

An Improved Description of Technetium Spectra (Tc I and Tc II), 2000 to 9000 Å

W. R. Bozman, W. F. Meggers, and C. H. Corliss

Institute for Basic Standards, National Bureau of Standards, Washington, D.C. 20234

(June 26, 1967)

A new description of technetium spectra has been made that is more complete and provides more accurate data on wavelengths than those reported heretofore. The observations were made in the region 2000 to 9000 Å with arc and spark sources. Larger samples of technetium and spectrographs of higher resolution were used and the number of lines reported (4500) is more than doubled. The intensities are estimated over a range from 1 to 20,000 and the relative strengths in arc and spark permit assignment of the origin of the lines to neutral atoms (3300 lines) or ions (1200 lines).

Key Words: Spectra of technetium; technetium, spectra of; wavelengths of technetium

1. Introduction

It is nearly a hundred years since Mendeléeff predicted the existence of the chemical analog of manganese, which we now call technetium. Because it was first produced artificially, the element was named from the Greek word τεχνητός, artificial [1].¹ Over the past 30 years increasingly larger amounts of the element have been artificially prepared. By 1949 Meggers and Scribner were able to obtain 6 mg of ⁹⁹Tc from the Atomic Energy Commission. With this sample they made a description of arc and spark spectra of technetium [2] which they hoped would “serve for spectrochemical identification and for structural analyses of these spectra.”

Although the list of lines published by Meggers and Scribner did not entirely fulfill their hopes, it provided material for a preliminary analysis of the structures of Tc I and Tc II by Meggers [3] and for the remarkable discovery by Merrill [4] of naturally occurring technetium in R Andromedae and other S stars.

In order to make a substantial extension to the preliminary analyses of Meggers [3] it has been necessary to reobserve the spectrum with larger samples of technetium and higher spectrographic resolution. The new observations, which are reported in the present paper, have doubled the number of known lines and significantly improved the accuracy of the wavelengths.

Using this new list of lines, and also observations of the Zeeman effect, Bozman [5, 6] has reported the classification of 900 lines of Tc I as transitions among

40 even and 70 odd levels. Most of these levels have been compiled and published by C. E. Moore [7]. Further analysis and details of the work already reported will be published shortly.

Moore and Catalán extended the analysis of Tc II from this list and provided new terms and *g*-values for her compilation, *Atomic Energy Levels* [8]. The analysis of Tc II is far from complete. Further observations below 2000 Å are needed.

2. Observations

2.1. Samples and Sources

These new observations were made possible by the generous loan of 20 mg of ⁹⁹Tc as ammonium pertechnetate (NH₄TcO₄) from the Atomic Energy Commission, obtained with the help of G. W. Parker of the Oak Ridge National Laboratory.

Preliminary experiments in the manipulation and excitation of the sample were conducted with (NH₄)₆Mo₇O₂₄ because of the rarity and radioactivity of the technetium. As a result of studies of various electrical parameters and electrode configurations the following conditions were adopted for the exposures.

For the arc exposures 400 μg of Tc was evaporated from solution in a shallow cup on the end of a 1/4-in diam copper or silver rod which served as the lower anode. The upper cathode of the same material was tipped with a 90° cone. A 2-min exposure was made from the center portion of a 5 A arc in air drawn across a 3-mm gap between the electrodes.

¹ Figures in brackets indicate the literature references at the end of this paper.

For the spark exposures 200 μg of Tc was evaporated from solution on the flat ends of a pair of truncated wedges forming the tips of $\frac{1}{4}$ -in diam copper or silver rods. A 30-sec exposure was made with light from the portion of a 5-mm gap next to one electrode surface. The spark was produced by the discharge from a capacitor of 0.006 μF charged by a 30,000 V transformer. Several successive exposures from freshly loaded pairs of electrodes were necessary to obtain spark spectra of adequate strength on the plates.

All regions of the spectrum were photographed with both silver and copper electrodes to permit observation of Tc lines masked by lines of the electrode material. A typical spectrogram consisted of successive juxtaposed spectra as follows: standard iron arc, Cu or Ag blank arc, arc of Tc on Cu or Ag, spark of Tc on Cu or Ag, Cu or Ag blank spark, standard iron arc.

The arcs and sparks were always operated in a brass housing with quartz windows to prevent contamination of the surroundings with the radioactive ^{99}Tc . A current of air was drawn through the housing with a vacuum pump and the exhaust was filtered through glass wool where the used Tc was collected.

2.2. Spectrographs and Standards

The region from 2000 to 6900 \AA was photographed with a 1200 line/mm concave grating ruled by R. W. Wood and mounted in parallel light. This mounting produces stigmatic images of the slit to allow use of juxtaposed spectra. The average resolution with the slit width used was about 1/50,000, i.e., the equivalent slit width was about 0.06 \AA at 3000 \AA . This region was photographed on Eastman 103-O-UV and 103a-F(3) plates. One set of exposures was made on the Hilger E-1 Littrow quartz prism spectrograph in the region 2000 to 2300 \AA .

The region from 6600 to 9000 \AA was observed with a 600 line/mm grating mounted in parallel light and with an equivalent slit width of about 0.2 or 0.3 \AA . No spark exposures were made in this region.

A few exposures were made beyond 9000 \AA and below 2000 \AA by using electrodeless lamps but the lamps did not run well.

Every region of the spectrum was photographed from two to four times and each plate was measured twice, each time by a different observer. Each wavelength represents about five measurements, on the average.

Since this work was all done in 1952 and 1953 before the advent of standard wavelengths from thorium, the iron arc was used to provide the standard lines.

3. Results

The results of this investigation are presented in table 1, where wavelengths and relative intensities of 4500 spectral lines characteristic of technetium atoms and ions are given. In the region from 2000 to 2300 \AA the wavelengths represent the average of eight measurements for most of the lines. From 2300 to

4200 \AA , six observations were made and from 4200 to 9000 \AA the averages were made from four observations. All regions were observed in both arc and spark and on both copper and silver electrodes except for wavelengths longer than 6900 \AA where no spark observations were made.

In the earlier experiments reported in [2], all the spectra were excited from copper electrodes; in the present work the use of silver electrodes as well as higher resolving power has revealed lines previously obscured by copper lines. In particular, the Tc II line at 2529.34 was not previously resolved from the Cu II line at 2529.30 and its absence from the earlier line list prevented the discovery of the $4d^6 a^5D$ term of Tc II by Meggers [3].

The probable error in the wavelengths depends, of course, on the region of the spectrum and on the number of measurements. The agreement observed among the measurements was sufficient to warrant the retention of three decimal places at wavelengths shorter than 6900 \AA ; at longer wavelengths only two decimal places are given.

The relative intensities of the lines have been estimated on a scale extending from 1 to 20,000. The relative intensities of the very strong lines are undoubtedly distorted by severe self-absorption and the true relative intensities among these lines are better represented by the numbers reported in reference [2], where a smaller amount of Tc was used in each exposure. No attempt has been made to represent a true scale of relative power radiated in different regions of the spectrum. It is probable that the intensities in the short wavelength regions, especially those below 2300 \AA are much underestimated relative to the visible and near ultraviolet, whereas intensities in the infrared portion are probably slightly overestimated.

The lines which are stronger in the arc originate in the neutral atom and those of equal or greater intensity in the spark originate in the singly charged ion or, perhaps in a few cases in the shortest wavelength region, in the doubly charged ion.

The intensity numbers are in some cases accompanied by literal symbols indicating characteristic features of the lines as follows:

- c*—complex
- d*—double
- e*—enhanced at the electrode
- h*—hazy
- H*—very hazy
- l*—shaded to longer waves
- s*—shaded to shorter waves
- w*—wide
- W*—very wide
- tr*—intensity < 1 .

The complex characteristic exhibited by some Tc lines is due to hyperfine structure arising from interaction of valence electrons with the atomic nucleus. This structure has been studied in detail at higher resolution by Kessler and Trees [9].

TABLE 1. Spectrum of technetium

Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity	
	Arc	Spark		Arc	Spark		Arc	Spark		Arc	Spark
2054.468		4	2140.738		6	2258.410		1	2376.040		8
2057.704	2		2140.943	1		2260.870		1	2377.770	1	
2058.880	2		2141.830		3h	2261.247	3	15	2382.098	6	
2060.266		2	2144.900	2		2263.533		2	2382.386		2
2060.961	2e	6	2145.322	5		2266.220	10	30	2382.992	3	
2062.929		2e	2147.193	2	2	2267.424	2	2	2384.650	1	15
2064.022	4	1	2148.305	4	4	2268.100		1	2385.338		2
2064.211		1	2149.764		2	2270.722		1	2386.030		1
2064.853	tr		2151.250		5	2271.094	5	50	2387.188	3	
2065.154		1	2153.390	2		2271.218	5	40	2392.012	8	
2067.630		3	2154.668	2		2271.662	3		2393.422		1
2068.323	1		2155.278		12	2272.441	5	10	2394.498		2
2071.289	1		2156.272	30	1	2272.976	2		2394.777		1
2072.072		4	2156.608		1	2274.525	2		2394.974	6	
2073.563	2		2156.908		2	2274.624	2		2395.291		1
2076.700		1	2157.780	1		2278.403	1	3	2396.628		2
2077.210		1	2157.800		10	2280.304	2		2396.984		1
2079.071		6	2158.702	1		2280.884	4		2397.400		2
2079.504		10	2159.292	2	3	2282.121	10		2398.652	2	
2079.808		1	2159.843	5e	50h	2282.361		1	2398.682		60
2081.466		2	2160.606		1	2282.713	10		2399.368	4	
2084.088	5	2	2160.771	2	10	2285.451	50	15	2400.896		4
2084.683	1		2163.546	3	4	2287.470	2	1	2404.101	2	50
2086.853	1		2164.988		8	2287.931		1	2405.128	8	
2087.628	3		2165.902	5	10	2291.637	1	3	2406.651		3
2089.268	3	10	2168.554		1	2292.104	1	2	2407.099		3
2089.657		3	2170.123	1	10	2298.080	100	30	2407.875	5	
2090.682	4	20	2170.546	1		2299.095		1	2408.158		6
2090.987		2	2173.446	3	5	2299.947	1	2	2408.815	7	
2091.730		1	2177.980		4	2300.405		2h	2410.193		2
2092.830	1		2178.935		8	2300.950	3	4	2412.610	6	
2093.310	1		2180.454		6	2302.556		1	2414.471		3
2094.551		1	2182.032		30	2310.706		2h	2416.217	30	
2096.307	2	10	2183.001		15	2313.897		1	2417.524		3
2096.519	3		2184.244		2	2318.731		3	2418.031	7	
2098.119	5		2185.394	30		2324.596	2		2418.647	5	
2098.756	2		2187.476	1	1	2328.389		2	2418.737		1
2099.330	1		2188.218	5	20	2334.046		1	2419.818	2	
2099.680		1	2189.055	30		2336.041		2	2420.775		1
2101.520	4		2191.623	2	15	2337.526		2	2421.296	2h	2h
2101.580		1	2193.347	40	1	2338.278		3w	2423.228	50	3
2101.811	1		2193.999	4	20	2341.028		2	2424.538	20	1
2103.808	6		2196.669		4	2341.610		6	2425.250		1
2104.054		1	2197.501		15	2341.970		1	2425.904		1
2104.340		1	2198.344		2	2344.719	1	10	2427.084	2	
2105.248		2	2198.517		1	2344.845		6	2427.848	3	
2106.234	15	30	2199.825		8	2345.088	2		2431.360		1
2107.617		1	2204.151	4		2345.162		7	2432.337	2	
2107.848		6	2206.006	2		2346.592		5	2432.596		2h
2108.680		1	2207.310		1	2349.167		5	2433.728	8	
2109.056	1	4h	2214.224		2h	2349.594		1	2434.364		2
2110.302	5		2215.245		20	2350.096		1	2434.859		1
2111.252	5		2216.031		4	2350.320		1	2435.628		1
2114.259	3		2216.244		8	2353.166		2	2435.829	20	
2114.484	5		2221.000		2	2353.742		3	2436.824		5
2116.436	20	30	2221.133	3		2354.096		3	2436.994	10	
2118.218	2	2	2221.349		3	2354.448		1	2439.081	5	
2119.114	4		2221.918		4	2355.979		1	2441.284		1
2119.406	15		2226.626		6	2356.839	4		2441.494	1	2
2123.830	3	8	2227.876		6	2360.456		1	2445.560	1	4
2124.074	1		2233.860		8	2360.770		8	2446.049	3	
2125.302	4h	30h	2234.642	1	10w	2361.827	5		2446.864	4	
2126.542		1h	2236.270		6	2365.533		1	2447.440		1
2130.284		2	2237.176		3	2365.856		2	2447.860	3	
2131.912	3		2237.466		1	2366.539		6	2447.900		2
2132.061		5	2237.919		3	2367.660		1	2448.603		2
2133.182		4	2248.533	6		2368.010		1	2448.950	3	
2133.658		2	2252.319	1	1	2368.349		2	2449.119		10w
2135.169		30h	2254.524		3hw	2369.026		2	2450.093		4
2138.133		6h	2256.790		5	2372.104		1	2450.614		6

TABLE I. Spectrum of technetium - Continued

Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity	
	Arc	Spark		Arc	Spark		Arc	Spark		Arc	Spark
2451.602	5		2493.432	20	8	2529.340	80	400	2565.669		3
2451.759		2h	2493.696		2	2529.550	2		2566.024		25
2452.415		8	2494.129	8		2530.340	3	150	2566.322		10
2453.691	15		2495.025		2	2530.922	2h		2567.011	50	
2453.946		1	2496.767	100	500	2531.372		30	2567.034		250
2454.446		1	2497.232	1	70	2532.027		25	2567.510		2
2455.056	2		2497.317	2		2532.965		40 c	2567.733		20 cw
2455.936		1	2499.139		2	2533.247		1	2568.376	1	
2456.144		1	2499.582		15	2533.467	10	1	2568.405		3
2456.386	2		2500.654	2		2534.576	1	30	2568.664		4
2456.480	10		2500.837		1	2535.893		1	2569.623		2 c
2456.715		1	2500.990	15	1	2536.626		1	2569.874		40
2457.276		1	2501.361		5	2536.966		2	2571.164		8
2458.994	10		2501.882		2	2537.274		2	2571.590		30 wl
2460.764		2	2502.363	7	1	2537.405		3	2572.644		1
2461.523	9		2503.284		15 c	2537.513		4	2572.923		10
2461.655		2	2503.550	6		2538.039	1	5	2573.166		6
2461.876	3		2503.969		40	2538.507		1	2573.387		5
2463.500		2	2505.031		15 c	2538.688		10	2573.482		5
2463.694	80w	2w	2506.782	7		2538.804	2		2573.883		9
2464.340	3		2507.131	5 c	300	2539.025	3	1	2574.442	5	30 c
2464.470	1	10	2508.000		15 c	2539.790		2	2575.061	30	30
2464.804		1	2508.410		4	2540.468		6h	2575.234	1	40
2465.086	20	1	2508.783		5hw	2540.600		10	2575.581	15	
2465.740	10	1	2508.853	10		2540.767		1	2576.281	80	90
2466.100		2	2509.449		3	2541.367		10	2576.756		1
2466.382		1	2510.021		1	2543.227	500	5000 c	2577.000		2
2466.873	30	1	2510.167	30	4	2544.144	2		2577.861	40	40
2467.058		2	2510.878		3h	2544.405		15 c	2578.301	10	200
2467.520		5w	2511.270		10	2544.807	60	400	2578.791	300h l	100 hl
2468.114	3		2512.134	2		2545.565	15	1	2580.871	1	5
2468.715		2	2512.265		8	2545.754		5	2581.004	1	12
2471.286		4	2512.565	1 c	2hw	2546.043	1		2582.277		30h
2472.132		10	2512.957	2h	2h	2546.306		1h	2583.091		5
2473.915	8		2513.602	4		2546.993		10	2584.966		1
2474.106	1	4	2514.890	1		2547.919	50		2585.091		6
2474.570	2		2515.925		15	2547.930		150	2585.454		2
2475.107	20		2516.107		1	2548.526		3hw	2585.545		2
2475.158		2h	2516.267		20	2549.353		2	2585.946		8
2475.852		1h	2516.897		50hw	2549.763		2	2586.258		4
2476.283		1	2517.146	1 c	100w	2549.860	2		2586.678	10	
2477.800	1	2	2519.170		50hw	2550.043		30	2586.726		10
2478.843		10	2519.435		10	2550.832		2	2586.953		20h
2480.699	50		2519.604	2		2552.055		1	2587.437	5h	
2481.010		1	2519.825	1	4	2553.202		2h	2587.760		15
2481.160		1	2520.030	1	8	2554.346		3	2587.926	4	
2482.381		2	2520.204		3h	2554.759		10	2588.920		40
2482.600		2	2520.678		10hw	2556.090		30	2589.861	200	3
2483.224	50	1	2521.058		2	2556.587		4	2590.007		1
2484.080	4		2521.640		4	2556.867		2	2590.189	20w s	
2484.572	8	8	2521.679	2		2557.391		15 h c	2590.713		4
2485.598		5	2521.857	5	6	2558.206	2	80	2591.147		15
2486.496	20		2522.299		4	2558.606	50	300	2591.386		2
2486.884	2		2522.451		4	2559.004		7	2591.790	3	
2487.086		6h	2522.538		20	2559.237	3		2591.879		3h
2487.234		15	2523.409		50	2559.434		3	2592.416		2
2487.735		2	2523.527	2		2559.902	2		2592.816	100	5
2488.049	1h	10hw	2523.876	1	20	2560.209		1	2593.053	5	80
2488.111	5 c		2525.028	4		2560.614	10	2	2593.247	10	
2489.058		50 c	2525.259		6	2560.673		1	2593.594	10h	30h
2489.456	2	15	2525.460		1	2561.141		6	2593.921	4	
2489.800	2	15	2525.767		2	2561.996		10	2594.067		2
2490.115		50 c	2526.039		1	2562.818	10		2594.519		4
2490.319		1	2526.548	3		2563.183		1	2595.740	12	
2490.729		4	2526.769		50 c	2563.349	2		2596.768	3	30
2490.854	10		2527.082		2	2564.647		7	2596.944		1
2491.062		20	2527.247		2	2564.825		2	2597.194	20	150
2491.279	15		2527.624		40	2565.173		4	2598.621		10h
2492.124		4	2528.088		6	2565.463		1	2600.403	1	80
2492.721	25	3	2528.716		3	2565.560	4		2600.925		10

TABLE 1. Spectrum of technetium - Continued

Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity	
	Arc	Spark		Arc	Spark		Arc	Spark		Arc	Spark
2601.491	10		2639.865		3 h	2673.024	6		2714.656		4
2601.807		2w	2640.038	8		2673.412	15	200	2715.205	30	
2602.093	10	100	2640.159	1	60w	2673.854		2	2715.460		20
2602.535		20	2640.482		5	2674.079		3	2715.818	5	30
2603.727		20h	2641.255	30	1	2674.614		6	2716.542		40
2604.866	8	30	2642.101		4	2674.825	10		2716.671	6	35
2605.391	3	70	2642.372	100		2675.223	3 c	200 c	2718.186		4
2605.753	4		2642.531		4	2675.634		20	2718.996		10
2605.840		7h	2643.006	20	200	2676.364		3 h	2719.321	6	100
2606.796		1	2644.496	40	500 c	2677.027		2 h	2719.794		10
2607.236		20	2644.864	1	1	2678.057		7 h	2720.891		2
2608.134		20	2645.380		5	2678.571	2	30 c	2721.552		2
2608.570	3		2645.585		15	2679.012		5	2722.296		1
2608.855	500	15	2645.662	20		2679.417		3	2722.503		1
2609.064		4	2646.245	15	100	2680.659		8	2723.010		3
2609.323	6		2646.751	20 c		2680.929		7	2723.400		80
2609.993	1000 c	2000 c	2647.011	1000 c	3000 c	2681.190	80	500	2723.550	30	
2610.645		3	2647.359		10	2682.316		15	2723.750		20
2610.889		10	2647.980		3	2682.699	15 cw	200 cw	2724.193	2w	200w
2612.171	4		2648.306	20	200	2683.054		5 h	2725.418		5 h
2612.421		1	2649.162		40 h	2683.139	60		2725.656	4 c	400 c
2612.979	3 h		2649.207	300 c		2683.740		6	2726.171		10
2613.219	3 h		2650.217		3	2683.886	80	1	2726.691	1000	40
2613.283		40	2650.394	10		2684.191	5		2727.078	3	30
2613.742	8		2650.603	1	20 h	2684.234		6	2727.634		20
2613.941		2	2651.801		2	2684.507		60 c	2727.802	3	1
2614.233	1500	30	2652.083		5 h	2684.959		2	2728.306		2
2614.637		12	2652.351	100	600	2685.396	3 c	100 c	2728.471	30 c	1
2615.127		10	2652.898		20	2686.023		8	2729.743		5 h
2615.873	1000	20	2653.400		2	2686.900		1	2730.225		6
2616.068		80	2653.526		2	2687.326		30	2730.377		1
2617.565		20	2653.566	30		2688.033		3	2730.529	500	10
2618.279	30		2653.746		10	2688.059	20		2732.251		2 h
2618.670		2	2654.306	100	3	2688.255		100 c	2732.872	300	10
2618.790		5	2654.902		8	2690.451		9	2733.039		1
2619.063	10		2657.327	15		2690.673	12		2733.248		2
2619.302		60	2657.572	1	1	2691.294		20	2733.782		7
2619.691	3		2657.975		1	2691.361		7	2733.969		3
2619.944		70	2658.180		2	2691.812	8	200	2734.097	4	
2620.285		6	2658.578		3	2693.112	80	2	2735.135		30
2620.501		1	2659.931	5 h		2693.744		40	2735.912		10
2620.803		20	2660.884	120	30 l	2694.533		3	2736.200		15
2620.932	10		2661.156		3	2694.768		20	2736.231	150	
2622.823		6	2661.642	1	100	2694.780	10		2736.503	2	40
2623.123	6		2662.032		2 h	2695.259		2	2736.830	60 c	300 c
2623.381		1	2662.296	100	2	2696.537	1	100	2737.122		30 h
2623.780		1	2662.642	1	80	2696.636	50		2737.680		60
2624.376		15	2663.162	3		2696.755	15	1	2737.973	100	1
2625.487	10	200	2663.897	12		2697.383		20	2738.148		1
2625.983		50	2663.947		4	2697.598		5	2738.826	20 c	500 c
2626.422		7	2664.66	8		2699.433		3	2739.302		2
2626.654		2	2664.69		20	2699.788		30	2739.819	3	
2626.914		1	2665.100		15	2700.664		20	2740.060	3	100 hl
2627.786		2	2665.404		1	2701.494		1	2741.142		12
2627.967		100	2665.733	20	70	2701.640		15	2741.406		1
2629.509		2	2666.463		2	2702.271	70		2742.526		3
2630.052	8		2666.636	3		2702.447		20	2742.745		4
2630.288		4	2667.175		9	2702.959	40	800	2742.904		2
2631.617	20		2667.780		3	2703.239		10	2743.821	8	80
2631.806		4w	2668.308		2	2706.936		8	2744.309		2
2634.444		10	2668.958		30 c	2707.327		10	2745.724		1
2634.909	200	1000	2669.654	1		2707.896	100	700	2746.517		5
2635.618	4		2669.872		15 s	2708.785	1000	10	2747.375	1	15
2635.769		6	2670.110	2	20	2710.536		30 c	2749.226		50 cw
2636.334		15	2670.341		2 h	2710.745		50 c	2749.831		2
2636.357	80		2670.818		3	2711.481		5	2751.489	1	250 c
2636.500		3	2671.014		25	2712.591		8	2752.295		10
2638.802		9	2671.380		1	2713.551		20w	2753.051		15
2639.070		15	2671.878		1	2714.568		9	2753.291		1
2639.320		4	2672.333		2 h	2714.600	2		2755.761	100	8

TABLE 1. Spectrum of technetium - Continued

Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity	
	Arc	Spark		Arc	Spark		Arc	Spark		Arc	Spark
2757.008		1	2795.286		2	2838.547	5 c	50 c	2883.508		5
2757.282		6	2795.650		80	2838.876		8	2883.670	5	
2757.577		6	2795.778	200	500	2839.140		1	2884.748		10
2758.714		5	2796.709		4	2839.854		30	2885.548		20 c
2759.211		1	2797.730		3	2840.375	50	400	2886.079		20
2759.790		2	2798.079		2	2841.656		1	2887.429	1	2
2760.132		15 h	2798.208		8	2842.303		4	2887.734	1000	8
2760.380	7		2800.450		4	2843.352		20	2888.458	100	25
2761.281		8	2800.770		10	2843.766	8		2889.200	30	300 c
2762.134	100	3	2802.455		2	2845.044	60	3	2889.487	3	
2762.337	200	8	2802.810	1000	8	2845.472	7	4	2890.438		20
2763.231		50	2803.018	150	3	2845.786	2	3	2890.793	6	300 c
2763.871		5	2803.389		4	2846.392	10	200	2891.176		5
2763.957	8		2803.921		8	2846.617		3	2891.324		15
2764.501		5	2804.855		6	2846.742	10	30	2892.347		60
2765.507		3	2805.179		10	2847.327	6		2892.759	4	150
2765.713	1	20 c	2805.983		2	2847.700		5w	2893.160	200	2
2765.947	60	1	2806.626		15	2847.874	1		2893.448	150	2
2766.886	500	10	2807.100		2	2847.909		2	2893.900		10
2767.363		10 h	2807.433		3	2848.157		4w	2894.322	200	2
2769.051	15	4	2807.915		15 d	2849.196	60	3	2894.831		15
2769.590		15	2808.356	500	10	2850.154		2	2895.473		15
2769.714	5		2809.646	50 c	150 c	2850.931		10	2896.340	1000	10
2769.879		5	2810.046		8	2850.956	150	10	2897.776	6	
2771.216	2 h	100 c	2810.225		15	2851.222		3	2899.363		2
2771.797		10	2810.240		20	2851.358	1	3	2900.692		80
2772.052	1	6	2811.152		1 h	2851.732		4	2902.134	7	10
2773.303		30	2811.614	500	1000	2851.985		20w	2902.539		4
2773.786	2	200	2812.447		3	2852.294		15	2902.910		4
2774.278		4	2812.999		4	2853.319		2	2903.813	40	3
2774.809		1 h	2813.499		5 d	2853.554		1	2904.956	10	
2775.076		10	2813.784		60 c	2853.643		2	2905.420		1
2775.328	6		2814.184	8	100	2855.637	10	1	2906.251		8
2775.601	3	70	2814.626		6	2857.128	500 h	7	2906.618		100
2776.041		10	2814.847		6	2858.482	10 h		2906.882		9 c
2776.559		4	2814.860	30		2859.110	2000 c	200 c	2907.625		10 c
2777.313	20	500	2814.959		2	2859.852		2	2907.856		4
2777.645		2	2815.965		8	2860.770	6 c	600 c	2907.982	15	
2778.117		9	2816.515		10 h	2860.988	15		2909.036	7	
2778.269		1	2816.999	3	40	2861.361		3 h	2909.074		30 h
2778.908	150	9	2817.286		7	2861.684		30	2909.508		1
2779.773	1	30	2817.612	1	15	2862.772		4	2909.852	5	
2781.222	25		2818.630		15	2863.335	10		2910.202	10w	150w
2782.052	1000	15	2819.050		4	2863.528		4	2910.689		6
2782.235		3	2819.460	40	1	2864.486	500	8	2911.702		6
2782.955		1	2820.198		20	2864.892		6	2911.996	2	10
2784.372		10 h	2820.645		6 l	2866.069	8 c	300 c	2913.147	1000	7
2784.726		5	2821.352	100	500	2867.213	8		2913.792	8	
2785.134		8	2821.590	5	100w	2867.430	8		2914.242		3
2785.288		20	2822.910		8 h	2867.673		3	2915.394		6
2785.586	500	10	2824.380		3 h	2868.087	100	3	2915.850		3
2786.941		1	2825.042	6 c	80 c	2868.788	4	1	2919.650		3
2787.234	15	2	2825.342	6 c	100 c	2869.283	20		2920.850	7	
2787.609		2	2825.967	10		2869.303		30	2921.054	15w	100w
2787.937		30	2826.166	2 c	100 c	2869.497	10	1	2921.496		50
2788.797		7 h	2828.042	200	10	2870.295		4	2921.912	500	2
2788.888	40		2829.090		4	2870.422		15	2922.736	3	70
2789.246	500		2829.375	5		2871.438		3 h	2923.155	5	
2789.273		100w	2829.607		10 s	2871.986		4	2923.342	20 c	200 c
2790.293		2	2830.202		1	2872.234		30 cw	2924.254		70
2790.443		9	2830.823	4		2873.660	20		2924.870		3
2790.628		1	2830.869		3	2874.101		10	2925.065		7
2790.920	2 h		2831.180	60	600	2877.196		3	2927.098	3	
2791.739		3	2833.599		200	2877.606		1	2927.318		10
2792.070		7 c	2834.326		3	2878.703	1	30	2927.783		1
2792.973		4	2834.762		2	2879.133		50	2927.960		1
2793.672		4	2836.117	12	150	2880.406	5	200 c	2928.198	1000	2
2794.228	3	60	2836.900		3	2881.269		20 hw	2928.434	1	40
2794.526	100	1	2837.382		10 hw	2882.362		60	2929.515		20
2795.072		6	2838.231		1	2882.891		4	2930.035		18

TABLE 1. Spectrum of technetium - Continued

Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity	
	Arc	Spark		Arc	Spark		Arc	Spark		Arc	Spark
2930.485	20	1	2978.254		2	3026.445		4	3074.270	20	1
2931.134		20	2979.338	100	3	3026.887	300w	200w	3076.238	80	2
2931.552		6	2979.752	10		3029.220		3	3076.528	10	
2932.062	4		2979.780		7	3030.276	6		3076.855	12	
2932.118		4	2980.832		2 h	3030.718	2		3077.591	3	
2932.923	3		2982.217		3 h	3031.220		3w	3077.701		100
2932.975		1	2982.552	8	400	3031.486		1	3078.630		3 h
2933.888	80		2983.712		20 h	3032.089		10	3079.907		10
2933.924		50	2984.137	20	1	3033.158	50	2	3081.075	15	1
2936.921	3	50	2984.362	30		3033.621		4	3082.098		2 h
2937.801	6		2984.388		60	3034.568	80		3082.886	3w	3 h
2938.868	10		2985.046	15		3034.642		3	3083.289		15 c
2938.993	1	70	2985.364	150	7	3034.963		2	3083.354	20	
2939.501		1	2985.601	8		3035.512		1	3084.499		4 h
2939.990	15	1	2985.932	8		3036.014		7	3085.752		1
2940.487		2	2986.453	15		3036.878	40	2	3085.906	12	
2940.928		3	2987.235		3	3037.449	3		3089.120		3
2941.835		8	2988.172	20 c		3037.902	20	800	3089.340	150	2
2942.082	30	1	2988.468	5		3038.226	100	2	3090.222	30	1
2942.912	4 c	100 c	2988.614		10	3040.228		3	3092.517		2 h
2945.518		20	2990.132	8w	5 h lw	3040.605	15	1	3092.749		30 c
2946.220		2	2990.748		2 h lw	3040.874	12	1	3093.617		10
2946.581		8	2992.873	30 h		3042.213		2	3093.988		1
2947.107	15	1	2993.232	18 h		3042.359		3	3095.014	20w	
2948.070		3	2993.460	8		3042.643	40	2	3095.740	30	
2948.473	8	100 c	2993.762		15	3043.049	12	1	3095.834		7
2948.633	15	400 c	2993.910	1	1	3043.774	8		3096.672	5	
2949.255	20		2994.097	15	8	3043.938	8		3096.710		2
2949.456		10 h	2996.882		4	3044.686		15w	3097.269		20
2949.580	25	1	2997.076	20		3044.978	10		3097.582	5	
2950.248		15	2997.186		8	3045.292		10 c	3098.556		40
2950.375	3	50	2997.635	1		3046.502		20 c	3098.657	20	
2950.803	2	30	2997.906	20		3047.113	4		3099.098	1000	10
2951.033		10	2997.953		2	3047.529		15 h	3099.517	200	2
2952.068		20	2998.235	6		3049.047		6 h	3100.462		4
2952.544		40	2998.356		8 h	3050.818	6		3100.638		3
2953.162		4	2999.690		2	3051.332	4		3100.880	1	30
2953.838	8 h		3000.418		1	3051.550	100 h		3101.582	5	
2954.046	10 h		3001.055	1	150	3051.600		5	3101.782		2
2954.149	10 h		3001.590		2	3052.128	20w		3102.822	2	
2955.928	200	3	3002.269	10		3052.474	40		3103.443	10	
2956.229		3	3002.669	15	5	3052.507		10w	3104.293	30	1
2957.823	6	1	3003.022	10	10	3053.106	10	7	3105.107		70
2958.357	3		3003.698	30	1	3055.464		5	3105.387		10
2958.424		7	3004.379	15	15	3056.670	5		3106.937	30	2
2958.547	2		3004.601	5	5	3057.014	20	4	3108.254	60	2
2958.832		5	3005.488		9w	3057.327	30	2	3108.576		1
2961.636	1	30	3007.007	1	100 c	3057.515		10	3109.122		20 c
2962.086	7	40	3008.782		2	3058.509		20	3109.151	40	
2962.569		4	3009.746		6	3059.308		1	3110.563		30
2964.287	20		3010.831	100	2	3059.550	6		3110.759	15	
2964.487	10	800	3011.868		1 h	3060.103	4		3110.938	3	
2965.488		3	3012.388		1 h	3060.672	30	1	3111.392	10w	
2966.196		50	3015.161	2	30	3060.904		4	3115.296		4
2966.550		15	3016.298	12		3061.283	3		3115.977	60	2
2967.084	1		3017.232	300	7	3061.780		10	3116.382		3
2967.242		10 h 1	3018.341	4		3062.112	80	2	3116.698	2	
2967.956		2 h	3019.179	3	15	3062.361	200	2	3116.914	10	
2968.233		1	3020.452	3	3	3064.667	300	3	3118.644	5	
2968.769	8		3021.555	150	2	3066.393		4	3119.171	80	6
2969.770	3		3022.035	20		3066.602	100 c		3119.662	40	1
2970.186		2	3022.203		20 h	3068.337	120 c		3119.888	1	40
2970.740		40 h 1	3022.578		10 h	3069.956	3	200	3120.937		2 h
2970.760		20 h	3022.665	100		3070.241	30		3121.306	10 h	
2970.900	20		3022.998		1	3072.702	8		3121.970		50
2973.179	18		3023.680	200	3	3072.898		15	3122.642	700	3
2973.650	200	5	3024.208		1	3073.046	10		3123.556	10	
2976.179		25	3025.263	80	3	3073.326	12		3126.184		5
2976.379	5		3025.523	3		3073.726		2	3126.390	8w	
2976.561	15 c	400 c	3025.932		1	3073.969		2	3126.807	5	

TABLE I. Spectrum of technetium - Continued

Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity	
	Arc	Spark		Arc	Spark		Arc	Spark		Arc	Spark
3127.464	2		3178.366		5	3226.044	15		3290.974		5
3127.855	10		3178.630	3		3227.412	4		3291.233		5
3128.878		8h	3179.168	1		3227.589	1		3291.960	20	1
3129.049	20		3180.305	200	3	3228.040		2h	3292.364		2h
3131.003	6		3181.158	2		3230.022	60		3292.930		7h
3131.233	1500	20	3181.648	1		3230.336	1		3293.649		5
3131.553	5		3182.367	2000	60	3230.640	1		3296.270		20
3132.555	10		3182.783	8	3	3230.938	1	200	3296.504	10	
3133.128		30c	3183.108	2000	60	3231.114	15		3297.074	3	
3133.336		15c	3183.577	1		3231.936	5		3297.360		50h
3136.593		100	3184.472	1		3234.984		4	3298.297		10
3137.054		1	3187.327	3		3236.439	5		3298.842	30	600
3138.322	20		3188.077	1		3237.017	1000	3000	3300.572	1	
3138.968	5		3189.707		4h	3237.922	1		3300.770	100	4
3139.936	25		3190.355	2	100	3238.487		4	3301.168		2
3140.656		20c	3191.620	10		3239.518	12	4	3301.572	3	
3140.994	5h	40h	3192.051	20		3239.789	5		3301.960		120h
3143.561	4		3192.310		3	3240.682		6	3301.990	20	
3143.640		15	3192.574	2		3241.837	100	5	3302.864	1	
3144.166		20	3192.905	2		3242.251	4h	1h	3303.510	6	
3144.291	20		3193.078	1		3244.193	500	15	3305.607		30c
3144.568		15	3195.202	800c	1000c	3245.509		3	3305.669	2	
3145.591		20	3195.485	20		3245.708		3	3305.891	80	10
3145.937	6		3195.658	3		3246.191		8	3306.817		3h
3145.996		5	3195.766		6	3247.273		2	3309.412		8
3146.212	12		3196.591	3w		3249.340		6	3309.607		2h
3146.471		1	3196.945		2	3249.600	10		3310.646	200	15
3147.160	15	1	3197.530	40w		3250.389	10	2	3311.051	20	2
3148.414		2	3197.711	10		3250.638	10		3312.135		2
3149.897	2		3197.766		3h	3252.048	300	10	3312.240	2	
3150.265	40c	5c	3198.069	3		3254.700	10		3312.524		100
3150.650	8		3198.497	15	3	3254.960		40	3313.652	150	5
3152.779	3		3199.149		3	3256.102	40	2	3314.051		5
3153.172		20	3200.062	1		3256.326	2	500	3315.755	4	
3153.353	20		3200.980	8		3257.679		1	3315.806		50c
3155.079	2		3202.831	300c	6c	3259.261	3	1	3317.626		6h
3155.476	5		3203.108		2	3259.910	10	5	3318.772		4
3156.794		50h	3205.345	1		3261.370	20	3	3319.252		5
3157.339	5		3205.474	4		3261.937	40	6	3320.134		7h
3157.636		5	3205.847		1	3262.099		20	3322.288	40	1
3158.046		30	3207.866	4		3262.896	6	2h	3322.966	5h	1
3158.688	6		3208.270	6		3263.308		3h	3323.888		7
3159.378		6	3208.390		3	3263.870	2		3324.200		3
3159.789	2		3208.430	4		3264.664	1h	20h	3325.140	8	
3160.463	2		3208.770		6	3266.305		20h	3325.552	200	6
3160.579	3		3208.904	5		3266.911	20	400	3326.605	1	
3161.674	300	8	3209.838	1		3269.427		15c	3327.102	150cw	1c
3162.542		1	3210.245	1		3269.660	4	60	3327.665	1	
3163.140	12		3212.021	1000	2000	3269.800		50	3328.252	5	
3165.003	6		3213.286	8		3270.060	20	10h	3330.766	100	2
3165.167		40w	3214.738	3		3270.608	5	1	3331.319		5
3166.993	3		3214.901	7		3271.164	5	1	3331.700		1
3168.271	1		3215.764	3		3271.754		1	3331.740		10
3168.918	3		3216.518	6		3272.111	10	2	3332.227		3
3169.258		5w	3217.130		4	3272.534		10h l	3332.468	50	2
3170.380		50	3217.463	25		3276.29	5	10h l	3334.500	2	7h
3170.484	1		3217.956	2		3281.392	6		3336.089	5c	
3170.833	3		3218.254		15h	3281.848	4		3336.715	4	
3171.064	4		3218.559	10		3282.390	8	200	3337.486	10	2hl
3171.199	3		3219.052	3		3283.918	1		3337.977	5	
3171.598		20hw	3219.174	1		3284.768	5		3338.252		20
3171.912	8		3219.726		25	3285.816		20h	3338.873		18
3172.013	6		3220.315	3		3286.297		10h	3339.202		10
3173.295	3000	100	3220.737	40	2	3286.688	2		3339.332	6	
3174.738		30c	3221.320	2		3287.143	100		3340.697		1
3175.554		6	3221.573	1		3287.194		50	3341.198		2
3176.025		3	3223.585		20	3287.900		2h	3342.141	3	
3177.714	6		3223.762	3		3288.293		3h	3343.113	4	
3177.909		10	3223.880	6		3290.250	3		3343.770	10	
3178.186	10		3225.500	2		3290.624		8	3344.295	2	

TABLE 1. Spectrum of technetium - Continued

Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity	
	Arc	Spark		Arc	Spark		Arc	Spark		Arc	Spark
3345.016	15w		3402.105	200	4	3447.451	3		3504.052	2	
3345.597	3	200	3403.330	3		3449.652		2h	3504.163	3	
3348.460		20h	3403.481	10		3449.897	15		3505.359	40	30
3348.930	4		3403.579	10		3450.647		2h	3505.558	3	
3349.356		3	3403.931	200 c	2	3451.050	200	8	3506.114	50	1
3349.880	6	1	3404.559		1	3451.507	3		3506.431	8	
3350.218		2	3405.328	80	5	3453.020	30	1	3506.931	10	
3350.563	60	3	3405.826	20	1	3453.751		1	3507.187	100 c	1
3350.830	50 c	1h	3406.669	4		3454.073	30	1	3508.271	100	1
3351.985	1		3406.964	10		3454.623	8		3509.519	4	
3352.844	1		3407.281	80		3456.127		20	3509.869	2	
3353.156	2		3408.331	50		3456.476		15	3510.193		1
3354.093	20		3409.506	1		3456.637	5		3510.594	10	
3354.954	5	2hw	3411.646	1	80h	3456.849	200	5	3510.912	100	4
3356.884	8		3411.804	40		3457.243	400	20	3511.328	20	
3358.038	12		3413.843	1		3457.603	40	3	3511.919	20	1
3358.421	2		3414.600	10		3458.023	20	10	3512.546	5	
3358.468		2h	3415.448	15	1	3459.102		4	3512.768	6	
3359.232	15	2	3415.867	15	1	3460.916	1		3514.302	10	
3362.156	1		3417.738	10		3461.406	1		3514.700	2	
3362.322	3		3418.053	20	1	3461.714	10	1	3515.174	12	1
3362.603		10	3418.101		3wd	3462.413		6w	3515.973		2h
3363.038	4	100	3418.203	40 cw	1	3463.507		2	3517.206	40	1
3363.549	2		3418.556		4	3464.214		3w	3517.442	10	
3363.678		5	3418.581	15		3465.212	5		3518.126	8	
3363.700	2		3419.100	100	6	3466.278	5000 cw	500 cw	3519.092		2
3366.753	400	15	3419.451	15		3467.213		10	3519.414		10
3367.198	3		3420.583	2		3467.959		25 c	3520.054	30 c	
3368.420	5		3421.450		5h	3468.087	3		3520.276	20	
3371.402	5		3421.987		2h	3470.188	10		3520.514	30 c	
3371.646	10		3422.675	2		3470.299	5		3520.832	1	
3371.902	15		3422.972	3	4	3470.514	150	5	3521.305	20	1
3372.543	8		3424.321	1	40	3470.726	10		3521.641	5	1
3373.429	30	1	3425.382	20		3472.165	30	6	3522.082	60	1
3373.572	25	1	3426.414	3		3472.896	15		3522.275	30	
3373.906	3		3426.653		10	3473.726	20		3522.516	15	
3374.626	8		3427.853	60		3475.178	80	2	3524.523	20	1
3375.368	4		3428.958	1h		3475.592	1000	10	3525.271	1	
3375.560		4h	3431.150	2w		3476.980	1		3525.828	800	15
3376.014		1	3431.750	40	2	3477.838	1		3526.178	300	5
3377.781	10		3431.920		2	3478.432	10		3526.730	6w	
3378.067		10h	3432.263		2h	3478.926		2h	3526.869		2h
3379.606	10		3433.155	6 c		3479.315	8		3527.626	50	2
3379.925	4h		3434.182		2h	3479.452	10		3527.976	30	
3380.343	3		3434.701	200	4	3480.787	8		3528.285	1	
3380.410	15	2	3435.213	20		3481.400		20 c	3528.996		3h
3380.574	5		3435.679	40	1	3482.288	2h		3529.829	100	2
3382.096	4		3436.110	3		3482.676	1	10	3530.813	10	
3382.676		15	3436.300	4		3484.620	60	1	3531.002	3	
3385.004	10		3436.440		1	3486.226	1000 c	30 c	3531.318	15	
3385.490		1h	3436.644	3		3490.139		10hw	3531.733	3	
3386.387	20		3437.439	150	1	3490.299	100	2	3534.878	150	3
3386.674	40	1	3438.248		10	3493.394	400	5	3535.399		10
3388.166		20	3438.525		1	3493.884	1		3535.506	500	12
3388.459	8		3438.729	80	1	3494.168	20	1	3536.086	1	
3389.492	12		3439.217	3		3494.623	500	4	3537.194	10	
3390.808	1		3439.819	12		3494.866		7h	3538.119	300	
3391.364	1	10	3440.451	6		3495.827	20		3538.374		2
3392.227	50		3440.724	3		3496.950	1		3538.678	800	3
3392.604	3		3441.086		15	3499.141	40	1	3539.148	20	
3394.179	300	10	3441.217	3w		3499.895	3		3539.759	12	
3394.808		2	3441.818	3h		3500.161	6		3540.174	1	
3396.903	60	1	3442.233		5h	3500.704	1000	20	3541.772	2000 c	20 c
3397.830	40		3442.337	10		3501.241	200	2	3542.616	8 c	
3398.120	1		3442.803	4		3501.507	20	10h	3543.212		3h
3398.327	300	6	3442.916		3	3502.467	80	2	3544.096	4	
3398.545		2	3443.472	200 c	2	3502.704	800 c	20 c	3544.382	20	1
3398.738	10		3444.012		8h	3503.336	30	20hw	3544.500	2	
3400.118	3		3444.428	3		3503.586	30		3546.934	20	
3401.681	25	1	3445.021	1		3503.786	40		3548.113	2h	

TABLE 1. Spectrum of technetium - Continued

Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity	
	Arc	Spark		Arc	Spark		Arc	Spark		Arc	Spark
3548.825	2h		3595.661	1000cw	10cw	3643.950	8		3702.366	8	
3549.725	6000c	60c	3596.181	4		3644.134	50	2	3702.498		2h
3550.645	4000c	40c	3597.401	12		3644.427	3		3703.176	60	2
3551.206	30		3598.261		1	3645.630	2		3703.830	800	20
3551.998	3		3598.830	30		3645.796		2	3704.797	300	5
3552.828	4		3599.152		2h	3646.851	2		3705.481	100	2
3553.539	60	1	3599.750	50	1	3648.040	1000c	50c	3705.712	80	1
3554.580	30		3602.191	20	1	3648.860	10		3706.705	200	4
3554.919	2		3602.639	1		3650.344	60	2	3707.627	200	5
3556.056	40	2h	3604.794	1	3h	3651.467	600	20	3708.261	200	3
3556.178		1	3605.717	7		3654.054	10	1	3709.226	2	
3558.209	2		3605.938	15		3656.458	1		3709.527	15	
3558.260		1h	3606.265		2h	3658.152	10		3709.831	80	1
3558.662	15		3607.321	1000c	30c	3658.588	1000c	60c	3710.126	90	2
3559.111	3	1h	3607.625	200	5	3659.882	3		3710.428	4	
3559.390	1h	1h	3608.271	2000c	80c	3661.452	400c	30c	3711.048	2	
3559.754	300	5	3609.045	60		3662.032	6		3711.388	80	1
3560.319	800	15	3609.527	1		3662.838	30	1	3712.256	1000	10
3560.876	50		3609.843	6		3663.091	8		3712.819	300	3
3561.192	50	1	3609.906	5	9h	3664.455	6		3713.838	25	
3562.303	4		3610.354	1		3664.575		7h	3714.516	100	1
3563.000	5		3610.550	10c		3664.916	200	2	3715.944	500	5
3563.994		2	3611.109	2	10c	3667.349	10		3716.706	4	
3564.359	5		3611.156	50		3667.510	30	1	3716.809	20	2
3564.566	1		3611.788	4		3667.794	10		3717.024	15	1
3565.008		3	3612.108	60		3667.991	10		3717.287	1	8
3565.217	100	1	3612.346	3		3668.940	20	1	3718.861	10000	300
3565.490	80	1	3612.833	4	3h	3669.152	40	2	3720.407		2h
3566.883	3		3613.163		1	3669.918	40	1h	3720.688		2h
3568.853	800	5	3613.232	3	1	3671.710		2	3721.056	3	
3569.852	30s		3614.282	15		3672.087	8		3721.160		4h
3570.654	100	1	3615.814	50	1	3672.553	3		3722.885		5hw
3572.631	1	10	3616.346		10h	3673.014	1		3723.132	40	
3573.083	50		3616.528	30		3673.285		4h	3723.674	1500	15
3573.306	10h	4h	3617.692	20		3675.003	3		3724.176	10	
3573.654	1		3618.582	8h		3675.429	30		3724.395	2000	20
3574.410	25		3618.943	200	3	3675.584		5	3725.082	20	
3574.610	80	1	3619.664	20		3675.855	10w		3726.152	100	2
3575.420	100	1	3619.795	10	15	3675.899		4hw	3726.351	5000	40
3575.463		2h	3622.453	1		3678.089	80	2	3727.364	200	
3575.964	20		3623.508	5		3678.388	70	2	3728.291	2	
3576.324	50		3625.555	150	3	3679.146	1000	30	3728.886	30	
3576.495		4h	3626.294	10		3679.603	1		3729.177	400c	5c
3577.228	6		3627.364	1000c	10c	3680.318	300	6	3729.618	2	
3577.796	1		3627.858	100	2	3680.518		8h	3730.358	10	
3577.986	15		3628.476	2		3680.575	50		3730.836	60	1
3578.764	12		3628.901	30	1	3681.683	40		3731.412	8	
3578.969	60		3630.388	200	2	3682.592	100	2	3731.735	500	3
3580.059	1000	10c	3631.227	2		3683.073	2		3735.501	30	
3581.258	600	3	3633.244	150	2	3684.744	5000	100	3735.753	4	
3581.744	10		3634.258	1h	8	3686.027		1h	3737.420	300	2
3582.075	800	4	3634.764		3h	3687.772	20	1	3737.662	10h	
3582.628	2000	10	3634.800	10		3691.324	1		3737.693		20h
3583.464	12		3635.146	3000c	50c	3691.608	50	1h	3738.501	20	
3584.005	1		3636.070	10000c	500c	3691.674		5c	3739.342	1	
3585.684	30	1	3637.447	8		3692.759	300	4	3740.388	1	
3586.566	3		3638.012	1		3693.400	8		3740.494	1	
3587.386	1		3638.220	1000	15	3694.327	30d	1	3740.988	2	
3587.942	4000	40	3638.848	200	4	3695.404		1	3742.789	150	3
3589.471	15		3639.069	1		3695.734	1		3743.508	1	
3589.890	3h	2h	3639.379	900	15	3695.999	30w	1h	3743.610	2	
3590.471	1		3640.095		10w	3696.297	150	3	3744.026	150	2
3591.222	50	1	3640.226	400	10	3696.747		2h	3744.801		6h
3591.483	80	4	3641.093	6	1	3697.415	100	1	3745.012	400	5
3591.942	8cw		3641.183	15	1	3697.736	30	1	3745.808	4hl	
3592.920		1h	3641.534	30	1	3698.694		3hw	3746.148	1000	10
3593.471	200	3	3642.576		2	3698.959	3		3746.640	100	2
3593.580	10		3642.985	30	1	3701.478	5	1	3746.845	5000	150
3594.573	300	4	3643.157	3		3701.966	1		3748.406	1	
3594.908	50cw		3643.376	10		3702.077		3h	3749.634	10	

TABLE 1. Spectrum of technetium - Continued

Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity	
	Arc	Spark		Arc	Spark		Arc	Spark		Arc	Spark
3749.928	60	4	3791.524	3		3847.351	100	1	3908.596	20	
3750.061	40		3791.734	300	7	3847.596	500	3	3909.038	8	
3750.566	6		3792.102	20		3847.870	10h	1	3909.782	20	
3751.056	6		3792.674	6		3848.310	5h		3909.958	10	
3752.024	30	1	3792.774	1		3849.519	1		3911.157	5	
3752.134	1000	10	3793.087	3		3850.553	5		3911.921	3	
3752.944	20		3793.207	1		3851.222	300	3	3914.538	3	
3754.048	60	3	3793.721	2		3852.328	80	1	3914.723	1	
3754.368	4000	40	3793.986	3 c		3853.323	2		3915.174	2	
3754.885	4		3794.800	60	1	3854.074	8		3915.889	10	
3755.048	3		3795.502		4h	3854.326	50		3916.536	60	1
3755.221	80	3	3796.522	12		3854.768	10		3916.941	5	
3755.652	10 c		3797.435	200	5	3855.555	20		3917.443	10 c	
3756.230	12		3797.767	1000	10	3855.914	1		3917.743		4h
3756.334		2h	3798.055	40	1	3856.543	20		3919.148	50	
3757.722	3		3798.981	20 c		3856.734	500 c	5h	3919.375	300	3
3758.535	1000	10	3799.692	80	2	3857.388	20		3920.550	30 cw	
3758.948	5		3801.645		5hw	3858.063		4	3922.134	100	1
3759.170		7	3802.025	2h		3860.129	8		3923.663	300 c	3 c
3759.305	5		3803.976	40	1	3861.259	25 c		3924.131	20	
3759.553	20	1	3804.534	2		3863.068	200	3	3924.469	2	
3761.481	8		3806.144	15		3863.830	100	1	3925.143	10	
3761.807	2000	20	3806.424	5		3864.106	400	4	3925.953	20	
3762.880	6		3807.381	10		3865.112	3		3927.356	5	
3763.974	40	1	3808.633	10d		3866.012	30		3927.573	200	2
3764.566	2		3809.798	1	6	3866.190		20 cw	3928.323	10	
3765.576	1		3810.355	2		3866.608	5		3928.770	30	
3765.962	2		3810.568	30		3868.240	1000	8	3928.913	20	
3767.858	2d		3811.253	80	2	3870.292	10		3929.113	10	
3768.365	30		3812.390	10		3871.055	12		3929.378	40	
3768.774	5000	100	3813.040	15 cw	1 c	3871.223	12		3929.821	5	
3769.352	6		3813.846	10		3874.609	12		3931.319	3	
3769.680	3		3814.339	6	2h	3875.658	200	2	3931.907	8	
3769.783		1	3814.667	200	3	3876.366	80	1	3932.218	2	
3770.320		1h	3815.509	80	1	3877.139	30		3933.438	150	2
3770.498	15		3816.888	300	4	3878.295	4		3933.705	200	
3771.031	3000	50	3817.967	150	3	3879.160	500 c	10 c	3934.832	30	
3771.467	4		3818.119	100	2	3880.715	600 c	20 c	3936.175	1	
3772.088	60	2	3819.103	1	10 c	3882.497	10		3936.648	70	
3772.388	40	2	3820.761	50	2	3885.638	3		3939.726	25	
3772.782	20	1	3821.083	4		3886.896	2		3940.054	70	
3773.413	50	4	3822.672	80		3888.177	1h		3940.478		2h
3773.930	1		3823.066	1		3888.440	80	1	3942.866	30	
3774.783	15		3824.102	1		3888.665	7		3943.868	120	1
3774.970	10		3824.467	300	4	3888.814	2		3946.571	4000 c	20 c
3775.355	50 c	1	3825.531	5		3889.130	150	2	3947.087	2000	10
3775.560	15		3826.013	20		3890.033	1		3948.151	1	
3776.288	1		3826.352	1		3890.320	20		3948.513	2	
3776.999	6h		3827.193	2		3892.122	300 cw	100 cw	3948.844	4	
3777.274	500	10	3827.593	60	1	3892.332	100	1	3949.224	9	
3778.194	10		3828.537	500	4	3893.220	200	2	3950.391	80	
3779.032		2hw	3828.750	3		3893.837	4		3951.016	7	
3779.373	2000	40	3829.220	150		3894.201	15		3951.831	180	
3779.693	40	1	3829.274		10h	3894.482	15		3952.193	6	
3780.680	3000 cw	100 cw	3830.352	200	3	3894.688	2		3953.651	100	1
3782.299	15		3831.883	20		3895.390	2		3953.765	30	
3784.057	500	6	3832.448	200	1	3898.531	2		3955.734	200	3
3784.802	1		3832.817	600	5	3899.120	100	1	3956.410	3	
3785.222	20	1	3833.425		3h	3899.827	600	5	3958.114	10	
3785.560	6		3837.559	1500	15	3901.473	5		3958.793	15	
3786.064	200	3	3839.577	1		3902.832	10		3959.090	80 c	1 c
3786.494	10		3840.137	60		3903.740	60		3959.520	150	2
3786.566		3h	3841.307	800	8	3903.934	80	1	3959.943		15w
3787.537		3h	3842.342	80		3904.195	3		3960.770	20w	
3787.772	1		3843.349	2		3905.322	8		3961.520		1
3788.154	2		3843.968	100	2	3905.517	30		3963.361	2	
3788.370	1		3844.061	20		3905.774	100	1	3963.714	2	
3789.232	2		3844.347	60	1	3906.400	20		3964.266	30	
3789.955	2h		3845.974	800	8	3907.681	1		3964.467	20	
3791.282	500	8	3846.941	8		3907.958	30		3965.619	3	

TABLE 1. Spectrum of technetium - Continued

Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity	
	Arc	Spark		Arc	Spark		Arc	Spark		Arc	Spark
3967.500	100 c		4036.267	1		4110.221	1000	5	4201.850	20	1
3967.912	2		4036.787	3		4111.199	6		4206.568	50	5
3969.207	10		4037.195		2	4111.386	150	1	4211.430	20	1
3970.239		6h	4038.253	8		4113.341	30		4212.420	1	3
3971.232	8		4039.246	1000	8	4114.340	6		4214.220	5	
3971.503	80	1	4041.016		5h	4115.077	10000	300	4215.510	10	1
3971.914	40		4041.559	100		4117.021	4		4218.609	300	20
3972.264	20		4041.781	200		4118.740	6		4220.346	50h	1
3974.554	30h		4042.657	10		4119.274	600	5	4221.619	10	
3975.020	150 cw	30 c	4043.401	8		4120.163		2h	4229.948	6	
3976.526	3		4046.697	80		4121.576	100		4230.207	10	1
3978.706	8		4048.086	20		4122.206	4		4230.832	150	5
3979.095	20		4049.108	10000 c	150 c	4124.217	8000	200	4231.195	5	
3979.637	300	2	4050.888	60	1	4127.899	1		4232.096	40	1
3980.354	500	3	4051.569	2		4128.268	1000	20	4235.709		1h
3981.279	6		4051.949	500	4	4128.557	80	1	4238.191	5000 c	100 c
3981.688	8		4053.177	200	3	4129.862	6		4238.991	5	
3982.171	100	1	4054.415	30		4130.453	150	2	4239.567	20	1
3984.967	10000 c	100 c	4056.082	200 c	4 c	4130.877	30		4241.996	8	
3985.903	10		4057.283	60	2h	4131.212	2		4242.979	40	1
3987.780	400	3	4058.232	30	1	4132.530	40		4246.613	1	
3988.961	10		4058.666	2		4133.276	20		4247.038	4	
3989.216	20		4060.853	40	1	4133.679	2		4248.953	30	1
3989.449	8		4061.516	20		4134.490	3		4252.756		2h
3989.888	15		4062.095	8		4134.813	300	3	4253.527	4	1h
3990.392	2		4064.868	3		4137.234	15		4253.776	4h	
3991.320	20		4069.023	100	1	4137.660	4		4256.134	10	
3992.094	50		4070.834	40	1	4139.116	300	3	4257.338	30	1
3992.965	3h		4071.059	100	1	4139.849	800	8	4258.587	20	1
3994.038	300	1	4071.454	5		4141.267	400	4	4262.270	10000	400
3994.509	2000	10	4073.802	1		4142.917	20		4262.687	1000	20
3995.741	3		4074.034	6		4144.950	6000	30	4264.027	6w	
3996.974	200	1	4074.857	20		4145.080	3000	15	4264.303	8	
3997.257	3		4076.463	2		4146.202	80	1	4266.158	80	1
3998.755	40		4077.074	15		4146.882	20		4266.532		2h
4001.332	20		4078.159	1		4147.615	200	2	4266.983	2	
4001.843	20		4079.004		5h	4150.200	15		4267.978	8	
4003.867	4		4079.786	30		4151.241	10		4268.503	30	1
4003.976	4		4079.914	3		4153.672	150	1	4269.531		8w
4004.182	15		4080.042		2	4155.867	2		4269.660	4	
4004.689	300	2	4081.966	3		4158.547	10		4270.767	6h	
4005.886	15		4082.800	10		4159.319	20		4270.880		8h
4006.161	30		4083.537	400	3	4159.820		3h	4274.971	800	1000
4006.631	30 c		4084.500		6h	4160.346	1		4275.504	18	2
4007.136	500		4084.650	10		4160.998	1		4275.906	20	2
4007.603	10		4085.085	20		4161.547	100	1	4277.514		5h
4007.874	40		4086.325	18		4162.970	1		4278.895	800	100
4008.152	20		4087.299	50	1	4163.271	10	1	4279.263	18	2
4008.837	50		4088.707	10000	100	4163.702	20		4285.559	1	
4009.179	15		4089.285	60		4165.609	10000	100	4286.353	4	1
4010.897	1		4091.555	100 ld	1	4167.424	500	6	4286.843	1	
4011.043	10		4092.373	12		4169.680	1000	10	4287.854		2h
4011.358	12		4093.694	200	2	4170.274	4000	40	4288.404		2h
4011.996	1000	5	4094.163	80	1	4172.532	5000	60	4289.115	5	1
4014.293	20		4095.668	15000	500	4174.462	70		4289.563	20	2
4015.474	30		4098.004		2h	4176.276	1000	50	4290.783		3h
4015.760	20		4098.784	100	1	4182.629	5		4294.351	80	12
4016.683	400	2	4100.114	150 cw		4185.815	3		4297.058	10000	1000
4017.223	600	4	4100.902	20		4186.506	800	30	4299.523		1h
4020.755	2000	10	4101.312	100	1	4188.910	10		4301.301		2h
4023.576	4w		4101.989	30		4189.609	50		4302.319	1	
4024.865		1	4103.368	10		4190.306	2		4302.452		2h
4025.475	60		4103.501	10		4190.477	4		4303.372		1h
4029.108	80	1	4103.987	3		4191.415	10		4303.717	1	
4030.034	3		4105.089	80		4193.557	1		4304.848	4	1
4031.626	20000 cw	300 cw	4106.246	60		4194.224	3		4305.516	15	2
4033.677	1		4106.723	80	1	4196.063	1		4305.819	80	8
4034.014	80		4107.644	20		4198.312			4308.615	15	2
4034.673	20		4108.979	50 c		4199.466	30		4309.370	2	
4035.658	5w		4109.646	40		4200.228	3w		4309.858	1	

TABLE I. Spectrum of technetium - Continued

Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity	
	Arc	Spark		Arc	Spark		Arc	Spark		Arc	Spark
4310.222	60	6	4395.571	2		4472.512	2h		4547.088	1	
4311.376	3		4397.254	1		4473.662	15c	2	4548.614	1	
4312.504	10	1	4398.003	1		4474.506	8	1	4549.156	1h	
4314.021	9	1	4398.689		1	4475.003	7	1	4549.439	80	8
4314.679	1		4399.337	4		4477.233		3	4550.270	4h	
4318.061	6	1	4401.518	10		4478.078	2		4551.728	2	
4318.983	5	1	4402.054	1h		4478.673	4	1	4552.204	400	40
4319.887	2		4402.819		2h	4480.251	100	10	4552.456	150	15
4320.505	3		4403.905	6	1	4481.533	1000	100	4552.854	800	80
4321.068	1		4404.176	2		4484.351	10	1	4554.042	1	3
4322.015		2h	4404.403	1		4486.050	6c	1	4557.046	1000	100
4323.016	2		4405.081	7	1	4487.061	3000	300	4558.711	40	4
4323.356	80	7	4405.485	2		4488.624	3		4560.205	15	2
4323.958	12	2	4405.922	3		4490.128	1		4560.421	20c	2
4324.867	12	2	4406.427	1		4491.473	1h	2h	4562.522	8	1
4326.393	3	1	4407.346	7	1	4492.173	2		4562.913	30	3
4328.778	60	6	4409.034	3	1	4492.735	10	1	4563.741	25	2
4330.231	2		4409.815	2		4493.388	8h	7h	4564.539	2000	300
4331.866	1		4412.004	100	7	4495.027	400	50	4565.436	4	1
4332.452	150	10	4412.685	2	1	4495.213	20		4566.421	7	1
4334.768	3	1	4413.322	1		4497.337	2w		4567.216	1h	
4335.187	4	1	4415.452	20c	1	4497.713	5		4568.135	3	
4336.855	400cw	40cw	4415.718	5	1	4498.529	60	8	4568.769	1	
4338.248	2h		4417.269	1		4499.295	7h	1h	4569.751	1	
4339.914	3h		4418.412	7	1	4500.170	1h		4570.599	15	
4341.109	2		4420.302	80	6	4501.743	60	6	4570.861	60	10
4342.242	20	2	4421.430	2h		4503.399	100	10	4571.453	2	
4342.570	4	1	4421.878	3h		4504.058	1h		4572.062	5	1
4343.584	1		4423.089	2h		4505.081	1		4573.977	8	1
4343.918	4	1	4423.781	3hw		4505.473	2		4576.521	2	
4344.579	70	7	4425.139	1h		4505.881	3		4577.129	20	3
4345.442	10		4427.294	10	1	4506.068	1		4578.447	1000	100
4350.013	5h		4428.702	2	1	4506.640	2		4579.084	60	5
4350.415	1	1	4429.592	1000	200	4507.177	4		4579.559	3	
4352.487	2h		4431.716	15	2	4507.775	3		4580.291	3w	
4354.823	2		4432.571	12	2	4508.719	8	1	4580.613	7	1
4355.398	15w	2	4433.783	1h		4511.312	3h		4582.377	25	3
4356.093	3	1	4434.486	1		4512.691	8		4582.726	4	1
4358.491	400	40	4434.845		20c	4514.019	2h		4583.246	1	
4359.257	200	30	4436.731	2		4515.978	1000	100	4583.686	2	
4361.959	20	2	4437.056	1h		4516.601		2h	4584.710	3h	1h
4363.014	80	8	4438.999	5		4521.263	20	2	4584.851	50	4
4363.838		1	4441.418	2h		4522.075	4	1	4585.884	150	15
4364.017	1		4445.316	6	1	4522.841	10000	1000	4586.309	4	1
4364.889	1		4446.502	8	2	4525.760	2		4587.037	6	1
4365.425	1		4447.015	12c		4526.321	10	2	4587.628	4	1
4365.999	4		4450.790	5c	1	4526.507	8	1	4588.232	30	3
4368.340	2		4451.433	1		4531.157	30	4	4588.536	2	2
4368.616	1		4452.078	6		4531.219	5	1	4588.857		3
4368.940	30	4	4452.273	60	6	4531.391	8	1	4589.297	2h	
4369.255	25	3	4452.581	1		4531.703	20	3	4590.690	1h	
4370.094	70	7	4454.142	3		4534.236	1		4591.689	3w	
4370.717	60	7	4454.811	1		4534.299	1		4591.988	1	
4371.661	1		4456.621	20	3	4534.760	3h	1h	4592.306	1	
4372.086	10	1	4458.057	3		4536.110	1		4593.346	1000	100
4373.181	15	2	4459.395	10	2	4536.365	2		4594.059	100	10
4373.952	70	7	4463.038	20	2	4536.680	2		4597.273		2h
4378.519		2h	4463.535	1		4537.052	2		4597.393	2h	
4380.132	2		4463.852	60	6	4537.347	100	10	4598.217	10	1
4381.583	4	1	4464.277	15	1	4537.844	5	1	4600.164	1	
4383.075	60	6	4464.864	6		4538.556	3	1	4601.231	3	
4384.317	1		4465.090	20	2	4539.530	2000	500	4601.586	2	
4384.574	1		4465.613	80	8	4540.200	3		4602.408	30	3
4385.626	1		4466.575	3	1	4541.247	5		4602.721	100	10
4385.881	1		4467.384	3	1	4542.090	400	40	4603.162	15	2
4387.501	15	1	4468.309	1h		4543.900	5	1	4607.170	3	
4388.605	3	1	4469.173	10	1	4544.609	3		4608.005	80	8
4391.923	3	1	4470.061	4	1	4545.546	50	5	4608.314	20	2
4392.265	1		4470.369	1		4546.672	2		4608.833	8	1
4393.787	7		4471.986	3		4546.896	2		4609.159	300c	30c

TABLE 1. Spectrum of technetium - Continued

Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity	
	Arc	Spark		Arc	Spark		Arc	Spark		Arc	Spark
4610.531	20	2	4686.406	150	15	4762.362	200	20	4848.716	3	
4611.171	40		4687.627	20	1	4763.931	1		4849.608	40	2
4611.386	2		4687.978	100	15	4764.796	5		4850.368	4	
4611.811	3		4688.365	3 h		4764.987	3		4850.740	1 h	
4613.089	1		4689.359	400	40	4765.381	8	1	4853.588	20000	2000
4616.857	1000	100	4689.810	150	5	4766.305	7	1	4855.343	1	
4617.447	20	2	4692.384	60	2	4770.363	1		4857.211	100	10
4618.192		2	4694.282	300	30	4771.543	4000	400	4858.446	2	
4619.725	1		4695.788	15	3	4773.237	5	1	4859.216	40 c	2 c
4620.048	3		4697.047	3		4773.890	200	20	4860.424	1	
4621.129	30		4697.513	25 h	2 h	4776.355	120	12	4861.232	20	2
4621.458	40		4700.186	1		4777.557	1		4862.193	100 c	8 c
4622.691	200 c	20 c	4701.169	2		4778.820	5	1	4862.931	40	4
4622.950	30 c	1 c	4701.814	5	1	4779.501	8 c	1 c	4863.323	20	2
4624.122	3	1	4702.586	1		4779.898	50	5	4864.125	6	1
4624.961	300	30	4702.880	50	5	4780.607	80	3	4866.733	10000	1000
4625.628	5	1	4704.802	15	2	4781.012	1 h		4869.240	3 c	
4625.753	5	1	4705.542	5	1	4783.925	200	20	4870.772	200	20
4626.557	20		4706.918	1000	100	4784.137	20	2	4873.799	10 c	
4626.803	2		4707.575	20	2	4784.720	100	10	4874.325	1	
4628.063	60	4	4709.786	1		4785.597	500	50	4874.768	30	1
4629.253	1		4710.758	2		4787.589	40	2	4875.142	1	
4630.572	1000		4711.448	2		4787.758	100	8	4876.444	1	
4630.978	4		4712.120	8 c		4789.492	150	15	4876.768	12 c	1
4631.378	80	3	4713.610	3		4790.482	200 c	20 c	4877.016	30	3
4631.815	10	1	4714.222	200	20	4791.623	250	20	4877.344	15	2
4632.740	30	3	4714.605	40	4	4792.120	5	1	4878.094	12	1
4633.152	200	20	4716.787	80	8	4796.176	3		4882.586	8	1
4635.433	1		4717.766	2000	200	4796.480	10	1	4885.044	30	3
4635.752	150	15	4719.018	500 c	50 c	4797.895	6 h		4885.889	12	1
4637.500	3000	300	4719.281	4000 c	400 c	4799.079	4		4886.190	4	
4640.015	2		4720.726	6		4799.978	300	30	4888.695	100	10
4641.296	6	1	4723.828	3	1	4800.700	80 c	5 c	4889.444	50	5
4641.669	1		4724.842	1		4803.291	30		4890.884	150 c	10 c
4643.280	500	20	4725.202	1		4803.623	2		4891.918	8000	800
4645.490	150 c	5 c	4726.798	10	1	4804.777	1 h		4892.490	150	15
4646.620	80	8	4728.082	50	5	4805.688	100	10	4893.153	1 h	
4647.573	120	10	4729.302	15	2	4806.992	8	1	4893.651	10 c	1 c
4648.332	2000	200	4731.023	2 cw		4807.349	8	1	4894.780	5 cw	20 cw
4650.556	8	1	4731.918	10	1	4807.988	1 h		4895.977	2	
4652.005	2		4732.044	10	1	4809.094	1		4896.832	1	
4653.609	100	1	4732.469	25	1	4809.416	100	10	4897.251	8	1
4654.658	120	10	4733.869	20 c	2 c	4810.633	2		4899.704	1	
4655.363	1		4735.058	8	1	4811.842	60	6	4900.046	30	3
4656.440	12	1	4736.515	200 cd	20 cd	4812.630	3		4900.955	10	1
4657.006	60 sd	6	4737.434	1		4813.324	50	5	4901.708	20	2
4658.934	2		4738.652	2		4814.073	66	6	4902.085	1	
4659.798	30	3	4739.551	100 c	10 c	4816.062	30 c	1	4903.747	2	
4660.212	2000 c	200	4740.608	10000	1000	4816.794	500	80	4906.410	50	5
4660.590	30 c	3	4741.284	50	5	4819.024	1 h		4906.791	10	1
4663.237	2 h		4741.532	6	1	4820.739	10000	1000	4908.509	1000	100
4664.337	100	10	4742.940	8	1	4825.236	1		4909.053	5	1
4666.311	3		4744.250	1 h		4825.748	20	2	4909.566	2000	200
4667.326	1		4746.009	100 c sd	10 c sd	4828.203	1		4912.422	5 c	
4668.354	40		4747.833	1		4828.698	2		4913.020	500	50
4668.879	100	10	4749.614	500	20	4831.347	300	30	4914.166	10	1
4669.305	2000	200	4750.552	3		4834.367	1000	100	4914.699	150 c	15 c
4671.749	10	1	4750.759	8	1	4835.394	1000	100	4915.372	1	
4672.170	400	40	4751.548	15	2	4838.034	1		4915.810	30	3
4672.545	3		4752.717	1000	60	4839.017	1		4918.917	3	
4672.824	40	4	4755.362	1 h		4840.974	20	2	4919.229	5	
4673.077	45	4	4756.111	100	10	4841.364	100	10	4920.668	200 c 1	20 c
4674.245	30	1	4756.498	1		4842.022	10 h	1 h	4921.646	20	2
4678.073	3		4757.502	40 c	2	4842.488	1		4922.482	2w	
4678.903	200	20	4757.840	2		4843.559	6	1	4923.601	300	3
4682.129	1 h	1 h	4758.094	80	6	4843.850	1 h	1	4925.412	2	
4682.732	20 c	1	4759.280	40	3	4844.326	2		4927.031	5	1
4683.599	150	15	4759.806	50	3	4845.642	2		4928.676	3	
4684.716	2		4760.160	2		4845.980	1		4929.749	25	2
4685.423	1		4761.968	40	3	4846.444	1		4930.360	20	2

TABLE I. Spectrum of technetium - Continued

Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity	
	Arc	Spark		Arc	Spark		Arc	Spark		Arc	Spark
4930.904	15		5046.622	3h		5167.774	8	1	5286.886	10 cw	1
4932.271	10 l	30wd	5046.903	2h		5168.470	2		5287.228	10 c	1
4933.430	10		5051.303	40	4	5169.324	2		5288.330	1	
4933.798	25 c	2	5055.274	300	30	5172.292	4hd		5291.060	2h	
4934.586	25 c	2	5058.331	60	6	5173.910	2		5291.905	3h	
4936.132	40	3	5060.686	500	50	5174.812	2000	200	5292.263	30 c	3 c
4938.821	30	4	5062.136	2		5177.018	2		5299.669	20	1
4939.112	2		5067.632	1		5177.387	3		5304.310	4h	
4940.576	1		5069.549	50	5	5177.746	10 c		5305.307	100	6
4941.567	1		5070.378	4		5178.104	10		5306.210	1h	
4944.246	30 c	3 c	5074.051	3		5181.930	2h s		5307.558	5	
4945.219	1		5074.690	1	1	5183.999	50	2	5307.875	1	
4947.078	50 c	5 c	5075.184	10	1	5184.994	10	1	5311.163	10	1
4948.064	400	40	5079.561	2		5186.791	2w		5313.696	1h	
4948.839	20	2	5080.268	1h		5189.687	40	4	5314.964	400	40
4949.111	2		5081.860	3		5193.144	20h	2h	5317.056	2h	
4949.264	5		5083.969	30	3	5202.152	10 cw		5317.509	30 c	3 c
4950.743	2		5085.611	2		5205.268	2h		5318.186	15 c	1 c
4951.056		10hw	5086.922	40	4	5206.561	100		5320.198	600	60
4953.351	1h		5088.200	1		5206.862	10		5325.132	5	
4954.508	2h		5090.743	80	8	5207.358	4		5325.848	4	
4954.713	10	1	5093.182	10	1	5208.623	25		5328.406	10	1
4954.985	20	2	5095.575	2		5211.262	6		5329.620	4	
4956.337	40	4	5096.280	5000	500	5211.477	6		5332.201	2	
4959.942	4		5100.033	6	1	5214.087	20	4	5334.790	200	20
4961.532	1		5100.327	3	1	5220.239	15	3	5335.080	6	1
4962.654	10	1	5100.653	4	1	5221.447	10	1	5336.594	1	
4963.023	2		5102.525	30	3	5223.517	2		5337.066	5	1
4964.735	2h	2h	5103.240	200 c	20 c	5225.360	10	1	5339.754	1h	
4966.255	10	1	5103.531	10	1	5225.554	200	20	5345.690	8	
4967.200	60 cw	6	5104.321	500	50	5228.648	40 cw	4 cw	5345.890	15 c	1 c
4968.854	5 c		5107.080	3 c	1h	5228.756	10		5350.498	4	
4976.340	5000	500	5107.581	8	1	5230.342	12	1	5350.873	15	
4978.569	20	2	5109.079	4	1	5231.268	15	1	5353.480	500 cw	50 cw
4979.028	8	1	5109.809	200	20	5232.164	5	1	5355.110	6	1
4980.214	3		5111.113	1		5232.929	1h		5356.634	200	20
4980.448	50	4	5111.377	1		5233.326	1		5358.646	300	30
4988.083	2		5112.019	3		5236.130	7	1	5359.222	40	4
4988.710	1		5113.370	5		5236.452	5	1	5360.142	200	20
4989.332	3h		5113.686	30	3	5237.180	2		5360.690	15	1
4990.428	2h		5116.141	2h		5237.521	2		5362.420	4wd	
4991.346	1h		5116.564	2		5238.247	1		5364.050	20	2
4993.978	80 c		5118.483	2		5240.304	2h		5366.082	10	1
4994.997	400	40	5118.940	8		5240.953	20 c	2 c	5367.090	2	
4999.120	30	2	5120.605	100	10	5242.641	2		5367.166	4hw	10hw
5000.831	50 c	3	5122.180	20	2	5243.094	2		5370.824	7	1
5002.674	200	20	5122.739	6	1	5245.600	4w		5372.086	1h	
5003.405	2		5123.400	5wd		5246.653	4w		5372.719	1h	
5005.737	100	5	5125.158	6 c	1 c	5247.006	20	2	5375.201	500h	50h
5010.766	30	2	5126.626		3h	5249.428	20 c	2	5376.298	10h	1h
5014.517	200 cw	20 cw	5129.152	1h		5251.421	40 c	3 c	5377.414	20	2
5017.324	1h		5130.260	1h		5252.768	3w		5378.457	2	1
5019.628	1h		5134.320	40h	3	5253.052	5		5378.970	1h	
5022.250	2h		5135.789	6	1	5253.421	6		5380.416	1	
5022.669	1h		5136.156	40	4	5254.762	20 c	2 c	5381.585	1h	
5024.722	20	2	5138.886	3		5260.217	200 cw	20 c	5382.704	20 c	1 c
5026.238	500	50	5139.262	500	50	5261.444	200 c	20 c	5383.509	30 c	2 c
5026.793	300	30	5140.450	1		5262.925	1		5385.832	10h	
5027.894	150	15	5141.227	1		5266.227	6	1	5386.872	10	1
5031.663	4		5146.542	30w	3w	5266.402	8	1	5387.630	6h	
5032.107	10	1	5147.030	20w	1w	5267.214	4	1h	5389.320	20 cw	1h
5032.446	80	8	5147.997	4		5267.350	3		5390.214	1	
5033.613	5	1	5150.630	500	50	5273.229	20h	1h	5390.697	1	
5035.760	3		5152.053	1		5273.930	15	2	5393.629	5h	
5036.002	4		5157.991	10	1	5274.824	50	5	5394.569	3h	
5036.833	5	1	5158.858	30 c	3 c	5275.512	1000	100	5395.149	1	
5039.572	10	1	5160.130	1		5279.330	30 c	2 c	5395.802	4h	
5041.905	1h		5161.810	2000	200	5281.101	20 c	1 c	5396.690	2	
5043.699	2		5162.410	5h		5285.067	800	80	5397.539	5	
5045.580	2h		5167.038	1		5285.838	8	1	5400.480	20	

TABLE I. Spectrum of technetium - Continued

Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity	
	Arc	Spark		Arc	Spark		Arc	Spark		Arc	Spark
5407.910	50 c	3 c	5524.107	150	15	5645.694	2		5773.656	20	2
5411.928	20	1	5526.878	6		5650.259	1		5775.069	10 cw	1 c
5412.915	20h	1	5528.233	100	10	5651.335		7	5777.360	1	
5413.624	2h		5532.793	1		5652.123	1		5777.976	6	1
5417.121	3		5535.098	10		5652.909	1		5792.474	10 cw	
5418.934	2h		5536.394	20	1	5654.338	6		5794.646	100	10
5421.787	5		5538.875	10 cw	1 c	5656.005	100	8	5795.956	5 cw	
5422.382	2		5539.304	1		5657.490	3		5799.850	80 c	8 c
5423.048	150 c	15 c	5540.596	10	1	5658.106	8	1	5802.433	10	1
5425.956	6	1	5541.939	200	20	5661.557	20	2	5805.214	20	2
5430.712	2		5543.627	80	8	5662.104	10	1	5805.525	10	1
5431.246	15h	1	5545.860	5h		5664.232	4		5806.126	2h	
5432.437	5		5548.227	2		5664.900	40 cw	2 cw	5806.672	3h	
5433.894	1		5550.528	100	10	5666.338	7		5807.107	1w	
5435.139	1		5554.516	1h		5667.058	15		5809.536	1	
5436.993	2		5555.551	1h		5667.615	15		5814.241	100 cw	10 c
5438.774	2h		5556.110	2		5672.153	60	6	5814.639	2	
5439.507	20 c	1 c	5560.712	3h		5675.178	5 h s		5815.038	1h	
5441.440	2		5563.006	10 cw		5678.478	50	2	5817.348	2h	
5442.071	4 cw		5564.840	3h		5679.174	5		5819.176	15 h 1	
5444.258	50	5	5565.140	1		5680.973	15		5820.292	1	
5447.402	200	20	5566.102	4hd		5682.298	1h		5820.785	2	
5447.800	20 c		5567.748	2h		5685.567	8 c		5821.310	10	1
5448.384	20		5568.700	5		5687.301	200	20	5823.196	8	1
5449.335	2 cw		5570.032	3		5688.730	20	2	5826.552	30 ld	1h
5449.720	2		5570.880	10 cw	2	5689.046	200	20	5827.189	10	1
5450.471	10		5572.858	20	1	5692.212	15h	1	5831.477	200	20
5451.900	500 c	50 c	5575.438	10h		5694.330	15 c	2 c	5831.858	2	
5454.124	3		5576.283	20	1	5696.056	20h	2	5832.836	2	
5455.112	20wd		5576.800	25	1	5696.626	18 cw	2 c	5833.314	2h	
5455.952	100		5577.649	15w		5702.894	5h		5834.358	2h	
5456.494	1		5578.255	4h		5704.900	2 c		5835.865	6	1
5458.159	30 cw		5580.231	8 cw		5705.403	1h		5836.329	150 c	15 c
5459.118	2 c		5580.828	1		5711.460	4hw		5838.366	10	1
5460.747	10		5581.931	2 c		5718.775	1h		5846.973	1	
5461.092	9 c		5584.031	20	2	5719.542	10	1	5847.754	1	
5462.422	4h		5589.019	3000 cw	300 cw	5720.205	1h		5850.364	6	1
5467.471	10		5591.400	1h		5721.090	10h	1h	5851.707	1h	
5468.768	3		5594.491	1h		5723.255	2h		5853.376	25h	2h
5471.072	1		5596.614	2h		5725.314	700	70	5855.439	7 cw	
5471.962	300		5602.229	200	20	5732.791	3		5855.898	1	
5473.258	2		5603.543	5h	1h	5734.691	2h		5856.656	5	
5474.435	2		5604.069	2h		5735.636	3		5863.865	30h	
5475.624	2		5604.762	1h		5737.543	5w		5865.146	5h	
5477.540	20 cw s		5605.534	2		5739.108	2h		5865.393	15 c	1 c
5480.035	3 c		5606.376	10h		5739.479	1h		5865.826	10 cw	1
5480.635	4h		5611.482	20	2	5741.301	5		5867.484	10 c	1
5482.840	50	5	5613.021	3h		5741.943	10hw	1h	5871.273	20	1
5483.012	70	7	5613.863	2h		5745.020	3h		5873.635	7	1
5485.026	50 c	1 c	5615.272	8	1	5748.307	3		5874.804	20	1
5485.373	60	3	5616.347	5h		5749.542	10 c		5879.288	18h	
5486.028	2		5616.795	10		5750.098	2h		5882.067	25	2
5490.391	30 c	2	5617.651	7	1	5751.050	1h		5885.365	10 cw	
5490.903	5		5620.450	2000 c	200	5751.614	1h		5890.704	1	
5496.054	10	1	5622.748	2h		5752.219	2		5891.658	1h	
5500.096	20	2	5625.232	6		5754.775	20h		5893.590	15	1
5501.168	1		5626.180	1		5755.199	3h		5894.662	1h	
5502.110	5		5627.469	2		5758.298	1h		5896.406	6	
5502.971	30h	1h	5628.956	1		5760.389	2		5897.420	3	
5504.608	2h		5629.568	5		5761.734	1		5901.728	2	
5505.274	30h	2h	5629.937	300	30	5762.449	5		5903.415	3	
5506.890	80 cw	5 c	5633.820	1		5764.119	1h		5903.570	2	
5507.476	3h		5636.253	30	3	5765.698	5h		5905.477	8h	
5510.866	10	1	5636.840	40h	2h	5767.232	4hc		5905.904	10	1
5511.478	2		5637.792	8h	1	5767.546	6		5908.577	15 cw	1 c
5511.811	1		5640.782	40 c	2 c	5768.002	2		5914.939	1	
5512.876	4h		5642.132	1500	150	5769.704	3		5915.751	3h	
5513.630	10h		5643.940	6		5770.249	4		5917.250	1	
5514.216	20h		5644.357	12	1	5771.468	500 c	50 c	5917.963	2h	
5518.051	30	3	5644.944	800	80	5772.500	1h		5918.780	1	

TABLE I. Spectrum of technetium - Continued

Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity	
	Arc	Spark		Arc	Spark		Arc	Spark		Arc	Spark
5919.462	5	1	6063.930	20 c	2	6267.598	2		6511.774	1	
5923.357	150	10	6065.090	200	20	6274.014	1		6515.160	20	
5924.468	100 cw	100 cw	6066.182	5 h		6275.425	4		6515.660	2 h	
5925.384	20 c	1 c	6069.785	30	3	6277.250	2 cw		6516.192	2	
5925.714	10	1	6076.041	2		6278.234	2 c		6519.740	1	
5926.286	200	20	6077.819	1		6287.962	4 cw		6526.817	200	20
5926.687	3 h		6080.327	1		6288.358	1 h		6528.038	5 c	
5928.111	2		6083.456	1		6290.397	5		6532.494	2	
5930.310	20		6085.229	800	80	6292.239	1 h		6533.606	2	
5930.544	2		6089.828	2 h		6295.943	1		6534.063	6	
5931.929	600 c	60 c	6091.146	1		6296.423	2		6534.659	10	
5937.136	5 h		6093.741	20 c	2 c	6296.765	6 h		6535.947	3 h	
5938.394	20	2	6097.790	1		6299.959	1 h		6536.633	5	
5942.259	20 cw	1	6098.891	3 h		6303.104	2 hw		6537.425	2 c	
5946.514	10 cw		6099.387	300	30	6304.048	6		6563.197	4	
5951.484	40 c	3 c	6102.961	500 cw	50 c	6305.028	30	3	6564.004	50 w	
5951.924	8 c		6106.898	1 h		6306.260	8		6568.820	2 h	
5955.318	2		6107.205	2 h		6310.420	40 c	3 c	6576.820	50 wld	
5958.646	1 h		6111.120	20	1	6312.179	100	10	6579.243	150	
5961.256	2		6112.030	20 h	1 h	6318.408	1 w		6581.747	8	
5969.013	6	1	6112.630	1		6319.033	1		6586.147	3	
5974.845	8	1	6115.490	4 h		6320.700	5		6590.039	15	
5977.678	1		6120.684	1000	100	6321.099	1		6595.124	4	
5979.170	2 h		6122.196	1		6326.116	1		6595.244	6	
5979.893	4		6124.339	5		6328.690	2 h		6598.037	10	
5980.512	20 c	1 c	6127.167	8	1	6330.962	2		6602.099	5	
5980.694	10		6127.791	1		6332.742	2		6609.746	3 h s	
5986.820	6		6130.805	1000	100	6347.458	1		6614.304	3	
5988.406	1 h		6132.230	150 c	10 c	6352.866	2		6618.080	2	
5993.208	10 cw s		6145.959	3		6354.632	50 cw	2 c	6625.573	500 cw s	10 cw s
5995.204	1		6148.136	1 h		6354.860	100	10	6627.896	50 c	1 c
5996.700	15 c	1 c	6148.320	1 h		6356.732	100	10	6629.071	1	
5997.130	5		6150.522	2		6369.313	4		6646.143	1	
5999.701	3 c		6151.460	7 h		6380.889	5 c		6647.489	4	
6002.900	2 h		6154.274	5	1	6382.724	3		6648.383	30	1
6003.496	1		6156.540	1 h		6386.778	5 h		6649.388	3	
6004.566	3 h		6159.510	1 h		6388.426	30 cw	1	6650.177	2	
6005.099	1 h	1 h	6162.172	3	2	6389.871	80	6	6656.906	2	
6005.099	1 h	1 h	6163.603	8	1	6392.408	30 c	2 c	6661.433	5	
6006.099	2 h		6167.399	1		6392.716	3		6662.015	20	
6010.191	20 c	2 c	6174.723	1 h		6408.830	100	8	6664.722	2	
6011.790	4		6182.668	20	2	6412.941	3 h		6673.263		1 h
6012.104	15 cw	1 cw	6183.771	10	1	6416.316		2 h	6673.656	300 c	5 c
6013.183	10 h		6184.698	100	2	6419.206	2		6684.967	3	
6018.624	8 c		6185.908	5		6419.353	2		6687.099	100	1
6020.726	10	1	6187.702	3		6428.104	3		6691.680	3	
6023.500	50	5	6192.665	800	80	6432.774	5		6694.386	4	
6024.046	2 h		6193.908	1		6439.080	3	5	6696.684	2	
6024.423	10	1	6195.384	40	2	6442.684	1 h		6699.464	2	
6026.085	2		6197.312	1		6445.100	30 cw	1 cw	6701.142	5	
6028.542	6	1	6198.853	4 h		6449.026	4		6707.478	8	
6030.297	5	1	6202.095	1		6449.552	1		6710.202	10	
6032.355	60	6	6202.630	5		6452.922	2		6712.512	4	
6035.193	2 h		6202.902	3		6453.357	1		6718.327	1 h	
6036.500	1		6204.446	4		6453.925	3		6721.629	3	
6037.506	1		6205.040	2 h		6455.896	1000	30	6731.187	50	
6038.504	4 h		6213.347	3 h		6460.338	5 h		6733.847	7	
6039.271	6 h		6214.032	30	2	6461.928	600 c	20 c	6738.066	1	
6041.982	2		6218.473	2		6462.548	1		6742.901	5	
6043.390	1 h 1		6220.783	4 h		6467.134	1		6745.042	6	
6047.358	1		6231.258	1 h		6467.570	2 h		6747.530	7 h	
6047.992	60	6	6232.076	2 h		6469.605	20 h		6748.838	5	
6051.632	1		6236.621	3 c		6470.270	100	6	6749.077	50	
6052.397	1 h		6236.865	8	1	6472.663	3 h		6753.399	10	
6052.685	1 h		6238.625	2		6478.692	4		6754.509	15	
6053.042	1		6239.698	20		6479.620	1 h		6758.326	20	
6055.056	2 h s		6244.178	600 cw	50 c	6491.676	200 cw	5	6761.469	30	1
6056.454	1		6248.971	15	1	6493.570	2 c		6764.101	2	
6057.249	20	2	6255.807	5	1	6496.606	10		6764.574	5	
6063.473	30	3	6266.102	2 w		6499.312	3		6764.758	8	

TABLE 1. Spectrum of technetium - Continued

Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity	
	Arc	Spark		Arc	Spark		Arc	Spark		Arc	Spark
6767.183	2		6998.653	15		7350.29	1		7782.99	15	
6770.387	1h		7002.37	150		7360.06	10		7793.04	800cw	
6772.562	1h		7004.78	6		7362.46	5w		7795.70	2	
6773.899	4		7006.29	20c		7366.33	40cw		7798.28	60	
6776.580	8		7011.44	2		7395.06	50		7807.20	10	
6781.305	1h		7012.56	3h		7396.80	100		7811.10	2	
6786.003	80	2	7014.10	10c		7402.61	100cw 1		7812.65	4	
6786.452	1		7016.57	100		7405.36	200		7816.74	60	
6786.965	10		7020.02	20		7421.12	8		7817.72	800	
6787.951	2		7022.91	5		7424.01	20		7826.31	10	
6788.665	3		7023.63	6		7427.15	60		7826.91	10	
6795.564	2		7029.72	8		7429.12	1		7848.36	2c	
6798.629	70	2	7032.89	10		7431.65	2		7854.40	10	
6800.793	2		7045.97	3		7434.12	150		7856.38	100	
6805.049	5		7048.47	30		7452.49	600		7858.25	10	
6805.942	15		7054.80	10		7461.59	60		7861.44	200	
6813.340	5		7061.63	7		7470.14	50		7863.22	10	
6813.590	5		7065.59	10		7471.77	20		7871.25	400ld	
6815.382	1		7071.44	30		7494.28	6		7874.76	60cw	
6818.126	10		7076.77	15		7512.28	3		7876.19	2	
6823.962	1		7077.56	2		7516.40	3w		7879.37	8c	
6825.480	3		7083.59	15		7534.95	80		7881.63	5	
6826.146	5		7084.87	1		7540.26	800		7885.98	40cw	
6826.686	5		7086.18	500cw d		7543.39	80		7894.75	2	
6830.007	8		7093.12	60		7545.51	30		7898.56	3	
6833.736	3		7097.24	3		7547.26	5		7905.72	20c	
6837.906	4hw		7109.81	8		7548.44	50		7911.29	4c	
6854.469	3h		7115.78	8		7550.99	10w		7912.19	4c	
6855.365	5		7117.17	4		7554.48	5		7920.37	10h	
6856.902	60	1	7117.39	5		7555.35	2		7949.71	15c	
6860.726	30	1	7123.97	4		7574.02	200		7958.09	5	
6862.371	15		7124.78	30		7577.61	2		7960.65	1	
6866.473	15		7134.82	1		7579.26	500		7963.92	20	
6866.677	25		7140.18	3		7583.93	5		7965.45	70	
6867.526	2		7141.28	200		7584.33	3		7968.30	50	
6871.646	2		7144.67	15		7586.44	5		7981.80	50cw	
6872.303	1		7156.87	20		7587.56	5		7999.73	500	
6873.070	2		7157.62	200c		7588.61	7		8001.88	10	
6874.626	10		7169.73	2w		7593.15	7		8014.78	1	
6876.690	50		7173.04	3		7600.96	3		8017.22	8	
6894.386	20		7177.91	3hw		7605.80	10wd		8021.57	2	
6899.136	3		7179.04	10		7618.42	30		8029.46	8c	
6901.620	2		7191.59	3		7619.79	3		8036.95	2	
6905.117	10		7194.65	2		7624.53	90		8042.47	30	
6907.514	30		7207.02	8		7631.14	1		8045.33	25	
6923.552	1		7212.36	4w		7631.82	4		8057.76	4	
6924.055	15		7220.54	2		7634.53	7		8065.72	3	
6928.934	3h		7226.46	1		7635.08	4		8067.21	2	
6930.264	6		7228.63	4		7649.80	2		8068.79	40c	
6931.795	30		7229.02	4		7652.00	1		8073.66	10c	
6933.236	30		7243.35	3w		7655.82	1		8112.77	1	
6939.892	4		7248.12	4		7657.04	2		8113.54	1	
6941.465	4		7251.68	15		7658.37	30c		8116.91	5	
6944.988	2		7253.09	5		7661.98	1		8119.86	40	
6945.597	15		7256.08	70		7667.64	2		8126.55	200	
6949.320	7h		7264.84	3		7672.72	2		8127.78	15	
6951.282	3		7283.16	15		7676.95	4		8132.65	5h	
6952.625	3		7296.24	5wd		7679.20	2		8134.10	3h	
6958.593	4		7304.60	6		7681.79	15		8142.63	30	
6960.046	2		7305.00	5		7684.45	100		8153.48	8	
6968.151	30		7316.44	15d		7697.37	500		8160.53	10c	
6969.394	4		7320.30	5w		7698.19	80cw		8160.94	15	
6971.534	1		7322.38	100		7701.92	1		8170.55	200	
6974.191	2		7327.32	4h		7719.59	2h		8175.13	1	
6975.067	7		7329.14	80		7722.19	3		8176.18	5	
6980.153	10		7331.89	5		7733.63	5c		8200.05	3	
6985.402	30		7338.20	50		7737.36	50c		8205.27	150	
6988.946	1		7340.13	4		7746.60	10		8206.49	100	
6990.300	40		7341.85	2		7777.22	40		8208.41	2	
6998.037	8		7345.81	4		7779.59	6c		8211.31	150	

TABLE I. Spectrum of technetium—Continued

Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity		Wave-length	Intensity	
	Arc	Spark		Arc	Spark		Arc	Spark		Arc	Spark
8225.07	50		8309.16	200		8497.12	5h		8735.34	3	
8231.21	2		8315.50	60		8507.15	1		8737.93	100 cw	
8237.08	500 cw		8319.07	20 cw		8514.70	30		8751.77	20	
8248.96	40		8322.49	5		8519.73	1		8756.86	15	
8250.43	3		8323.35	1		8522.53	20		8757.41	4w	
8254.50	30		8330.37	1		8531.06	100		8766.68	6	
8264.13	10		8346.57	40		8537.65	30		8787.24	3	
8265.64	3		8383.67	40		8543.61	100		8790.90	2	
8269.84	1h		8399.36	1		8595.93	10		8808.81	2h	
8270.83	2h		8404.00	7		8604.09	3		8812.42	5c	
8271.93	2hd		8415.55	50 cw		8639.39	4		8820.91	10c	
8276.20	1h		8422.43	5		8645.03	3		8829.82	200 cw	
8278.00	1		8445.82	20		8652.76	50		8897.64	2c	
8283.27	1		8462.80	10c		8664.12	6		8901.47	30c	
8285.09	1		8477.91	2		8673.62	8		8909.93	2	
8285.68	2		8481.34	50c		8707.21	100 cw		8917.73	8	
8306.22	2		8484.00	40		8719.95	30				
8308.15	200		8492.13	1		8722.68	25				

4. References

- [1] C. Perrier and E. Segré, *Nature* **159**, 24 (1947).
 [2] W. F. Meggers and B. F. Scribner, *J. Res. NBS* **45**, 476 (1950) RP2161.
 [3] W. F. Meggers, *J. Res. NBS* **47**, 7 (1951) RP2221.
 [4] P. W. Merrill, *Astrophys. J.* **116**, 21 (1952).
 [5] W. R. Bozman, *J. Opt. Soc. Am.* **44**, 824(A) (1954).
 [6] W. R. Bozman, *J. Opt. Soc. Am.* **46**, 383(A) (1956).
 [7] C. E. Moore, *Atomic Energy Levels*, Vol III, NBS Circ. 467 (Washington, 1958) p. 17.
 [8] *ibid.* p. 19.
 [9] K. G. Kessler and R. E. Trees, *Phys. Rev.* **92**, 303 (1953).

(Paper 71A6-471)