	28446.297	83.813	994.028	
22.000	22207.490	65.432	776.019	
24.000	17710.514	52.182	618.877	
26.000	14380.108	42.369	502.499	
28.000	11856.455	34.934	414.312	
30.000	9906.210	29.187	346.163	
35.000	6630.005	19.534	231.679	
40.000	4683.351	13.799	163.655	
45.000	3448.420	10.160	120.502	
50.000	2624.198	7.732	91.700	
60.000	1639.719	4.831	57.298	
70.000	1105.840	3.258	38.642	
72.860	999.032	2.944	34.910	<i>K</i> <sub><math>\alpha</math>1</sub>
80.000	789.335	2.326	27.583	
82.558	729.544	2.150	25.493	<i>K</i> <sub><math>\beta</math>1</sub>
85.527	668.054	1.968	23.344	
85.529	2788.410	8.216	97.438	<i>K</i> edge
90.000	2438.719	7.185	85.219	
100.000	1849.818	5.450	64.640	

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LEAD

Pb

**ATOMIC DATA**

Atomic weight = 207.210 gr/mole

Density = 11.340 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 344.100 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	88.006
<i>L<sub>I</sub></i>	15.860
<i>L<sub>II</sub></i>	15.198
<i>L<sub>III</sub></i>	13.035

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	84.922
<i>K<sub>α1</sub></i>	74.957
<i>L<sub>β1</sub></i>	12.611
<i>L<sub>α1</sub></i>	10.549

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	2144694.750	6232.766	70679.562	
1.500	863044.812	2508.122	28442.104	
2.000	453333.188	1317.446	14939.838	
3.000	183964.359	534.625	6062.644	
3.849	106202.633	308.639	3499.965	
3.851	536603.938	1559.442	17684.070	<i>M</i> edge
4.000	486149.219	1412.814	16021.308	
5.000	272317.812	791.391	8974.380	
6.000	169838.438	493.573	5597.117	
7.000	114084.414	331.544	3759.713	
8.000	80914.180	235.147	2666.570	
9.000	59822.297	173.851	1971.476	
10.000	45701.977	132.816	1506.133	
10.549	39882.215	115.903	1314.340	<i>L</i> <sub><math>\alpha</math>1</sub>
12.000	28748.551	83.547	947.424	
12.611	25352.875	73.679	835.518	<i>L</i> <sub><math>\beta</math>1</sub>
13.034	23325.244	67.786	768.696	
13.036	55528.039	161.372	1829.956	<i>L</i> <sub>III</sub> edge
14.000	46207.484	134.285	1522.792	
15.197	37418.684	108.744	1233.153	
15.199	52275.277	151.919	1722.760	<i>L</i> <sub>II</sub> edge
15.859	46842.371	136.130	1543.715	
15.861	54116.148	157.269	1783.427	<i>L</i> <sub>I</sub> edge
16.000	52902.844	153.743	1743.442	
18.000	38938.691	113.161	1283.245	
20.000	29585.908	85.981	975.019	
22.000	23067.486	67.037	760.201	
24.000	18374.156	53.398	605.530	
26.000	14901.979	43.307	491.103	
28.000	12273.521	35.668	404.480	
30.000	10244.198	29.771	337.603	
35.000	6840.143	19.878	225.421	
40.000	4821.648	14.012	158.900	
45.000	3543.509	10.298	116.778	
50.000	2691.886	7.823	88.713	
60.000	1676.868	4.873	55.262	
70.000	1127.919	3.278	37.171	
74.957	947.319	2.753	31.219	<i>K</i> <sub><math>\alpha</math>1</sub>
80.000	803.251	2.334	26.472	
84.922	691.236	2.009	22.780	<i>K</i> <sub><math>\beta</math>1</sub>
88.005	632.286	1.838	20.837	
88.007	2575.681	7.485	84.883	<i>K</i> edge
90.000	2437.933	7.085	80.343	
100.000	1879.790	5.463	61.949	

**ATOMIC DATA**

Atomic weight = 209.000 gr/mole

Density = 9.800 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 347.000 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	90.527
<i>L<sub>I</sub></i>	16.385
<i>L<sub>II</sub></i>	15.708
<i>L<sub>III</sub></i>	13.418

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	87.335
<i>K<sub>α1</sub></i>	77.097
<i>L<sub>β1</sub></i>	13.021
<i>L<sub>α1</sub></i>	10.836

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	2384404.250	6871.482	67340.523	
1.500	937604.750	2702.031	26479.904	
2.000	484487.625	1396.218	13682.937	
3.000	192140.750	553.720	5426.454	
3.998	100440.086	289.453	2836.636	
4.000	503309.312	1450.459	14214.500	<i>M</i> edge
4.000	503309.312	1450.459	14214.500	
5.000	283724.156	817.649	8012.959	
6.000	177860.438	512.566	5023.148	
7.000	119983.008	345.772	3388.569	
8.000	85406.609	246.129	2412.060	
9.000	63341.719	182.541	1788.902	
10.000	48523.297	139.837	1370.399	
10.836	39628.957	114.204	1119.204	<i>L</i> <sub><math>\alpha</math>1</sub>
12.000	30662.947	88.366	865.985	
13.021	24990.186	72.018	705.775	<i>L</i> <sub><math>\beta</math>1</sub>
13.417	23187.072	66.822	654.851	
13.419	52402.191	151.015	1479.947	<i>L</i> <sub>III</sub> edge
14.000	47040.977	135.565	1328.535	
15.707	35111.281	101.185	991.615	
15.709	49028.895	141.294	1384.678	<i>L</i> <sub>II</sub> edge
16.000	46785.000	134.827	1321.306	
16.384	44037.891	126.910	1243.721	
16.386	51220.746	147.610	1446.580	<i>L</i> <sub>I</sub> edge
18.000	40344.797	116.267	1139.421	
20.000	30844.459	88.889	871.112	
22.000	24176.084	69.672	682.783	
24.000	19345.133	55.750	546.347	
26.000	15751.775	45.394	444.863	
28.000	13018.551	37.517	367.671	
30.000	10899.332	31.410	307.820	
35.000	7322.922	21.104	206.815	
40.000	5186.078	14.945	146.466	
45.000	3824.827	11.023	108.021	
50.000	2913.399	8.396	82.280	
60.000	1821.233	5.249	51.435	
70.000	1227.188	3.537	34.658	
77.097	960.090	2.767	27.115	<i>K</i> <sub><math>\alpha</math>1</sub>
80.000	874.438	2.520	24.696	
87.335	701.464	2.022	19.811	<i>K</i> <sub><math>\beta</math>1</sub>
90.000	650.767	1.875	18.379	
90.526	641.392	1.848	18.114	
90.528	2593.439	7.474	73.244	<i>K</i> edge
100.000	2016.561	5.811	56.952	

**ATOMIC DATA**

Atomic weight = 222.000 gr/mole

Density = 0.009730 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 368.600 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	98.417
<i>L<sub>I</sub></i>	18.055
<i>L<sub>II</sub></i>	17.334
<i>L<sub>III</sub></i>	14.612

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	94.877
<i>K<sub>α1</sub></i>	83.800
<i>L<sub>β1</sub></i>	14.316
<i>L<sub>α1</sub></i>	11.724



## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	2484526.750	6740.441	65.584496	
1.500	1050820.250	2850.842	27.738689	
2.000	571569.875	1550.651	15.087831	
3.000	243317.297	660.112	6.422890	
4.000	133331.297	361.724	3.519570	
4.477	105483.023	286.172	2.784454	
4.479	440328.969	1194.598	11.623443	<i>M</i> edge
5.000	331087.969	898.231	8.739788	
6.000	206624.547	560.566	5.454305	
7.000	138852.719	376.703	3.665320	
8.000	98505.898	267.243	2.600278	
9.000	72837.172	197.605	1.922696	
10.000	55645.707	150.965	1.468890	
11.724	37124.035	100.716	0.979970	<i>L</i> <sub><math>\alpha</math>1</sub>
12.000	34996.137	94.943	0.923799	
14.000	23700.748	64.299	0.625633	
14.316	22404.793	60.783	0.591423	<i>L</i> <sub><math>\beta</math>1</sub>
14.611	21283.572	57.742	0.561826	
14.613	48107.820	130.515	1.269911	<i>L</i> <sub>III</sub> edge
16.000	38121.957	103.424	1.006312	
17.333	31057.473	84.258	0.819830	
17.335	43334.262	117.564	1.143902	<i>L</i> <sub>II</sub> edge
18.000	39334.699	106.714	1.038325	
18.054	39032.879	105.895	1.030358	
18.056	44454.637	120.604	1.173477	<i>L</i> <sub>I</sub> edge
20.000	34282.586	93.008	0.904964	
22.000	26883.143	72.933	0.709639	
24.000	21515.453	58.371	0.567947	
26.000	17518.803	47.528	0.462447	
28.000	14476.531	39.274	0.382140	
30.000	12116.380	32.871	0.319838	
35.000	8131.254	22.060	0.214642	
40.000	5749.629	15.599	0.151774	
45.000	4232.855	11.484	0.111735	
50.000	3217.917	8.730	0.084944	
60.000	2003.270	5.435	0.052881	
70.000	1344.079	3.646	0.035480	
80.000	953.634	2.587	0.025173	
83.800	847.094	2.298	0.022361	<i>K</i> <sub><math>\alpha</math>1</sub>
90.000	706.720	1.917	0.018655	
94.877	618.706	1.679	0.016332	<i>K</i> <sub><math>\beta</math>1</sub>
98.416	564.463	1.531	0.014900	
98.418	2349.684	6.375	0.062025	<i>K</i> edge
100.000	2254.870	6.117	0.059522	

**ATOMIC DATA**

Atomic weight = 232.000 gr/mole

Density = 11.700 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 385.200 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	109.649
<i>L<sub>I</sub></i>	20.470
<i>L<sub>II</sub></i>	19.692
<i>L<sub>III</sub></i>	16.300

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	105.592
<i>K<sub>α1</sub></i>	93.334
<i>L<sub>β1</sub></i>	16.200
<i>L<sub>α1</sub></i>	12.966

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	2608587.500	6772.034	79232.797	
1.500	1204450.000	3126.817	36583.762	
2.000	696918.562	1809.238	21168.086	
3.000	323253.281	839.183	9818.440	
4.000	187929.500	487.875	5708.139	
5.000	123618.984	320.922	3754.782	
5.181	115655.008	300.247	3512.885	
5.183	363465.844	943.577	11039.850	<i>M</i> edge
6.000	249728.094	648.308	7585.199	
7.000	168349.438	437.044	5113.417	
8.000	119744.445	310.863	3637.097	
9.000	88735.992	230.363	2695.252	
10.000	67918.352	176.320	2062.940	
12.000	42840.953	111.217	1301.244	
12.966	35254.543	91.523	1070.816	<i>L</i> <sub><math>\alpha</math>1</sub>
14.000	29077.178	75.486	883.185	
16.000	20821.525	54.054	632.430	
16.200	20186.346	52.405	613.137	<i>L</i> <sub><math>\beta</math>1</sub>
16.299	19882.055	51.615	603.894	
16.301	45696.320	118.630	1387.972	<i>L</i> <sub>III</sub> edge
18.000	35513.156	92.194	1078.671	
19.691	28275.693	73.405	858.841	
19.693	39439.922	102.388	1197.942	<i>L</i> <sub>II</sub> edge
20.000	37914.648	98.428	1151.613	
20.469	35739.547	92.782	1085.547	
20.471	40628.078	105.473	1234.030	<i>L</i> <sub>I</sub> edge
22.000	33628.426	87.301	1021.424	
24.000	26766.838	69.488	813.011	
26.000	21702.961	56.342	659.202	
28.000	17876.518	46.408	542.978	
30.000	14926.146	38.749	453.364	
35.000	9983.276	25.917	303.230	
40.000	7053.927	18.312	214.255	
45.000	5197.845	13.494	157.878	
50.000	3959.400	10.279	120.262	
60.000	2479.144	6.436	75.301	
70.000	1674.692	4.348	50.867	
80.000	1196.391	3.106	36.339	
90.000	892.352	2.317	27.104	
93.334	815.735	2.118	24.777	<i>K</i> <sub><math>\alpha</math>1</sub>
100.000	688.828	1.788	20.922	
105.592	603.527	1.567	18.331	<i>K</i> <sub><math>\beta</math>1</sub>
109.648	551.082	1.431	16.738	
109.650	2064.039	5.358	62.693	<i>K</i> edge

**ATOMIC DATA**

Atomic weight = 238.070 gr/mole

Density = 19.050 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 395.300 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	115.603
<i>L<sub>I</sub></i>	21.756
<i>L<sub>II</sub></i>	20.947
<i>L<sub>III</sub></i>	17.167

**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	111.289
<i>K<sub>α1</sub></i>	98.428
<i>L<sub>β1</sub></i>	17.218
<i>L<sub>α1</sub></i>	13.613

## TOTAL CROSS SECTIONS

ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	2972116.000	7518.634	143229.969	
1.500	1260711.250	3189.252	60755.246	
2.000	687090.062	1738.148	33111.727	
3.000	293247.406	741.835	14131.958	
4.000	160950.750	407.161	7756.417	
5.000	101385.211	256.477	4885.880	
5.548	81827.258	207.000	3943.358	
5.550	309860.281	783.861	14932.554	<i>M</i> edge
6.000	254084.578	642.764	12244.652	
7.000	171744.156	434.465	8276.565	
8.000	122443.062	309.747	5900.684	
9.000	90922.266	230.008	4381.657	
10.000	69719.797	176.372	3359.884	
12.000	44117.273	111.605	2126.066	
13.613	32195.363	81.445	1551.535	<i>L</i> <sub>α1</sub>
14.000	30023.695	75.952	1446.879	
16.000	21548.818	54.513	1038.464	
17.166	18107.078	45.806	872.603	
17.168	39857.293	100.828	1920.773	<i>L</i> <sub>III</sub> edge
17.218	39565.750	100.090	1906.723	<i>L</i> <sub>β1</sub>
18.000	35371.430	89.480	1704.593	
20.000	27126.152	68.622	1307.243	
20.946	24149.680	61.092	1163.803	
20.948	33634.184	85.085	1620.873	<i>L</i> <sub>II</sub> edge
21.755	30568.422	77.330	1473.130	
21.757	35714.504	90.348	1721.126	<i>L</i> <sub>I</sub> edge
22.000	34742.301	87.888	1674.275	
24.000	27974.709	70.768	1348.136	
26.000	22903.906	57.941	1103.768	
28.000	19021.615	48.119	916.675	
30.000	15993.725	40.460	770.758	
35.000	10840.532	27.424	522.419	
40.000	7728.325	19.551	372.438	
45.000	5728.369	14.491	276.057	
50.000	4379.620	11.079	211.059	
60.000	2750.190	6.957	132.535	
70.000	1856.002	4.695	89.443	
80.000	1321.558	3.343	63.688	
90.000	981.051	2.482	47.278	
98.428	783.483	1.982	37.757	<i>K</i> <sub>α1</sub>
100.000	753.044	1.905	36.290	
111.289	577.306	1.460	27.821	<i>K</i> <sub>β1</sub>
115.602	525.710	1.330	25.335	
115.604	1969.126	4.981	94.895	<i>K</i> edge

**ATOMIC DATA**

Atomic weight = 239.100 gr/mole

Density = 19.700 gr/cm<sup>3</sup>1.000 cm<sup>2</sup>/gr = 397.000 barns/atom**ABSORPTION EDGES**

EDGE	ENERGY(KeV)
<i>K</i>	121.760
<i>L<sub>I</sub></i>	23.095
<i>L<sub>II</sub></i>	22.263
<i>L<sub>III</sub></i>	18.053

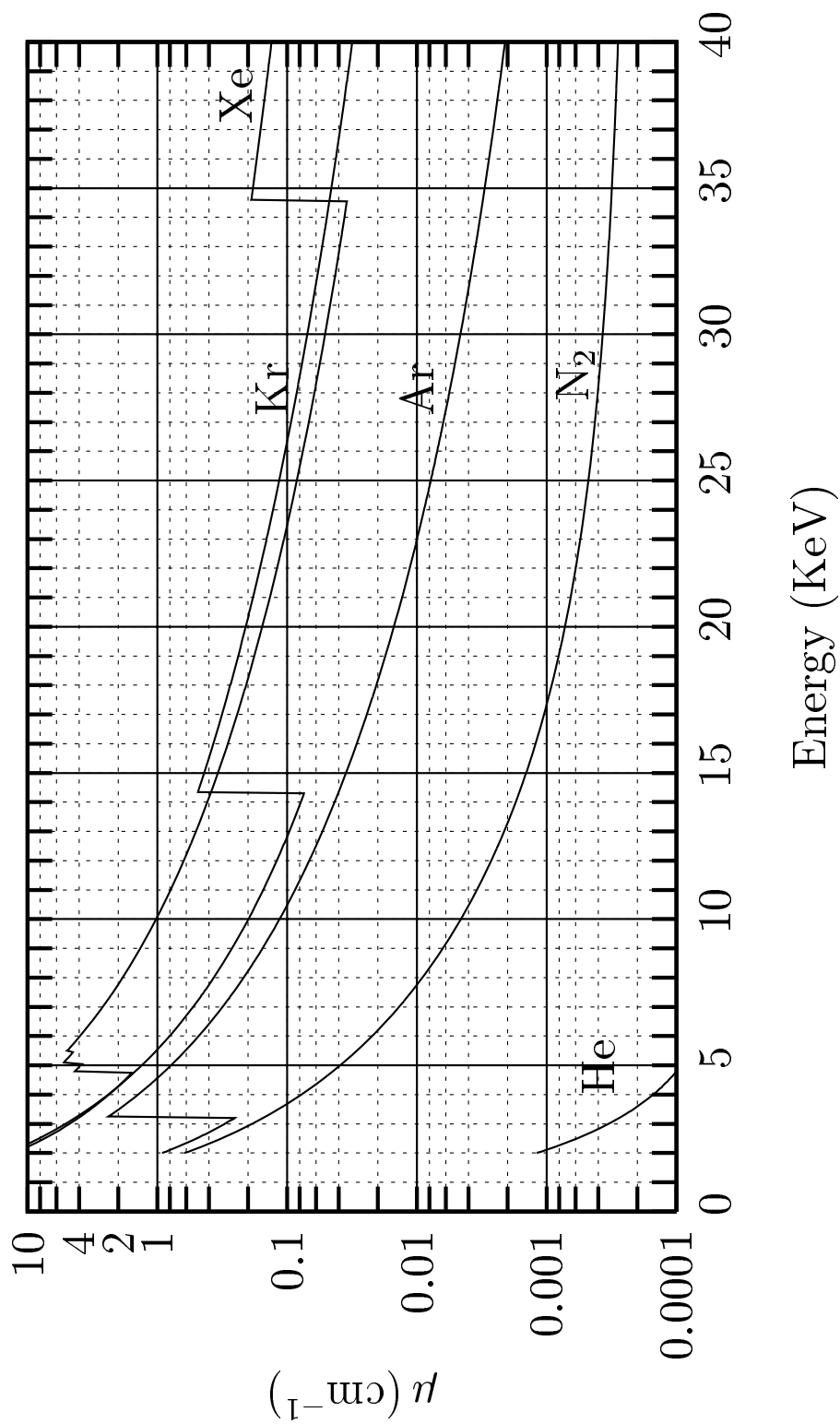
**FLUORESCENT ENERGIES**

LINE	ENERGY(KeV)
<i>K<sub>β1</sub></i>	117.146
<i>K<sub>α1</sub></i>	103.653
<i>L<sub>β1</sub></i>	18.278
<i>L<sub>α1</sub></i>	14.279

## TOTAL CROSS SECTIONS

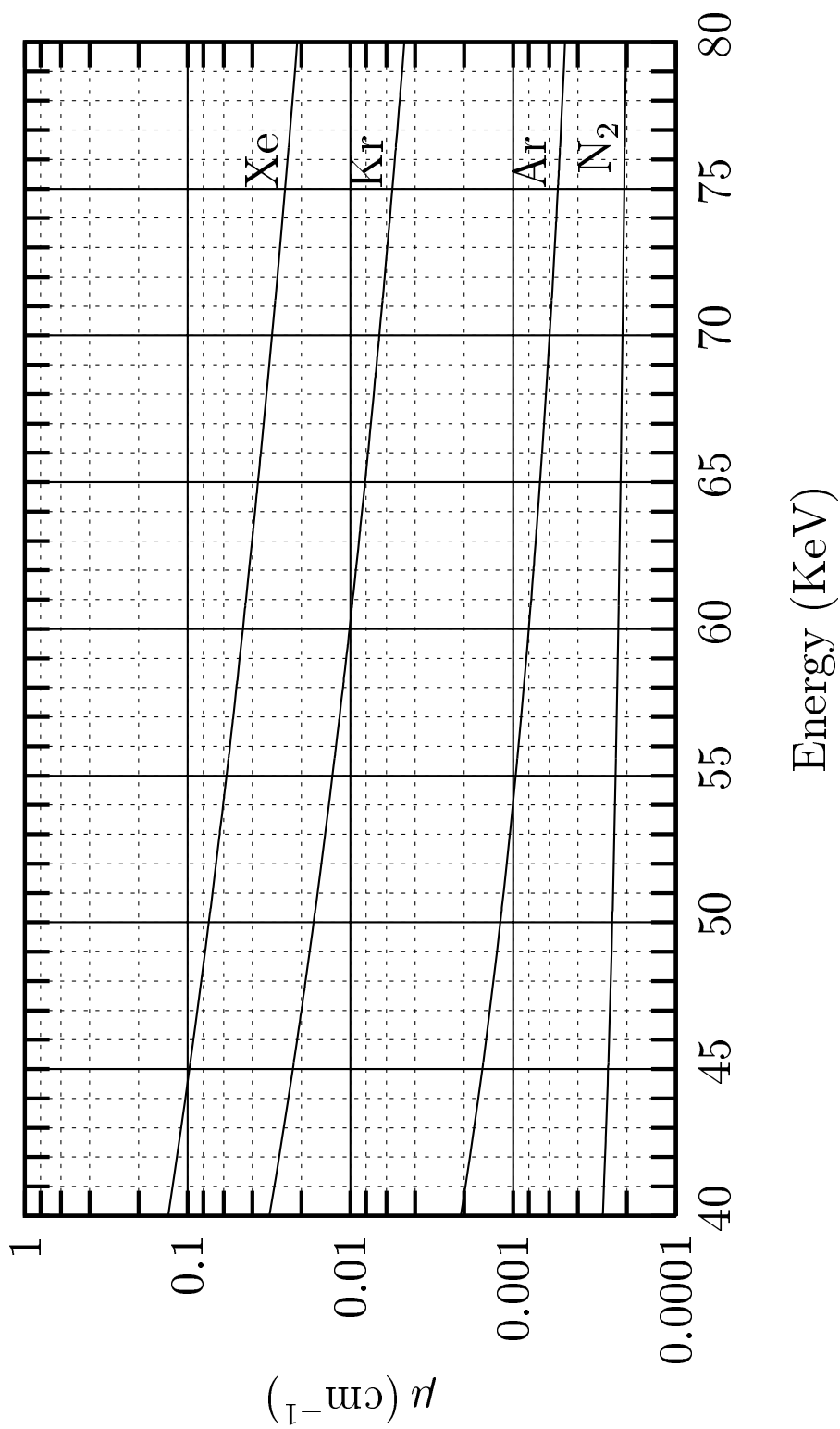
ENERGY (KeV)	$\sigma = \mu/\rho$ (barns/atom)	$\sigma = \mu/\rho$ (cm <sup>2</sup> /gr)	$\mu$ (cm <sup>-1</sup> )	Notes
1.000	2827372.750	7121.846	140300.359	
1.500	1323897.000	3334.753	65694.641	
2.000	773659.125	1948.764	38390.645	
3.000	363841.531	916.477	18054.605	
4.000	213571.828	537.964	10597.897	
5.000	141517.109	356.466	7022.386	
5.913	103970.484	261.890	5159.241	
5.915	310773.188	782.804	15421.239	<i>M</i> edge
6.000	299460.000	754.307	14859.854	
7.000	200712.359	505.573	9959.782	
8.000	142047.969	357.803	7048.728	
9.000	104796.672	263.971	5200.238	
10.000	79891.969	201.239	3964.413	
12.000	50046.781	126.062	2483.430	
14.000	33770.516	85.064	1675.766	
14.279	32117.027	80.899	1593.717	<i>L</i> <sub><math>\alpha</math>1</sub>
16.000	24061.068	60.607	1193.962	
18.000	17869.361	45.011	886.716	
18.052	17739.980	44.685	880.296	
18.054	38352.109	96.605	1903.115	<i>L</i> <sub>III</sub> edge
18.278	37153.992	93.587	1843.662	<i>L</i> <sub><math>\beta</math>1</sub>
20.000	29476.346	74.248	1462.680	
22.000	23082.217	58.142	1145.390	
22.262	22392.576	56.404	1111.168	
22.264	31167.146	78.507	1546.581	<i>L</i> <sub>II</sub> edge
23.094	28360.938	71.438	1407.331	
23.096	33576.180	84.575	1666.123	<i>L</i> <sub>I</sub> edge
24.000	30496.959	76.819	1513.325	
26.000	24941.119	62.824	1237.632	
28.000	20689.783	52.115	1026.672	
30.000	17376.078	43.768	862.239	
35.000	11742.948	29.579	582.711	
40.000	8347.291	21.026	414.211	
45.000	6169.539	15.540	306.146	
50.000	4703.871	11.849	233.416	
60.000	2938.276	7.401	145.804	
70.000	1973.213	4.970	97.915	
80.000	1398.595	3.523	69.401	
90.000	1033.809	2.604	51.300	
100.000	790.378	1.991	39.220	
103.653	721.707	1.818	35.813	<i>K</i> <sub><math>\alpha</math>1</sub>
117.146	530.771	1.337	26.338	<i>K</i> <sub><math>\beta</math>1</sub>
121.759	482.217	1.215	23.929	
121.761	1831.123	4.612	90.864	<i>K</i> edge

# Absorption Coefficient of Inert Gases

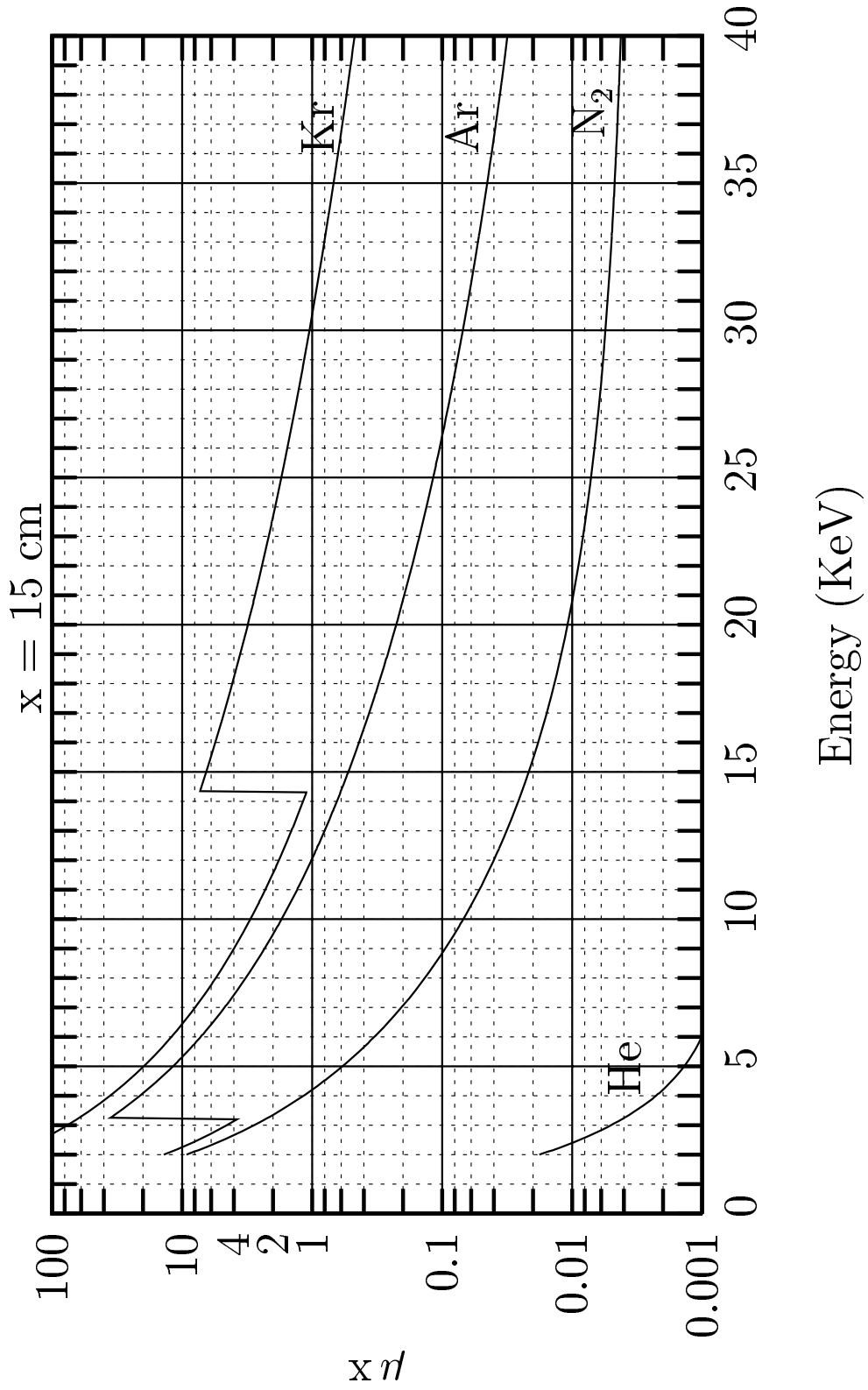




# Absorption Coefficient of Inert Gases



Inert Gases:  $x = 15 \text{ cm}$



# Inert Gases: $x = 30$ cm

