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ELECTROMAGNETICALLY ENRICHED ISOTOPES

INVENTORY, JANUARY 31, 1952

BY

C. P. Keim
C. E. Normand
Boyd Weaver

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ELECTROMAGNETICALLY ENRICHED ISOTOPES

Inventory, January 31, 1952

C. P. Keim
C. E. Normand
Boyd Weaver

January 31, 1952

ISOTOPE RESEARCH AND PRODUCTION DIVISION
C. P. Keim, Director

OAK RIDGE NATIONAL LABORATORY

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ABSTRACT

This inventory lists the isotopes which have been concentrated electromagnetically, along with the completed information on their enriched abundances, and the element weights and product forms available in milligram quantities to users on Atomic Energy Commission projects and in university and industrial laboratories.

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INTRODUCTION

This report of electromagnetically enriched isotopes is revised frequently to include all isotopes which are available for use, or are in the process of chemical refinement. The most recent information on the isotopic abundance of each enriched sample and the amount of each isotope in the inventory is also listed. The list also includes those isotopes which have been concentrated but are not available at present.

All weights reported are element weights converted from compound weights by standard gravimetric factors.

On all shipments material will be shipped in the product form shown unless special arrangements are made for further chemical processing.

Isotopic abundance data not in this report, such as concentrations of other isotopes in the sample, will be submitted upon request. Spectrographic analyses and complete isotopic abundance data will be forwarded with all shipments or as soon as available.

Any users of isotopes who need mass analysis services should check with the Isotopes Division of the A. E. C. regarding their specific needs.

Isotopes produced by the electromagnetic process are available in milligram quantities for distribution on loan within and outside of the Atomic Energy Commission and may be requested by using A. E. C. form 100. Copies of this form may be obtained from the Isotopes Division, U. S. Atomic Energy Commission, P. O. Box "E", Oak Ridge, Tennessee.

Users of Stable Isotopes who need extensions of their loan periods should write The Isotopes Division, Atomic Energy Commission, Oak Ridge, Tennessee.

All purchase orders are to be sent to Dr. C. P. Keim, Oak Ridge National Laboratory, Y-12 Area, Oak Ridge, Tennessee.

SUMMARY OF PRODUCTION AND SHIPMENTS

Atomic No.	Element	Production Completed	No.of Samples Now Available For Shipment	No. Of Individual Shipments Made
3	Lithium	19	9	65
4	Beryllium	2	0	2
5	Boron	3	3	2
5	Carbon	2	2	2
8	Oxygen	2	0	0
12	Magnesium	15	11	33
14	Silicon	9	5	19
16	Sulfur	10	7	13
17	Chlorine	2	2	5
19	Potassium	29	22	42
20	Calcium	36	15	30
22	Titanium	10	12	33
23	Vanadium	2	1	0
24	Chromium	12	9	42
26	Iron	113	44	50
28	Nickel	18	9	50
29	Copper	10	9	21
30	Zinc	15	10	28
31	Gallium	2	2	7
32	Germanium	5	4	14
34	Selenium	38	21	44
35	Bromine	4	2	0
37	Rubidium	2	2	3
38	Strontium	11	5	25
40	Zirconium	19	19	42
42	Molybdenum	15	14	62
47	Silver	6	7	15
48	Cadmium	16	16	60
49	Indium	11	9	18
50	Tin	51	30	102
51	Antimony	4	2	18
52	Tellurium	29	25	77
56	Barium	7	4	25
57	Lanthanum	2	2	3
58	Cerium	9	6	16
60	Neodymium	7	6	27
62	Samarium	7	10	31
72	Hafnium	6	6	26
74	Tungsten	10	17	33
75	Rhenium	2	2	11
80	Mercury	23	36	59
81	Thallium	16	16	19
82	Lead	3	18	50
	TOTAL	614	453	1,224

Natural Isotopic Abundance:

Li 6 - 7.43%

Li 7 - 92.57%

Lithium
Atomic No. 3

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Li 6	H	23(a)	93.91	0	
Li 6	I	25(a)	87.76	0	
Li 6	AR	139(a)	95.5	0	
Li 6	BQ	264(a)	95.4	0	
Li 6	CT	376(a)	99.4	0	
Li 6	CU	378(a)	98.8	0	
Li 6	DV	499(a)	98.32	0	
Li 6	ED	537(a)	95.2	0	
Li 6	ED	537(b)	95.5	0	
Li 6	EZ	627(e)	88.22	12	Li_2SO_4
Li 6	FI	667(a)	94.07	325	Li_2SO_4
Li 6	FI	667(b)	94.29	0	LiF
Li 6	FI	667(c)	91.75	0	Li_2SO_4
Li 6	FI	667(d)	93.39	82	Li_2SO_4
Li 7	H	24(a)	99.89	0	Li_2SO_4
Li 7	I	26(a)	99.91	10	Li_2SO_4
Li 7	AR	140(a)	99.5	711	Li_2SO_4
Li 7	BQ	265(a)	99.8	0	

Natural Isotopic Abundance:

Li 6 - 7.43%

Li 7 - 92.57%

Lithium (cont'd)
Atomic No. 3

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Li 7	BQ	265(ar)	99.8	216	Li_2SO_4
Li 7	CT	377(a)	99.6	0	LiF
Li 7	CU	379(a)	98.4	2,545	Li_2SO_4
Li 7	DV	500(a)	99.58	0	
Li 7	ED	538(a)	99.87	0	
Li 7	EZ	628(e)	99.86	9,178	Li_2SO_4

Natural Isotopic Abundance:

B 10 - 18.83%

B 11 - 81.17%

Boron
Atomic No. 5

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
B 10	DP	481(a)	Analysis Incomplete	25	H_3BO_3
B 11	BM	250(a)	Analysis Incomplete	10	H_3BO_3
B 11	DP	482(a)	Analysis Incomplete	200	H_3BO_3

Natural Isotopic Abundance:

C 12 - 98.91%

C 13 - 1.09%

Carbon
Atomic No. 6

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
C 12	FD	638(ah)	99.963	0	
C 12	FD	638(ai)	Analysis Incomplete	8,400	C
C 12	FD	638(aj)	99.945	9,900	C

Natural Isotopic Abundance:

Mg 24 - 78.98%

Mg 25 - 10.03%

Mg 26 - 10.99%

Magnesium
Atomic No. 12

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Mg 24	P	47(a)	99.5	1,570	MgO
Mg 24	Q	50(a)	98.36	192	MgO
Mg 24	BZ	288(a)	99.52	2,527	MgO
Mg 24	BZ	288(b)	99.2	132	MgO
Mg 24	BZ	288(c)	99.5	2,251	MgO
Mg 24	BZ	288(d)	99.4	1,786	MgO
Mg 24	DZ	519(a)	99.59	3,478	MgO
Mg 25	P	48(a)	83.22	0	
Mg 25	P	48(ar)	83.22	515	MgO
Mg 25	Q	51(a)	62.59	20	MgO
Mg 25	Q	51(b)	65.67	14	MgO
Mg 25	BZ	289(a)	86.8	195	MgO
Mg 25	DZ	520(a)	92.33	1,490	MgO
Mg 26	P	49(a)	96.16	416	MgO
Mg 26	Q	52(a)	97.00	0	
Mg 26	BZ	290(a)	95.91	203	MgO
Mg 26	DZ	521(a)	98.12	804	MgO

Natural Isotopic Abundance:

Si 28 - 92.17%

Si 29 - 4.71%

Si 30 - 3.12%

Silicon
Atomic No. 14

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Si 28	AI-AJ	103-106(a)	99.4	1,796	SiO_2
Si 28	BW	280(a)	98.1	7,510	SiO_2
Si 28	EB	524(a)	99.16	9,041	SiO_2
Si 29	AI-AJ	104-107(a)	68.6	63	SiO_2
Si 29	BW	281(a)	63.6	0	
Si 29	EB	525(a)	68.62	90	SiO_2
Si 30	AI-AJ	105-108(a)	63.9	120	SiO_2
Si 30	BW	282(a)	49.6	550	SiO_2
Si 30	EB	526(a)	64.04	48	SiO_2

Natural Isotopic Abundance:

S 32 - 94.89%

S 33 - 0.80%

S 34 - 4.29%

S 36 - 0.02%

Sulfur
Atomic No. 16

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
S 32	CX	391(a)	97.90	113	S
S 32	ES	596(a)	98.45	7,463	CdS
S 33	CX	392(a)	5.54	76	S
S 33	CX	392(b)	5.54	30	S
S 33	ES	597(a)	9.8	0	
S 34	CX	393(a)	20.65	0	
S 34	CX	393(b)	5.38	59	S
S 34	ES	598(a)	14.92	1,099	CdS
S 36	ES	599(a)	0.88	27	CdS

Natural Isotopic Abundance:

Cl 35 - 75.4%

Cl 37 - 24.6%

Chlorine
Atomic No. 17

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Cl 35	AV	161(cl)	79.5	18	AgCl
Cl 35	DH	436(a)	92.4	0	
Cl 37	DH	438(a)	65.6	248	AgCl

Natural Isotopic Abundance:

K 39 - 93.25%

*K 40 - 0.011%

K 41 - 6.74%

Potassium
Atomic No. 19

Electromagnetically Concentrated Isotopes

*Radioactive

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
K 39	W	67(a)	99.93	0	
K 39	BJ	237(a)	99.5	1,592	$KClO_4$
K 39	CM	346(a)	99.9	35	KCl
K 39	CM	346(ar)	99.9	9,920	KCl
K 39	DA	407(a)	99.94	19,428	K_2SO_4
K 39	DB	410(a)	99.74	5,659	KCl
K 39	DT	494(a)	99.89	9,384	KCl
K 39	EX	621(g)	99.96	18,470	KCl
K 39	EY	624(i)	99.94	24,977	KCl
K 39	FA	629(a)	99.83	10,473	KCl
K 40	W	68(a)	0.16	0	
K 40	BJ	238(a)	0.40	0	
K 40	CM	347(a)	0.14	0	
K 40	CM	347(ar)	0.14	0	
K 40	DA	408(a)	1.31	10	KCl
K 40	DB	411(a)	0.40	124	KCl
K 40	DB	411(ar)	0.40	318	KCl

Natural Isotopic Abundance:

K 39 - 93.25%

*K 40 - 0.011%

K 41 - 6.74%

Potassium (cont'd)
Atomic No. 19

Electromagnetically Concentrated Isotopes

*Radioactive

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
K 40	DT	495(a)	7.13	0	
K 40	EX	622(u)	3.64	7	KCl
K 40	EY	625(t)	7.75	0	
K 40	FA	630(a)	0.978	33	KCl
K 41	W	69(a)	88.36	0	
K 41	BJ	239(a)	92.9	65	$KClO_4$
K 41	CM	348(a)	86.8	37	KCl
K 41	DA	409(a)	95.45	0	
K 41	DB	412(a)	91.61	0	
K 41	DT	496(a)	98.94	705	KCl
K 41	DT	496(ar)	98.94	65	KCl
K 41	EX	623(e)	99.20	1,071	KCl
K 41	EY	626(e)	99.21	750	KCl
K 41	FA	631(a)	87.75	540	KCl

Natural Isotopic Abundance:

Calcium
Atomic No. 20

Ca 40 - 96.96% Ca 46 - 0.0033%

Ca 42 - 0.64% Ca 48 - 0.185%

Ca 43 - 0.145%

Ca 44 - 2.06%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Ca 40	V	61(a)	99.95	0	
Ca 40	V	61(b)	98.6	114	CaO
Ca 40	X	70(a)	99.97	1,048	CaO
Ca 40	BN	251(a)	98.9	5,825	$CaCO_3$
Ca 40	DI	441(d)	99.83	35,259	$CaCO_3$
Ca 40	EV	613(a)	Analysis Incomplete	28,720	$CaCO_3$
Ca 40	FF	648(a)	Analysis Incomplete	44,750	$CaCO_3$
Ca 42	BN	252(a)	56.1	0	
Ca 42	DI	442(b)	28.3	393	$CaCO_3$
Ca 42	EV	614(a)	Analysis Incomplete	210	$CaCO_3$
Ca 42	FF	649(a)	Analysis Incomplete	439	$CaCO_3$
Ca 43	V-X	63-72(a)	34.4	0	
Ca 43	BN	253(a)	59.9	0	
Ca 43	DI	443(b)	37.56	0	
Ca 43	EV	615(a)	Analysis Incomplete	0	
Ca 43	FF	650(a)	Analysis Incomplete	78	$CaCO_3$
Ca 44	V	64(a)	95.8	0	

Natural Isotopic Abundance:

Calcium (cont'd)
Atomic No. 20

Ca 40 - 96.96% Ca 46 - 0.0033%

Ca 42 - 0.64% Ca 48 - 0.185%

Ca 43 - 0.145%

Ca 44 - 2.06%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Ca 44	V	64(a)	95.8	0	
Ca 44	X	73(a)	21.1	0	
Ca 44	BN	254(a)	85.4	40	$CaCO_3$
Ca 44	CS	373(a)	96.2	115	$CaCO_3$
Ca 44	DI	444(a)	91.9	134	$CaCO_3$
Ca 44	EV	616(a)	Analysis Incomplete	723	$CaCO_3$
Ca 44	FF	651(a)	Analysis Incomplete	1,143	$CaCO_3$
Ca 46	V-X	65-74(a)	7.3	0	
Ca 46	CS	374(a)	4.8	0	
Ca 46	DI	445(a)	1.45	0	
Ca 46	EV	617(a)	Analysis Incomplete	0	
Ca 46	FF	652(a)	Analysis Incomplete	0	
Ca 48	V-X	66-75(a)	13.1	0	
Ca 48	BW	256(a)	83.9	0	
Ca 48	CS	375(a)	62.2	0	
Ca 48	DI	446(a)	42.32	0	
Ca 48	EV	618(a)	Analysis Incomplete	0	
Ca 48	FF	653(a)	Analysis Incomplete	50	$CaCO_3$

Natural Isotopic Abundance:

Ti 46 - 7.97%

Ti 47 - 7.41%

Ti 48 - 73.50%

Ti 49 - 5.64%

Ti 50 - 5.48%

Titanium
Atomic No. 22

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Ti 46	BF	215(a)	84.26	0	
Ti 46	BF	215(ar)	84.26	83	TiO_2
Ti 46	EN	576(a)	82.68	309	TiO_2
Ti 47	BF	216(a)	82.05	8	TiO_2
Ti 47	BF	216(ar)	82.05	99	TiO_2
Ti 47	EN	577(a)	63.11	1,844	TiO_2
Ti 48	BF	217(a)	99.23	50	TiO_2
Ti 48	EN	578(a)	98.90	23,108	TiO_2
Ti 49	BF	218(a)	77.62	37	TiO_2
Ti 49	BF	218(ar)	77.62	55	TiO_2
Ti 49	EN	579(a)	77.27	412	TiO_2
Ti 50	BF	219(a)	84.69	0	
Ti 50	BF	219(ar)	84.69	0	
Ti 50	EN	580(a)	81.44	496	TiO_2

Natural Isotopic Abundance:

V 50 - 0.28%

V 51 - 99.72%

Vanadium
Atomic No. 23

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
V 50	FM	683(b)	Analysis Incomplete	0	
V 51	FB	633(a)	Analysis Incomplete	2,500	V_2O_5
V 51	FM	684(a)	Refinement Incomplete	26,250	V_2O_5

Natural Isotopic Abundance:

Chromium
Atomic No. 24

Cr 50 - 4.40%

Cr 52 - 83.73%

Cr 53 - 9.49%

Cr 54 - 2.38%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Cr 50	D	10(a)	73.76	0	
Cr 50	CD	309(a)	41.2	0	
Cr 50	CD	309(ar)	41.2	0	
Cr 50	EU	609(a)	88.3	644	Cr_2O_3
Cr 52	D	11(a)	99.14	510	Cr_2O_3
Cr 52	D	11(ar)	99.14	140	Cr_2O_3
Cr 52	CD	310(a)	99.1	3,459	Cr_2O_3
Cr 52	EU	610(a)	97.1	23,140	Cr_2O_3
Cr 53	D	12(a)	88.59	113	Cr_2O_3
Cr 53	CD	311(a)	92.1	110	Cr_2O_3
Cr 53	EU	611(a)	90.06	478	Cr_2O_3
Cr 54	D	13(a)	61.0	0	
Cr 54	CD	312(a)	83.1	0	
Cr 54	EU	612(a)	88.95	105	Cr_2O_3

Natural Isotopic Abundance:
Fe 54 - 5.09%
Fe 56 - 91.52%
Fe 57 - 2.24%
Fe 58 - 0.34%

Iron
Atomic No. 26

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Fe 54	B	3(a)	55.47	57	Fe_2O_3
Fe 54	B	3(f)	39.0	268	Fe_2O_3
Fe 54	C	6-I(a)	42.85	195	Fe_2O_3
Fe 54	C	6-II(a)	38.99	0	
Fe 54	E	14(a)	81.06	17	Fe_2O_3
Fe 54	F	18(a)	83.03	32	Fe_2O_3
Fe 54	AM	122(a)	49.2	343	Fe_2O_3
Fe 54	AZ	183(a)	93.27	16	Fe_2O_3
Fe 54	BA	187(a)	87.9	10	Fe_2O_3
Fe 54	BA	187(ar)	87.9	10	Fe_2O_3
Fe 54	BB	194(a)	87.4	69	Fe_2O_3
Fe 54	CI	328(a)	84.3	62	Fe_2O_3
Fe 54	DO	477(a)	34.47	67,272	Fe_2O_3
Fe 54	FC	634(a)	Analysis Incomplete	1,534	Fe_2O_3
Fe 54	FN	685(a)	Refinement Incomplete		
Fe 56	B	4(a)	98.41	3,235	Fe_2O_3
Fe 56	B	4(e)	98.5	901	Fe_2O_3

Natural Isotopic Abundance:

Iron
Atomic No. 26

Fe 54 - 5 90%

Fe 56 - 91.52%

Fe 57 - 2.24%

Fe 58 - 0.34%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Fe 56	C	9(a)	98.7	2,683	Fe_2O_3
Fe 56	C	9(c)	96.89	462	Fe_2O_3
Fe 56	E	15(a)	98.62	10,403	Fe_2O_3
Fe 56	F	19(a)	97.42	1,120	Fe_2O_3
Fe 56	AM	123(a)	98.9	2,627	Fe_2O_3
Fe 56	AZ	184(a)	99.0	12,451	Fe_2O_3
Fe 56	BA	188(a)	98.5	35,474	Fe_2O_3
Fe 56	BB	192(a)	98.3	9,818	Fe_2O_3
Fe 56	CI	329(a)	96.5	51,056	Fe_2O_3
Fe 56	CZ	404(f)	99.84	11,892	Fe_2O_3
Fe 56	DO	478(a)	99.70	0	
Fe 56	FC	635(a)	Analysis Incomplete	18,171	Fe_2O_3
Fe 56	FN	686(a)	Refinement Incomplete		
Fe 57	B	5(a)	21.10	62	Fe_2O_3
Fe 57	B	5(f)	30.5	81	Fe_2O_3
Fe 57	C	7(b)	56.13	0	
Fe 57	E	16(a)	73.01	0	

Natural Isotopic Abundance:

Iron (cont'd)
Atomic No. 26

Fe 54 - 5.90%

Fe 56 - 91.52%

Fe 57 - 2.24%

Fe 58 - 0.34%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Fe 57	F	20(a)	69.63	15	Fe_2O_3
Fe 57	AM	124(a)	33.2	69	Fe_2O_3
Fe 57	AZ	185(a)	67.7	0	
Fe 57	BA	189(a)	75.8	0	
Fe 57	BB	193(a)	77.6	24	Fe_2O_3
Fe 57	CI	330(a)	50.7	0	
Fe 57	CZ	405(f)	51.91	509	Fe_2O_3
Fe 57	DK	449(a)	79.43	232	Fe_2O_3
Fe 57	DL	453(a)	62.38	830	Fe_2O_3
Fe 57	DL	453(d)	59.31	1,381	Fe_2O_3
Fe 57	DL	453(a)	31.9	1,245	Fe_2O_3
Fe 57	DL	453(f)	59.3	1,122	Fe_2O_3
Fe 57	DL	453(j)	43.45	2,571	Fe_2O_3
Fe 57	DM	459(a)	74.6	190	Fe_2O_3
Fe 57	DL	463(a)	40.61	1,687	Fe_2O_3
Fe 57	DL	463(b)	45.43	1,018	Fe_2O_3
Fe 57	DL	463(e)	67.3	278	Fe_2O_3
Fe 57	DL	463(j)	53.53	184	Fe_2O_3

Natural Isotopic Abundance:

Iron (cont'd)
Atomic No. 26

Fe 54 - 5.90%

Fe 56 - 91.52%

Fe 57 - 2.24%

Fe 58 - 0.34%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Fe 57	DL	463(k)	54.23	1,766	Fe_2O_3
Fe 57	DL	467(c)	63.1	165	Fe_2O_3
Fe 57	DN	471(a)	84.78	0	
Fe 57	DN	475(a)	87.29	0	
Fe 57	FN	687(a)	Refinement Incomplete		
Fe 57	FC	636(a)	Analysis Incomplete	1,256	Fe_2O_3
Fe 58	C	8(b)	22.0	15	Fe_2O_3
Fe 58	E	17(b)	40.7	0	
Fe 58	AM	125(a)	10.3	44	Fe_2O_3
Fe 58	CI	331(a)	46.0	0	
Fe 58	DL	454(f)	23.4	39	Fe_2O_3
Fe 58	DL	454(m)	71.7	92	Fe_2O_3
Fe 58	DL	464(l)	79.8	0	
Fe 58	DL	464(p)	71.8	0	
Fe 58	DO	480(a)	75.7	117	Fe_2O_3
Fe 58	DO	480(b)	42.0	484	Fe_2O_3
Fe 58	DO	480(c)	34.8	37	Fe_2O_3
Fe 58	FC	637(i)	60.62	0	

Natural Isotopic Abundance:

Iron(cont'd)
Atomic No. 26

Fe 54 - 5.90%

Fe 56 - 91.52%

Fe 57 - 2.24%

Fe 58 - 0.34%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Fe 58	FC	637(j)	76.13	0	
Fe 58	FC	637(l)	79.39	0	
Fe 58	FN	688(b)	74.20	37	Fe_2O_3
Fe 58	FN	688(c)	59.65	104	Fe_2O_3
Fe 58	FN	688(d)	Analysis Incomplete	361	Fe_2O_3
Fe 58	FN	688(f)	Analysis Incomplete	177	Fe_2O_3
Fe 58	FN	688(g)	65.85	82	Fe_2O_3
Fe 58	FN	688(i)	78.66	115	Fe_2O_3
Fe 58	FN	688(j)	78.02	86	Fe_2O_3

Natural Isotopic Abundance:

Ni 58 - 67.4%

Ni 60 - 26.7%

Ni 61 - 1.2%

Ni 62 - 3.8%

Ni 64 - 0.88%

Nickel
Atomic No. 28

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Ni 58	J	27(a)	98.05	0	
Ni 58	K	33(a)	98.51	12	NiO
Ni 58	AS-AT	141-147(a)	99.3	134	NiO
Ni 58	DF	422(a)	98.36	5,685	NiO
Ni 58	FJ	669(a)	Refinement Incomplete		
Ni 60	J	28(a)	94.4	18	NiO
Ni 60	J	28(ar)	94.4	390	NiO
Ni 60	K	34(a)	87.10	680	NiO
Ni 60	AS-AT	142-148(a)	97.7	0	
Ni 60	DF	423(a)	95.0	0	
Ni 60	FJ	670(a)	Refinement Incomplete		
Ni 61	J	29(a)	78.83	0	
Ni 61	K	35(a)	34.42	28	NiO
Ni 61	AS-AT	143-149(a)	80.9	0	
Ni 61	DF	424(a)	72.2	40	NiO
Ni 61	FJ	671(a)	Refinement Incomplete		
Ni 62	J	30(a)	94.25	0	

Natural Isotopic Abundance:

Nickel
Atomic No. 28

Ni 58 - 67.4%

Ni 60 - 26.7%

Ni 61 - 1.2%

Ni 62 - 3.8%

Ni 64 - 0.88%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Ni 62	AS-AT	144-150(a)	94.7	20	NiO
Ni 62	K	36(a)	67.99	50	NiO
Ni 62	DF	425(a)	91.2	0	
Ni 62	FJ	672(a)	Refinement Incomplete		
Ni 64	J	32(a)	85.10	10	NiO
Ni 64	K	38(a)	64.2	0	
Ni 64	AS-AT	146-152(a)	97.4	0	
Ni 64	DF	427(a)	80.6	0	
Ni 64	FJ	674(a)	Refinement Incomplete	0	

Natural Isotopic Abundance:

Cu 63 - 69.09%

Cu 65 - 30.91%

Copper
Atomic No. 29

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Cu 63	A	1(a)	97.0	650	CuO
Cu 63	A	1(ar)	97.0	960	CuO
Cu 63	J-K	31-37(a)	99.35	730	CuO
Cu 63	AS-AT	145-151(a)	99.77	0	
Cu 63	AV	161(cu)	98.2	203	CuO
Cu 63	DF	426(a)	99.11	3,351	CuO
Cu 63	DL	455(a)	96.12	578	CuO
Cu 63	DU	497(a)	99.40	17,750	CuO
Cu 63	FJ	673(a)	Refinement Incomplete		
Cu 65	A	2(a)	93.81	0	
Cu 65	A	2(ar)	93.81	461	CuO
Cu 65	AV	162(cu)	90.6	14	CuO
Cu 65	DU	498(a)	98.16	13,866	CuO

Natural Isotopic Abundance:

Zn 64 - 49.18%

Zn 66 - 27.76%

Zn 67 - 4.05%

Zn 68 - 18.40%

Zn 70 - 0.61%

Zinc
Atomic No. 30

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Zn 64	AG	97(a)	83.8	394	ZnO
Zn 64	BK	240(a)	93.4	0	
Zn 64	EK	556(a)	93.12	9,530	ZnO
Zn 66	AH	100(a)	78.4	712	ZnO
Zn 66	BK	241(a)	76.1	0	
Zn 66	EK	557(a)	93.79	7,900	ZnO
Zn 67	AG	98(a)	62.6	0	
Zn 67	BK	242(a)	56.0	102	ZnO
Zn 67	EK	558(a)	60.46	1,303	ZnO
Zn 68	AH	101(a)	72.6	0	
Zn 68	BK	243(a)	93.9	18	ZnO
Zn 68	EK	559(a)	95.47	6,631	ZnO
Zn 70	AH	102(a)	32.9	20	ZnO
Zn 70	BK	244(a)	32.0	39	ZnO
Zn 70	BK	244(ar)	32.0	0	
Zn 70	EK	560(a)	48.40	231	ZnO

Natural Isotopic Abundance:

Ga 69 - 60.00%

Ga 71 - 40.00%

Gallium
Atomic No. 31

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Ga 69	EI	554(a)	98.42	11,827	Ga_2O_3
Ga 71	EI	555(a)	98.08	137	Ga_2O_3

Natural Isotopic Abundance:

Germanium
Atomic No. 32

Ge 70 - 20.63% Ge 76 - 7.75%

Ge 72 - 27.41%

Ge 73 - 7.84%

Ge 74 - 36.37%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Ge 70	BD-BE	205-210(a)	88.1	359	GeO_2
Ge 72	BD-BE	206-211(a)	89.2	1,162	GeO_2
Ge 73	BD-BE	207-212(a)	68.9	0	
Ge 73	BD-BE	207-212(ar)	68.9	186	GeO_2
Ge 74	BD-BE	208-213(a)	95.2	1,762	GeO_2
Ge 76	BD-BE	209-214(a)	79.3	0	

Natural Isotopic Abundance:

Selenium
Atomic No. 34

Se 74 - 0.84% Se 80 - 49.97%

Se 76 - 9.15% Se 82 - 8.89%

Se 77 - 7.53%

Se 78 - 23.62%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Se 74	AK	109(a)	6.5	10	Se
Se 74	BS	268(a)	14.1	0	
Se 74	CY	397(a)	12.3	0	
Se 74	CY	397(ar)	12.3	255	Se
Se 74	DY	513(a)	12.08	143	Se
Se 74	FG	654(a)	18.02	90	Se
Se 74	FG	654(b)	33.06	0	
Se 76	AN	126(a)	43.5	10	Se
Se 76	BS	269(a)	41.5	600	Se
Se 76	CY	398(a)	54.8	542	Se
Se 76	CY	398(ar)	54.8	390	Se
Se 76	DY	514(a)	57.40	89	Se
Se 76	FG	655(a)	74.20	374	Se
Se 76	FG	655(b)	88.51	148	Se
Se 77	AK	110(a)	50.1	99	Se
Se 77	BS	270(a)	53.6	143	Se
Se 77	BS	270(ar)	53.6	500	Se
Se 77	CY	399(a)	49.4	408	Se

Selenium (cont'd)
Atomic No. 34

Natural Isotopic Abundance:

Se 74 - 0.84% Se 80 - 49.97%

Se 76 - 9.15% Se 82 - 8.89%

Se 77 - 7.53%

Se 78 - 23.62%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Se 77	DY	515(a)	58.40	52	Se
Se 77	FG	656(c)	74.22	203	Se
Se 77	FG	656(d)	83.16	10	Se
Se 77	FG	656(e)	86.58	10	Se
Se 77	FG	656(f)	91.73	25	Se
Se 77	FG	656(g)	86.00	8	Se
Se 78	AN	127(a)	79.3	68	Se
Se 78	AN	127(ar)	79.3	104	Se
Se 78	BS	271(a)	72.7	1,853	Se
Se 78	CY	400(a)	81.7	707	Se
Se 78	CY	400(ar)	81.7	1,026	Se
Se 78	DY	516(a)	82.56	52	Se
Se 78	FG	657(b)	90.24	667	Se
Se 78	FG	657(d)	96.55	145	Se
Se 80	AK	111(a)	86.7	281	Se
Se 80	BS	272(a)	94.6	1,120	Se
Se 80	BS	272(ar)	94.6	257	Se

Natural Isotopic Abundance:

Selenium (cont'd)
Atomic No. 34

Se 74 - 0.84% Se 80 - 49.97%

Se 76 - 9.15% Se 82 - 8.89%

Se 77 - 7.53%

Se 78 - 23.62%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Se 80	CY	401(a)	91.7	1,136	Se
Se 80	DY	517(a)	93.76	41	Se
Se 80	FG	658(a)	96.94	1,506	Se
Se 80	FG	658(b)	98.39	1,151	Se
Se 82	AN	128(a)	49.6	96	Se
Se 82	BS	273(a)	44.4	0	
Se 82	BS	273(ar)	44.4	1,087	Se
Se 82	CY	402(a)	51.6	314	Se
Se 82	CY	402(ar)	51.6	260	Se
Se 82	CY	518(a)	52.36	1,081	Se
Se 82	FG	659(a)	75.74	460	Se
Se 82	FG	659(b)	89.87	140	Se

Natural Isotopic Abundance:

Br 79 - 50.57%

Br 81 - 49.43%

Bromine
Atomic No. 35

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Br 79	EJ	552(a)	86.98	342	AgBr
Br 81	EJ	553(a)	96.81	318	AgBr

Natural Isotopic Abundance:

Rb 85 - 72.27%

*Rb 87 - 27.73%

Rubidium
Atomic No. 37

Electromagnetically Concentrated Isotopes

*Radioactive

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Rb 85	EW	619(a)	95.97	3,109	RbCl
Rb 87	EW	620(a)	89.62	2,025	RbCl

Natural Isotopic Abundance:

Sr 84 - 0.56%

Sr 86 - 9.86%

Sr 87 - 7.02%

Sr 88 - 82.6%

Strontium
Atomic No. 38

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Sr 84	Z	77(a)	27.2	0	
Sr 84	BL	245(a)	61.6	0	
Sr 84	EH	548(a)	63.68	0	
Sr 84	FL	679(a)	Analysis Incomplete	392	$SrCO_3$
Sr 86	Z	78(a)	69.9	0	
Sr 86	Z	78(ar)	69.9	290	SrO
Sr 86	BL	246(a)	88.2	0	
Sr 86	EH	549(a)	89.02	23	$Sr(NO_3)_2$
Sr 86	FL	680(a)	Refinement Incomplete		
Sr 87	EH	550(a)	60.03	1,838	$SrCO_3$
Sr 87	FL	681(a)	Refinement Incomplete		
Sr 88	Z	79(a)	98.9	1,049	SrO
Sr 88	BL	248(a)	99.5	322	$SrSO_4$
Sr 88	EH	551(a)	99.67	39	$Sr(NO_3)_2$
Sr 88	FL	682(a)	Analysis Incomplete	13,480	$SrCO_3$

Natural Isotopic Abundance:

Zirconium
Atomic No. 40

Zr 90 - 50.83%

Zr 91 - 11.21%

Zr 92 - 17.18%

Zr 94 - 17.79%

Zr 96 - 2.99%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Zr 90	AA	80(a)	91.7	18	ZrO_2
Zr 90	AA	80(ar)	91.7	460	ZrO_2
Zr 90	CK	334(a)	98.0	7,045	ZrO_2
Zr 90	CK	334(ar)	98.0	1,878	ZrO_2
Zr 90	CV	381(a)	95.6	3,612	ZrO_2
Zr 90	EE	439(a)	98.66	11,487	ZrO_2
Zr 91	AA	81(a)	54.4	50	ZrO_2
Zr 91	AA	81(ar)	54.4	100	ZrO_2
Zr 91	CK	335(a)	86.6	33	ZrO_2
Zr 91	CK	335(ar)	86.6	1,956	ZrO_2
Zr 91	CV	382(a)	75.1	839	ZrO_2
Zr 91	EE	540(a)	86.89	1,998	ZrO_2
Zr 92	AA	82(a)	3.8	0	
Zr 92	AA	82(ar)	3.8	65	ZrO_2
Zr 92	CK	336(a)	92.7	387	ZrO_2
Zr 92	CK	336(ar)	92.7	1,951	ZrO_2
Zr 92	CV	383(a)	89.8	1,099	ZrO_2

Natural Isotopic Abundance:

Zirconium
Atomic No. 40

Zr 90 - 50.83%

Zr 91 - 11.21%

Zr 92 - 17.18%

Zr 94 - 17.79%

Zr 96 - 2.99%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Zr 92	EE	541(a)	95.38	5,577	ZrO_2
Zr 94	AA	83(a)	82.1	94	ZrO_2
Zr 94	AA	83(ar)	82.1	40	ZrO_2
Zr 94	CK	337(a)	92.8	68	ZrO_2
Zr 94	CK	337(ar)	92.8	1,794	ZrO_2
Zr 94	CV	384(a)	80.9	861	ZrO_2
Zr 94	EE	542(a)	97.92	5,325	ZrO_2
Zr 96	ZZ	84(a)	40.6	22	ZrO_2
Zr 96	CK	338(a)	74.6	0	
Zr 96	CK	338(ar)	74.6	20	ZrO_2
Zr 96	CV	385(a)	43.6	0	
Zr 96	EE	543(a)	89.48	140	ZrO_2

Natural Isotopic Abundance:

Molybdenum
Atomic No. 42

Mo 92 - 15.04% Mo 98 - 24.00%

Mo 94 - 9.35% Mo 100- 9.67%

Mo 95 - 15.78%

Mo 96 - 16.56%

Mo 97 - 9.60% **Electromagnetically Concentrated Isotopes**

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Mo 92	R-T	53(a)	92.07	24	MoO_3
Mo 92	R-T	53(ar)	92.07	485	MoO_3
Mo 92	AW	163(a)	95.5	0	
Mo 92	AW	163(ar)	95.5	225	MoO_3
Mo 94	R-T	54(a)	74.68	0	
Mo 94	AW	164(a)	79.1	120	MoO_3
Mo 95	R-T	55(a)	80.75	1,405	MoO_3
Mo 95	AW	165(a)	88 0	121	MoO_3
Mo 95	AW	165(ar)	88.0	182	MoO_3
Mo 96	R-T	56(a)	85.94	3,397	MoO_3
Mo 96	AW	166(a)	90.6	581	MoO_3
Mo 97	R-T	57(a)	77.97	474	MoO_3
Mo 97	R-T	57(ar)	77.97	284	MoO_3
Mo 97	AW	167(a)	75.4	1,110	MoO_3
Mo 98	R-T	58(a)	95.0	637	MoO_3
Mo 98	R-T	58(b)	89.9	493	MoO_3
Mo 98	AW	168(a)	96.3	1,109	MoO_3

Natural Isotopic Abundance:

Molybdenum
Atomic No. 42

Mo 92 - 15.04% Mo 98 - 24.00%

Mo 94 - 9.35% Mo 100- 9.67%

Mo 95 - 15.78%

Mo 96 - 16.56%

Mo 97 - 9.60%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Mo 100	R-T	59(a)	90.24	0	
Mo 100	R-T	59(ar)	90.24	200	MoO_3
Mo 100	R-T	59(b)	90.20	240	MoO_3
Mo 100	AW	169(a)	93.0	25	MoO_3

Natural Isotopic Abundance:

Ag 107 - 51.86%

Ag 109 - 48.14%

Silver
Atomic No. 47

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Ag 107	N	41(a)	98.96	39	AgCl
Ag 107	S-U	41(b)	90.26	115	AgCl
Ag 107	S-U	41(br)	90.26	2,143	Ag
Ag 107	EA	522(a)	96.10	2,131	AgCl
Ag 109	N	42(a)	95.88	31	AgCl
Ag 109	S-U	42(b)	92.16	22	AgCl
Ag 109	S-U	42(br)	92.16	1,644	Ag
Ag 109	EA	523(a)	99.54	1,736	AgCl

Natural Isotopic Abundance:

Cd 106 - 1.22%	Cd 112 - 23.79%
Cd 108 - 0.89%	Cd 113 - 12.34%
Cd 110 - 12.43%	Cd 114 - 28.81%
Cd 111 - 12.86%	Cd 116 - 7.66%

Cadmium
Atomic No. 48

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Cd 106	AC	88(a)	19.94	117	CdO
Cd 106	CD	314(a)	32.9	0	
Cd 108	AX	170(a)	14.2	438	CdO
Cd 108	AX	170(ar)	14.2	60	CdO
Cd 108	CD	315(a)	24.8	16	CdO
Cd 110	AX	171(a)	55.8	2,027	CdO
Cd 110	CE	316(a)	70.0	2,518	CdO
Cd 111	AC	89(a)	53.3	295	CdO
Cd 111	CE	317(a)	64.5	3,541	CdO
Cd 112	AX	172(a)	79.3	1,890	CdO
Cd 112	CE	318(a)	83.5	4,013	CdO
Cd 113	AB	86(a)	25.5	376	CdO
Cd 113	CE	319(a)	54.1	2,418	CdO
Cd 114	AC	90(a)	79.52	772	CdO
Cd 114	CE	320(a)	94.2	3,418	CdO
Cd 114	CE	320(ar)	94.2	316	CdO
Cd 116	AB	87(a)	24.01	401	CdO

Cadmium (cont'd)
Atomic No. 48

Natural Isotopic Abundance:

Cd 106 - 1.22%	Cd 112 - 23.79%
Cd 108 - 0.89%	Cd 113 - 12.34%
Cd 110 - 12.43%	Cd 114 - 28.81%
Cd 111 - 12.86%	Cd 116 - 7.66%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Cd 116	CE	321(a)	71.2	31	CdO
Cd 116	CE	321(ar)	71.2	10	CdO

Natural Isotopic Abundance:

*In 113 - 4.22%

*In 115 - 95.78%

Indium
Atomic No. 49

Electromagnetically Concentrated Isotopes

*Radioactive

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
In 113	BH	225(a)	22.8	600	In_2O_3
In 113	CO	354(a)	16.8	415	In_2O_3
In 113	CQ	358(a)	65.4	0	
In 113	DE	419(a)	14.2	735	In_2O_3
In 113	ER	584(a)	59.58	738	In_2O_3
In 115	AD	92(a)	99.56	964	In_2O_3
In 115	BH	226(a)	99.6	856	In_2O_3
In 115	BH	226(ar)	99.6	470	In_2O_3
In 115	CO	355(a)	99.9	14,563	In_2O_3
In 115	CQ	359(a)	99.8	12,379	In_2O_3
In 115	DE	420(a)	99.92	0	
In 115	ER	595(a)	99.94	41,900	In_2O_3

Natural Isotopic Abundance:

Sn 112 - 1.00%	Sn 118 - 24.07%
Sn 114 - 0.68%	Sn 119 - 8.63%
Sn 115 - 0.44%	Sn 120 - 32.53%
Sn 116 - 14.40%	Sn 122 - 4.68%
Sn 117 - 7.68%	*Sn 124 - 5.89%

Tin
Atomic No. 50

Electromagnetically Concentrated Isotopes

*Radioactive

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Sn 112	EI	227(a)	30.8	10	SnO_2
Sn 112	CR	360(a)	45.5	0	
Sn 112	EC	527(a)	72.49	0	
Sn 114	AL	113(a)	32.7	0	
Sn 114	BI	228(a)	19.2	0	
Sn 114	CR	361(a)	24.1	0	
Sn 114	EC	528(a)	50.03	160	SnO_2
Sn 115	BI	229(a)	4.5	28	SnO_2
Sn 115	CR	362(a)	12.1	0	
Sn 115	EC	529(a)	14.0	535	SnO_2
Sn 116	AL	115(a)	76.3	0	
Sn 116	AY	176(a)	74.5	116	SnO_2
Sn 116	BC	198(a)	58.4	388	SnO_2
Sn 116	BI	230(a)	43.2	304	SnO_2
Sn 116	CR	363(a)	89/57	3,840	SnO_2
Sn 116	EC	530(a)	92.64	7,284	SnO_2
Sn 117	AL	116(a)	69.8	0	

Natural Isotopic Abundance:

Sn 112 - 1.00%	Sn 118 - 24.07%
Sn 114 - 0.68%	Sn 119 - 8.63%
Sn 115 - 0.44%	Sn 120 - 32.53%
Sn 116 - 14.40%	Sn 122 - 4.68%
Sn 117 - 7.68%	*Sn 124 - 4.89%

Tin (cont'd)
Atomic No. 50

Electromagnetically Concentrated Isotopes

*Radioactive

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Sn 117	BI	231(b)	75.3	288	SnO_2
Sn 117	CR	364(a)	73.93	4,748	SnO_2
Sn 117	EC	531(a)	77.07	4,482	SnO_2
Sn 118	AL	117(a)	69.3	918	SnO_2
Sn 118	AY	178(a)	90.1	1,014	SnO_2
Sn 118	BC	200(a)	91.8	63	SnO_2
Sn 118	BI	232(a)	84.6	1,020	SnO_2
Sn 118	CR	365(a)	93.26	8,510	SnO_2
Sn 118	EC	532(a)	94.91	13,126	SnO_2
Sn 119	AL	118(a)	68.3	0	
Sn 119	AY	179(a)	77.1	93	SnO_2
Sn 119	BC	201(a)	64.4	382	SnO_2
Sn 119	BI	233(a)	78.5	166	SnO_2
Sn 119	CR	366(a)	78.25	5,024	SnO_2
Sn 119	EC	533(a)	79.82	18,057	SnO_2
Sn 120	AL	119(a)	93.5	420	SnO_2
Sn 120	AY	180(a)	95.4	1,588	SnO_2

Natural Isotopic Abundance:

Sn 112 - 1.00%	Sn 118 - 24.07%
Sn 114 - 0.68%	Sn 119 - 8.63%
Sn 115 - 0.44%	Sn 120 - 32.53%
Sn 116 - 14.40%	Sn 122 - 4.68%
Sn 117 - 7.68%	*Sn 124 - 5.89%

Tin (cont'd)
Atomic No. 50

Electromagnetically Concentrated Isotopes

*Radioactive

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Sn 120	BC	202(a)	72.6	3,155	SnO_2
Sn 120	BI	234(a)	53.6	1,760	SnO_2
Sn 120	CR	367(a)	97.01	18,120	SnO_2
Sn 120	EC	534(a)	98.14	18,026	SnO_2
Sn 122	AL	120(a)	61.0	0	
Sn 122	AY	181(a)	70.7	0	
Sn 122	BC	203(a)	42.9	0	
Sn 122	BI	235(a)	45.8	13	SnO_2
Sn 122	CR	368(a)	83.66	2,545	SnO_2
Sn 122	EC	535(a)	88.92	2,235	SnO_2
Sn 124	AL	121(a)	64.5	0	
Sn 124	BC	204(a)	52.0	0	
Sn 124	BI	236(a)	71.0	0	
Sn 124	BI	236(ar)	71.0	125	SnO_2
Sn 124	CR	369(a)	83.1	0	
Sn 124	CR	369(au)	83.1	0	
Sn 124	CR	369(ar)	83.1	0	
Sn 124	EC	536(a)	95.04	30	SnO_2

Natural Isotopic Abundance:

Sn 112 - 1.00%	Sn 118 - 24.07%
Sn 114 - 0.68%	Sn 119 - 8.63%
Sn 115 - 0.44%	Sn 120 - 32.53%
Sn 116 - 14.40%	Sn 122 - 4.68%
Sn 117 - 7.68%	*Sn 124 - 5.89%

Tin (cont'd)
Atomic No. 50

Electromagnetically Concentrated Isotopes

*Radioactive

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Sn 124	EC	536(as)	95.04	0	

Natural Isotopic Abundance:

Sb 121 - 57.25%

Sb 123 - 42.75%

Antimony
Atomic No. 51

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Sb 121	AE	93(a)	99.4	0	
Sb 121	BT	274(a)	97.7	75	Sb
Sb 123	AE	94(a)	96.7	0	
Sb 123	BT	275(a)	95.6	1,379	Sb

Natural Isotopic Abundance:

Te 120 - 0.094%
Te 122 - 2.46%
Te 123 - 0.86%
Te 124 - 4.67%
Te 125 - 6.97%
Te 126 - 18.69%
Te 128 - 31.81%
*Te 130 - 34.41%

Tellurium
Atomic No. 52

Electromagnetically Concentrated Isotopes

*Radioactive

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Te 120	AU	153(a)	18.0	0	
Te 120	CA	292(a)	13.7	0	
Te 120	DX	505(a)	22.3	0	
Te 120	FE	640(a)	19.90	12	Te
Te 122	AU	154(a)	77.8	19	Te
Te 122	CA	293(a)	79.4	0	
Te 122	DX	506(a)	86.24	39	Te
Te 122	FE	641(a)	81.72	240	Te
Te 123	AU	155(a)	34.9	7	Te
Te 123	CA	294(a)	45.8	0	
Te 123	DX	507(a)	60.91	67	Te
Te 123	FE	642(a)	48.58	114	Te
Te 124	AU	156(a)	72.5	56	Te
Te 124	CA	295(a)	83.9	198	Te
Te 124	CA	295(b)	21.8	225	Te
Te 124	DX	508(a)	76.47	555	Te
Te 124	FE	643(a)	81.34	650	Te

Natural Isotopic Abundance:

Te 120 - 0.094%
Te 122 - 2.46%
Te 123 - 0.86%
Te 124 - 4.67%
Te 125 - 6.97%
Te 126 - 18.69%
Te 126 - 31.81%
*Te 130 - 34.44%

Tellurium (cont'd)
Atomic No. 52

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Te 125	AU	157(a)	81.1	38	Te
Te 125	CA	296(a)	87.9	0	
Te 125	CA	296(b)	40.5	264	Te
Te 125	CA	296(ar)	87.9	2,130	Te
Te 125	DX	509(a)	81.65	0	
Te 125	FE	644(a)	80.53	1,262	Te
Te 126	AU	158(a)	93.2	1,496	Te'
Te 126	CA	297(a)	95.4	1,547	Te
Te 126	CA	297(ar)	95.4	943	Te
Te 126	CA	297(b)	79.0	914	Te
Te 126	DX	510(b)	89.68	4,411	Te
Te 126	FE	645(a)	93.46	3,261	Te
Te 128	AU	159(a)	93.5	1,156	Te
Te 128	CA	298(a)	94.4	8,795	Te
Te 128	CA	298(ar)	94.4	714	Te
Te 128	CA	298(b)	91.8	1,594	Te
Te 128	CA	298(c)	94.0	111	Te

Natural Isotopic Abundance:

Tellurium (cont'd)
Atomic No. 52

Te 120 - 0.094% Te 126 - 18.69%

Te 122 - 2.46% Te 128 - 31.81%

Te 123 - 0.86% Te 130 - 34.44%

Te 124 - 4.67%

Te 125 - 6.97%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Te 128	DX	511(a)	82.32	5,760	Te
Te 128	FE	646(a)	96.47	4,881	Te
Te 130	AU	160(a)	93.0	530	Te
Te 130	CA	299(a)	97.4	7,905	Te
Te 130	CA	299(b)	93.5	0	
Te 130	CA	299(br)	93.5	950	Te
Te 130	DX	512(a)	78.23	4,936	Te
Te 130	FE	647(a)	97.78	4,914	Te

Natural Isotopic Abundance:

Barium
Atomic No. 56

Ba 130 - 0.103%
Ba 132 - 0.096%
Ba 134 - 2.39%
Ba 135 - 6.55%
Ba 136 - 7.79%
Ba 137 - 11.25%
Ba 138 - 71.83%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Ba 130	DG	429(a)	16.0	0	
Ba 132	DG	430(a)	7.43	0	
Ba 134	DG	431(a)	51.39	0	
Ba 135	DG	432(a)	67.32	751	$BaCO_3$
Ba 136	DG	433(a)	50.02	183	$BaCO_3$
Ba 137	DG	434(a)	38.98	1,100	$BaCO_3$
Ba 138	DG	435(a)	98.04	1,380	$BaCO_3$

Natural Isotopic Abundance:

La 138 - 0.087%

La 139 - 99.903%

Lanthanum
Atomic No. 57

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
La 138	EF	544(a)	0.597	351	La_2O_3
La 139	EF	545(a)	99.96	17,643	La_2O_3

Natural Isotopic Abundance:

Ce 136 - 0.195%

Ce 138 - 0.265%

Ce 140 - 88.44%

Ce 142 - 11.10%

Cerium
Atomic No. 58

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Ce 136	DD	415(a)	16.6	0	
Ce 136	DW	501(a)	8.94	0	
Ce 136	FK	675(a)	22.29	0	
Ce 138	DD	416(a)	8.9	0	
Ce 138	DW	502(a)	4.42	300	CeO_2
Ce 138	FK	676(a)	Refinement Incomplete		
Ce 140	CW	389(a)	98.5	3,786	CeO_2
Ce 140	DD	417(a)	98.7	8,397	CeO_2
Ce 140	DW	503(a)	99.25	0	
Ce 140	FK	677(a)	Refinement Incomplete		
Ce 142	DD	418(b)	87.4	29	CeO_2
Ce 142	DW	504(a)	84.42	516	CeO_2
Ce 142	FK	678(a)	Refinement Incomplete		

Natural Isotopic Abundance:

Neodymium
Atomic No. 60

Nd 142 - 26.83%
Nd 143 - 12.10%
Nd 144 - 23.95%
Nd 145 - 8.36%
Nd 146 - 17.29%
Nd 148 - 5.80%
Nd 150 - 5.67%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Nd 142	EQ	587(a)	93.00	85	Nd_2O_3
Nd 143	EQ	588(a)	83.93	104	Nd_2O_3
Nd 144	EQ	589(a)	93.45	93	Nd_2O_3
Nd 145	EQ	590(a)	78.60	189	Nd_2O_3
Nd 146	EQ	591(a)	95.60	64	Nd_2O_3
Nd 148	EQ	592(a)	89.85	0	
Nd 150	EQ	593(a)	94.76	0	

Natural Isotopic Abundance:

Samarium
Atomic No. 62

Sm 144 - 3.13%
Sm 152 - 26.59%
*Sm 147 - 15.12%
Sm 154 - 22.62%
Sm 148 - 11.29%
Sm 149 - 13.87%
Sm 150 - 7.38%

Electromagnetically Concentrated Isotopes

*Radioactive

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Sm 144	EM	567(a)	72.13	17	Sm_2O_3
Sm 144	FH	660(a)	58.93	82	Sm_2O_3
Sm 147	EM	569(a)	81.63	14	Sm_2O_3
Sm 147	FH	661(a)	78.35	377	Sm_2O_3
Sm 148	EM	570(a)	76.01	729	Sm_2O_3
Sm 148	FH	662(a)	62.40	649	Sm_2O_3
Sm 149	EM	571(a)	71.53	34	Sm_2O_3
Sm 149	FH	663(a)	73.01	131	Sm_2O_3
Sm 150	EM	572(a)	74.09	348	Sm_2O_3
Sm 150	FH	664(a)	68.04	907	Sm_2O_3
Sm 152	EM	573(a)	89.90	3,312	Sm_2O_3
Sm 152	FH	665(a)	93.92	4,769	Sm_2O_3
Sm 154	EM	574(a)	92.10	2,649	Sm_2O_3
Sm 154	FH	666(a)	96.05	2,208	Sm_2O_3

Natural Isotopic Abundance:

Hafnium
Atomic No. 72

Hf 174 - 0.17%
Hf 176 - 5.22%
Hf 177 - 18.53%
Hf 178 - 27.25%
Hf 179 - 13.67%

Hf 179 - 13.67%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Hf 174	ET	602(a)	7.85	83	HfO_2
Hf 176	ET	603(a)	48.46	98	HfO_2
Hf 177	ET	604(a)	61.71	788	HfO_2
Hf 178	ET	605(a)	80.91	1,448	HfO_2
Hf 179	ET	606(a)	46.57	578	HfO_2
Hf 180	ET	607(a)	93.96	1,412	HfO_2

Natural Isotopic Abundance:

Tungsten
Atomic No. 74

W 180 - 0.16%

W 182 - 26.21%

W 183 - 14.33%

W 184 - 30.61%

W 186 - 28.69%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
W 180	BG	220(a)	9.00	0	
W 180	CL	340(a)	4.95	41	WO_3
W 180	CL	340(ar)	4.95	54	WO_3
W 180	EL	561(a)	6.95	275	WO_3
W 182	BG	221(a)	94.25	46	WO_3
W 182	CL	341(a)	91.58	1,639	WO_3
W 182	EL	562(a)	92.33	10,990	WO_3
W 183	BG	222(a)	86.21	217	WO_3
W 183	CL	342(a)	82.01	745	WO_3
W 183	EL	563(a)	82.63	6,164	WO_3
W 184	BG	223(a)	95.72	440	WO_3
W 184	CL	343(a)	91.14	106	WO_3
W 184	CL	343(ar)	91.14	2,980	WO_3
W 184	EL	564(a)	95.06	10,974	WO_3
W 186	BG	224(a)	97.94	92	WO_3
W 186	CL	344(a)	97.17	616	WO_3
W 186	CL	344(ar)	97.17	372	WO_3
W 186	EL	565(a)	97.54	11,493	WO_3

Natural Isotopic Abundance:

Re 185 - 37.31%

Re 187 - 62.69%

Rhenium
Atomic No. 75

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Re 185	CP	356(a)	85.38	2,512	Re
Re 187	CP	357(a)	98.22	715	Re

Natural Isotopic Abundance:

Mercury
Atomic No. 80

Hg 196 - 0.16% Hg 202 - 29.76%

Hg 198 - 10.02% Hg 204 - 6.86%

Hg 199 - 16.90%

Hg 200 - 23.10%

Hg 201 - 13.20%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Hg 196	DR	485(a)	8.44	0	
Hg 196	DR	485(b)	1.90	0	
Hg 196	DR	485(c)	1.46	347	Hg
Hg 198	DR	486(a)	79.11	366	Hg
Hg 198	DR	486(b)	66.11	375	Hg
Hg 198	DR	486(c)	53.37	853	Hg
Hg 198	DR	486(d)	54.35	2,930	Hg
Hg 199	DR	487(a)	73.9	45	Hg
Hg 199	DR	487(b)	72.1	28	Hg
Hg 199	DR	487(c)	68.0	0	
Hg 199	DR	487(d)	65.45	43	Hg
Hg 199	DR	487(e)	62.51	177	Hg
Hg 200	DR	488(a)	91.39	103	Hg
Hg 200	DR	488(b)	86.45	119	Hg
Hg 200	DR	488(c)	80.85	749	Hg
Hg 200	DR	488(d)	74.90	3,478	Hg
Hg 200	DR	488(e)	64.66	1,420	Hg

Natural Isotopic Abundance:

Mercury (cont'd)

Hg 196 - 0.16%
Hg 198 - 10.02%
Hg 199 - 16.90%
Hg 200 - 23.10%
Hg 202 - 29.76%
Hg 204 - 6.86%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Hg 200	DR	488(f)	76.28	1,492	Hg
Hg 201	DR	489(a)	71.8	26	Hg
Hg 201	DR	489(b)	62.48	90	Hg
Hg 201	DR	489(c)	57.90	230	Hg
Hg 201	DR	489(d)	57.3	178	Hg
Hg 201	DR	489(e)	51.48	121	Hg
Hg 202	DR	490(a)	98.3	52	Hg
Hg 202	DR	490(b)	98.06	20	Hg
Hg 202	DR	490(c)	97.33	55	Hg
Hg 202	DR	490(d)	96.45	122	Hg
Hg 202	DR	490(e)	95.13	379	Hg
Hg 202	DR	490(f)	91.46	1,032	Hg
Hg 202	DR	490(g)	87.87	354	Hg
Hg 202	DR	490(h)	80.27	4,334	Hg
Hg 202	DR	490(i)	75.75	825	Hg
Hg 204	DR	491(a)	89.17	31	Hg
Hg 204	DR	491(b)	77.61	228	Hg

Natural Isotopic Abundance:

Mercury (cont'd)
Atomic No. 80

Hg 196 - 0.16%
Hg 198 - 10.02%
Hg 199 - 16.90%
Hg 200 - 23.10%
Hg 201 - 13.20%
Hg 202 - 29.76%
Hg 204 - 6.86%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Hg 204	DR	491(c)	69.80	0	
Hg 204	DR	491(d)	62.78	129	Hg
Hg 204	DR	491(e)	49.66	1,346	Hg
Hg 204	DR	491(f)	42.91	662	Hg
Hg 204	DR	491(g)	30.07	363	Hg
Hg 204	DR	491(h)	72.34	93	Hg

Natural Isotopic Abundance:

Tl 203 - 29.51%

Tl 205 - 70.49%

Thallium
Atomic No. 81

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Tl 203	BV-3	278(a)	75.6	194	Tl_2O_3
Tl 203	BX	284(a)	61.1	5,899	Tl_2O_3
Tl 203	BY-3	286(a)	47.9	6,875	Tl_2O_3
Tl 203	CC-3	307(a)	58.8	601	Tl_2O_3
Tl 203	CF-3	322(a)	86.0	1,170	Tl_2O_3
Tl 203	CG-3	324(a)	34.1	106	Tl_2O_3
Tl 203	CH-3	326(a)	61.0	1,892	Tl_2O_3
Tl 205	BR-3	267(a)	89.5	1,436	Tl_2O_3
Tl 205	BU-3	277(a)	92.8	4,276	Tl_2O_3
Tl 205	BV-3	279(a)	95.2	1,047	Tl_2O_3
Tl 205	BX	285(a)	98.7	940	Tl_2O_3
Tl 205	BY-3	287(a)	92.8	2,715	Tl_2O_3
Tl 205	CC-3	308(a)	86.1	577	Tl_2O_3
Tl 205	CF-3	323(a)	95.6	176	Tl_2O_3
Tl 205	CH-3	327(a)	91.8	1,594	Tl_2O_3
Tl 205	CJ-3	333(a)	90.5	3,818	Tl_2O_3

Natural Isotopic Abundance:

Pb 204 - 1.37%

Pb 206 - 26.26%

Pb 207 - 20.82%

Pb 208 - 51.51%

Lead
Atomic No. 82

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Pb 204	O	43(a)	7.8	87	$PbCrO_4$
Pb 204	AQ	135(a)	16.69	0	
Pb 204	AQ	135(ar)	16.69	38	$PbCrO_4$
Pb 204	BO	257(a)	23.4	13	$PbCrO_4$
Pb 204	CN	349(a)	27.0	0	
Pb 204	EO	581(a)	25.70	2,825	PbO
Pb 206	O	44(a)	75.67	278	$PbCrO_4$
Pb 206	AQ	136(a)	77.9	255	$PbCrO_4$
Pb 206	BO	258(a)	71.3	238	$PbCrO_4$
Pb 206	BO	258(ar)	71.3	1,018	$PbCrO_4$
Pb 206	CN	350(a)	81.0	0	
Pb 206	EO	582(a)	64.93	4,207	PbO
Pb 207	O	45(a)	61.55	181	$PbCrO_4$
Pb 207	AQ	137(a)	48.2	553	$PbCrO_4$
Pb 207	AQ	137(ar)	48.2	512	$PbCrO_4$
Pb 207	BO	259(a)	66.8	1,299	$PbCrO_4$
Pb 207	BO	259(ar)	56.8	529	$PbCrO_4$
Pb 207	CN	351(a)	61.6	0	

Natural Isotopic Abundance:

Lead (cont'd)
Atomic No. 82

Pb 204 - 1.37%

Pb 206 - 26.26%

Pb 207 - 20.82%

Pb 208 - 51.51%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Pb 207	EO	583(a)	61.06	5,660	PbO
Pb 208	O	46(a)	92.1	33	$PbCrO_4$
Pb 208	O	46(ar)	92.1	160	$PbCrO_4$
Pb 208	AQ	138(a)	82.10	846	$PbCrO_4$
Pb 208	BO	260(a)	96.6	486	PbO
Pb 208	CN	352(ar)	95.8	166	$PbSO_4$
Pb 208	EO	584(a)	87.97	23,445	PbO