POSSIBLE PALLADIUM-RELATED NUCLEAR REACTIONS

Shang-Xian Jin and Hal Fox [1]

ABSTRACT

The recent discoveries by Bockris and Minevski [1] and by Mizuno et al. [2] of apparent numerous low-temperature nuclear reactions has challenged current atomic models. By making the assumption that standard conservation laws for nuclear reactions would be preserved, a large variety of possible nuclear reactions have been proposed and checked for obeying conservation rules. The purpose of this paper is to present a list of some possible nuclear reactions between palladium isotopes and the following single particles: deuterons, protons, neutrons, and alpha particles.

A. INTRODUCTION

The recent reports of a considerable number of anomalous nuclear reactions reported by Bockris and Minevski [1] plus similar results reported by Mizuno, et al. [2] challenge the current atomic models. In order to get a better understanding of how such nuclear reactions **might possible occur**, the authors have compiled a list of **possible** nuclear reactions. In compiling this list, the authors have used the well-accepted concepts of conservation principles to determine which nuclear reactions involving deuterium (d), protons (p), neutrons (n), and alpha particles (") could occur. Each resulting nuclear reaction has been checked for obeying the conservation rules of **energy, baryon number, charge, spin, parity, and isospin.** No attempt has been made to explain how the various particles can overcome the Coulomb barrier to cause such nuclear reactions. No attempt has been made to rank the reactions according to probabilities. Also, no attempt has been made to consider all of the possible nuclear reactions between the particles and the secondary nuclides produced. Some of the experimental results given in references [1] and [2] suggest that whatever process is promoting nuclear reactions with the palladium could possibly cause nuclear reactions to occur with isotopes or elements produced by the initial palladium nuclear reactions.

B. LIST OF POSSIBLE NUCLEAR REACTIONS

The following five sections list many (but not all) possible nuclear reactions. Section 1 list the reactions between deuterium and various stable palladium isotopes. Section 2 lists the possible nuclear reactions between protons and various stable palladium isotopes. Section 3 lists possible neutron reactions with stable palladium isotopes. Section 4 lists the possible nuclear reactions with alpha particles and various stable palladium isotopes. In sections 1 through 4, the end products from the nuclear reactions all produce smaller mass elements. In section 5, are listed some of the many nuclear reactions with stable palladium isotopes that can produce higher-mass isotopes and elements.

In all sections, when a radioactive or metastable nuclide results (marked with an *) the natural radioactive decay for that nuclide is shown indented from the left margin. For such nuclides, the half-life is given, and followed

[1] Fusion Information Center, P.O. Box 58639, Salt Lake City, UT 84158

by the chain of radioactive events (with the emission of alpha, beta, or gammas). The energies of the emitted particles are also shown. In all cases, the energy of radiation for alpha and beta particles are shown in Mev and the energy for gamma-ray emissions are shown in Kev.

The following are the list of symbols used:

symbols:		time:	
"	alpha particle	MS	milliseconds
$-	negative electron	S	seconds
$+	positron	M	minutes
(	gamma ray	D	days
p	proton	A	years
d	deuteron		
n	neutron		
t	triton	*	radioactive or metastable nuclide
g	electron capture	T	weak
IT	isomeric transition	<T	very weak
e-	conversion electron		

(energy of radiation in Mev for Alpha and Beta, Kev for gamma)

In section 5 the dotted lines (two places) indicates that there are many other possible nuclear reactions that could occur and obey the various conservation rules. The choices of reactions made by the authors were determined by analyzing data that was provided by Bockris and Minevski [1] and by Mizuno, et al. [2].

1. d + Pd 6 C + D + ...

$d + {}_{46}Pd^{106} \rightarrow {}_{45}Rh^{104*} + \alpha + 7.75$ Mev
$d + {}_{46}Pd^{108} \rightarrow {}_{45}Rh^{106*} + \alpha + 10.6$
$d + {}_{46}Pd^{110} \rightarrow {}_{45}Rh^{108*} + \alpha + 7.40$
${}_{45}Rh^{104*} \rightarrow {}_{46}Pd^{104}$ 42.3 S; β^- 2.44; γ 555.8
${}_{45}Rh^{106*} \rightarrow {}_{46}Pd^{106}$ 29.9S; β^- 3.54; γ 511.9, 621.9
${}_{45}Rh^{108*} \rightarrow {}_{46}Pd^{108}$ 17 S; β^- 4.5; γ 433.9, 618.8

$d + {}_{46}Pd^{102} \rightarrow {}_{3}Li^{6} + {}_{44}Ru^{98} - 0.66$
$d + {}_{46}Pd^{104} \rightarrow {}_{3}Li^{6} + {}_{44}Ru^{100} - 1.14$
$d + {}_{46}Pd^{105} \rightarrow {}_{3}Li^{6} + {}_{44}Ru^{101} - 1.70$
$d + {}_{46}Pd^{106} \rightarrow {}_{3}Li^{6} + {}_{44}Ru^{102} - 1.75$
$d + {}_{46}Pd^{108} \rightarrow {}_{3}Li^{6} + {}_{44}Ru^{104} + 0.619$
$d + {}_{46}Pd^{110} \rightarrow {}_{3}Li^{6} + {}_{44}Ru^{106*} - 2.97$
${}_{44}Ru^{106*} \rightarrow {}_{45}Ph^{106*}$ 1.02 A; β^- 0.0394 $\rightarrow {}_{46}Pd^{106}$ 29.9S; β^- 3.54; γ 551.9, 621.9

$d + {}_{46}Pd^{102} \rightarrow {}_{3}Li^{6} + {}_{42}Mo^{94} + \alpha - 2.89$
$d + {}_{46}Pd^{104} \rightarrow {}_{3}Li^{6} + {}_{42}Mo^{96} + \alpha - 3.99$
$d + {}_{46}Pd^{105} \rightarrow {}_{3}Li^{6} + {}_{42}Mo^{97} + \alpha - 4.24$
$d + {}_{46}Pd^{106} \rightarrow {}_{3}Li^{6} + {}_{42}Mo^{98} + \alpha - 5.17$
$d + {}_{46}Pd^{108} \rightarrow {}_{3}Li^{6} + {}_{42}Mo^{100} + \alpha - 3.72$

$d + {}_{46}Pd^{104}$ → ${}_{4}Be^{6*} + {}_{43}Tc^{100*}$ - 8.80
$d + {}_{46}Pd^{106}$ → ${}_{4}Be^{8*} + {}_{43}Tc^{100*}$ + 4.14
→ ${}_{4}Be^{6*} + {}_{43}Tc^{102*}$ - 10.5
$d + {}_{46}Pd^{108}$ → ${}_{4}Be^{10*} + {}_{43}Tc^{100*}$ - 0.148
→ ${}_{4}Be^{8*} + {}_{43}Tc^{102*}$ + 6.27
$d + {}_{46}Pd^{110}$ → ${}_{4}Be^{10*} + {}_{43}Tc^{102*}$ - 3.21
→ ${}_{4}Be^{12*} + {}_{43}Tc^{100*}$ + 4.80
${}_{43}Tc^{100*}$ → 15.8 S;$G 3.4, 2.9; (539.5, 590.8 → ${}_{44}Ru^{100}$
${}_{43}Tc^{102*}$ → 4.4 M;$G 1.8;(475.1, 628.1 → ${}_{44}Ru^{102}$
→ 5.3 S;$G4.2, 3.4, 2.2;(475.1 → ${}_{44}Ru^{102}$

$d + {}_{46}Pd^{104}$ → ${}_{4}Be^{6*} + {}_{42}Mo^{99*}$ + p - 18.4
$d + {}_{46}Pd^{105}$ → ${}_{4}Be^{11*} + {}_{42}Mo^{95}$ + p - 15.0
$d + {}_{46}Pd^{106}$ → ${}_{4}Be^{6*} + {}_{42}Mo^{101*}$ + p - 18.9
→ ${}_{4}Be^{8*} + {}_{42}Mo^{99*}$ + p - 3.04
$d + {}_{46}Pd^{108}$ → ${}_{4}Be^{8*} + {}_{42}Mo^{101*}$ + p - 1.67
→ ${}_{4}Be^{10*} + {}_{42}Mo^{99*}$ + p - 7.33
$d + {}_{46}Pd^{110}$ → ${}_{4}Be^{10*} + {}_{42}Mo^{101*}$ + p - 11.6

$d + {}_{46}Pd^{106}$ → ${}_{4}Be^{6*} + {}_{42}Mo^{99*}$ + t - 24.1
$d + {}_{46}Pd^{108}$ → ${}_{4}Be^{6*} + {}_{42}Mo^{101*}$ + t - 23.2
→ ${}_{4}Be^{8*} + {}_{42}Mo^{99*}$ + t - 7.33
$d + {}_{46}Pd^{110}$ → ${}_{4}Be^{8*} + {}_{42}Mo^{101*}$ + t - 11.6
→ ${}_{4}Be^{10*} + {}_{42}Mo^{99*}$ + t - 16.8
${}_{42}Mo^{99*}$ → 2.747 D;$G1.214;(140.5, 739.5 → ${}_{43}Tc^{99*}$ → 6.01 H; IT 142.7, 2.2(eG), (140.5; $G 0.435 → ${}_{44}Ru^{99}$
${}_{42}Mo^{101*}$ → 14.6 M;$G0.7, 2.23;(191.9, 590.9, 1012.5, 506.0 → ${}_{43}Tc^{101*}$ → 14.2 M;$G 1.32;(306.8 → ${}_{44}Ru^{101}$

$d + {}_{46}Pd^{106}$ → ${}_{4}Be^{6*} + {}_{41}Nb^{98*}$ + " - 1.41
$d + {}_{46}Pd^{108}$ → ${}_{4}Be^{8*} + {}_{41}Nb^{98*}$ + " + 2.75
$d + {}_{46}Pd^{110}$ → ${}_{4}Be^{10*} + {}_{41}Nb^{98*}$ + " - 6.73
${}_{4}Be^{6*}$ → 5.0E-21 S; 2p, "
${}_{4}Be^{8*}$ → 7E-17 S;2" 0.0641
${}_{4}Be^{10*}$ → 1.6E6 A;$G 0.556 → ${}_{5}B^{10}$
${}_{4}Be^{11*}$ → 13.8 S;$G 11.5, 9.4;(2124.5 → ${}_{5}B^{11}$
${}_{4}Be^{12*}$ → 12 MS;$G → ${}_{5}B^{12*}$ → 20.20 MS;$G 13.37;(4439 → ${}_{6}C^{12}$
${}_{41}Nb^{98*}$ → 51 M;$G 2.3, 1.9;(787.3, 722.7 → ${}_{42}Mo^{98}$
→ 2.9 S;$G4.6;(787.3, 1024.0 → ${}_{42}Mo^{98}$

$d + {}_{46}Pd^{105}$ → ${}_{5}B^{10} + {}_{42}Mo^{96}$ + n - 6.60

$d + {}_{46}Pd^{102}$ → ${}_{5}B^{12*} + {}_{42}Mo^{92}$ - 1.35
$d + {}_{46}Pd^{104}$ → ${}_{5}B^{12*} + {}_{42}Mo^{94}$ - 1.24
$d + {}_{46}Pd^{105}$ → ${}_{5}B^{12*} + {}_{42}Mo^{95}$ - 0.93

$d + {}_{46}Pd^{106}$ → ${}_{5}B^{12*} + {}_{42}Mo^{96}$ - 1.34
$d + {}_{46}Pd^{108}$ → ${}_{5}B^{12*} + {}_{42}Mo^{98}$ + 1.35
$d + {}_{46}Pd^{110}$ → ${}_{5}B^{12*} + {}_{42}Mo^{100}$ - 2.39

$d + {}_{46}Pd^{102}$ → ${}_{5}B^{10} + {}_{42}Mo^{96}$ + n - 6.60
$d + {}_{46}Pd^{105}$ → ${}_{5}B^{8*} + {}_{41}Nb^{98*}$ + p - 22.0
${}_{5}B^{8*}$ → 770 MS;$G14; (")8.359, (2")1.57 → ${}_{4}Be^{8}$
${}_{5}B^{12*}$ → 20.2 MS;$G13.37;(4439, (")0.2 → ${}_{6}C^{12}$

$d + {}_{46}Pd^{106}$ → ${}_{6}C^{10*} + {}_{41}Nb^{98*}$ - 8.96
$d + {}_{46}Pd^{108}$ → ${}_{6}C^{12} + {}_{41}Nb^{98*}$ + 10.1
$d + {}_{46}Pd^{110}$ → ${}_{6}C^{14*} + {}_{41}Nb^{98*}$ - 5.29
${}_{41}Nb^{98*}$ → 51 M;$G 2.3, 1.9;(787.3, 722.7 → ${}_{42}Mo^{98}$
→ 2.9S;$G 4.6;(787.3, 1024.0 → ${}_{42}Mo^{98}$

$d + {}_{46}Pd^{106}$ → ${}_{6}C^{10*} + {}_{40}Zr^{97*}$ + p - 15.8
$d + {}_{46}Pd^{108}$ → ${}_{6}C^{12} + {}_{40}Zr^{97*}$ + p + 3.25
$d + {}_{46}Pd^{110}$ → ${}_{6}C^{14*} + {}_{40}Zr^{97*}$ + p - 15.8
$d + {}_{46}Pd^{112}$ → ${}_{6}C^{16*} + {}_{40}Zr^{97*}$ + p - 10.2

$d + {}_{46}Pd^{108}$ → ${}_{6}C^{10*} + {}_{40}Zr^{97*}$ + t - 20.1
$d + {}_{46}Pd^{110}$ → ${}_{6}C^{12} + {}_{40}Zr^{97*}$ + t - 6.22
$d + {}_{46}Pd^{112}$ → ${}_{6}C^{14*} + {}_{40}Zr^{97*}$ + t - 7.18
${}_{6}C^{10*}$ → 19.3 S;$G 1.87;(718.3 → ${}_{5}B^{10}$
${}_{6}C^{14*}$ → 5730 A;$G 0.157 → ${}_{7}N^{14}$
${}_{6}C^{16*}$ → 0.75 S;$G → ${}_{7}N^{16*}$ → 7.13 S;$G 4.27, 10.44;(6129, 7115 → ${}_{8}O^{16}$
${}_{40}Zr^{97*}$ → 16.8 H;$G 1.92;(743.3 → ${}_{41}Nb^{97*}$ → 1.23 H;$G 1.27;(658 → ${}_{42}Mo^{97}$

$d + {}_{46}Pd^{102}$ → ${}_{7}N^{12*} + {}_{40}Zr^{92}$ - 3.68
$d + {}_{46}Pd^{104}$ → ${}_{7}N^{12*} + {}_{40}Zr^{94}$ - 6.36
→ ${}_{7}N^{14} + {}_{40}Zr^{92}$ + 9.32
$d + {}_{46}Pd^{105}$ → ${}_{7}N^{14} + {}_{40}Zr^{93*}$ + 9.0
→ ${}_{7}N^{12*} + {}_{40}Zr^{95*}$ - 6.96
$d + {}_{46}Pd^{106}$ → ${}_{7}N^{14} + {}_{40}Zr^{94}$ + 7.63
→ ${}_{7}N^{12*} + {}_{40}Zr^{96}$ - 8.68
$d + {}_{46}Pd^{108}$ → ${}_{7}N^{12*} + {}_{40}Zr^{98*}$ - 9.46
→ ${}_{7}N^{14} + {}_{40}Zr^{96}$ + 9.21
$d + {}_{46}Pd^{110}$ → ${}_{7}N^{14} + {}_{40}Zr^{98*}$ + 3.21
${}_{40}Zr^{93*}$ → 1.5E6 A;$G 0.060;(30.4 → ${}_{41}Nb^{93}$
${}_{40}Zr^{95*}$ → 64.02 D;$G 0.366, 0.40;(756.7, 724.2 → ${}_{41}Nb^{95*}$ → 3.61 D;$G 1.16;(204.1 → ${}_{42}Mo^{95}$
→ 34.97 D;$G 0.160;(765.8 → ${}_{42}Mo^{95}$
${}_{40}Zr^{98*}$ → 30.7 S;$G 2.2 → ${}_{41}Nb^{98*}$ → 51 M;$G 2.3, 1.9;(787.3, 722.7 → ${}_{42}Mo^{98}$
→ 2.9 S;$G 4.6;(787.3, 1024.0 → ${}_{42}Mo^{98}$

$d + {}_{46}Pd^{105}$ → ${}_{7}N^{14} + {}_{38}Sr^{89*} + \gamma + 8.63$

$d + {}_{46}Pd^{106}$ → ${}_{7}N^{12*} + {}_{38}Sr^{92*} + \gamma - 13.6$

→ ${}_{7}N^{14} + {}_{38}Sr^{90*} + \gamma + 0.597$

$d + {}_{46}Pd^{108}$ → ${}_{7}N^{12*} + {}_{38}Sr^{94*} + \gamma - 14.4$

→ ${}_{7}N^{14} + {}_{38}Sr^{92*} + \gamma + 4.25$

$d + {}_{46}Pd^{110}$ → ${}_{7}N^{14} + {}_{38}Sr^{94*} + \gamma - 1.75$

${}_{7}N^{12*}$ → 11.0 M;$G16.3;(4439; (3")0.192 → ${}_{6}C^{12}$

$d + {}_{46}Pd^{102}$ → ${}_{9}F^{18*} + {}_{38}Sr^{86} + 8.85$

$d + {}_{46}Pd^{104}$ → ${}_{9}F^{18*} + {}_{38}Sr^{88} + 10.6$

$d + {}_{46}Pd^{105}$ → ${}_{9}F^{18*} + {}_{38}Sr^{89*} + 10.1$

$d + {}_{46}Pd^{106}$ → ${}_{9}F^{18*} + {}_{38}Sr^{90*} + 8.29$

$d + {}_{46}Pd^{108}$ → ${}_{9}F^{18*} + {}_{38}Sr^{92*} + 8.66$

$d + {}_{46}Pd^{110}$ → ${}_{9}F^{18*} + {}_{38}Sr^{94*} + 2.66$

$d + {}_{46}Pd^{102}$ → ${}_{9}F^{19} + {}_{38}Sr^{84} + n - 3.10$

$d + {}_{46}Pd^{104}$ → ${}_{9}F^{19} + {}_{38}Sr^{86} + n - 0.71$

$d + {}_{46}Pd^{106}$ → ${}_{9}F^{19} + {}_{38}Sr^{88} + n + 2.20$

$d + {}_{46}Pd^{108}$ → ${}_{9}F^{19} + {}_{38}Sr^{90*} + n + 3.59$

$d + {}_{46}Pd^{110}$ → ${}_{9}F^{19} + {}_{38}Sr^{92*} + n - 1.23$

${}_{38}Sr^{89*}$ → 50.52 D;$G 1.49;(909.2 → ${}_{39}Y^{89}$

${}_{38}Sr^{90*}$ → 29.1 A;$G 0.546 → ${}_{39}Y^{90*}$ → 2.67 D;$G<T 2.281;(2186.2 → ${}_{40}Zr^{90}$

→ 3.19 H; IT 479.5;(202.5;$GT;(2318.9 → ${}_{40}Zr^{90}$

${}_{38}Sr^{92*}$ → 2.71 H;$G 0.54;(1384.0 → ${}_{39}Y^{92*}$ → 3.54 H;$G 3.64;(934.5, 1405.4 → ${}_{40}Zr^{92}$

${}_{38}Sr^{94*}$ → 1.25 M;$G 2.08;(1427.6 → ${}_{39}Y^{94*}$ → 18.7 M;$G 4.92;(918.7, 1138.9, 550.9 → ${}_{40}Zr^{94}$

$d + {}_{46}Pd^{102}$ → ${}_{9}F^{18*} + {}_{36}Kr^{82} + \gamma + 2.50$

$d + {}_{46}Pd^{104}$ → ${}_{9}F^{18*} + {}_{36}Kr^{84} + \gamma + 2.86$

$d + {}_{46}Pd^{106}$ → ${}_{9}F^{18*} + {}_{36}Kr^{86} + \gamma + 3.20$

${}_{9}F^{18*}$ → 1.830 H;$G 0.635, g → ${}_{8}O^{18}$

$d + {}_{46}Pd^{102}$ → ${}_{10}Ne^{24*} + {}_{37}Rb^{80*} + 3.29$

→ ${}_{10}Ne^{22*} + {}_{37}Rb^{82*} + 5.90$

$d + {}_{46}Pd^{104}$ → ${}_{10}Ne^{24*} + {}_{37}Rb^{82*} + 7.94$

${}_{37}Rb^{80*}$ → 34 S;$G 4.1; g;(616.6 → ${}_{36}Kr^{80}$

${}_{37}Rb^{82*}$ → 6.47 H; g;$G 0.80;(776.5, 554.3, 619.1 → ${}_{36}Kr^{82}$

→ 1.258 M;$G 3.4; g;(776.5 → ${}_{36}Kr^{82}$

$d + {}_{46}Pd^{102}$ → ${}_{10}Ne^{19*} + {}_{36}Kr^{84} + p - 14.0$

$d + {}_{46}Pd^{104}$ → ${}_{10}Ne^{19*} + {}_{36}Kr^{86} + p - 2.06$

$d + {}_{46}Pd^{104}$ → ${}_{10}Ne^{19*} + {}_{36}Kr^{88*} + p - 6.10$

d + $_{46}Pd^{104}$ 6 $_{10}Ne^{19*}$ + $_{36}Kr^{84}$ + t - 10.5
d + $_{46}Pd^{106}$ 6 $_{10}Ne^{19*}$ + $_{36}Kr^{86}$ + t - 9.85
d + $_{46}Pd^{108}$ 6 $_{10}Ne^{19*}$ + $_{36}Kr^{88*}$ + t - 10.4
$_{36}Kr^{88*}$ 6 2.84 H;$G 0.52, 2.9;(2392.1, 196.3 6 $_{37}Rb^{88*}$ 6 17.1 M;$G 5.31;(1836.1, 898.1 6 $_{38}Sr^{88}$

d + $_{46}Pd^{104}$ 6 $_{10}Ne^{24*}$ + $_{35}Br^{78*}$ + " + 0.74
6 $_{10}Ne^{22}$ + $_{35}Br^{80*}$ + " + 5.21
d + $_{46}Pd^{105}$ 6 $_{10}Ne^{23}$ + $_{35}Br^{80*}$ + " + 3.33
d + $_{46}Pd^{106}$ 6 $_{10}Ne^{24*}$ + $_{35}Br^{80*}$ + " + 2.68
$_{10}Ne^{19*}$ 6 17.22 S;$G 2.24; g;(109.9, 1356.8 6 $_{9}F^{19}$
$_{10}Ne^{24*}$ 6 3.38 M;$G 1.98;(427.3 6 $_{11}Na^{24*}$
$_{11}Na^{24*}$ 6 14.96 H;$G 1.391;(1368.6, 2754.0 6 $_{12}Mg^{24}$
6 20.2 MS; IT 472.3; $G ~6 6 $_{12}Mg^{24}$

d + $_{46}Pd^{102}$ 6 $_{12}Mg^{26}$ + $_{35}Br^{78*}$ + 14.9
d + $_{46}Pd^{104}$ 6 $_{12}Mg^{26}$ + $_{35}Br^{80*}$ + 15.8
6 $_{12}Mg^{28*}$ + $_{35}Br^{78*}$ + 12.2
d + $_{46}Pd^{106}$ 6 $_{12}Mg^{28*}$ + $_{35}Br^{80*}$ + 14.1
$_{35}Br^{78*}$ 6 6.45 M;$G 2.5, g;(613.7 6 $_{34}Se^{78}$
6 6.45 M;$G ,(?T 6 $_{36}Kr^{78}$
$_{35}Br^{80*}$ 6 17.66 M;$G 2.00;(616.6 6 $_{36}Kr^{80}$
6 17.66 M;g;$G 0.85;(665.9 6 $_{34}Se^{80}$

d + $_{46}Pd^{104}$ 6 $_{12}Mg^{27*}$ + $_{34}Se^{78}$ + p + 8.05
d + $_{46}Pd^{106}$ 6 $_{12}Mg^{27*}$ + $_{34}Se^{80}$ + p + 8.29
d + $_{46}Pd^{108}$ 6 $_{12}Mg^{27*}$ + $_{34}Se^{82}$ + p + 11.5

d + $_{46}Pd^{106}$ 6 $_{12}Mg^{27*}$ + $_{34}Se^{78}$ + t - 0.105
d + $_{46}Pd^{108}$ 6 $_{12}Mg^{27*}$ + $_{34}Se^{80}$ + t + 4.00
d + $_{46}Pd^{110}$ 6 $_{12}Mg^{27*}$ + $_{34}Se^{82}$ + t + 2.02

d + $_{46}Pd^{106}$ 6 $_{12}Mg^{24}$ + $_{33}As^{80*}$ + " + 6.50
d + $_{46}Pd^{108}$ 6 $_{12}Mg^{26}$ + $_{33}As^{80*}$ + " + 12.2
d + $_{46}Pd^{110}$ 6 $_{12}Mg^{28*}$ + $_{33}As^{80*}$ + " + 9.15
$_{12}Mg^{22*}$ 6 3.86 S;$G 3.1;(582, 72.9 6 $_{11}Na^{22*}$ 6 2.605 A;$G 0.546, g; (1274.5 6 $_{10}Ne^{22}$
$_{12}Mg^{27*}$ 6 9.45 M;$G 1.75, 1.59; g;(843.8, 1014.4 6 $_{13}Al^{27}$
$_{12}Mg^{28*}$ 6 21.0 H;$G 0.459;(30.6, 1342.3 6 $_{13}Al^{28*}$ 6 2.25 M;$G 2.86; (1179.0 6 $_{14}Si^{28}$

d + $_{46}Pd^{104}$ 6 $_{14}Si^{26*}$ + $_{33}As^{80*}$ + 2.63
d + $_{46}Pd^{105}$ 6 $_{14}Si^{27*}$ + $_{33}As^{80*}$ + 8.86
d + $_{46}Pd^{106}$ 6 $_{14}Si^{28*}$ + $_{33}As^{80*}$ + 16.5
d + $_{46}Pd^{108}$ 6 $_{14}Si^{30}$ + $_{33}As^{80*}$ + 22.8
d + $_{46}Pd^{110}$ 6 $_{14}Si^{32*}$ + $_{33}As^{80*}$ + 20.6
$_{33}As^{80*}$ 6 16 S;$G 5.4, 4.7;(665.9 6 $_{34}Se^{80}$

$d + {}_{46}Pd^{104}$ → $ {}_{14}Si^{29} + {}_{32}Ge^{76} + p + 11.5$
$d + {}_{46}Pd^{106}$ → $ {}_{14}Si^{29} + {}_{32}Ge^{78*} + p + 9.62$

$d + {}_{46}Pd^{106}$ → $ {}_{14}Si^{29} + {}_{32}Ge^{76} + t + 3.39$
$d + {}_{46}Pd^{108}$ → $ {}_{14}Si^{29} + {}_{32}Ge^{78*} + t + 5.33$

$d + {}_{46}Pd^{102}$ → $ {}_{14}Si^{30} + {}_{31}Ga^{70*} + " + 16.12$
→ $ {}_{14}Si^{32*} + {}_{31}Ga^{68*} + " + 14.0$
$d + {}_{46}Pd^{104}$ → $ {}_{14}Si^{32*} + {}_{31}Ga^{70*} + " + 14.3$
$ {}_{14}Si^{26*}$ → 2.23 S;$G 3.83;(829 → $ {}_{13}Al^{26*}$ → 6.345 S;$G 3.21 → $ {}_{12}Mg^{26}$
→ 7.3E5 A;$G 1.17; g;(1808.6 → $ {}_{12}Mg^{26}$
$ {}_{14}Si^{27*}$ → 4.14 S;$G 3.85;(2210 → $ {}_{13}Al^{27}$
$ {}_{14}Si^{32*}$ → 1.0E2 A;$G 0.221 → $ {}_{15}P^{32*}$ → 14.28 D;$G 1.709 → $ {}_{16}S^{32}$
$ {}_{31}Ga^{68*}$ → 1.130 H;$G 1.899, g;(1077.3 → $ {}_{30}Zn^{68}$
$ {}_{31}Ga^{70*}$ → 21.1 M;$G 1.65;(1039,176.2 → $ {}_{32}Ge^{70}$
$ {}_{33}As^{80*}$ → 16 S;$G 5.4, 4.7; 665.9 → $ {}_{34}Se^{80}$

$d + {}_{46}Pd^{102}$ → $ {}_{15}P^{30*} + {}_{32}Ge^{74} + 23.1$
→ $ {}_{15}P^{32*} + {}_{32}Ge^{72} + 22.1$
→ $ {}_{15}P^{34*} + {}_{32}Ge^{70} + 20.6$

$d + {}_{46}Pd^{104}$ → $ {}_{15}P^{30*} + {}_{32}Ge^{76} + 21.4$
→ $ {}_{15}P^{32*} + {}_{32}Ge^{74} + 21.5$
→ $ {}_{15}P^{34*} + {}_{32}Ge^{72} + 21.1$
$d + {}_{46}Pd^{106}$ → $ {}_{15}P^{30*} + {}_{32}Ge^{78*} + 19.4$
→ $ {}_{15}P^{32*} + {}_{32}Ge^{76} + 20.8$
→ $ {}_{15}P^{34*} + {}_{32}Ge^{74} + 21.5$
$d + {}_{46}Pd^{108}$ → $ {}_{15}P^{32*} + {}_{32}Ge^{78*} + 22.7$
→ $ {}_{15}P^{34*} + {}_{32}Ge^{76} + 24.7$
$d + {}_{46}Pd^{110}$ → $ {}_{15}P^{34*} + {}_{32}Ge^{78*} + 21.4$

$d + {}_{46}Pd^{102}$ → $ {}_{15}P^{29*} + {}_{32}Ge^{74} + n + 7.51$
→ $ {}_{15}P^{31} + {}_{32}Ge^{72} + n + 14.2$
→ $ {}_{15}P^{33*} + {}_{32}Ge^{70} + n + 14.1$
$d + {}_{46}Pd^{104}$ → $ {}_{15}P^{29*} + {}_{32}Ge^{76} + n + 5.82$
→ $ {}_{15}P^{31} + {}_{32}Ge^{74} + n + 13.5$
→ $ {}_{15}P^{33*} + {}_{32}Ge^{72} + n + 14.6$
$d + {}_{46}Pd^{105}$ → $ {}_{15}P^{28*} + {}_{32}Ge^{78*} + n - 4.42$
$d + {}_{46}Pd^{106}$ → $ {}_{15}P^{29*} + {}_{32}Ge^{78*} + n + 3.89$
→ $ {}_{15}P^{31} + {}_{32}Ge^{76} + n + 12.8$
→ $ {}_{15}P^{33*} + {}_{32}Ge^{74} + n + 15.0$
$d + {}_{46}Pd^{108}$ → $ {}_{15}P^{31} + {}_{32}Ge^{78*} + n + 14.8$
→ $ {}_{15}P^{33*} + {}_{32}Ge^{76} + n + 18.1$

$d + {}_{46}Pd^{110}$ → ${}_{15}P^{33*} + {}_{32}Ge^{78*} + n + 14.9$

${}_{32}Ge^{78*}$ → 1.45 H;$G 0.70;(277 → ${}_{33}As^{78*}$ → 1.512 H;$G 4.3, 3.7, 3.0, 1.7;(613.7, 694.9, 1308.7 → ${}_{34}Se^{78}$

$d + {}_{46}Pd^{102}$ → ${}_{15}P^{30*} + {}_{30}Zn^{70} + '' + 12.5$

→ ${}_{15}P^{32*} + {}_{30}Zn^{68} + '' + 17.1$

→ ${}_{15}P^{34*} + {}_{30}Zn^{66} + '' + 16.5$

$d + {}_{46}Pd^{104}$ → ${}_{15}P^{30*} + {}_{30}Zn^{72*} + '' + 9.64$

→ ${}_{15}P^{32*} + {}_{30}Zn^{70} + '' + 15.2$

→ ${}_{15}P^{34*} + {}_{30}Zn^{68} + '' + 16.1$

$d + {}_{46}Pd^{106}$ → ${}_{15}P^{32*} + {}_{30}Zn^{72*} + '' + 13.2$

→ ${}_{15}P^{34*} + {}_{30}Zn^{70} + '' + 15.2$

$d + {}_{46}Pd^{108}$ → ${}_{15}P^{34*} + {}_{30}Zn^{72*} + '' + 17.2$

${}_{15}P^{28*}$ → 0.270 S;$G 11.5;(1779.0 → ${}_{14}Si^{28}$

${}_{15}P^{29*}$ → 4.14 S;$G 3.94;(1273.4, 2425.9 → ${}_{14}Si^{29}$

${}_{15}P^{30*}$ → 2.50 M;$G 3.24; g;(2235.2 → ${}_{14}Si^{30}$

${}_{15}P_{32*}$ → 14.28 D;$G 1.709 → ${}_{16}S^{32}$

${}_{15}P^{33*}$ → 25.3 D;$G 0.249 → ${}_{16}S^{33}$

${}_{15}P^{34*}$ → 12.4 S;$G 5.1, 3.2;(2127.7 → ${}_{16}S^{34}$

$d + {}_{46}Pd^{102}$ → ${}_{16}S^{36} + {}_{31}Ga^{68*} + 23.0$

$d + {}_{46}Pd^{104}$ → ${}_{16}S^{36} + {}_{31}Ga^{70*} + 23.3$

→ ${}_{16}S^{38*} + {}_{31}Ga^{68*} + 17.7$

$d + {}_{46}Pd^{106}$ → ${}_{16}S^{38*} + {}_{31}Ga^{70*} + 19.0$

${}_{31}Ga^{68*}$ → 1.130 H;$G 1.899;(1077.3 → ${}_{30}Zn^{68}$

${}_{31}Ga^{70*}$ → 21.1 M;$G 1.65;(1039, 176.2 → ${}_{32}Ge^{70}$

$d + {}_{46}Pd^{102}$ → ${}_{16}S^{31*} + {}_{30}Zn^{72*} + p + 5.05$

${}_{30}Zn^{72*}$ → 46.5 H;$G 0.30;(144.7 → ${}_{31}Ga^{72*}$ → 144.10 H;$G 0.96,0.64;(834.1, 2201.7, 630 → ${}_{32}Ge^{72}$

$d + {}_{46}Pd^{102}$ → ${}_{16}S^{38*} + {}_{29}Cu^{62*} + '' + 12.5$

→ ${}_{16}S^{36} + {}_{29}Cu^{64*} + '' + 18.9$

→ ${}_{16}S^{34} + {}_{29}Cu^{66*} + '' + 19.0$

→ ${}_{16}S^{32} + {}_{29}Cu^{68*} + '' + 14.9$

$d + {}_{46}Pd^{104}$ → ${}_{16}S^{38*} + {}_{29}Cu^{64*} + '' + 13.6$

→ ${}_{16}S^{36} + {}_{29}Cu^{66*} + '' + 18.2$

→ ${}_{16}S^{34} + {}_{29}Cu^{68*} + '' + 16.6$

$d + {}_{46}Pd^{106}$ → ${}_{16}S^{38*} + {}_{29}Cu^{66*} + '' + 13.9$

→ ${}_{16}S^{38*} + {}_{29}Cu^{68*} + '' + 16.9$

$d + {}_{46}Pd^{108}$ → ${}_{16}S^{38*} + {}_{29}Cu^{68*} + '' + 16.5$

→ ${}_{16}S^{31*}$ → 2.56 S;$G 4.39;(1286.2 → ${}_{15}P^{31}$

→ ${}_{16}S^{38*}$ → 2.84 H;$G 0.99;(1941.9 → ${}_{17}Cl^{38*}$ → 37.2 M;$G 4.91, 1.11;(2167.6, 1642.4 → ${}_{18}Ar^{38}$

$d + {}_{46}Pd^{102}$ 6 ${}_{18}Ar^{40} + {}_{29}Cu^{64*}$ + 25.7
6 ${}_{18}Ar^{42*} + {}_{29}Cu^{62*}$ + 22.4
$d + {}_{46}Pd^{104}$ 6 ${}_{18}Ar^{40} + {}_{29}Cu^{66*}$ + 25.0
6 ${}_{18}Ar^{42*} + {}_{29}Cu^{64*}$ + 23.6
$d + {}_{46}Pd^{106}$ 6 ${}_{18}Ar^{40} + {}_{29}Cu^{68*}$ + 23.7
6 ${}_{18}Ar^{42*} + {}_{29}Cu^{66*}$ + 23.9
$d + {}_{46}Pd^{108}$ 6 ${}_{18}Ar^{42*} + {}_{29}Cu^{68*}$ + 26.5
${}_{18}Ar^{42*}$ 6 33 A;$G 6 ${}_{19}K^{42*}$ 6 12.36 H;$G 3.52;(1524.6 6 ${}_{20}Ca^{42}$
${}_{29}Cu^{62*}$ 6 9.74 M;$G 2.93; g; (1173.0, 875.7 6 ${}_{28}Ni^{62}$
${}_{29}Cu^{64*}$ 6 12.70 H; g; $G 0.578;(1345.8 6 ${}_{30}Zn^{64}$
6 12.70 H;$G 0.651 6 ${}_{28}Ni^{64}$
${}_{29}Cu^{66*}$ 6 5.10 M;$G 2.63;(1039.3 6 ${}_{30}Zn^{66}$
${}_{29}Cu^{68*}$ 6 31 S;$G 3.5, 4.6;(1077.3, 1261.2 6 ${}_{30}Zn^{68}$

$d + {}_{46}Pd^{104}$ 6 ${}_{19}K^{47*} + {}_{28}Ni^{58}$ + n + 11.6
$d + {}_{46}Pd^{106}$ 6 ${}_{19}K^{47*} + {}_{28}Ni^{60}$ + n + 15.3
$d + {}_{46}Pd^{108}$ 6 ${}_{19}K^{47*} + {}_{28}Ni^{62}$ + n + 21.0
$d + {}_{46}Pd^{110}$ 6 ${}_{19}K^{47*} + {}_{28}Ni^{64}$ + n + 19.0
${}_{19}K^{47*}$ 6 17.5 S;$G 4.0;(2013.4, 586.0 6 ${}_{20}Ca^{47*}$
${}_{20}Ca^{47*}$ 6 4.536 D;$G 0.694, 1.990;(1297.1 6 ${}_{21}Sc^{47*}$ 6 3.349 D;$G 0.439, 0.600; (159.4 6 ${}_{22}Ti^{47}$

$d + {}_{46}Pd^{108}$ 6 ${}_{20}Ca^{46} + {}_{27}Co^{64*}$ + 33.8
$d + {}_{46}Pd^{110}$ 6 ${}_{20}Ca^{48} + {}_{27}Co^{64*}$ + 36.1
${}_{27}Co^{64*}$ 6 0.30 S;$G 7.0;(1345.8, 931.1 6 ${}_{28}Ni^{64}$

$d + {}_{46}Pd^{105}$ 6 ${}_{22}Ti^{52*} + {}_{25}Mn^{54*}$ + n + 21.7
${}_{25}Mn^{54*}$ 6 312.2 D; g;(834.8 6 ${}_{24}Cr^{54}$
${}_{22}Ti^{52*}$ 6 1.7 M;$G 1.8;(124.5, 17.0 6 ${}_{23}V^{52*}$ 6 3.76 M;$G 2.47; (1434.1 6 ${}_{24}Cr^{52}$

2. p + Pd 6 C + D + . . .

$p + {}_{46}Pd^{105}$ 6 ${}_{5}B^{10} + {}_{42}Mo^{96}$ - 4.38 Mev

$p + {}_{46}Pd^{104}$ 6 ${}_{9}F^{19} + {}_{38}Sr^{86}$ + 1.51
$p + {}_{46}Pd^{106}$ 6 ${}_{9}F^{19} + {}_{38}Sr^{88}$ + 4.42
$p + {}_{46}Pd^{108}$ 6 ${}_{9}F^{19} + {}_{38}Sr^{90*}$ + 2.83
$p + {}_{46}Pd^{110}$ 6 ${}_{9}F^{19} + {}_{38}Sr^{92*}$ + 0.996
${}_{38}Sr^{90*}$ 6 29.1 A;$G 0.456 6 ${}_{39}Y^{90*}$ 6 2.67 D;$G 2.281;(2186.2 6 ${}_{40}Zr^{90}$
6 3.19 H; IT 479.5;(202.5;$G ;(2318.9 6 ${}_{40}Zr^{90}$
${}_{38}Sr^{92*}$ 6 2.71 H;$G 0.54;(1384.0 6 ${}_{39}Y^{92*}$ 6 3.54 H;$G 3.64;(934.5, 1405.4 6 ${}_{40}Zr^{92}$

$p + {}_{46}Pd^{102}$ 6 ${}_{9}F^{19} + {}_{36}Kr^{80}$ + " - 6.65
$p + {}_{46}Pd^{104}$ 6 ${}_{9}F^{19} + {}_{36}Kr^{82}$ + " - 2.47

$p + {}_{46}Pd^{106}$ 6 ${}_{9}F^{19} + {}_{36}Kr^{84}$ + '' - 1.12
$p + {}_{46}Pd^{108}$ 6 ${}_{9}F^{19} + {}_{36}Kr^{86}$ + '' + 0.10
$p + {}_{46}Pd^{110}$ 6 ${}_{9}F^{19} + {}_{36}Kr^{88*}$ + '' - 2.29
${}_{36}Kr^{88*}$ 6 2.84 H;$G 0.52, 2.9;(2392.1, 196.3 6 ${}_{37}Rb^{88*}$ 6 17.7 M;$G 5.31;(1836.1, 898.1 6 ${}_{38}Sr^{88}$

$p + {}_{46}Pd^{105}$ 6 ${}_{11}Na^{22*} + {}_{36}Kr^{84}$ + 6.49
$p + {}_{46}Pd^{105}$ 6 ${}_{11}Na^{22*} + {}_{34}Se^{80}$ + '' - 0.61
${}_{11}Na^{22*}$ 6 2.605 A;$G 0.546, g;(1274.5 6 ${}_{10}Ne^{22}$

$p + {}_{46}Pd^{105}$ 6 ${}_{13}Al^{28*} + {}_{34}Se^{78}$ + 12.8
$p + {}_{46}Pd^{105}$ 6 ${}_{13}Al^{28*} + {}_{32}Ge^{74}$ + '' + 6.72
${}_{13}Al^{28*}$ 6 2.25 M;$G 2.86, g;(1779.0 6 ${}_{14}Si^{28}$

$p + {}_{46}Pd^{102}$ 6 ${}_{15}P^{29*} + {}_{32}Ge^{74}$ + 9.73
$p + {}_{46}Pd^{102}$ 6 ${}_{15}P^{31} + {}_{32}Ge^{72}$ + 16.4
$p + {}_{46}Pd^{102}$ 6 ${}_{15}P^{33*} + {}_{32}Ge^{70}$ + 14.3
$p + {}_{46}Pd^{104}$ 6 ${}_{15}P^{29*} + {}_{32}Ge^{76}$ + 8.04
$p + {}_{46}Pd^{104}$ 6 ${}_{15}P^{31} + {}_{32}Ge^{74}$ + 15.7
$p + {}_{46}Pd^{104}$ 6 ${}_{15}P^{33*} + {}_{32}Ge^{72}$ + 14.8
$p + {}_{46}Pd^{105}$ 6 ${}_{15}P^{28*} + {}_{32}Ge^{78*}$ - 2.19
$p + {}_{46}Pd^{106}$ 6 ${}_{15}P^{29*} + {}_{32}Ge^{78*}$ + 6.12
$p + {}_{46}Pd^{106}$ 6 ${}_{15}P^{31} + {}_{32}Ge^{76}$ + 15.0
$p + {}_{46}Pd^{106}$ 6 ${}_{15}P^{33*} + {}_{32}Ge^{74}$ + 15.1
$p + {}_{46}Pd^{108}$ 6 ${}_{15}P^{31} + {}_{32}Ge^{78*}$ + 13.9
$p + {}_{46}Pd^{108}$ 6 ${}_{15}P^{33*} + {}_{32}Ge^{76}$ + 15.3
$p + {}_{46}Pd^{110}$ 6 ${}_{15}P^{33*} + {}_{32}Ge^{78*}$ + 10.2
${}_{15}P^{28*}$ 6 0.270 S;$G 11.5;(1779.0 6 ${}_{14}Si^{28}$
${}_{15}P^{29*}$ 6 4.14 S;$G 3.94;(1273.4, 2425.9 6 ${}_{14}Si^{29}$
${}_{15}P^{33*}$ 6 25.3 D;$G 0.249 6 ${}_{16}S^{33}$
${}_{32}Ge^{78*}$ 6 1.45 H;$G 0.70;(277 6 ${}_{33}As^{78*}$ 6 1.512 H;$G 4.3, 3.7, 1.7, 3.0;(613.7, 694.9, 1308.7 6 ${}_{34}Se^{78}$

$p + {}_{46}Pd^{105}$ 6 ${}_{21}Sc^{52*} + {}_{26}Fe^{54}$ + 29.1
${}_{21}Sc^{52*}$ 6 8.2 S;$G 7.0, 4.6;(1049.7, 1267.9 6 ${}_{22}Ti^{52*}$ 6 1.7 M;$G 1.8; (124.5, 17.0 6 ${}_{23}V^{52*}$ 6

.6 ${}_{23}V^{52*}$ 6 3.76 M;$G 2.47;(1434.1 6 ${}_{24}Cr^{52}$

$p + {}_{46}Pd^{105}$ 6 ${}_{15}P^{34} + {}_{31}Ga^{70}$ + d + 0.524

$p + {}_{46}Pd^{105}$ 6 ${}_{23}V^{52*} + {}_{24}Cr^{54}$ + 27.2
${}_{23}V^{52*}$ 6 3.76 M;$G 2.47;(1434.1 6 ${}_{24}Cr^{52}$

$p + {}_{46}Pd^{105}$ 6 ${}_{22}Ti^{52*} + {}_{25}Mn^{54*}$ + 23.9
${}_{22}Ti^{52*}$ 6 1.7 M;$G 1.8;(124.5 6 ${}_{23}V^{52*}$ 6 3.76 M;$G 2.47; (1434.1 6 ${}_{24}Cr^{52}$

$p + {}_{46}Pd^{105}$ → ${}_{20}Ca^{48} + {}_{25}Mn^{54*}$ + '' + 16.2

${}_{25}Mn^{54*}$ → 312.2 D; g, (834.8 → ${}_{24}Cr^{54}$

3. n + Pd → C + D + . . .

$n + {}_{46}Pd^{106}$ → ${}_{4}Be^{6*} + {}_{42}Mo^{101*}$ - 16.7

→ ${}_{4}Be^{8*} + {}_{42}Mo^{99*}$ - 0.816

$n + {}_{46}Pd^{108}$ → ${}_{4}Be^{8*} + {}_{42}Mo^{101*}$ - 2.89

→ ${}_{4}Be^{10*} + {}_{42}Mo^{99*}$ - 8.11

$n + {}_{46}Pd^{108}$ → ${}_{4}Be^{10*} + {}_{42}Mo^{101*}$ - 9.37

${}_{4}Be^{6*}$ → 5.0E-21 S;2p, ''

${}_{4}Be^{8*}$ → ~7E-17 S;2'' .0641

${}_{4}Be^{10*}$ → 1.6E6 A; $G 0.556 → ${}_{5}B^{10}$

${}_{42}Mo^{99*}$ → 2.747 D;$G 1.214;(140.5, 739.5 → ${}_{43}Tc^{99*}$ →

${}_{43}Tc^{99*}$ → 6.01 H; IT 142.7, 2.2(eG); (140.5; $G .435 → ${}_{44}Ru^{99}$

${}_{42}Mo^{101*}$ → 14.6 M;$G 7.2, 2.3;(191.9, 591, 1013, 5060 → ${}_{43}Tc^{101*}$→

${}_{43}Tc^{101*}$ → 14.2 M;$G 1.32;(306.8 → ${}_{44}Ru^{101}$

$n + {}_{46}Pd^{105}$ → ${}_{5}B^{8} + {}_{41}Nb^{98}$ - 19.75

$n + {}_{46}Pd^{106}$ → ${}_{6}C^{10} + {}_{40}Zr^{97}$ - 14.6

$n + {}_{46}Pd^{108}$ → ${}_{6}C^{10} + {}_{40}Zr^{99}$ - 18.8

→ ${}_{6}C^{12} + {}_{40}Zr^{97}$ + 1.48

$n + {}_{46}Pd^{110}$ → ${}_{6}C^{12} + {}_{40}Zr^{99}$ - 1.91

→ ${}_{6}C^{14} + {}_{40}Zr^{97}$ - 0.355

$n + {}_{46}Pd^{102}$ → ${}_{10}Ne^{19} + {}_{36}Kr^{84}$ + 0.826

$n + {}_{46}Pd^{104}$ → ${}_{10}Ne^{19} + {}_{36}Kr^{86}$ + 0.110

$n + {}_{46}Pd^{106}$ → ${}_{10}Ne^{19} + {}_{36}Kr^{88}$ - 3.88

$n + {}_{46}Pd^{108}$ → ${}_{10}Ne^{19} + {}_{36}Kr^{90}$ + 7.13

$n + {}_{46}Pd^{102}$ → ${}_{14}Si^{29} + {}_{32}Ge^{74}$ + 15.5

$n + {}_{46}Pd^{104}$ → ${}_{14}Si^{29} + {}_{32}Ge^{76}$ + 13.8

$n + {}_{46}Pd^{106}$ → ${}_{14}Si^{29} + {}_{32}Ge^{78*}$ + 11.0

${}_{32}Ge^{78*}$ → 1.45 H;$G 0.70;(277 → ${}_{33}As^{78*}$ → 1.512 H;$G 4.3, 3.7, 3.0;(613, 694, 1308 → ${}_{34}Se^{78}$

$n + {}_{46}Pd^{102}$ → ${}_{14}S^{31} + {}_{30}Zn^{72}$ + 7.27

$n + {}_{46}Pd^{105}$ → ${}_{9}F^{17} + {}_{36}Kr^{88}$ + p - 9.40

→ ${}_{9}F^{19} + {}_{36}Kr^{86}$ + p - 7.70

$n + {}_{46}Pd^{105}$ 6 ${}_{11}Na^{25} + {}_{34}Se^{80}$ + p - 0.517

$n + {}_{46}Pd^{105}$ 6 ${}_{13}Al^{29} + {}_{32}Ge^{76}$ + p + 3.80

$n + {}_{46}Pd^{104}$ 6 ${}_{4}Be^{11*} + {}_{30}Zr^{90}$ + " - 15.2
$n + {}_{46}Pd^{106}$ 6 ${}_{4}Be^{11*} + {}_{30}Zr^{92}$ + " - 14.5
$n + {}_{46}Pd^{108}$ 6 ${}_{4}Be^{11*} + {}_{30}Zr^{94}$ + " - 18.6
$n + {}_{46}Pd^{110}$ 6 ${}_{4}Be^{11*} + {}_{30}Zr^{96}$ + " - 15.0
${}_{4}Be^{11*}$ 6 13.8 S;$G 11.5, 9.4;(2124.6 6 ${}_{5}B^{11}$

$n + {}_{46}Pd^{102}$ 6 ${}_{10}Ne^{19} + {}_{34}Se^{80}$ + " - 6.28
$n + {}_{46}Pd^{104}$ 6 ${}_{10}Ne^{19} + {}_{34}Se^{82}$ + " - 7.93
$n + {}_{46}Pd^{106}$ 6 ${}_{10}Ne^{19} + {}_{34}Se^{84}$ + " - 10.1

4. " + Pd 6 C + D + . . .

" $+ {}_{46}Pd^{102}$ 6 ${}_{4}Be^{6*} + {}_{44}Ru^{100}$ - 14.4
" $+ {}_{46}Pd^{104}$ 6 ${}_{4}Be^{6*} + {}_{44}Ru^{102}$ - 16.3
" $+ {}^{46}Pd^{105}$ 6 ${}^{4}Be^{6*} + {}_{44}Ru^{103}$ - 17.1
6 ${}_{4}Be^{8*} + {}_{44}Ru^{101}$ - 3.00
6 ${}_{4}Be^{10*} + {}_{44}Ru^{99}$ - 11.0
" $+ {}_{46}Pd^{106}$ 6 ${}_{4}Be^{6*} + {}_{44}Ru^{104}$ - 17.8
${}_{4}Be^{6*}$ 6 5.0E-21 S; 2p, "
${}_{4}Be^{8*}$ 6 ~7E-17 S;2" .0641
${}_{4}Be^{10*}$ 6 1.6E6 A; $G 0.556 6 ${}_{5}B^{10}$

" $+ {}_{46}Pd^{102}$ 6 ${}_{6}C^{10*} + {}_{42}Mo^{96}$ - 12.8
6 ${}_{6}C^{12} + {}_{42}Mo^{94}$ - 2.91
6 ${}_{6}C^{14*} + {}_{42}Mo^{92}$ - 1.72
6 ${}_{6}C^{16*} + {}_{42}Mo^{90}$ - 18.7
" $+ {}_{46}Pd^{106}$ 6 ${}_{6}C^{10*} + {}_{42}Mo^{100}$ - 17.0
6 ${}_{6}C^{12} + {}_{42}Mo^{98}$ - 0.630
6 ${}_{6}C^{14*} + {}_{42}Mo^{96}$ - 1.70
6 ${}_{6}C^{16*} + {}_{42}Mo^{94}$ - 12.8
" $+ {}_{46}Pd^{110}$ 6 ${}_{6}C^{10*} + {}_{42}Mo^{104}$ - 21.4
6 ${}_{6}C^{12} + {}_{42}Mo^{102}$ - 2.32
6 ${}_{6}C^{14*} + {}_{42}Mo^{100}$ - 2.75
6 ${}_{6}C^{16*} + {}_{42}Mo^{98}$ - 11.5
${}_{6}C^{10*}$ 6 19.3S;$G 1.87;(718.3 6 ${}_{5}B^{10}$
${}_{6}C^{14*}$ 6 5730 A;$G 0.157 6 ${}_{7}N^{14}$
${}_{6}C^{16*}$ 6 0.75 S;$G 6 ${}_{7}N^{16*}$ 6 7.13 S;$G 4.27, 10.44;(6129, 7115 6 ${}_{8}O^{16}$

" $+ {}_{46}Pd^{104}$ 6 ${}_{6}C^{10*} + {}_{42}Mo^{98}$ - 17.6
6 ${}_{6}C^{12} + {}_{42}Mo^{96}$ - 1.81
6 ${}_{6}C^{14*} + {}_{42}Mo^{94}$ - 1.60
6 ${}_{6}C^{16*} + {}_{42}Mo^{92}$ - 13.9
" $+ {}_{46}Pd^{108}$ 6 ${}_{6}C^{10*} + {}_{42}Mo^{102}$ - 19.2
6 ${}_{6}C^{12} + {}_{42}Mo^{100}$ - 0.916
6 ${}_{6}C^{14*} + {}_{42}Mo^{98}$ - 2.01
6 ${}_{6}C^{16*} + {}_{42}Mo^{96}$ - 12.0

" $+ {}_{46}Pd^{102}$ 6 ${}_{8}O^{14*} + {}_{40}Zr^{92}$ - 5.06

" $+ {}_{46}Pd^{104}$ 6 ${}_{8}O^{14*} + {}_{40}Zr^{94}$ - 7.73

	6	$_{8}O^{16}$ + $_{40}Zr^{90}$	- 10.4		6	$_{8}O^{16}$ + $_{40}Zr^{92}$	- 12.2
	6	$_{8}O^{18}$ + $_{40}Zr^{88*}$	- 1.11		6	$_{8}O^{18}$ + $_{40}Zr^{90}$	+ 2.56
	6	$_{8}O^{20*}$ + $_{40}Zr^{86*}$	- 11.37		6	$_{8}O^{20*}$ + $_{40}Zr^{88}$	- 7.18
" + $_{46}Pd^{105}$	6	$_{8}O^{14}$ + $_{40}Zr^{95*}$	- 8.33	" + $_{46}Pd^{106}$	6	$_{8}O^{14*}$ + $_{40}Zr^{96}$	- 10.1
	6	$_{8}O^{16}$ + $_{40}Zr^{93*}$	- 12.5		6	$_{8}O^{16}$ + $_{40}Zr^{94}$	- 13.9
	6	$_{8}O^{18}$ + $_{40}Zr^{91}$	- 2.69		6	$_{8}O^{18}$ + $_{40}Zr^{92}$	+ 1.75
	6	$_{8}O^{19}$ + $_{40}Zr^{90}$	- 0.557		6	$_{8}O^{20*}$ + $_{40}Zr^{90}$	- 2.51
" + $_{46}Pd^{108}$	6	$_{8}O^{14}$ + $_{40}Zr^{98}$	- 13.8	" + $_{46}Pd^{110}$	6	$_{8}O^{16}$ + $_{40}Zr^{98}$	- 18.3
	6	$_{8}O^{16}$ + $_{40}Zr^{96}$	- 15.4		6	$_{8}O^{18*}$ + $_{40}Zr^{96}$	+ 0.290
	6	$_{8}O^{18}$ + $_{40}Zr^{94}$	+ 0.945		6	$_{8}O^{2}$ + $_{40}Zr^{94}$	- 2.45
	6	$_{8}O^{20*}$ + $_{40}Zr^{92}$	- 2.40				

$_{8}O^{14*}$ 6 70.60 S;$G 1.81;(2312.7 6 $_{7}N^{14}$

$_{8}O^{20*}$ 6 13.5 S;$G 2.75;(1056.8 6 $_{9}F^{20*}$ 6 11.0 S;$G 5.40;(1633.6 6 $_{10}Ne^{20}$

" + $_{46}Pd^{102}$	6	$_{10}Ne^{24*}$ + $_{38}Sr^{82}$	- 3.97	" + $_{46}Pd^{104}$	6	$_{10}Ne^{24*}$ + $_{38}Sr^{84}$	- 0.398
	6	$_{10}Ne^{22}$ + $_{38}Sr^{84}$	+ 3.16		6	$_{10}Ne^{22}$ + $_{38}Sr^{86}$	+ 5.55
	6	$_{10}Ne^{20}$ + $_{38}Sr^{86}$	+ 6.05		6	$_{10}Ne^{20}$ + $_{38}Sr^{88}$	- 7.96
	6	$_{10}Ne^{18*}$ + $_{38}Sr^{88}$	- 2.92		6	$_{10}Ne^{18*}$ + $_{38}Sr^{90*}$	- 6.38
" + $_{46}Pd^{105}$	6	$_{10}Ne^{23}$ + $_{38}Sr^{86}$	+ 3.67	" + $_{46}Pd^{106}$	6	$_{10}Ne^{24*}$ + $_{38}Sr^{86}$	+ 2.98
	6	$_{10}Ne^{20}$ + $_{38}Sr^{89*}$	+ 7.25		6	$_{10}Ne^{22}$ + $_{38}Sr^{88}$	+ 8.46
	6	$_{10}Ne^{18}$ + $_{38}Sr^{91}$	- 7.62		6	$_{10}Ne^{20}$ + $_{38}Sr^{90*}$	- 5.49
					6	$_{10}Ne^{18}$ + $_{38}Sr^{92*}$	- 9.08
" + $_{46}Pd^{108}$	6	$_{10}Ne^{24*}$ + $_{38}Sr^{88}$	+ 6.76	" + $_{46}Pd^{110}$	6	$_{10}Ne^{24*}$ + $_{38}Sr^{90*}$	+ 5.96
	6	$_{10}Ne^{22}$ + $_{38}Sr^{90*}$	+ 6.85		6	$_{10}Ne^{22}$ + $_{38}Sr^{92*}$	+ 5.03
	6	$_{10}Ne^{20}$ + $_{38}Sr^{92*}$	+ 2.06		6	$_{10}Ne^{20}$ + $_{38}Sr^{94*}$	- 0.133
	6	$_{10}Ne^{18*}$ + $_{38}Sr^{94*}$	- 13.7				

$_{38}Sr^{89*}$ 6 50.52 D;$G 1.49;(909.2 6 $_{39}Y^{89}$

$_{38}Sr^{90*}$ 6 29.1 A;$G 0.546 6 $_{39}Y^{90*}$

$_{39}Y^{90*}$ 6 2.67 D;$G 2.281;(2186.2 6 $_{40}Zr^{90}$

6 3.19 H; IT 479.5;(202.5;$G ;(2318.9 6 $_{40}Zr^{90}$

$_{38}Sr^{91*}$ 6 9.5 H;$G 1.09, 2.70, 1.36;(555.6, 1024.3, 749.7 6 $_{39}Y^{91*}$ 6 49.7 M; IT 555.6 6 $_{40}Zr^{91}$

6 58.5 D;$G1.545;(1205 6 $_{40}Zr^{91}$

$_{38}Sr^{92*}$ 6 2.71 H;$G 0.54(1384.0 6 $_{39}Y^{92*}$ 6 3.54 H;$G 3.64;(934.5, 1405.4 6 $_{40}Zr^{92}$

$_{38}Sr^{94*}$ 6 1.25 M;$G 2.08;(1427.6 6 $_{39}Y^{94*}$ 6 18.7 M;$G 4.92; 918.7, 1138.9, 550.9 6 $_{40}Zr^{94}$

" + $_{46}Pd^{102}$	6	$_{12}Mg^{22*}$ + $_{36}Kr^{84}$	- 2.69	" + $_{46}Pd^{104}$	6	$_{12}Mg^{22*}$ + $_{36}Kr^{86}$	- 3.34
	6	$_{12}Mg^{24}$ + $_{36}Kr^{82}$	+ 9.02		6	$_{12}Mg^{24}$ + $_{36}Kr^{84}$	+ 9.38
	6	$_{12}Mg^{26}$ + $_{36}Kr^{80}$	+ 8.60		6	$_{12}Mg^{26}$ + $_{36}Kr^{82}$	+ 9.82
	6	$_{12}Mg^{28*}$ + $_{36}Kr^{78}$	+ 3.66		6	$_{12}Mg^{28*}$ + $_{36}Kr^{80}$	+ 5.93
" + $_{46}Pd^{105}$	6	$_{12}Mg^{25}$ + $_{36}Kr^{84}$	+ 9.64	" + $_{46}Pd^{106}$	6	$_{12}Mg^{22*}$ + $_{36}Kr^{88*}$	- 7.39
	6	$_{12}Mg^{22}$ + $_{36}Kr^{87*}$	- 4.90		6	$_{12}Mg^{24}$ + $_{36}Kr^{86}$	+ 9.72
					6	$_{12}Mg^{26}$ + $_{36}Kr^{84}$	+ 11.2
					6	$_{12}Mg^{28*}$ + $_{36}Kr^{82}$	+ 8.13

" + $_{46}Pd^{108}$ → $_{12}Mg^{24}$ + $_{36}Kr^{88*}$ + 6.53
→ $_{12}Mg^{26}$ + $_{36}Kr^{86}$ + 12.4
→ $_{12}Mg^{28}$ + $_{36}Kr^{84}$ - 10.3
$_{36}Kr^{87*}$ → 1.27;$G 3.5, 3.9;(402.6 → $_{37}Rb^{87}$
$_{36}Kr^{88*}$ → 2.84 H;$G 0.52, 2.9;(2392.1, 196.3 → $_{37}Rb^{88*}$ → 17.7 M;$G 5.31;(1836.1, 898.1 → $_{38}Sr^{88}$
$_{12}Mg^{22*}$ → 3.86 S;$G 3.1;(582, 72.9 → $_{11}Na^{22*}$ → 2.605 A;$G 0.546, g;(1274.5 → $_{10}Ne^{22}$
$_{12}Mg^{28*}$ → 21.0 H;$G 0.459;(30.6, 1342.3 → $_{13}Al^{28*}$ → 2.25 M;$-2.86;(1179.0 → $_{14}Si^{28}$

" + $_{46}Pd^{110}$ → $_{12}Mg^{26}$ + $_{36}Kr^{88*}$ + 6.00
→ $_{12}Mg^{28}$ + $_{36}Kr^{86*}$ + 12.4

" + $_{46}Pd^{102}$ → $_{14}Si^{26*}$ + $_{34}Se^{80}$ - 0.60
→ $_{14}Si^{28}$ + $_{34}Se^{78}$ + 13.0
→ $_{14}Si^{30}$ + $_{34}Se^{76}$ + 14.2
→ $_{14}Si^{32*}$ + $_{34}Se^{74}$ + 10.8

" + $_{46}Pd^{104}$ → $_{14}Si^{26*}$ + $_{34}Se^{82}$ - 2.25
→ $_{14}Si^{28}$ + $_{34}Se^{80}$ + 12.2
→ $_{14}Si^{30}$ + $_{34}Se^{78}$ + 15.5
→ $_{14}Si^{32*}$ + $_{34}Se^{76}$ + 9.32

" + $_{46}Pd^{105}$ → $_{14}Si^{25}$ + $_{34}Se^{84*}$ - 13.9
→ $_{14}Si^{27}$ + $_{34}Se^{82}$ + 3.98

" + $_{46}Pd^{106}$ → $_{14}Si^{26*}$ + $_{34}Se^{84*}$ - 4.41
→ $_{14}Si^{28}$ + $_{34}Se^{82}$ + 11.6
→ $_{1}4Si^{30}$ + $_{34}Se^{80}$ + 14.7
→ $_{14}Si^{32*}$ + $_{34}Se^{78}$ + 13.6

" + $_{46}Pd^{108}$ → $_{14}Si^{28}$ + $_{34}Se^{84*}$ + 10.3
→ $_{14}Si^{30}$ + $_{34}Se^{82}$ + 14.9
→ $_{14}Si^{32*}$ + $_{34}Se^{80}$ + 14.7
$_{14}Si^{26*}$ → 2.23 S;$G 3.83;(829 → $_{13}Al^{26*}$ → 6.345 S;$G 3.21 → $_{12}Mg^{26}$
$_{14}Si^{32*}$ → 1.0E2 A;$G 0.221; → $_{15}P^{32*}$ → 14.28 D;$G 1.709 → $_{16}S^{32}$
$_{34}Se^{84*}$ → 3.3 M H;$G 1.41;(408.2 → $_{35}Br^{84*}$ → 6.0M;$G 2.2;(1463, 424, 881.7 → $_{36}Kr^{84}$
→ 31.8M;$G 4.65, 3.8, 2.7;(881.7, 1897.7 → $_{36}Kr^{84}$

" + $_{46}Pd^{110}$ → $_{14}Si^{30}$ + $_{34}Se^{84*}$ + 14.3
→ $_{14}Si^{32}$ + $_{34}Se^{82}$ + 15.8

" + $_{46}Pd^{102}$ → $_{16}S^{30*}$ + $_{32}Ge^{76}$ + 1.77
→ $_{16}S^{32}$ + $_{32}Ge^{74}$ + 13.9
→ $_{16}S^{34}$ + $_{32}Ge^{72}$ + 17.0
→ $_{16}S^{36}$ + $_{32}Ge^{70}$ + 15.7

" + $_{46}Pd^{104}$ → $_{16}S^{30*}$ + $_{32}Ge^{78}$ - 1.14
→ $_{16}S^{32}$ + $_{32}Ge^{76}$ + 12.2
→ $_{16}S^{34}$ + $_{32}Ge^{74}$ + 16.4
→ $_{16}S^{36}$ + $_{32}Ge^{72}$ + 16.3

" + $_{46}Pd^{106}$ → $_{16}S^{32}$ + $_{32}Ge^{78*}$ + 10.3
→ $_{16}S^{34}$ + $_{32}Ge^{76}$ + 15.7
→ $_{16}S^{36}$ + $_{32}Ge^{74}$ + 16.6

" + $_{46}Pd^{108}$ → $_{16}S^{34}$ + $_{32}Ge^{78*}$ + 14.6
→ $_{16}S^{36}$ + $_{32}Ge^{76}$ + 16.8
→ $_{16}S^{38}$ + $_{32}Ge^{74}$ + 13.2

" + $_{46}Pd^{110}$ → $_{16}S^{36}$ + $_{32}Ge^{78*}$ + 16.5
$_{16}S^{30*}$ → 1.18 S;$G 4.42, 5.09;(667.2 → $_{15}P^{30*}$ → 2.50M;$G 3.24; g;(2235.2 → $_{14}Si^{30}$
$_{32}Ge^{78*}$ → 1.45 H;$G 0.70;(277 → $_{33}As^{78*}$ → 1.512 H;$G 4.3, 3.7, 1.7, 3.0;(613.7, 694.9, 1308.7 → $_{34}Se^{78}$

" + $_{46}Pd^{102}$ → $_{18}Ar^{34*}$ + $_{30}Zn^{72*}$ + 1.02
→ $_{18}Ar^{36}$ + $_{30}Zn^{70}$ + 14.3
→ $_{18}Ar^{38}$ + $_{30}Zn^{68}$ + 19.2
→ $_{18}Ar^{40}$ + $_{30}Zn^{66}$ + 18.4
→ $_{18}Ar^{42*}$ + $_{30}Zn^{64}$ + 14.9

" + $_{46}Pd^{104}$ → $_{18}Ar^{36}$ + $_{30}Zn^{72*}$ + 11.4
→ $_{18}Ar^{38}$ + $_{30}Zn^{70}$ + 17.3
→ $_{18}Ar^{40}$ + $_{30}Zn^{68}$ + 18.1
→ $_{18}Ar^{42}$ + $_{30}Zn^{66}$ + 16.3

" + $_{46}Pd^{106}$ → $_{18}Ar^{38}$ + $_{30}Zn^{72*}$ + 15.4
→ $_{18}Ar^{40}$ + $_{30}Zn^{70}$ + 17.1

" + $_{46}Pd^{108}$ → $_{18}Ar^{40}$ + $_{30}Zn^{72*}$ + 16.1
→ $_{18}Ar^{42*}$ + $_{30}Zn^{70}$ + 16.9

6 $_{18}Ar^{42*}$ + $_{30}Zn^{68}$ + 16.9

" + $_{46}Pd^{110}$ 6 $_{18}Ar^{42*}$ + $_{30}Zn^{72*}$ + 16.6

$_{18}Ar^{34*}$ 6 844 MS;$G 5.037, 666.5, 461, 2580 6 $_{17}Cl^{34*}$ 6

$_{17}Cl^{34*}$ 6 32.2 M;$G 2.5, 1.3;(2127.7, 1176, 3303.6 6 $_{16}S^{34}$

6 1.528 S;$G 4.47 6 $_{16}S^{34}$

$_{18}Ar^{42*}$ 6 33 A;$G 6 $_{19}K^{42*}$ 6 12.36 H;$G 3.52;(1524.6 6 $_{20}Ca^{42}$

$_{30}Zn^{72*}$ 6 46.5 H;$G 0.30;(144.7 6 $_{31}Ga^{72*}$ 6 14.10 H;$G 0.96, 0.64;(834.1, 2201.7, 630 6 $_{32}Ge^{72}$

" + $_{46}Pd^{105}$ 6 $_{19}K^{41}$ + $_{29}Cu^{68*}$ + 15.0

6 $_{19}K^{43*}$ + $_{29}Cu^{66*}$ + 16.9

6 $_{19}K^{45*}$ + $_{29}Cu^{64*}$ + 16.1

$_{29}Cu^{64*}$ 6 12.70 H; g; $G 0.578;(1345.8 6 $_{30}Zn^{64}$

6 12.70 H;$G 0.651 6 $_{28}Ni^{64}$

$_{29}Cu^{66*}$ 6 5.10 M;$G 2.63;(1039.3 6 $_{30}Zn^{66}$

$_{29}Cu^{68*}$ 6 31 S;$G 3.5, 4.6;(1077.3, 1261.2 6 $_{30}Zn^{68}$

$_{19}K^{45*}$ 6 22.3 H;$G 0.83;(372.8, 617.5 6 $_{20}Ca^{43}$

$_{19}K^{45*}$ 6 17.8 M;$G 2.1;(174.2, 1705.6 6 $_{20}Ca^{45}$ 6 162.7 D;$G 0.258;(12.4 6 $_{21}Sc^{45}$

" + $_{46}Pd^{102}$ 6 $_{20}Ca^{48}$ + $_{28}Ni^{58}$ + 7.97

6 $_{20}Ca^{46}$ + $_{28}Ni^{60}$ + 19.0

6 $_{20}Ca^{44}$ + $_{28}Ni^{62}$ + 22.1

6 $_{20}Ca^{42}$ + $_{28}Ni^{64}$ + 22.7

6 $_{20}Ca^{40}$ + $_{28}Ni^{66*}$ + 20.1

" + $_{46}Pd^{104}$ 6 $_{20}Ca^{50*}$ + $_{28}Ni^{58}$ + 12.8

6 $_{20}Ca^{48}$ + $_{28}Ni^{60}$ + 21.0

6 $_{20}Ca^{46}$ + $_{28}Ni^{62}$ + 22.9

6 $_{20}Ca^{44}$ + $_{28}Ni^{64*}$ + 21.6

6 $_{20}Ca^{42}$ + $_{28}Ni^{66}$ + 17.6

" + $_{46}Pd^{106}$ 6 $_{20}Ca^{50*}$ + $_{28}Ni^{60}$ + 16.6

6 $_{20}Ca^{48}$ + $_{28}Ni^{62}$ + 23.5

6 $_{20}Ca^{46}$ + $_{28}Ni^{64}$ + 22.8

6 $_{20}Ca^{44}$ + $_{28}Ni^{66*}$ + 20.0

" + $_{46}Pd^{108}$ 6 $_{20}Ca^{50*}$ + $_{28}Ni^{62}$ + 19.2

6 $_{20}Ca^{48}$ + $_{28}Ni^{64}$ + 24.2

6 $_{20}Ca^{46}$ + $_{28}Ni^{66*}$ + 22.1

$_{28}Ni^{66*}$ 6 54.6 H;$G 0.20 6 $_{29}Cu^{66*}$ 6 5.10 M;$G 2.63;(1039.3 6 $_{30}Zn^{66}$

$_{20}Ca^{50*}$ 6 14 S;$G 3.12;(256.9, 1519.3, 71.6, 1590.8 6 $_{21}Sc^{50*}$

$_{21}Sc^{50*}$ 6 1.71 M;$G 3.69;(1553.8, 1121, 523.8 6 $_{22}Ti^{50}$

" + $_{46}Pd^{102}$ 6 $_{22}Ti^{46}$ + $_{26}Fe^{60*}$ + 20.1

6 $_{22}Ti^{48}$ + $_{26}Fe^{58}$ + 25.1

6 $_{22}Ti^{50}$ + $_{26}Fe^{56}$ + 26.5

6 $_{22}Ti^{52*}$ + $_{26}Fe^{54}$ + 20.2

" + $_{46}Pd^{104}$ 6 $_{22}Ti^{48}$ + $_{26}Fe^{60*}$ + 22.9

6 $_{22}Ti^{50}$ + $_{26}Fe^{58}$ + 26.6

6 $_{22}Ti^{52*}$ + $_{26}Fe^{56}$ + 23.1

" + $_{46}Pd^{106}$ 6 $_{22}Ti^{50}$ + $_{26}Fe^{60*}$ + 25.4

6 $_{22}Ti^{52*}$ + $_{26}Fe^{58}$ + 24.1

" + $_{46}Pd^{108}$ 6 $_{22}Ti^{52*}$ + $_{26}Fe^{60*}$ + 23.8

$_{22}Ti^{52*}$ 6 1.7 M;$G 1.8;(124.5, 17.0 6 $_{23}V^{52*}$ 6 3.76M;$G 2.47;(1434.1 6 $_{24}Cr^{52}$

$_{26}Fe^{60*}$ 6 1.5E6 A;$G 0.147;(58.6 6 $_{27}Co^{60*}$ 6 10.47 M; IT 58.69 eG;$G 1.6; (1322.5 6 $_{28}Ni^{60}$

6 5.271 A;$G 0.318; (1322.5, 1173.2 6 $_{28}Ni^{60}$

" + $_{46}Pd^{105}$ 6 $_{11}Na^{23}$ + $_{36}Kr^{84}$ + d - 7.16

6 $_{11}Na^{21*}$ + $_{36}Kr^{86}$ + d - 13.7

$_{11}Na^{21*}$ 6 22.48 S;$G 2.51; (350.7 6 $_{10}Ne^{21}$

" + $_{46}Pd^{105}$ 6 $_{12}Mg^{27*}$ + $_{35}Br^{80*}$ + d - 8.65
$_{12}Mg^{27*}$ 6 9.45 M;$G 1.75, 1.59; g;(843.8, 1014.4 6 $_{13}Al^{27}$
$_{35}Br^{80*}$ 6 17.66 M;$G 2.00;(616.6 6 $_{36}Kr^{80}$
6 17.66 M;g $G 0.85;(665.9 6 $_{36}Kr^{80}$

" + $_{46}Pd^{105}$ 6 $_{17}Cl^{37}$ + $_{30}Zn^{70}$ + d + 2.20

" + $_{46}Pd^{105}$ 6 $_{19}K^{43*}$ + $_{28}Ni^{64}$ + d + 4.57
6 $_{19}K^{45*}$ + $_{28}Ni^{62}$ + d + 4.24
6 $_{19}K^{41}$ + $_{28}Ni^{66*}$ + d + 2.49
$_{19}K^{43*}$ 6 22.3 H;$G 0.83; (372.8, 617.5 6 $_{20}Ca^{43}$
$_{19}K^{45*}$ 6 17.8 M;$G 2.1; (174.2, 1705.6 6 $_{20}Ca^{45*}$ 6 162.7 D;$G 0.258 6 $_{21}Sc^{45}$

" + $_{46}Pd^{105}$ 6 $_{11}Na^{20*}$ + $_{36}Kr^{88*}$ + p - 20.4
6 $_{11}Na^{20*}$ + $_{36}Kr^{86}$ + t - 24.5
$_{11}Na^{20*}$ 6 447 MS;$G 11.25; (1633.6 6 $_{10}Ne^{20}$
$_{36}Kr^{88*}$ 6 2.84 H;$G 0.52, 2.9;(2392.1, 196.3 6 $_{37}Rb^{88*}$ 6 17.7 M;$G 5.31;(1836.1, 898.1 6 $_{38}Sr^{88}$

" + $_{46}Pd^{105}$ 6 $_{17}Cl^{36*}$ + $_{30}Zn^{72*}$ + p + 4.38
6 $_{17}Cl^{36*}$ + $_{30}Zn^{70}$ + t - 1.86
$_{17}Cl^{36*}$ 6 3.01 E5 A;$G 0.709 6 $_{18}Ar^{36}$
3.01 E5 A; g,$G 0.12 6 $_{16}S^{36}$
$_{30}Zn^{72*}$ 6 46.5 H;$G0.30;(144.7 6 $_{31}Ga^{72*}$ 6 144.10 H;$G0.96, 0.64;(834.1, 2201.7, 630 6 $_{32}Ge^{72}$

5. a + Pd 6 C (a = d or ")

d + $_{46}Pd^{104}$ 6 $_{47}Ag^{106*}$ + 10.7
$_{47}Ag^{106*}$ 6 24.0 M;$G 1.96;(511.9 6 $_{46}Pd^{106}$

d + $_{46}Pd^{106}$ 6 $_{47}Ag^{108*}$ + 10.8
$_{47}Ag^{108*}$ 6 2.39 M; g,$G 1.65 ;(633.0 6 $_{48}Cd^{108}$
6 2.39 M; g; $G 0.88;(433.9, 618.8 6 $_{46}Pd^{108}$

d + $_{46}Pd^{108}$ 6 $_{47}Ag^{110*}$ + 11.1
$_{47}Ag^{110*}$ 6 24.6 S;$G 2.981;(657.8 6 $_{48}Cd^{110}$

d + $_{48}Cd^{110}$ 6 $_{49}In^{112*}$ + 10.8
$_{49}In^{112*}$ 6 14.4 M;$G 0.86 6 $_{50}Sn^{112}$
6 14.4 M; g,$G 1.56;(617.4, 606.7 6 $_{48}Cd^{112}$

d + $_{48}Cd^{112}$ 6 $_{49}In^{114*}$ + 11.1
$_{49}In^{114*}$ 6 1.198 M;$G 1.984;(1299.9 6 $_{50}Sn^{114}$
6 1.198 M; g,$G 0.40;(558.4, 576 6 $_{48}Cd^{114}$

$d + {}_{48}Cd^{114} \rightarrow {}_{49}In^{116*} + 11.4$

${}_{49}In^{116*} \rightarrow {}_{50}Sn_{116}$ (14.1 S:$G 3.3:(1293.6)

$d + {}_{50}Sn^{116} \rightarrow {}_{51}Sb^{118*} + 9.57$

${}_{51}Sb^{118*} \rightarrow {}_{50}Sn^{118}$ (3.6 M:$G 2.65:(1229.7)

$d + {}_{50}Sn^{118} \rightarrow {}_{51}Sb^{120*} + 9.57$

${}_{51}Sb^{120*} \rightarrow {}_{50}Sn^{120}$ (15.89 M:g,$G 1.72:(1171.4)

$" + {}_{46}Pd^{102} \rightarrow {}_{48}Cd^{106} + 1.63$

$" + {}_{46}Pd^{104} \rightarrow {}_{48}Cd^{108} + 2.26$

$" + {}_{46}Pd^{105} \rightarrow {}_{48}Cd^{109*} + 2.55$

${}_{48}Cd^{109*} \rightarrow {}_{47}Ag^{109}$ (462.0 D:g:(88.0)

$" + {}_{46}Pd^{106} \rightarrow {}_{48}Cd^{110} + 2.87$

$" + {}_{46}Pd^{108} \rightarrow {}_{48}Cd^{112} + 3.47$

$" + {}_{46}Pd^{110} \rightarrow {}_{48}Cd^{114} + 4.10$

$" + {}_{48}Cd^{108} \rightarrow {}_{50}Sn^{112} + 1.82$

$" + {}_{48}Cd^{110} \rightarrow {}_{50}Sn^{114} + 2.58$

$" + {}_{48}Cd^{112} \rightarrow {}_{50}Sn^{116} + 3.37$

$" + {}_{48}Cd^{114} \rightarrow {}_{50}Sn^{118} + 4.06$

$" + {}_{50}Sn^{116} \rightarrow {}_{52}Te^{120} + 0.305$

$" + {}_{50}Sn^{118} \rightarrow {}_{52}Te^{122} + 1.08$

$" + {}_{54}Te^{120} \rightarrow {}_{54}Xe^{124} + 2.47$

$" + {}_{54}Te^{122} \rightarrow {}_{54}Xe^{126} + 1.29$

$d + {}_{54}Te^{120} \rightarrow {}_{53}I^{122} - 0.817$

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$" + {}_{70}Yb^{170} \rightarrow {}_{72}Hf^{174} - 2.56$

$" + {}_{70}Yb^{172} \rightarrow {}_{72}Hf^{176} - 2.26$

$" + {}_{70}Yb^{174} \rightarrow {}_{72}W^{178*} - 2.92$

${}_{74}W^{178*} \rightarrow$ (21.6 D:g) $\rightarrow {}_{73}Ta^{178*} \rightarrow$ (2.4 H:g:(426.4, 235.5, 178, 213.4, 88.9) $\rightarrow {}_{72}Hf^{178}$

$\rightarrow$ (2.29 M:g,$G 0.89, 0.80:(93.2, 1350.6, 1340.9) $\rightarrow {}_{72}Hf^{178}$

$" + {}_{72}Hf^{176} \rightarrow {}_{74}W^{180} - 2.48$

$" + {}_{72}Hf^{178} \rightarrow {}_{74}W^{182} - 1.79$

$" + {}_{72}Hf^{180} \rightarrow {}_{74}W^{184} - 1.67$

$d + {}_{72}Hf^{178} \rightarrow {}_{73}Ta^{180*} - 9.55$

${}_{73}Ta^{180*} \rightarrow {}_{74}W^{180}$ (8.15 H:g:(93.3:$G 0.71, 0.61, (103.4)

$" + {}_{74}W^{180} \rightarrow {}_{76}Os^{184} - 3.07$

" + $_{74}W^{182}$ 6 $_{76}Os^{186}$ - 2.83

" + $_{76}Os^{184}$ 6 $_{78}Pt^{188*}$ - 3.07
$_{78}Pt^{188*}$ 6 10.2 D; g;(187.5, 195.0 6 $_{77}Ir^{188*}$
$_{77}Ir^{188*}$ 6 1.72 D;g,$G 1.65, 1.13;(155.1, 2214.7, 663.1, 478.0 6 $_{76}Os^{188}$

" + $_{76}Os^{186}$ 6 $_{78}Pt^{190}$ - 3.24
" + $_{76}Os^{188}$ 6 $_{78}Pt^{192}$ - 2.42

" + $_{78}Pt^{190}$ 6 $_{80}Hg^{194*}$ - 2.69
$_{80}Hg^{194*}$ 6 520 A; g 6 $_{79}Au^{194*}$ 6 1.64 D;g ,$G 1.49; (328.5, 293.6 6 $_{78}Pt^{194}$

" + $_{78}Pt^{192}$ 6 $_{80}Hg^{196}$ - 1.99
" + $_{78}Pt^{194}$ 6 $_{80}Hg^{198}$ - 1.33

" + $_{80}Hg^{196}$ 6 $_{82}Pb^{200*}$ - 3.06
$_{82}Pb^{200*}$ 6 21.5 H; g; (147.6 6 $_{81}Ti^{200*}$ 6 1.087 D;g ,$G 1.07; 1.44;(368.0, 1205.7 6 $_{80}Hg^{200}$
" + $_{80}Hg^{198}$ 6 $_{82}Pb^{202*}$ - 2.49
$_{82}Pb^{202*}$ 6 5.3 E4 A; g 6 $_{81}Ti^{202*}$ 6 12.23 D;g ,$G (439.6 6 $_{80}Hg^{202}$

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C. SUMMARY

Without addressing the issues of how deuterons, protons, neutrons, or alpha particles can overcome the Coulomb barrier [3], a list of some of the **nuclear reactions permitted by energy, baryon number, charge, spin, parity, and isospin conservation rules has been presented.** This list should help the experimenter examine some of the possible nuclear reactions that could explain the results observed in recent experiments [1,2]. This work has been accomplished assuming that the conservation rules **will be observed in all low-energy nuclear reactions.** Any replicated experimental evidence to the contrary will assure that the current atomic model should be revised.

The authors would appreciate any corrections and/or additions to the above list.

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