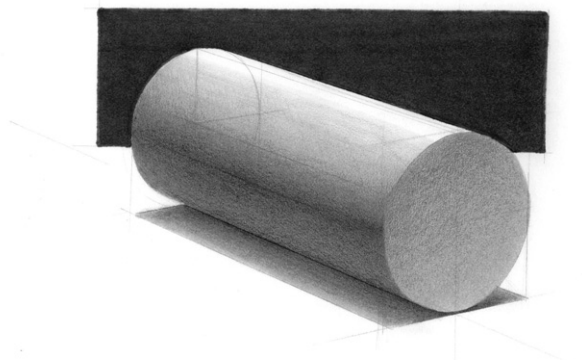


STATION 12

A 12th ELEMENT (X) ID CHALLENGE

A 12th cylinder (X) of the same size as the previous 11 has been placed on a scale and the density (for this station, density is much more useful than relative density - to obtain density from the mass, divide by the volume (3.22 g/cm^3) and magnetic property determined. Electrical conductivity and appearance should also be determined. The added challenge for this identification is that this element could be any of the non-radioactive elements found on the earth. Using the properties of the element and the periodic table, identify the element.



Station 12 - Answers to question.

See the last pages of the Station 11 section. The properties of element X are consistent with tin.

element	symbol	at. #	density (g/cm ³)	elect. cond.	mag. prop.	color	m.p. (°C)	b.p. (°C)	Keys
Hydrogen	H	1	0.09		D	CL	-259	-253	
Helium	He	2	0.18		D	CL	-272	-269	Elect. Cond. key
Neon	Ne	10	0.9		D	CL	-249	-246	C = elect. Cond.
Nitrogen	N	7	1.25		D	CL	-210	-196	C' = less cond. C
Oxygen	O	8	1.43		P	CL	-218	-183	SC = semiconductor
Fluorine	F	9	1.79		Y	-220	-188	WC = weak cond.	
Argon	Ar	18	1.78		D	CL	-189	-186	NC = non-conductor
Chlorine	Cl	17	3.21	WC	D	G	-101	-35	
Krypton	Kr	36	3.75		D	CL	-157	-153	Magnetic Properties
Xenon	Xe	54	5.9		D	CL	-112	-108	D = diamagnetic
Radon	Rn	86	9.73			CL	-71	-62	P = paramagnetic
Lithium	Li	3	0.53	C	P	S	180	1347	F = ferromagnetic
Potassium	K	19	0.86	C		S	64	774	AF = antiferromagnetic
Sodium	Na	11	0.97	C	P	S	98	883	
Calcium	Ca	20	1.55	C	P	S	839	1484	Color
Rubidium	Rb	37	1.63	C		S	39	688	CL = colorless
Magnesium	Mg	12	1.74	C	P	S	639	1090	Y = yellow
Phosphorus	P	15	1.82	NC	D	W	44	280	G = green
Beryllium	Be	4	1.85	C	D	SG	1278	2970	S = silver
Francium	Fr	87	1.87				27	677	W = white
Cesium	Cs	55	1.87		C	S	29	678	SG = slate gray
Sulfur	S	16	2.07	NC	D	Y	113	445	B = black
Carbon	C	6	2.27	WC	D	B	3500	4827	G = grey
Silicon	Si	14	2.33	SC	D	G	1410	2355	C = copper
Boron	B	5	2.34	NC	D	B	2300	2550	
Strontium	Sr	38	2.54	C	P	S	769	1384	
Aluminum	Al	13	2.7	C	P	S	660	2467	
Scandium	Sc	21	2.99	C		S	1539	2832	
Bromine	Br	35	3.12	NC	D	R	-7	59	
Barium	Ba	56	3.59	C	P	S	725	1140	
Yttrium	Y	39	4.47	C		S	1523	3337	
Titanium	Ti	22	4.54	C	P	S	1660	3287	
Selenium	Se	34	4.79		D	G	217	685	
Iodine	I	53	4.93	C		P	114	284	
Europium	Eu	63	5.24	C	P	S	822	1597	
Germanium	Ge	32	5.32	SC	D	G	937	2380	
Radium	Ra	88	5.5			S	700	1737	
Arsenic	As	33	5.72	C	D	S	81	613	
Gallium	Ga	31	5.91	C	D	S	30	2403	
Vanadium	V	23	6.11	C		S	1890	3380	
Lanthanum	La	57	6.15	C		S	920	3469	
Tellurium	Te	52	6.24	WC	D	S	449	990	
Zirconium	Zr	40	6.51	C	P	S	1852	4377	
Antimony	Sb	51	6.68	C	D	S	630	1750	
Praseodymium	Pr	59	6.77	C		S	935	3127	
Cerium	Ce	58	6.77	C	P	S	795	3257	
Ytterbium	Yb	70	6.96	C		S	824	1466	
Astatine	At	85	7				302	337	

element	symbol	at. #	density (g/cm ³)	elect. cond.	mag. prop.	color	m.p. (°C)	b.p. (°C)
Neodymium	Nd	60	7.01	C	F	S	1010	3127
Zinc	Zn	30	7.13	C	D	SG	420	907
Chromium	Cr	24	7.19	C	AF	S	1857	2672
Promethium	Pm	61	7.26	C		S	1100	3000
Indium	In	49	7.31	C	D	S	157	2000
Tin	Sn	50	7.31	C	P	S	232	2270
Manganese	Mn	25	7.43	C	P	S	1245	1962
Samarium	Sm	62	7.52	C	P	S	1072	1900
Iron	Fe	26	7.87	C	F	G	1535	2750
Gadolinium	Gd	64	7.9	C'	F	S	1311	3233
Terbium	Tb	65	8.23	C	F	S	1360	3041
Dysprosium	Dy	66	8.55	C	F	S	1412	2562
Niobium	Nb	41	8.57	C		G	2468	4927
Cadmium	Cd	48	8.65	C	D	S	321	765
Holmium	Ho	67	8.8	C	F	S	1470	2720
Cobalt	Co	27	8.86	C	F	G	1495	2870
Nickel	Ni	28	8.91	C	F	G	1453	2732
Copper	Cu	29	8.96	C	D	C	1083	2567
Erbium	Er	68	9.07	C	F	S	1522	2510
Polonium	Po	84	9.32	C		S	254	962
Thulium	Tm	69	9.32	C	P	S	1545	1727
Bismuth	Bi	83	9.75	C	D	G	271	1560
Lutetium	Lu	71	9.84	C		S	1656	3315
Actinium	Ac	89	10.07			S	1050	3200
Molybdenum	Mo	42	10.22	C	P	G	2612	4612
Silver	Ag	47	10.5	C	D	S	962	2212
Lead	Pb	82	11.35	C	D	SG	327	1740
Technetium	Tc	43	11.5	C		S	2200	4877
Thorium	Th	90	11.72	C		S	1750	4790
Thallium	Tl	81	11.85	C	D	S	303	1457
Palladium	Pd	46	12.02	C	P	S	1552	2927
Ruthenium	Ru	44	12.37	C	P	S	2250	3900
Rhodium	Rh	45	12.41	C	P	S	1966	3727
Hafnium	Hf	72	13.31	C		G	2150	5400
Curium	Cm	96	13.5			S	1340	
Mercury	Hg	80	13.55	C	D	S	-39	357
Americium	Am	95	13.67			S	994	2607
Berkelium	Bk	97	14.78				985	
Californium	Cf	98	15.1				900	
Protactinium	Pa	91	15.4	C		S	1568	
Tantalum	Ta	73	16.65	C		G	2996	5425
Uranium	U	92	18.95	C		S	1132	3818
Gold	Au	79	19.32	C	D	G	1064	2807
Tungsten	W	74	19.35	C	P	G	3410	5660
Plutonium	Pu	94	19.84	C'		S	640	3235
Neptunium	Np	93	20.2	C'		S	640	3902
Rhenium	Re	75	21.04	C		G	3180	5627
Platinum	Pt	78	21.45	C	P	G	1772	3827
Iridium	Ir	77	22.4	C	P	S	2410	4527
Osmium	Os	76	22.6	C	P	SG	3045	5027

