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CONTENTS

INTRODUCTION

Classification and Description of Antarctic Meteorites

The Japanese collection of Antarctic meteorites increases in number up to about 9000 as of 1992, but a large number of the meteorites are not yet classified. In order to classify the Antarctic meteorites belonging to the National Institute of Polar Research (NIPR, Tokyo), the organization of Meteorite-Classification Committee was approved by NIPR on January 23, 1992, and set up in NIPR. The Committee consists of 11 members, and most of them are petrologists working on meteorites. The chairperson and vice chairperson are Y. Ikeda and K. Yanai, respectively.

First, the Committee assigned the role to the members for the classification as follows:

Macroscopic description of meteorite;
K. Yanai and H. Kojima
Microscopic description and classification of chondrites;
Y. Ikeda, M. Kimura, T. Noguchi, H. Nagahara, H. Fujimaki, S. Matsunami, A. Tsuchiyama
Microscopic description and classification of achondrites and stony irons;
Y. Ikeda and H. Takeda
Classification of irons;
Y. Ikeda and K. Misawa

Secondly, the Committee decided not to follow the traditional way of meteorite description which has been written in sentence such as those in past METEORITES NEWS (NIPR) or Antarctic Meteorite NEWSLETTER (NASA), and decided to present the classification and description as a table (see Table 2). In order to do this, the Committee made a manual format (Table 1), by which each member carries out the microscopic description and classification by checking all of the articles. Table 1 consists of GENERAL DESCRIPTION (articles 1-1 to 1-7), MACROSCOPIC DESCRIPTION (2-1 to 2-7), MINERAL COMPOSITIONS (3-1 to 3-3), and MICROSCOPIC DESCRIPTION (4-1 to 11-1). Most of articles in the mineral composition and microscopic description were set up mainly for classification of chondrites, because about 90% of Antarctic meteorites are chondrites. Therefore, these articles in Table 1 are not enough for classification of achondrites and stony-irons, and detailed description for these meteorites will be presented as comments in article 11-1 (Table 3).

Thirdly, the Committee decided to start the classification of Yamato-79 series, because this series includes 4093 meteorites most of which are not classified.

This is the first report of the Committee to present the classification of about 200 Antarctic meteorites ranging from Yamato-790001 to Yamato-791000 thin sections of which were ready. Hereafter, the Committee will continue to present new results as soon as possible.

The Committee will make a data base for description and classification of Antarctic meteorites belonging to NIPR, which include all data given by the Committee. All of the data will be available to all meteorite researchers who request it.

Table 1. The manual format for classification and description of Antarctic meteorites. Select one or two heads for each article in MARCOSCOPIC and MICROSCOPIC DESCRIPTIONS.

Articles	with or without heads
GENERAL DESCRIPTION	
1-1	Meteorite name
1-2	Group and type
1-3	Weight of meteorite in grams
1-4	Dimension in cm
1-5	No. of thin section used for classification
1-6	Tentative pairing due to the field occurrence
1-7	Bulk chemistry; Is there the major element chemical composition?
MACROSCOPIC DESCRIPTION (observation by naked eyes)	
2-1	Shape of meteorite; how is the shape? 1: rounded, 2: subrounded, 3: angular, 4: other
2-2	Fusion crust; how much is the fusion crust in a real percent of the surface? 1: complete(>80%), 2: half(80-20%), 3: less(<20%), 4: free
2-3	Evaporite; is it recognized on the meteorite surface? 1: free, 2: slight, 3: remarkable
2-4	Fracturing index; what is the degree? 1: A(free), 2: A/B, 3: B(moderate), 4: B/C, 5: C(remarkable)
2-5	Interior structure; how is the structure? 1: massive, 2: porous, 3: breccia, 4: other
2-6	Interior color; what is the color? 1: black, 2: brown, 3: brassy, 4: green, 5: gray, 6: other
2-7	Xenolithic clast; is it recognized? 1: free, 2: rare, 3: many
MINERAL COMPOSITION (using an EPMA)	
3-1	Average composition of olivine in fayalite mole%, the range and (Percent Mean Deviation)
3-2	Average composition of low-Ca pyroxene in ferrosilite mole%, the range and (Percent Mean Deviation)
3-3	Average composition of plagioclase in anorthite mole% and the range
MICROSCOPIC DESCRIPTION (observation under microscope)	
MODE AND CHONDRULE SIZE	
4-1	Fine-grained matrix in volume %; the matrix in chondrites is defined to be aggregates of minerals smaller than several microns across. Then, chondrule fragments and isolated mineral fragments, which are larger than about 10 microns across, are excluded. 1: free, 2: <20%, 3: 20-50%, 4: 50-80%, 5: >80%, 6: pass (select 1 for equilibrated chondrites, 6 for achondrites and stony-irons)
4-2	Chondrule average diameter in mm; apparent sizes of a few tens of chondrules were measured for unequilibrated chondrites with petrologic types 2 and 3. 1: free, 2: <0.4mm, 3: 0.4-0.9mm, 4: >0.9mm, 5: pass (select "pass" for equilibrated chondrites, achondrites and stony-irons, and "free" for CI group)

4-3 Modal ratios of metal and sulfide were estimated under a microscope; metal is taken as a total of metal and limonite.
1: metal is more, by a factor of 2 or more, than sulfide.
2: metal is nearly equal to sulfide.
3: metal is less, by a factor of 2 or more, than sulfide.
4: magnetite is identified.
5: chromite or ilmenite is the major opaque mineral.
6: graphite is identified.
7: no opaque mineral.

CRYSTALLINITY OF CHONDRULE GROUNDMASS

5-1 Metamorphic plagioclase (or maskelynite) grains, larger than several microns across, is identified under a microscope; igneous plagioclase which crystallized directly from chondrule residual melts is excluded.
1: not present, 2: present but minor, 3: common, 4: pass
(select "pass" for achondrites and stony-irons)

5-2 Crystallinity of chondrule groundmass; for the case of chondrites, the following number corresponds roughly to the petrologic types.
1: free from chondrule. (CI group)
2: phyllosilicate is identified in chondrule groundmass. (CM group etc.)
3: clean glass, as well as devitrified or cryptocrystalline groundmass, is observed in chondrule groundmass. Except shock-induced glass and fusion-crust glass. (petrologic type 3)
4: no glass, but most are devitrified or cryptocrystalline. (petrologic type 4)
5: recrystallized groundmass, including metamorphic plagioclase larger than several microns across, as well as devitrified and cryptocrystalline ones, is observed. (petrologic type 4)
6: recrystallized groundmass, commonly including plagioclase, is common, but devitrified and cryptocrystalline ones are not observed. (petrologic type 6)
7: chondrules outlines disappear by recrystallization. (petrologic type 7)
8: pass for achondrites and stony-irons.

SHOCK FEATURE

6-1 Olivine extinction; how many large olivine grains show undulatory extinction under crossed Nicols in grain number %.
1: olivine-free,
2: <20%,
3: >20%,
4: mosaic extinction of olivine, as well as undulatory one

6-2 Crack and opaque vein;
1: free,
2: crack, thinner than a few microns, is observed,
3: opaque vein, wider than a few microns, is observed,
4: brecciated vein, including many mineral and/or rock fragments, is observed

6-3 Shock-darkened and shock-melt pockets, or partially melt glass;
1: free,
2: shock-darkened pocket is observed,
3: shock-melt pocket is observed,
4: meteorite experienced partial melting, and glass due to the melting occurs locally but not as pockets.

6-4 Degree of shock;
1: slight, corresponding to 1 or 2 for the terms 6-1, 6-2, and 6-3.
2: moderate, corresponding to 3 for the term 6-1 or 6-2, or both.
3: heavy, corresponding to 4 for the term 6-1, 4 for the term 6-2, or 3 or 4 for the term 6-3.

BRECCIA

7-1 1: non-breccia, including chondrites with brecciated veins.
2: monomict breccia
3: fine-grained massive breccia consisting mainly of fine-grained silicates of several to a few tens of microns, often including metal-sulfide spherules.
4: polymict breccia, including clasts of different groups or petrologic types.

INCLUSION AND XENOLITH

8-1 Ca- and Al-rich inclusion (CAI), amoeboid olivine inclusion (AOI), or xenolith is observed or not.
1: not,
2: CAI or AOI is observed,
3: xenolith is observed

TERRESTRIAL WEATHERING

9-1 Limonite veins are observed or not.
1: not,
2: minor; vein narrower than 50 microns is observed,
3: remarkable; vein wider than 50 microns is observed

9-2 Staining is estimated by the proportion of yellow or brown area in percents.
1: free, 2: slight(<20%), 3: remarkable(>20%)

9-3 Weathering Degree is estimated by the method of Ikeda and Kojima (1991, Proceedings of NIPR Symp. Antarc. Meteor. No. 4, 307-318) for chondrites; volume ratios of limonite to metal in a metal-limonite grain are measured for large grains under a microscope, and they are averaged to obtain the weathering index.
1: A(<7.5%), 2: A/B, 3: B(7.5%-35%), 4: B/C, 5: C(>35%), 6: pass
("pass" is for meteorites free of metal grains)

FUSION CRUST

10-1 Fusion crust is observed under a microscope or not. If any, the average width of crust (fusion-glass zone + opacitized zone) is measured.
1: free, 2: thin(<0.5mm), 3: thick(>0.5mm)

NOTEWORTHY DESCRIPTION

11-1 Comments noteworthy to describe are given in sentences, and they are summarized in Table 3.

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Table 2. Classification of Antarctic Meteorites
from Yamato-790001 to Yamato-79XXXX.

Meteorite	1-1	790001	790002	790003	790004	790005
Group, Type	4-4					
	5-3					
Weight (g)	1-3					
Dimension (cm)	1-4					
Thin section	1-5					
Tent. Pairing	1-6	no				
Bulk Comp.	1-7	no				
Shape	2-1					
Fusion	2-2					
Evaporite	2-3					
Fracturing	2-4					
Structure	2-5					
Color	2-6					
Xenolith	2-7					
Ol (Fa Mole%)	3-1					
Range						
		( )				
Low-Ca Pyx	3-2					
Range						
		( )				
Pl	3-3					
Range						
Matrix	4-1	1				
Chond. Size	4-2	5				
Metal, Sulf.	4-3	2				
Pl	5-1	2				
Groundmass	5-2	5				
Ol-extinct.	6-1	3				
Crack, Vein	6-2	1				
Shock pocket	6-3	1				
Shock Degree	6-4	2				
BRECCIA	7-1	1				
CAI, Xenolith	8-1	1				
Limonite	9-1	1				
Staining	9-2	3				
Weath. Index	9-3	3				
FUSION CRU.	10-1	3				
COMMENTS	11-1	no				

Table 3. Comments for Articles 1-6 (tentative pairing) and 11-1 (noteworthy description) in Table 2.

Meteorite	Comments
Y-79XXXX:	
Y-79YYYY:	
Y-79ZZZZ:	

REQUIREMENTS AND PROCEDURES FOR RESEARCH USING THE JAPANESE NIPR ANTARCTIC METEORITE COLLECTION

Requests for research samples are welcome from all qualified scientists. In general, requests are reviewed and considered by the Committee on Antarctic Meteorite Research (CAMR) of the National Institute of Polar Research (NIPR), which meets one to two times each year. Consortium-type sample requests may also be submitted. After a request is approved, samples are sent to the researcher from the Curator of Antarctic Meteorites, NIPR.

NIPR SAMPLE ALLOCATION POLICIES

I. Basic guidelines for allocation of meteorites at NIPR

1. All samples are provided on a loan basis, and remain the property of NIPR.
2. The pristine mass of the meteorite other than small rare meteorites after allocation must be at least 2/3 of the original mass. Pristine mass is defined as that portion of a specimen which has never been allocated, after initial polished thin section (PTS) preparation.
3. The pristine mass of small rare meteorites (less than 50 grams) after allocation must be at least 80% of the original mass. Rare meteorites are defined as meteorites other than type 4-6 ordinary chondrites, including rare type portions of large meteorites.
4. Allocations of any rare meteorite should generally be limited to samples less than 1 gram.
5. The term of the PTS loan will be for no more than 12 months. PTS should be returned promptly upon completion of the proposed research period.
6. PTS of any small meteorite (less than 5 grams) will not be, in general, loaned out but will be available for on-site use by scientists visiting NIPR.
7. Allocations will not be allowed until the meteorite has been announced and typed (classified) in a published issue of Meteorites News or an NIPR catalog.
8. Allocation from any meteorite that is under consortium study will generally not be permitted.
9. Investigators are strongly encouraged to limit requests to not more than 10 samples per request/review cycle. Higher numbers of samples may be approved, but in general, only 10 samples will be eligible for expeditious allocation processing. Investigators who request more than 10 samples should designate a subset for high-priority processing. A request for a chip for analysis plus a corresponding thin section for petrologic study of the same meteorite or clast will generally be counted as a single request, in relation to the 10-sample limit.
10. Investigators are encouraged to use NIPR sample request forms. However, all sample requests that fully comply with the following guidelines will receive careful consideration. Requests should consist of three parts:
    a. Background information: title of the research project; for the requesting scientist, his or her name, affiliation and position (e.g., University of Paris, Professor), and office address, including phone and preferably FAX and email; and for any coinvestigators, their name, affiliation, and position.
    b. A text section, explaining the general nature and purpose of the proposed research, and including details on the justification for each individual sample request.
    c. A *summary table*, with columns for each of the following information categories:
        (1) Specimen name (e.g., Yamato-86032, or Y-86032).
        (2) Preferred weight (the weight of sample you believe is justified for the proposed research).

(3) Minimum weight (estimated weight below which the proposed research would not be worth pursuing; in general, approved allocations will be at or very near the *preferred* weight).
(4) An instruction regarding preferred sampling site (e.g., fusion crust, inner part, outer part, central, etc.).
(5) Sample form (e.g., single chip, cube, plate, fragments, many grains, powder, PTS, etc.).

II. Guidelines for expedited allocation by the Curator of the NIPR

The following guidelines set forth the conditions under which the Curator of Antarctic Meteorites at NIPR can allocate samples without review and approval by the CAMR. If the Curator has any doubt about the allocation of any sample, the request should be referred to CAMR.

1. Allocation of polished thin sections except for destructive analysis
   The original mass of the meteorite must be larger than 5 grams for type 4-6 ordinary chondrites or over 10 grams for all other meteorites.
2. Allocation of samples in a form other than PTS
   a. The total available pristine mass of the meteorite at NIPR must be larger than 20 grams for type 4-6 ordinary chondrites or over 50 grams for all other meteorites.
   b. Allocations of up to 5 grams or 1 weight % of the original mass of type 4-6 ordinary chondrites (whichever is less) can be made by the Curator.

SAMPLE DISTRIBUTION

1. Sublease (transfer) of sample is not permitted, except to persons listed as coinvestigators on the written request for samples. If sublease to a person not originally listed as coinvestigator becomes necessary, a new written request must be submitted to the Curator of Antarctic Meteorites.
2. Promptly upon completion of the proposed research, unused or remaining meteorite samples must be returned to the Curator of Antarctic Meteorites, NIPR.

REPORTING RESULTS

1. Research results should be reported promptly, preferably by presentation at the annual NIPR Symposium on Antarctic Meteorites, and/or full-length publication in the Proceedings of the NIPR Symposium on Antarctic Meteorites. The Symposium is held once each year, customarily in early June. Papers submitted to the Proceedings are evaluated by the Editorial Committee of the NIPR, guided by two reviews for each paper.
2. For the reference of the Curator of Antarctic Meteorites, investigators are requested to send three copies of each full-length paper published on allocated samples, and one copy of each abstract about them, to the Curator. Reference copies of articles and abstracts published through NIPR are not necessary.

Mail requests to:

Dr. Hideyasu Kojima
Secretary, Committee on Antarctic Meteorite Research
National Institute of Polar Research (NIPR)
9-10, Kaga 1-chome, Itabashi-ku, Tokyo 173, Japan
Phone: (81) 03-3962-2938, FAX: (81) 03-3962-5711
E-mail: kojima@nipr.ac.jp

Send requests to: Department of Antarctic Meteorites, National Institute of Polar Research, 9-10, Kaga 1-chome, Itabashi-ku, Tokyo 173, Japan, Phone (81) 03-3962-2938, FAX (81) 03-3962-5711, E-mail curator@nipr.ac.jp

No. [ ]

NIPR Research Program for Antarctic Meteorites

Research project:

Date: Period of the project (months):

Principal investigator

Name: Signature _____

Affiliation & position:

Office address:

Phone: ext. FAX:

E-mail:

Coinvestigator(s)

Name(s):

Affiliation(s) & position(s):

Description of research plan and justification for sample request:

(continue)

	specimen name	preferred weight	minimum weight	sampling instructions	samle form
	(e.g., Y-86032)	(e.g., 0.25 g)	(e.g., 0.1 g)	(e.g., interior)	(e.g., chip(s))
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

received [ ] [ ]

Send requests to: Department of Antarctic Meteorites, National Institute of Polar Research, 9-10, Kaga 1-chome, Itabashi-ku, Tokyo 173, Japan, Phone (81) 03-3962-2938, FAX (81) 03-3962-5711, E-mail curator@nipr.ac.jp

No.

received

General	Meteorite	1-1	Y-790001	Y-790004	Y-790006	Y-790007	Y-790008
	Group & Type	1-2	L6	L6	Eucrite	Eucrite	L6
	Weight (gr.)	1-3	3.92	4.67	29.42	80.38	11.39
	Dimension (cm)	1-4	1.8x1.6x0.8	1.7x1.5x1.0	3.8x3.0x2.2	5.6x5.0x2.6	3.1x2.1x1.3
	Thin Section No.	1-5	51-1	51-1	80-2	91-2	51-1
	Tent. Pairing	1-6	no	no	no	no	no
	Bulk Comp.	1-7	no	no	no	no	no
Macroscopic	Shape	2-1	4	2	2	3	2
	Fusion Crust	2-2	2	2	1	1	2
	Evaporite	2-3	1	1	1	1	1
	Fracturing	2-4	A	A	A	A	A
	Structure	2-5	1	1	3	3	1
	Color	2-6	2	2	5	5	2
	Xenolith	2-7	1	1	3	3	1
Mineral Comp.	Olivine (PMD), Fa	3-1	24.8	24.9			24.2
	Ol. Range		23.9-26.1	24.0-26.1			23.7-25.0
	Low-Ca Pyx.(PMD), Fs	3-2	20.7	20.6			20.1
	Pyx. Range		20.2-21.0	19.9-21.3	24.9-50.0	25.5-52.5	18.9-20.9
	Plagioclase (PMD), An	3-3					
	Pl. Range			10.3			10.6
Microscopic	Matrix	4-1	1	1	6	6	1
	Chond. Size	4-2	5	5	5	5	5
	Metal, Sulfide	4-3	2	3	5	5	3
	Meta. Pl	5-1	2	3	4	4	3
	Chondrule Gdm	5-2	5	6	8	8	6
	Ol-extinct.	6-1	3	3	5	5	3
	Crack, Vein	6-2	1	3	5	5	1
	Shock Pocket	6-3	1	1, 2	5	5	1
	Shock Degree	6-4	2	2	4	4	2
	Breccia	7-1	1	1	4	4	1
	CAI, Xenolith	8	1	1	1	1	1
	Limonite	9-1	1	2	1	1	3
	Staining	9-2	3	3	1	1	2
	Weath. Index	9-3	B	A/B	A	A	B
	Fusion Crust	10-1	3	3	2	2	2
	Comments	11-1	no	no	yes	yes	

1-1	Y-790009	Y-790011	Y-790019	Y-790020	Y-790024	Y-790035	Y-790042
1-2	LL6	H5	H4	Eucrite	H4	L4	H4
1-3	12.46	8.2	9.88	86.27	3.99	4.5	2.64
1-4	2.8x2.1x1.9	2.6x1.8x1.2	2.6x2.0x1.5	7.1x4.6x3.4	1.8x1.4x1.1	1.7x1.5x1.2	1.4x1.2x1.1
1-5	51-1	51-1	51-1	80-2	51-1	51-1	51-1
1-6	no	no	no	no	no	yes, Y-790035	no
1-7	no	no	no	yes	no	no	no
2-1	3	4	3	3	3	3	3
2-2	2	3	1	2	4	2	2
2-3	1	1	1	1	1	1	1
2-4	A	A	A	A	A	A	A
2-5	1	1	1	3	1	1	3
2-6	5	2	5	5	2	5	5
2-7	1	1	1	3	1	1	1
3-1	27.9	18	18.1		18.3	25	16.5
	26.9-28.7	17.2-18.7	17.3-19.2		17.7-19.3	24.0-26.2	15.1-17.0
3-2	23.1	15.6	16		16.4	20.8	14.6
	22.4-24.3	15.0-16.1	15.3-17.1	25.9-51.9	15.0-22.2	20.1-22.1	13.9-15.3
3-3							
	8.9-10.0	12.6, 14.4	15.3-17.1				
4-1	1	1	1	6	1	1	1
4-2	5	5	5	5	5	5	5
4-3	3	1	1	5	2	3	2
5-1	3	3	1	4	2	1	1
5-2	6	5	4	8	4	4	4
6-1	2	3	4	5	3	2	2
6-2	1	1	3	5	3	1	1
6-3	1	2	3	5	2	1	1
6-4	1	2	1	4	2	1	1
7-1	1	1	2	4	1	1	1
8	1	1	2	1	1	1	1
9-1	1	3	1	1	3	2	1
9-2	2	3	3	1	3	3	3
9-3	A	B	B		B	A/B	B
10-1	2	1	2	1	1	1	2
11-1	no	no	no	yes			no

1-1	Y-790044	Y-790047	Y-790065	Y-790110	Y-790112	Y-790113
1-2	H5, H6	H4	H4	H4	CR2	Eucrite
1-3	44.02	46.1	13.88	1.11	23.97	19.00
1-4	3.8x3.4x2.1	5.6x3.8x2.0	3.0x2.0x1.8	1.4x0.8x0.6	3.1x2.6x2.5	3.3x2.6x1.6
1-5	51-1	51-1	51-2	51-1	70-1	82-2
1-6	no	yes, Y-790052	yes, Y-790052	yes, Y-790052	no	no
1-7	no	no	no	no	no	yes
2-1	2	3	3	2	1	3
2-2	2	3	3	1	1	1
2-3	1	1	1	1	1	1
2-4	B	B	B	A	A	A
2-5	1	1	1	1	3	3
2-6	2	2	2	5	1	5
2-7	1	1	3	1	2	3
3-1	18.2	18	18.5	18.4	2.4	
	17.2-20.0	17.3-19.4	17.5-20.2	17.5-18.4	0.5-29.9	79.2
3-2	16.2	16.2	16.3	16	2.2	
	15.6-16.4	15.0-18.1	15.5-17.2	15.2-16.6	0.9-3.9	24.8-41.5
3-3						
4-1	1	1	1	1	3	6
4-2	5	5	5	5	4	5
4-3	2	1	3	1	1	5
5-1	2	1	1	1	1	4
5-2	5	4	4	4	2	8
6-1	3	3	3	2	2	5
6-2	3	2	1	1	1	5
6-3	2, 3	1	4	2	1	5
6-4	3	2	3	2	1	4
7-1	2	1	1	1	1	4
8	1	1	1	1	2	1
9-1	3	2	2	2	2	1
9-2	2	3	3	3	2	1
9-3	B	B/C	C	B	B	A
10-1	2	2	1	1	1	2
11-1		no	no	no	no	yes

1-1	Y-790114	Y-790115	Y-790116	Y-790117	Y-790118	Y-790119	Y-790120
1-2	Eucrite	H4	L6	L5	Diogenite	L5	H7
1-3	3.92	51.38	190.65	151.37	12.25	11.07	2.82
1-4	2.0x1.6x1.4	3.7x3.0x2.7	6.1x5.8x3.8	6.0x4.2x4.2	2.2x2.0x1.7	2.8x1.6x1.5	1.8x1.8x0.7
1-5	81-1	51-1	51-1	51-1	51-1	51-1	51-1
1-6	no	no	no	no	yes, Y-74097	no	no
1-7	no	no	yes	yes	no	yes	no
2-1	3	3	3	3	1	3	2
2-2	1	3	1	1	4	1	1
2-3	1	1	1	1	1	1	1
2-4	A	A	A	A	A	A	A
2-5	3	1	1	1	1	1	1
2-6	5	2	5	5	4	5	5
2-7	3	1	1	1	1	1	1
3-1		18.6	25.5	25.2		24.2	19.2
		17.4-22.0	24.4-26.3	24.5-26.2		23.6-26.0	18.2-21.3
3-2		15.8	21.9	21		20.3	16.4
	26.4-32.5	14.9-18.1	20.8-25.1	20.6-21.3	22.7-26.5	19.5-21.3	15.9-16.9
3-3							
			10.4				
4-1	6	1	1	1	6	1	1
4-2	5	5	5	5	5	5	5
4-3	5	1	2	2	3, 5	2	1
5-1	4	1	2	2	4	2	3
5-2	8	4	5	5	8	5	7
6-1	5	2	2	2	5	3	3
6-2	5	2	1	1	2	1	2
6-3	5	2	2	1	5	2	1
6-4	4	2	2	1	4	2	2
7-1	4	1	1	1	1	1	1
8	1	1	1	1	1	1	1
9-1	1	1	2	2	1	2	2
9-2	2	3	3	3	2	3	3
9-3	A	B	B	B	A	B	B
10-1	1	2	2	3	1	2	3
11-1	yes	no	no	no	yes	no	no

1-1	Y-790121	Y-790122	Y-790123	Y-790124	Y-790125	Y-790126	Y-790128
1-2	H4	Eucrite	CM2	L6, 7	H6	L6	H5
1-3	10.36	109.54	6.79	10.27	6.02	7.38	56.81
1-4	3.0x1.6x1.5	5.7x5.0x3.1	2.3x2.2x1.6	5.8x3.8x3.6	2.4x1.7x1.1	2.6x1.6x0.9	4.7x2.9x2.5
1-5	51-1	80-1	71-1	51-1	51-1	81-2	51-1
1-6	no	no	no	no	no	no	no
1-7	no	yes	no	no	no	no	no
2-1	3	3	4	2	4	2	3
2-2	3	1	3	2	2	2	2
2-3	1	1	1	1	1	1	1
2-4	A/B	A	A	A	A/B	A/B	A/B
2-5	1	3	1	1	1	1	1
2-6	2	5	1	5	5	6	5
2-7	1	3	1	1	1	1	1
3-1	18.5			24.4	19.2	23.7	17.5
	17.8-19.3		0.7-86.6	23.3-25.5	18.2-20.0	17.6-26.1	17.5-19.0
3-2	16.3			20.5	16.7	19.6	15.7
	14.9-20.1	25.9-57.0	0.4-9.8	19.1-22.6	15.8-17.4	18.6-21.5	14.5-16.7
3-3							
					12		
4-1	1	6	4	1	1	1	1
4-2	5	5	2	5	5	5	5
4-3	1	5	4	2	1	2	1
5-1	1	4	1	3	3	1	3
5-2	4	8	2	7	6	6, 8	5
6-1	3	5	2	3	2	3	3
6-2	2	5	1	1	1	1	1
6-3	2	5	1	1	1	4	1
6-4	2	4	1	2	1	3	2
7-1	1	4	1	1	1	1	1
8	1	1	2	1	1	1	1
9-1	2	1	1	2	2	3	2
9-2	3	2	1	2	3	2	2
9-3	B			A/B	B	B/C	B
10-1	1	1	1	3	2	1	
11-1	no	yes	no	no	no	no	no

1-1	Y-790130	Y-790131	Y-790133	Y-790138	Y-790142	Y-790143	Y-790144
1-2	H5	L6	H6	H3	H6	LL	LL
1-3	107.3	2.13	60.01	39.32	83.49	52.26	92.32
1-4	1.5x1.2x0.8	1.5x1.2x0.8	4.9x3.9x2.6	4.4x2.9x2.1	4.6x3.4x3.1	4.1x3.9x2.2	6.0x3.3x2.9
1-5	82-1	51-1	51-1	51-1	71-1	92-2	101-3
1-6	no	no	no	no	no	no	no
1-7	no	no	no	no	no	no	no
2-1	1	3	2	2	1	3	2
2-2	1	2	2	2	2	4	4
2-3	1	1	1	1	1	1	1
2-4	A/B	A	B	B	A/B	B	A
2-5	1	1	1	1	1	2	1
2-6	5	5	2	2	2	4	4
2-7	1	1		1	1	1	1
3-1	17.6	25.1	18.9	17.5	19	19.4	27.8
	16.8-18.3	24.0-26.7	18.4-20.2	16.5-18.6	18.1-19.8	27.6-31.8	25.7-31.6
3-2	15.1	21.3	16.8	12.5	16.5		22.8
	14.7-16.7	20.0-23.1	15.7-19.2	8.4-18.0	15.7-17.4		21.2-24.6
3-3							
4-1	1	1	1	2	1	1	1
4-2	5	5	5	3	5	5	5
4-3	1	2	1	1	1	3	3
5-1	2	3	3	1	3	1	3
5-2	5	6	6	3	6	8	7
6-1	2	3	3	2	2	2	2
6-2	1	2, 3	1	1	1	1	1
6-3	1	1	1	1	1	4	2
6-4	1	2	2	1	1	3	1
7-1	1	1	1	1	1	1	1
8	1	1	1	1	1	1	1
9-1	2	2	2	1	2	1	2
9-2	3	2	2	2	3	2	2
9-3	B	B	B	A/B	B	A	A/B
10-1	2	2	1	1	1	1	1
11-1	no	no	no	no	no		no

1-1	Y-790148	Y-790149	Y-790157	Y-790161	Y-790166	Y-790167	Y-790171
1-2	H6	H	H4	H4	H5	H3	H4
1-3	3.57	16.23	8.4	88.38	64.42	18.75	43.96
1-4	2.0x1.2x1.0	2.7x2.0x1.7	2.6x1.8x1.2	4.5x4.0x2.1	4.2x3.5x2.8	2.3x2.1x1.8	4.1x2.9x1.9
1-5	51-1	51-1	51-1	72-1	51-1	51-1	51-1
1-6	no	no	no	no	no	no	yes, Y-790171
1-7	no	no	no	no	no	no	no
2-1	1	2	3	3	3	4	4
2-2	2	3	2	2	2	2	3
2-3	1	1	1	1	1	1	1
2-4	A/B	B	A/B	A/B	A	B	A/B
2-5	1	1	1	1	1	1	1
2-6	2	2	2	2	5	2	2
2-7	1	1	1	1	1	1	1
3-1	19.7	19	18.8	18.2	18.6	18.7	18.6
	19.3-20.3	17.6-19.7	17.9-19.7	17.1-18.9	17.9-19.2	18.1-19.4	17.5-21.0
3-2	17.7	16.4	16.6	17.6	16.2	16	15.7
	16.9-18.2	14.5-17.3	16.1-17.8	11.5-28.3	15.5-16.9	12.4-20.8	15.0-16.8
3-3							
4-1	1	1	1	1	1	2	1
4-2	5	1	5	5	5	3	5
4-3	1	1	1	1	1	1	1
5-1	3	1	1	1	3	1	1
5-2	6	8	4	4	5	3	4
6-1	2	3	3	2	2	2	2
6-2	1	1	1	1	1	1	1
6-3	1	1	2	1	1	1	1
6-4	1	3	2	1	1	1	1
7-1	1	3	1	1	1	1	1
8	1	1	1	1	1	1	1
9-1	1	2	2	3	1	2	1
9-2	2	2	2	3	2	3	2
9-3	B	B	B/C	C	B	C	B
10-1	3	1	1	2	1	1	1
11-1	no		no	no	no	no	no

1-1	Y-790175	Y-790178	Y-790181	Y-790185	Y-790187	Y-790189	Y-790191
1-2	H5	L6	H5	L6	H4	H5	L6
1-3	286.9	234.7	17.51	222.8	16.64	7.6	18.5
1-4	6.7x6.4x3.5	5.8x4.8x4.5	2.4x2.0x2.3	7.0x5.0x3.4	2.6x2.7x1.3	2.5x1.9x1.1	3.2x1.9x1.8
1-5	74-1	73-1	51-1	73-1	51-1	51-1	51-1
1-6	no	no	no	no	no	no	no
1-7	no	no	no	no	no	no	no
2-1	4	3	3	3	4	4	2
2-2	3	2	3	1	3	4	2
2-3	1	1	1	1	1	1	1
2-4	B	A/B	A	A/B	A/B	B	B
2-5	1	1	1	1	1	1	1
2-6	5	5	2	2	2	2	2
2-7	1	1	1	1	1	1	1
3-1	18.3	24.4	18	24.7	18.3	18.1	24.5
	17.4-19.8	23.1-25.4	17.5-18.8	23.3-26.3	17.9-18.7	16.9-18.7	23.1-26.2
3-2	15.9	20.3	15.8	20.5	15.9	16.1	20.7
	15.4-16.6	19.6-21.1	14.1-20.8	19.2-22.4	15.4-16.9	15.0-18.1	19.8-23.2
3-3							
4-1	1	1	1	1	1	1	1
4-2	5	5	5	5	5	5	5
4-3	1	2	1	2	1	1	2
5-1	2	3	3	3	1	2	3
5-2	5	6	6	6	4	5	6
6-1	3	2	2	3	2	2	3
6-2	1	1	1	3	1	1	3
6-3	2	2	2	2	1	1	3
6-4	2	1	2	2	1	1	3
7-1	1	1	1	1	1	1	2
8	1	1	1	1	1	1	1
9-1	2	2	3	1	3	2	3
9-2	3	2	3	3	2	2	2
9-3	B	B	C	A/B	B	B	B
10-1	1	1	1	1	1	1	2
11-1	no	no	no	no	no	no	no

1-1	Y-790194	Y-790195	Y-790199	Y-790215	Y-790237	Y-790238
1-2	L6	H4	H	H5	L6	H6
1-3	13.07	70.57	105.74	7.18	14.03	13.76
1-4	2.6x2.0x1.3	4.8x3.9x2.6	5.1x4.2x3.4	2.0x1.6x1.1	2.1x2.1x1.7	3.3x1.9x1.6
1-5	51-1	51-1	62-1	91-1	51-1	51-1
1-6	no	no	no	yes, Y-790215	no	yes, Y-790238
1-7	no	no	no	no	no	no
2-1	4	3	1	3	4	4
2-2	4	2	4	3	4	4
2-3	1	1	1	1	1	1
2-4	B	B	B	A/B	A/B	B
2-5	1	1	2	1	1	1
2-6	5	2	4	2	5	2
2-7	1	1	1	1	1	1
3-1	24.5	18.3	18.8	18.6	24.2	18.9
	23.6-25.2	17.6-19.3	17.8-20.0	16.8-20.1	22.9-24.8	17.7-19.7
3-2	20.2	15.8	16.5	16	20.2	16.8
	19.4-20.6	15.3-16.4	15.3-17.6	15.2-17.5	19.2-23.6	16.1-18.5
3-3						
	10.9, 11.5					12.8
4-1	1	1	1	1	1	1
4-2	5	5	5	5	5	5
4-3	3	1	1	1	3	1
5-1	3	3	4	2	3	3
5-2	6	4	8	5	6	6
6-1	3	2	3	3	3	3
6-2	3	1	4	3	3	3
6-3	3	1	3	1	3	2
6-4	3	1	3	2	3	3
7-1	1	1	3	1	1	1
8	1	1	1	1	1	1
9-1	2	1	2	2	2	2
9-2	2	2	2	3	2	3
9-3	A/B	B	B	B	B	B
10-1	1	1	1	1		1
11-1	no	no	no	no	no	no

1-1	Y-790244	Y-790247	Y-790250	Y-790251	Y-790253	Y-790254	Y-790256
1-2	L6	L5	LL	H4	L6	H5	LL6
1-3	3.66	475.9	354.2	274.6	232	92.26	381.2
1-4	2.0x1.6x0.8	9.5x6.1x5.5	11.8x7.8x3.3	6.5x5.4x3.8	7.0x5.1x4.3	5.8x4.0x2.7	7.5x6.4x5.0
1-5	51-1	92-2	80-2	82-1	74-1	72-1	74-1
1-6	yes, Y-790244	no	no	no	no	no	no
1-7	no	no	no	no	no	no	no
2-1	4	3	2	1	2	3	3
2-2	3	1	4	1	2	2	1
2-3	1	1	1	1	1	1	1
2-4	A/B	A	A	A	A/B	B	A
2-5	1	1	2	1	1	1	1
2-6	5	2	4	2	5	2	5
2-7	1	1	1	1	1	1	1
3-1	24	23.1	29.8	17.3	23.5	20.1	30.1
	22.9-25.9	21.9-25.4	27.7-41.8	16.2-19.6	22.7-24.2	19.1-21.6	29.0-31.0
3-2	19.8	19.7	23.1	15.3	19.4	17.7	24.1
	18.4-20.8	17.7-21.2	20.9-25.5	14.5-16.7	18.3-22.0	16.5-19.6	23.5-24.8
3-3							
							10
4-1	1	1	1	1	1	1	
4-2	5	5	5	5	5	5	
4-3	2	2	3	1	2	1	
5-1	3	1	1	1	3	2	3
5-2	6	5	8	4	6	5	6
6-1	3	3	4	3	3	4	3
6-2	1	3	1	3	2	4	2
6-3	2	1	4	1	1	2	1
6-4	2	2	3	2	2	3	2
7-1	1	1	1	1	1	1	1
8	1	1	1	1	1	1	1
9-1	2	2	1	3	2	3	2
9-2	2	2	2	3	2	3	2
9-3	B	B/C	A/B	B/C	B	B	B
10-1		3	1	3	3	1	2
11-1	no	no	no	no	no	no	no

1-1	Y-790257	Y-790260	Y-790265	Y-790266	Y-790267	Y-790269
1-2	L6	Eucrite	LL6	Eucrite	H6	H4
1-3	126.04	433.9	17.16	208.0	13.19	1269.2
1-4	7.2x4.2x4.0	9.2x6.7x5.0	3.3x2.4x2.0	7.4x5.0x5.9	2.3x2.1x1.9	11.1x10.9x7.2
1-5	72-1	71-2	51-1	61-1	51-1	71-1
1-6	no	no	no	no	no	yes, Y-790269
1-7	no	yes	no	yes	no	no
2-1	3	2	4	3	1	2
2-2	1	1	2	1	1	1
2-3	1	1	1	1	1	1
2-4	B	A	A/B	A	A	B/C
2-5	1	3	1	3	1	1
2-6	5	5	5	5	5	2
2-7	1	3	1	1	1	1
3-1	24		30.1		19.2	18
	22.9-25.6		29.2-31.8		18.6-19.7	16.7-19.2
3-2	20		24.5		16.4	15.7
	19.3-20.8	30.6-60.8	23.2-26.6	53.7-61.2	15.8-17.1	14.6-16.7
3-3						
4-1	1	6	1	6	1	1
4-2	5	5	5	5	5	5
4-3	2	5	3	5	1	1
5-1	3	4	3	4	3	1
5-2	6	8	6	8	6	4
6-1	3	5	3	5	3	2
6-2	2	5	2	1	2	1
6-3	1	5	2	5	2	1
6-4	2	4	2	4	2	1
7-1	1	4	4	1	1	1
8	1	1	1	1	1	1
9-1	2	1	2	1	2	3
9-2	2	2	3	1	3	3
9-3	B	A	B	A	B	B
10-1	1	2	2	2	3	1
11-1	no	yes	no	yes	no	no

1-1	Y-790270	Y-790299	Y-790331	Y-790332	Y-790333	Y-790334
1-2	H4	H4	L6	LL6	H3	H3
1-3	165.08	3.95	36.25	28.66	17.73	15.22
1-4	7.0x6.0x3.3	1.5x1.5x1.1	4.1x3.0x2.2	3.8x2.8x1.8	3.0x2.2x1.8	2.9x1.8x1.6
1-5	90-1	51-1	51-1	51-1	51-1	51-1
1-6	yes, Y-790269	yes, Y-790269	no	no	no	no
1-7	no	no	no	no	no	no
2-1	4	4	2	3	3	2
2-2	3	4	1	2	2	1
2-3	1	1	1	1	1	1
2-4	B/C	B	A	A	A/B	A
2-5	1	1	1	1	1	1
2-6	2	2	5	1	2	5
2-7	1	1	1	1	1	1
3-1	18.3	17.8	24.9	28.2	16.8	17.1
	17.7-19.2	17.4-18.4	24.3-25.6	26.7-30.8	13.1-18.0	16.1-17.9
3-2	16.1	15.6	20.5	23.4	12.8	13.1
	15.1-16.9	14.7-19.6	19.9-21.3	21.9-24.3	6.4-28.8	7.1-26.9
3-3						
			10.7-11.5			
4-1	1	1	1	1	2	2
4-2	5	5	5	5	3	3
4-3	1	1	2	3	1	1
5-1	1	1	3	3	1	1
5-2	4	4	6	6	3	3
6-1	3	2	3	3	2	2
6-2	2	1	4	2	1	1
6-3	1	2	2	2	1	1
6-4	2	1	3	2	1	1
7-1	1	1	1	1	1	1
8	1	1	1	1	1	1
9-1	2	2	2	2	3	3
9-2	3	3	3	2	3	3
9-3	B	B	B	B	C	C
10-1	1		2	1	2	1
11-1	no	no	no	no	no	no

1-1	Y-790335	Y-790338	Y-790339	Y-790344	Y-790380	Y-790383
1-2	L6	H4	H4	H3, 4	H3	L5
1-3	9.98	42.15	11.37	5.26	4.43	14
1-4	2.5x1.9x1.1	4.0x3.3x2.2	2.4x1.5x1.7	2.2x1.3x1.2	1.9x1.5x0.9	2.4x2.2x1.5
1-5	51-1	91-1	51-1	51-1	51-1	51-1
1-6	no	yes, Y-790337	yes, Y-790337	no	yes, Y-790380	yes, Y-790383
1-7	no	no	no	no	no	no
2-1	3	4	3	4	3	3
2-2	2	3	3	4	3	2
2-3	1	1	1	1	1	1
2-4	A	B	A/B	A/B	B	B
2-5	1	4	1	1	1	3
2-6	5	2	1	2	2	5
2-7	1	1	1	1	1	1
3-1	24.3	18.4	18.3	18.6	17.2	24.8
	23.7-25.9	17.3-21.5	17.5-19.4	17.5-19.8	16.4-21.2	23.5-26.2
3-2	20.4	15.8	16	17.8	13.5	20.7
	19.7-21.3	14.9-17.2	15.3-18.1	15.0-27.2	5.6-32.0	19.5-22.0
3-3						
			10.5			
4-1	1	1	1	1	2	1
4-2	5	5	5	5	3	5
4-3	2	1	2	1	1	1
5-1	3	2	1	1	1	2
5-2	6	5	3	3	3	5
6-1	3	3	3	3	2	3
6-2	3	1	1	1	4	1
6-3	3	2	1	1	2	1
6-4	3	2	2	2	2	2
7-1	1	1	1	1	1	1
8	1	1	1	1	1	1
9-1	3	3	2	1	3	1
9-2	3	3	3	3	3	3
9-3	B	C	B	B	B	B
10-1	2		1	1	2	1
11-1	no	no	no	no	no	no

1-1	Y-790385	Y-790387	Y-790388	Y-790396	Y-790415	Y-790416
1-2	L6	H4	H5	H	LL	H5, 6
1-3	4.21	21.13	23.05	5.06	63.44	142.46
1-4	2.1x1.2x1.3	2.5x2.3x2.1	3.0x2.6x2.1	1.9x1.5x1.1	5.8x3.2x3.1	7.2x4.0x3.3
1-5	51-1	51-1	51-1	51-1	61-1	91-1
1-6	no	no	yes, Y-790388	no	no	no
1-7	no	no	no	no	no	no
2-1	4	3	3	4	3	3
2-2	3	2	3	4	3	2
2-3	1	1	1	1	1	1
2-4	A/B	B	B	A	A	B
2-5	1	3	1	1	4	1
2-6	2	5	2	1	4	2
2-7	1	1	1	1	1	1
3-1	24.2	18.2	18.3	19.1	30.0	19.3
	23.3-25.1	17.4-18.9	17.5-18.9	17.3-19.7	28.0-33.7	18.5-21.2
3-2	20.5	15.9	15.7	16.2	23.8	16.5
	19.6-22.3	15.2-16.6	14.9-18.4	10.8-17.0	21.2-25.4	16.2-17.1
3-3						
	8.6, 14.1		11.6, 12.1			
4-1	1	1	1	1	1	1
4-2	5	5	5	5	5	5
4-3	2	1	2	1	3	1
5-1	3	1	2	1	1	2
5-2	6	4	5	8	8	5
6-1	3	3	3	3	2	3
6-2	4	1	1	1	1	2
6-3	1	1	2	1	4	1
6-4	2, 3	2	2	2	3	2
7-1	1	1	1	3	1	1
8	1	1	1	1	1	1
9-1	3	1	1	3	1	2
9-2	3	3	3	2	2	3
9-3	C	B	B	B	B	B
10-1	1	1	1	1		3
11-1	no	no	no			

1-1	Y-790417	Y-790420	Y-790425	Y-790432	Y-790436
1-2	H5	H6	H6	H4	H4
1-3	207	20.07	11.48	30.15	7.83
1-4	7.2x4.4x3.5	3.4x2.0x2.0	3.1x1.7x1.5	2.9x2.8x2.2	2.7x1.8x1.2
1-5	74-1	51-1	71-1	71-1	51-1
1-6	yes, Y-790417	yes, Y-790420	yes, Y-790426	yes, Y-790432	yes, Y-790432
1-7	no	no	no	no	no
2-1	3	3	3	3	3
2-2	2	2	4	4	4
2-3	1	1	1	1	1
2-4	B	A/B	B	B	B
2-5	1	1	1	1	1
2-6	2	5	2	2	2
2-7	1	1	1	1	1
3-1	19	18.6	19.7	18	18
	17.7-20.3	18.1-19.1	18.9-20.7	17.0-19.0	17.4-19.2
3-2	16.8	16.2	17.1	15.6	15.9
	16.2-17.7	15.2-16.9	16.1-17.9	14.9-16.2	15.2-20.1
3-3					
		11.8-12.5	11.7, 12.3		
4-1	1	1	1	1	1
4-2	5	5		5	5
4-3	1	1	1	1	1
5-1	2	3	1	1	1
5-2	5	6	8	4	4
6-1	3	3	2	3	3
6-2	2	2	4	1	
6-3	1	1	2	1	2
6-4	2	2	3	2	2
7-1	1	1	2	1	1
8	1	1	1	1	1
9-1	2	1	3	2	2
9-2	3	2	1	2	2
9-3	A/B	B	B	B	B
10-1	2	3	1	1	1
11-1	no	no	no	no	no

1-1	Y-790440	Y-790443	Y-790444	Y-790445	Y-790446	Y-790447
1-2	H4	H3	L4	H5	L6, 7	Eucrite
1-3	6.24	19.49	10.92	1574	713	3.03
1-4	2.4x1.3x1.1	2.9x2.3x1.6	2.3x2.2x1.7	13.0x8.9x8.0	11.1x8.5x8.1	1.8x1.3x1.0
1-5	51-1	51-1	51-1	91-1	91-2	51-1
1-6	yes, Y-790432	no	no	no	no	no
1-7	no	no	no	no	no	no
2-1	3	3	3	2	3	4
2-2	4	2	3	2	2	4
2-3	1	1	1	1	1	1
2-4	A/B	A/B	A/B	A/B	A/B	A
2-5	1	1	1	1	1	3
2-6	5	2	5	2	5	5
2-7	1	1	1	1	1	1
3-1	18.1	17.1	24	19.1	24.8	
	6.9-18.6	15.2-17.9	23.3-24.9	18.0-20.8	24.1-25.7	
3-2	16.3	11.6	20.3	16.8	21.5	
	15.1-20.6	4.3-19.1	19.3-20.9	15.6-17.7	20.1-23.1	16.8-60.0
3-3						
			8.9-11.0			
4-1	1	2	1	1	1	6
4-2	5	3	5	5	5	5
4-3	1	1	3	1	3	5
5-1	1	1	1	1	3	4
5-2	4	3	4	4, 5	6, 7	8
6-1	3	2	3	4	3	5
6-2		1	4	1	2	5
6-3	1	1	2	2	3	5
6-4	2	1	3	3	3	4
7-1	1	1	1	1	1	4
8	1	1	1	1	1	1
9-1	2	1	1	2	1	1
9-2	2	2	2	3	2	1
9-3	B	B	A/B	B	A/B	
10-1	1	2	1	1	3	1
11-1	no	no	no	no	no	yes

1-1	Y-790448	Y-790452	Y-790453	Y-790454	Y-790455	Y-790456
1-2	LL3	L6	L5	H5	L5	LL6
1-3	3480	82.15	106.06	10.1	22.68	72.65
1-4	14.8x13.2x10.4	5.0x3.4x3.5	5.0x4.2x3.1	2.3x1.9x1.5	3.4x2.6x1.8	5.8x2.9x2.9
1-5	91-4	81-1	82-1	51-1	52-1	51-1
1-6	no	no	no	no	no	no
1-7	yes	no	yes	no	no	no
2-1	1	4	3	3	4	2
2-2	1	4	3	1	3	1
2-3	1	1	1	1	1	1
2-4	A	A	A/B	A	B	A
2-5	1	3	3	1	3	1
2-6	1	5	5	1, 2	5	5
2-7	1	1	1	1	1	1
3-1	9.5	24.6	24.3	18.2	24.5	29.5
	0.2-24.9	23.7-27.2	23.5-25.8	17.5-19.4	23.4-25.7	27.2-32.2
3-2	5.8	20.8	20.3	16	20.4	23.8
	1.1-16.1	20.3-22.2	19.6-21.1	14.9-17.5	20.2-20.8	22.6-25.5
3-3						
			11.9,11.8,10.6,10.4		4.8-10.7	8.5
4-1	2	1	1	1	1	
4-2	3	5	5	5	5	
4-3	3	2	2	1	2	3
5-1	1	3		2	2	3
5-2	3	6	5	5	5	8
6-1	3	3	3	3	3	2
6-2	1	2	1	2	1	1
6-3	1	1	1	1	1	1
6-4	2	2	2	2	2	1
7-1	1	1	1	1	1	3
8	1	1	1	1	1	1
9-1	2	2	2	2	2	2
9-2	3	2	3	3	3	3
9-3	C	A/B	B	B	B	B
10-1	1	1	1	2	1	2
11-1	no	no	no	no	no	no

1-1	Y-790459	Y-790461	Y-790462	Y-790463	Y-790464	Y-790489
1-2	L6	H3	L6	H5	H5	L
1-3	19.92	778.9	1371	130.98	55.49	222.8
1-4	2.9x2.2x1.8	8.8x8.2x5.1	11.8x11.4x6.1	5.9x4.5x3.5	4.1x3.6x2.5	6.5x5.8x4.8
1-5	51-1	91-1	90-2	91-1	51-1	82-1
1-6	no	yes, Y-790461	no	yes, Y-790463	yes, Y-790463	no
1-7	no	yes	yes	yes	no	yes
2-1	2	3	3	4	4	1
2-2	1	3	2	3	3	4
2-3	1	1	1	1	1	1
2-4	A	B	B	B	B	A/B
2-5	1	1	3	1	3	1
2-6	1	2	5	2	2	5
2-7	1	1	3	2	1	1
3-1	24.1	17	24.7	20.4	18.7	24.7
	22.8-24.8	7.2-21.1	23.8-25.6	19.0-24.2	18.2-19.6	19.8-28.2
3-2	20.4	11.9	20.7	17.2	16.6	21
	19.8-21.2	1.9-18.7	20.0-21.7	16.4-19.8	15.8-19.9	18.6-23.7
3-3						
	10.2-11.5		9.8-10.7	11.7, 12.9	11.4, 20.0	
4-1	1	2	1	1	1	
4-2	5	3	5	5	5	5
4-3	2	1	2	1	1	1
5-1	3	1	3	2	3	1
5-2	6	3	6	5	5	1
6-1	3	3	3	3	3	2
6-2	1	2	4	2	3	1
6-3	1	1	2	2		1
6-4	2	2	2	2	2	4
7-1	1	1	1	1	1	3
8	1	1	1	1	1	1
9-1	2	3	2	2	3	1
9-2	2	3	3	3	3	1
9-3	B	B	B	B	B	B
10-1	2	3	1	1	1	1
11-1	no	no	no	no	no	no

1-1	Y-790491	Y-790493	Y-790499	Y-790500	Y-790501	Y-790502	Y-790503
1-2	H3	H4	L6	L6	H4	H4	H4
1-3	15.81	9.07	469.2	38.45	37.16	110.28	40.1
1-4	2.5x2.1x1.7	2.4x2.2x1.1	8.8x7.2x4.5	3.8x3.1x2.0	3.6x3.3x2.1	5.3X4.2X2.2	3.7x2.9x2.4
1-5	51-1	51-1	91-1	81-1	51-1	91-1	51-1
1-6	no	yes, Y-790493	no	no	no	no	no
1-7	no	no	yes	no	no	yes	no
2-1	1	4	1	1	3	3	3
2-2	1	4	1	1	4	1	2
2-3	1	1	1	1	1	1	1
2-4	A	A	A	A	A/B	A	A
2-5	1	1	1	1	1	1	
2-6	1	1	5	5	2	2	2
2-7	1	1	1	1	1	1	1
3-1	17.6	17.7	24	24.3	18.8	18.2	18.6
	16.8-18.1	16.7-18.8	23.3-25.0	23.3-25.2	17.9-19.9	17.1-19.2	18.1-19.9
3-2	15.3	15.6	20.2	20.2	16	15.8	15.5
	14.3-17.5	11.5-18.6	18.7-21.2	19.4-21.0	14.8-16.8	14.7-16.7	13.1-17.7
3-3							
4-1	1	1	1	1	1	1	1
4-2	5	5	5	5	5	5	5
4-3	2	1	3	2	1	1	1
5-1	1	1	3	3	1	1	1
5-2	3	4	6	6	4	4	4
6-1	2	3	3	3	3	3	3
6-2	1	1	3	1	1	3	1
6-3	2	2	1	1	1	2	1
6-4	2	2	2	2	2	2	2
7-1	1	1	1	1	2	1	2
8	1	1	1	1	1	1	1
9-1	3	3	2	3	3	3	3
9-2	3	2	3	3	3	3	3
9-3	B	B	B	B	B	C	C
10-1	1	1	2	2	1	2	1
11-1	no	no	no	no	no	no	no

1-1	Y-790504	Y-790508	Y-790509	Y-790514	Y-790518	Y-790519
1-2	L4	H5	H4, 5	H5	H4	LL
1-3	7.99	12.83	45.93	68.86	91.59	1388.4
1-4	2.4x2.2x0.9	2.5x2.1x1.4	4.0x3.6x2.5	4.4x3.5x2.6	4.2x4.1x3.2	10.2x9.4x8.1
1-5	51-1	51-1	51-1	51-1	81-1	60-2
1-6	yes, Y-790505	no	yes, Y-790509	no	no	yes, Y-790519
1-7	no	no	no	no	no	yes
2-1	3	2	3	1	2	3
2-2	2	2	3	3	1	3
2-3	1	1	1	1	1	1
2-4	A/B	A	B	B	A	B/C
2-5	1	1	1	1	1	3
2-6	2	2	2	4, 5	2	4, 5
2-7	1	1	1	1	1	1
3-1	24.2	18.5	18.3	18.9	18.3	
	23.3-25.2	17.3-21.7	17.7-19.1	18.5-19.8	17.4-18.9	
3-2	19.6	16.1	16.4	16.3	16.1	
	15.1-21.7	15.5-17.0	15.4-20.7	14.9-17.1	15.3-18.0	
3-3						
				12		
4-1	1	1	1	1	1	1
4-2	5	5	5	5	5	5
4-3	1	1	1	1	1	3
5-1	1	2	2	1	1	1
5-2	4	5	5	4	4	8
6-1	3	2	2	2	2	3
6-2	1	1	1	1	2	1
6-3	2	1	1	1	1	4
6-4	2	1	1	1	1	3
7-1	2	1	1	1	1	1
8	1	1	1	1	1	1
9-1	3	3	3	3	3	2
9-2	3	3	3	3	3	2
9-3	C	C	B/C	B/C	B/C	B
10-1	1	1	1		2	
11-1	no	no	no		no	no

1-1	Y-790520	Y-790523	Y-790528	Y-790529	Y-790560	Y-790574
1-2	LL	LL	LL	LL5	H4	LL5
1-3	565.3	406.9	777.7	952.9	37.71	22.04
1-4	9.9x7.0x6.1	8.4x7.4x4.6	10.0x8.0x7.3	9.0x8.3x8.2	3.1x2.8x2.4	3.6x2.1x2.1
1-5	91-1	91-1	91-1	81-2	51-1	93-1
1-6	yes, Y-790519	yes, Y-790519	yes, Y-790519	yes, Y-790519	no	yes, Y-790519
1-7	yes	yes	yes	yes	no	yes
2-1	2, 3	3	3	3	3	4
2-2	2	3	3	3	3	4
2-3	1	1	1	1	1	1
2-4	B	B	B	B	A/B	A/B
2-5	3	3	3	3	1	1
2-6	4, 5	4, 5	4, 5	4, 5	2	4, 5
2-7	1	1	1	1	1	1
3-1	26.3	26.5		23.4	18.7	27.2
	24.7-29.3	25.3-28.0	21.7-28.5	22.0-26.7	17.7-20.7	25.1-28.6
3-2	21.9	18.2	24.3	19.5	16.8	22.2
	21.3-23.4	6.5-23.8		17.0-21.5	14.8-19.2	19.3-23.5
3-3						
			15	30.7-52.4		
4-1	1	1	1	1	1	1
4-2	5	5	5	5	5	5
4-3		3	3	3	1	3
5-1	1	1	1	2	1	2
5-2	8	8	8	5	4	5
6-1	3	3	3	4	3	3
6-2	2	2	2	1	2	2
6-3	4	4	3	3	1	2
6-4	3	2	3	3	2	2
7-1	1	1	3	1	1	2
8	1	1	1	1	1	1
9-1	2	1	2	3	2	2
9-2	2	2	2	2	3	2
9-3	B	B	B	B	B	B
10-1			1	1	1	1
11-1	no	no	no		no	no

1-1	Y-790725	Y-790727	Y-790728	Y-790729	Y-790731	Y-790732	Y-790734
1-2	H5	Howardite	LL	L6	L6	H5	L6
1-3	4.1	120.42	368	236.8	88.11	35.01	492.8
1-4	2.0x1.4x0.8	6.0x3.9x3.6	7.7x7.0x5.1	6.4x4.8x4.7	5.6x3.7x2.2	5.2x2.3x2.1	9.3x8.1x5.0
1-5	51-1	52-2	91-1	82-1	82-1	51-1	82-1
1-6	no	no	no	no	no	no	yes, Y-790734
1-7	no	yes	no	yes	no	no	yes
2-1	1	1	2	3	3	3	2, 3
2-2	1	1	4	2	2	2	3
2-3	1	1	1	1	1	1	1
2-4	A	A	B	A/B	B	A/B	B
2-5	1	3	3	1	1	1	1
2-6	5	5	4, 5	5	5	2	5
2-7	1	1	1	2	1	1	
3-1	18.6		28.2	25.1	23.9	18.1	24.6
	18.0-19.4	11.5-70.6	27.1-30.2	23.7-28.2	22.5-25.0	17.6-18.7	23.8-25.5
3-2	16			21.2	21	15.5	20.2
	14.5-16.6	17.8-70.8		19.2-22.7	18.9-23.2	14.4-16.6	19.6-20.9
3-3							
		86.2-96.4			10.7-17.0		11.4
4-1	1	6	1	1	1	1	1
4-2	5	5	5	5	5	5	5
4-3	1	5	3	2	2	1	2
5-1	2	4	1	3	3	2	3
5-2	5	8	8	6	6	5	6
6-1	3	5	2	3	3	2	3
6-2	3	5	1	4	4	2	2
6-3	2	5	4	3	3	1	3
6-4	2	4	3	3	3	1	3
7-1	1	4	1	1	1	1	1
8	1	1	1	1	1	1	1
9-1	2	1	2	2	2	3	3
9-2	3	1	2	3	3	3	3
9-3	B		C	B	B	C	B
10-1	2	1	1	1		2	1
11-1	no	yes	no	no	no	no	no

1-1	Y-790740	Y-790743	Y-790744	Y-790745	Y-790747	Y-790748
1-2	L3	H6	L5	H4	H3	H6
1-3	206	17.96	18.7	8.43	10.31	498.8
1-4	7.0x4.8x4.5	3.0x2.2x1.9	2.7x2.0x1.9	2.2x1.8x1.5	2.4x2.2x1.2	8.7x5.7x6.4
1-5	83-1	51-1	51-1	51-1	51-1	91-1
1-6	no	yes, Y-790742	no	no	no	no
1-7	yes	no	no	no	yes	yes
2-1	3	3	3	4	2	2
2-2	1	3	2	3	2	1
2-3	1	1	1	1	1	1
2-4	A/B	B	A/B	A/B	A	B/C
2-5	1	1	1	1	1	3
2-6	5	2	2	2	2	2
2-7	1	1	1	1	1	1
3-1	24.7	19.3	25.3	18.3	19.1	18.7
	23.9-25.5	18.9-19.7	23.7-28.4	17.4-20.9	9.3-22.4	17.7-19.5
3-2	20.6	16.7	21.6	16.2	13.1	16.6
	20.0-21.1	15.9-17.7	20.2-26.4	15.6-16.6	3.2-28.3	15.1-17.8
3-3						
	9.9-10.3	11.5				11.7
4-1	1	1	1	1	2	1
4-2	5	5	5	5	3	5
4-3	2	1	2	1	2	1
5-1	3	3	2	1	1	2
5-2	5	6	5	4	3	8
6-1	3	3	3	2	2	2
6-2	1	2	3	1	1	2
6-3	2	2	2	1	1	2
6-4	2	2	2	1	1	2
7-1	1	1	1	1	1	3
8	1	1	1	1	1	1
9-1	1	3	2	2	2	2
9-2	3	3	3	3	2	2
9-3	B	B	B	B/C	A/B	B
10-1	2	1	2	1		1
11-1	no	no	no	no	no	

1-1	Y-790749	Y-790751	Y-790752	Y-790754	Y-790755	Y-790756	Y-790757
1-2	H4	L5, 6	LL6	H4	H5	H4	LL
1-3	1714.8	4.45	136.51	8.59	7.37	699.1	507.6
1-4	17.7x10.4x7.5	1.6x1.4x1.1	5.8x4.3x2.7	2.0x1.8x1.7	1.9x1.6x1.3	9.7x8.0x6.0	12.0x10.0x2.9
1-5	101-1	51-1	71-1	51-1	51-1	91-1	81-1
1-6	no	no	no	no	no	no	no
1-7	yes	no	yes	no	no	yes	yes
2-1	2	2	1	3	1	3	2
2-2	2	1	4		1	1	4
2-3	1	1	1	1	1	1	1
2-4	B	A	A	A	A/B	A	A/B
2-5	3	1	3	1	1	1	3
2-6	5	5	1, 5	5	5	5	4, 5
2-7	2	1	1	1	1	1	1
3-1	18.3	24.4	27.6	18.8	18.5	18.6	25.1
	17.0-19.1	23.2-26.2	25.3-28.8	18.2-19.3	17.1-19.5	17.5-21.1	22.4-26.9
3-2	16.1	20.4	23.5	15.9	16.5	16.4	20.5
	15.7-16.9	19.8-20.9	23.0-23.8	14.7-16.7	15.5-17.6	15.4-17.6	15.2-23.8
3-3							
			12.1				
4-1	1	1	1	1	1	1	1
4-2	5	5	5	5	5	5	5
4-3	1	2	3	1	1	1	3
5-1	1	3	3	1	3	1	3
5-2	4	6	8	4	5	4	8
6-1	4	3	4	3	2	2	3
6-2	1	2	2	1	2	1	1
6-3	2	1	4	1	1	1	4
6-4	3	2	3	1	1	2	3
7-1	1	1	1	1	1	1	1
8	1	1	1	1	1	1	1
9-1	2	2	1	1	1	2	2
9-2	3	3	2	2	3	3	2
9-3	B/C	B	A	B/C	B/C	B	A/B
10-1	1	2		3	3	2	1
11-1	no	no				no	no

1-1	Y-790760	Y-790761	Y-790764	Y-790765	Y-790767	Y-790769
1-2	H4	H4	H5	L6	L5	H6
1-3	301.2	95.69	8.82	21.6	135.45	12.07
1-4	7.1x5.0x5.7	4.7x3.8x3.2	2.4x1.8x1.1	2.9x2.2x1.9	5.5x4.5x2.6	2.4x1.7x1.5
1-5	91-1	91-1	51-1	51-1	81-1	51-1
1-6	no	no	no	yes, Y-790765	no	no
1-7	yes	no	no	no	yes	no
2-1	2	1	1	2	3	3
2-2	1	1	1	2	2	2
2-3	1	1	1	1	1	1
2-4	B	B	A	A	A/B	A
2-5	1	1	1	1	1	1
2-6	2	5	1	2	5	5
2-7	1	1	1	1	1	1
3-1	17.6	17.7	18.8	24.6	24.9	18.4
	16.1-18.9	16.9-18.4	11.7-23.3	23.3-26.4	23.4-25.6	17.0-19.4
3-2	15.7	15.5	17.1	20.6	20.6	16.2
	14.2-17.3	14.2-17.4	15.8-19.4	19.9-21.3	19.8-21.3	14.7-17.1
3-3						
		15.1	12			
4-1	1	1	1	1	1	1
4-2	5	5	5	5	5	5
4-3	1	1	2	2	2	1
5-1	1	1	2	3	3	3
5-2	4	4	5	6	5	6
6-1	3	2	3	4	3	2
6-2	1	1	3	4	2	1
6-3	1	1	1	3	1	1
6-4	2	1	2	3	2	1
7-1	1	1	1	2	1	1
8	1	1	1	1	1	1
9-1	2	1	2	3	1	1
9-2	3	2	3	3	3	1
9-3	B	B	B	B	B	B
10-1	2	1	3	2	2	
11-1	no	no	no			no

1-1	Y-790770	Y-790774	Y-790779	Y-790782	Y-790797	Y-790824
1-2	L3	L6	H4	LL	H4	H4
1-3	21.2	57.1	30.62	938.8	25.61	10.47
1-4	3.3x2.3x1.7	4.0x3.4x2.7	3.8x2.4x2.3	9.5x9.1x6.6	3.8x2.5x1.9	2.2x1.8x1.6
1-5	51-1	51-1	51-1	91-2	61-1	61-1
1-6	yes, Y-790770	yes, Y-790774	yes, Y-790779	yes, Y-790782	no	no
1-7	no	no	no	yes	no	no
2-1	3	3	3	4	3	3
2-2	3	3	3	4	3	3
2-3	1	1	1	1	1	1
2-4	B	B	B	B	A/B	A/B
2-5	3	1	1	3	1	1
2-6	5	5	2	2, 4, 5	2	2
2-7	1	1	1	1	1	1
3-1	24.8	24.1	17.9	29.2	18.2	18.3
	23.4-25.9	23.4-25.8	17.0-18.8	27.3-30.6	17.0-19.1	17.6-19.1
3-2	16.1	20	16.2	24.1	16.5	16
	6.5-24.8	19.5-21.0	13.6-24.9	23.5-25.0	15.3-19.7	15.3-17.0
3-3						
		10.5				
4-1	2	1	1	1	1	1
4-2	3	5	5	5	5	3
4-3	2	2	1	2	1	1
5-1	1	3	1	1	1	1
5-2	3	6	4	8	4	3
6-1	3	3	3	3	3	2
6-2	1	1	3	2	2	1
6-3	1	1	3	1	2	1
6-4	2	2	3	2	2	1
7-1	1	1	1	3	1	1
8	1	1	1	1	1	1
9-1	1	1	3	3	2	2
9-2	2	3	3	2	2	2
9-3	B	B	B	B	B	B
10-1	1	2	1	1	1	2
11-1	no	no	no		no	no

1-1	Y-790833	Y-790842	Y-790846	Y-790872	Y-790944	Y-790946
1-2	H4, 5	H4	H6	H4	H4	L6
1-3	6.27	7.32	6.27	3.8	12.08	250.7
1-4	2.5x1.7x1.0	2.2x2.1x1.0	2.0x1.7x1.1	2.0x1.5x0.6	2.8x2.2x1.2	12.7x10.3x10.5
1-5	61-1	61-1	61-1	61-1	61-1	61-2
1-6	no	no	no	no	no	yes, Y-790946
1-7	no	no	no	no	no	no
2-1	3	3	3	3	1	2
2-2	4	4	4	4	1	4
2-3	1	1	1	1	1	1
2-4	A/B	A/B	A/B	A/B	A	B
2-5	1	1	1	1	1	1
2-6	2	2	2	2	5	5
2-7	1	1	1	1	1	1
3-1	17.9	18.3	17.3	18.2	17.9	24.5
	17.2-18.6	17.2-19.1	16.3-18.3	17.5-18.9	17.4-19.5	23.9-25.5
3-2	15.7	16	15.6	16.2	15.6	20.2
	15.1-16.5	15.2-18.2	14.4-17.5	15.3-17.3	15.2-16.2	19.1-21.1
3-3						
4-1	1			1	1	1
4-2	5	1, 5	1, 5	5	5	5
4-3	1	1	1	1	1	2
5-1	2	1	3	1	1	3
5-2	5	4	6	4	4	6
6-1	3	3	4	3	2	3
6-2	2	1	4	2	1	4
6-3	1	1	4	2	1	2, 3
6-4	2	2	3	2	1	3
7-1	1	1	1, 2	1	1	1
8	1	1	1	1	1	1
9-1	2	2	2	2	2	2
9-2	2	2	2	3	3	2
9-3	B	B	B	B	B	B
10-1	1	1	2	1	2	1
11-1	no	no	no	no	no	no

1-1	Y-790952	Y-790957	Y-790960	Y-790962	Y-790963	Y-790965
1-2	H4	L5, 6	H7	H3, 4	H3, 4	L4
1-3	8.32	6715	20.82	0.92	40.32	78.75
1-4	2.2x2.1x1.1	23.8x20.3x11.7	2.6x2.5x1.8	1.1x1.0x0.5	3.5x3.0x2.4	4.7x4.0x2.5
1-5	61-1	83-1	61-1	61-1	61-1	81-1
1-6	yes, Y-790952	no	no	no	no	no
1-7	no	no	no	no	no	no
2-1	3	2	1	3	2	2
2-2	3	2	2	4	1	1
2-3	1	1	1	1	1	1
2-4	A/B	A/B	A/B	A	A	A
2-5	1	1	1	1	1	1
2-6	2	5	2	2	2	2
2-7	1	1	1	1	1	1
3-1	18.2	24.1	18.7	16.9	17.8	24.2
	16.7-22.9	22.9-25.2	18.2-19.3	9.3-22.6	17.1-18.4	20.1-26.6
3-2	15.9	20	16.2	15.7	15.5	20.9
	14.6-17.5	19.1-20.9	15.0-17.0	13.5-21.9	14.7-16.8	19.1-24.0
3-3						
			11.6			
4-1	1	1	1	1	1	1
4-2	5	5	5	3	3	5
4-3	1	2	1	1	1	2
5-1	1	3	3	1	1	1
5-2	4	6	7	3	3	4
6-1	3	4	2	3	2	3
6-2	1	1	3	1	1	1
6-3	1	1	1	2	1	2
6-4	2	3	2	2	1	2
7-1	1	1	1	1	1	1
8	1	1	1	1	1	1
9-1	2	1	2	2	2	2
9-2	3	2	2	3	3	3
9-3	B	A/B	B	B	B	B
10-1	2	1	2	1	2	2
11-1	no	no	no	no	no	no

1-1	Y-790969	Y-790971	Y-790972	Y-790975	Y-790980	Y-790981
1-2	L5	H5	H4, 5	LL6	H4	Ureilite
1-3	9.64	8.72	16.53	18.48	95.58	213.01
1-4	2.4x1.9x1.3	2.9x1.9x1.0	2.7x2.0x1.7	3.7x2.0x1.7	4.6x4.2x2.8	6.3x5.5x4.0
1-5	51-1	51-1	51-1	51-1	72-1	42-5
1-6	no	no	yes, Y-790973	no	yes, Y-790975	no
1-7	no	no	no	no	no	yes
2-1	2	3	3	3	2	2
2-2	2	1	2	3	2	2
2-3	1	1	1	1	1	1
2-4	A	A	A/B	A/B	A	A
2-5	1	1	1	2	1	1
2-6	5	5	5	5	2	1
2-7	1	1	1	1	1	1
3-1	24.8	19.1	18.7	30	18.5	
	24.1-26.1	17.8-21.5	18.0-19.4	29.3-31.4	16.9-22.8	5.3-21.6
3-2	20.4	16.6	16.4	24.6	15.8	
	19.1-21.8	14.6-19.3	15.4-17.2	23.2-27.0	14.8-18.8	10.7-16.7
3-3						
				8.6		
4-1	1	1	1	1	1	6
4-2	5	5	5	5	5	5
4-3	2	1	1	3	1	3
5-1	2	2	2	3	1	4
5-2	5	5	5	6	4	8
6-1	3	3	2	4	2	4
6-2	4	2	1	4	1	2
6-3	1	1	1	1	1	1
6-4	2	2	1	3	1	3
7-1	1	1		1	1	1
8	1	1		1	1	1
9-1	2	2	2	2	2	3
9-2	3	3	3	2	3	2
9-3	B	B	C	A/B	B	B
10-1	2	2	2	2	3	1
11-1	no	no	no	no	no	yes

1-1	Y-790982	Y-790983	Y-790985	Y-790987	Y-790990	Y-790991	Y-790992
1-2	LL6	L6	H4	H4	L5	Howardite	CO3
1-3	88.56	22.96	189.64	119.21	59.85	30.80	162.99
1-4	4.9x3.5x2.8	2.8x2.5x2.0	6.3x4.5x4.0	5.7x4.0x3.0	4.5x2.8x3.0	3.5x3.0x2.2	6.0x4.7x2.9
1-5	81-1	51-1	92-2	81-2	51-1	71-3	62-3
1-6	no	no	no	no	no	no	no
1-7	yes	no	yes	yes	no	yes	yes
2-1	2	3	3	3	3	3	3
2-2	2	2	1	2	2	2	4
2-3	1	1	1	1	1	1	1
2-4	A	B	A	A	A/B	A	A
2-5	1	1	1	1	1	3	1
2-6	5	5	2	2	5	5	1
2-7	1	1	1	1	1	3	1
3-1	30.8	24.5	17.7	18	24.6		
	29.7-33.1	22.9-25.5	16.8-18.8	16.5-20.9	23.9-26.9	28.3-45.7	0.1-68.3
3-2	24.8	20.7	15.6	16.7	20.5		
	24.0-25.7	20.1-23.8	14.8-16.4	13.0-26.3	19.9-21.2	21.5-58.3	0.5-14.7
3-3							
	9.9, 10.5						
4-1	1	1	1	1	1	6	3
4-2	5	5	5	5	5	5	2
4-3	3	2	1	1	2	5	2
5-1	3	3	1	1	2	4	1
5-2	6	6	4	4	5	8	3
6-1	3	3	2	2	3	5	2
6-2	2	4	1	2	1	5	1
6-3	1	3	1	1	1	5	1
6-4	2	3	1	1	2	4	1
7-1	1	1	1	1	1	4	1
8	1	1	1	1	1	1	2
9-1	2	2	2	2	1	1	1
9-2	2	3	3	3	3	2	2
9-3	A/B	B	B	B	B		A
10-1	3	1	2	2	1	1	1
11-1	no	no	no	no	no	yes	no

1-1	Y-790993	Y-790994	Y-790995	Y-790996	Y-790997	Y-790998	Y-790999
1-2	L6	L3	H4	H4	H5	H4	L6
1-3	81.56	49.45	4.32	78.68	177.93	18.15	154.34
1-4	3.6x3.8x3.2	3.6x2.9x2.5	1.6x1.4x1.2	4.0x3.9x2.9	5.9x4.9x4.3	2.8x2.3x1.5	6.2x4.5x3.3
1-5	81-1	51-1	51-1	81-2	74-1	51-1	81-1
1-6	no	no	no	no	no	no	no
1-7	no	no	no	no	yes	no	no
2-1	2	2	4	3	3	3	2
2-2	1	3	3	3	4	2	4
2-3	1	1	1	1	1	1	1
2-4	A	A	A	B/C	B/C	A	B/C
2-5	1	1	1	1	1	1	1
2-6	2	1	2	2	2	5	2
2-7	1	1	1	1	1	1	1
3-1	24.9	22.7	18.5	18.8	18.3	18.5	24.7
	24.0-26.8	13.7-23.9	17.6-19.3	17.8-20.8	17.5-19.4	17.8-19.3	23.0-25.4
3-2	20.5	15.6	16.1	15.9	16.1	16	20.2
	20.1-21.0	6.7-31.4	14.7-17.1	14.1-16.7	15.7-16.9	15.5-16.5	19.3-20.9
3-3							
	9.5, 10.9				11.2		
4-1	1	2	1	1	1	1	1
4-2	5	3	5	5	5	5	5
4-3	2	2	1	1	1	1	2
5-1	3	1	1	1	2	1	3
5-2	6	3	4	4	5	4	6
6-1	3	3	2	2	2	2	3
6-2	1	1	1	1	1	1	3
6-3	3	2	1	1	1	1	3
6-4	3	2	1	1	1	1	3
7-1	1	1	1	1	1	1	1
8	1	1	1	1	1	1	1
9-1	1	2	2	2	3	1	2
9-2	3	3	3	3	2	2	3
9-3	B	B	B	B	C	A	B
10-1	2	2	1	1	1	3	1
11-1	no	no	no	no	no	no	no

1-1	Y-791000
1-2	Diogenite
1-3	90.40
1-4	4.5x4.2x3.2
1-5	82-1
1-6	yes, Y-75032
1-7	yes
2-1	2
2-2	3
2-3	1
2-4	A
2-5	3
2-6	5
2-7	2
3-1	
3-2	
	29.8-34.0
3-3	
4-1	6
4-2	5
4-3	5
5-1	4
5-2	8
6-1	5
6-2	2
6-3	4
6-4	3
7-1	2
8	1
9-1	1
9-2	2
9-3	A
10-1	2
11-1	yes

Y-790006, 80-2: Eucrite

Angular, nearly complete with black shiny fusion crust. Several portions broken. Polymict eucrite. This PTS is a polymict HED breccia with lithic clasts and mineral fragments set in a more comminuted matrix. Lithic types include dark devitrified glass, with often phenocrysts of skeletal pyroxenes, fine grained variolitic clasts, and subophitic eucritic clasts with dark mesostasis-rich basalts. Mineral fragments include single pyroxene fragments, inverted pigeonite with coarse exsolution lamellae and Juvinas-type pyroxene with fine exsolution lamellae.

Y-790007, 91-2: Eucrite

A polymict HED breccia with several lithic clasts and mineral fragments set in a dark comminuted matrix. Lithic clast types include dark devitrified glass, eucritic clast with lath-shaped phenocrysts of pyroxene with variolitic matrix of plagioclase and pyroxene equigranular eucrites with dusty brownish pyroxene and plagioclase.

The PTS, 91-1 is different from the above PTS in that it has abundant fragments of inverted pigeonite with blebby exsolved augites like that of pyroxene cumulate eucrite Binda. Their host composition Ca3Mg64Fe33 is identical to those in Binda. In addition to many fragments of inverted pigeonite, there is a clast of this cumulate eucrite, in which an inverted pigeonite and a plagioclase are in direct contact, exhibiting a coarse-grained crystalline texture. The composition of the plagioclase is the most calcic (An94) among those found in polymict eucrites. Small fragments of pyroxene as Mg-rich as that in diogenites were rarely detected. Pigeonites with fine exsolution lamellae similar to those in ordinary eucrites (e.g. Juvinas) were occasionally found, but no clast of such rock has been detected. In spite of the predominance of the slowly-cooled eucrite components, this breccia contains rounded vitric clasts with radiating feathery phenocrysts. The largest vitric clast is 6mm in the longest dimension. A few basaltic clasts with an ophitic texture were found. Their pyroxenes show chemical zoning and their plagioclase is more Na-rich than the cumulate eucrite ones.

Y-790020, 80-2: Eucrite

Flat stone with one side preserving black shiny fusion crust. Two lithic clasts with ophitic textures 1cm in diameter are seen on the broken surface. Polymict eucrite.

A polymict HED breccia with abundant subophitic eucritic clasts including pyroxene with colorless core and brown rims and dark mesostatis. Mineral fragments are angular and are set in a more comminuted materials. Large pyroxene fragments include fragments with fine blebby augite. Binda-like inverted pigeonite, Moore County type pyroxene with coarse exsolution lamellae on (001) and Juvinas-type with fine exsolution lamellae.

The PTS, 80-1 is characterized by an occurence of a partly inverted pigeonite, 0.5mm in diameter, with coarse exsolution lamellae of augite Ca40Mg41Fe19 with (001) in common with the host pyroxene Ca3Mg59Fe38. It is similar to partly inverted pigeonite from Moore County. Small fragments of this type are also found in the matrix. Inverted pigeonites with blebby inclusions (Binda type) have not been detected in PTS, 80-1, but a lithic clast with pyroxene Ca2.8Mg63.7Fe33.5 and plagioclase An93.4 is present. The most Mg-rich pyroxene has a composition Ca4.2Mg70.0Fe25.8. Basaltic clasts with pyroxene showing chemical zoning are similar to those found in Y-75011 clast.

Y-790113, 82-2: Eucrite

Angular complete stone with black shiny fusion crust, some parts of which are broken. Polymict eucrite. A stained lithic crust 1x0.8mm in size is seen on a side face. A polymict HED breccia with subrounded clasts and fragments set in dark comminuted matrix. Eucritic clasts include a glassy clast with skeletal phenocrysts of pyroxene, very fine-grained eucrites and a part of coarse-grained eucrites. Dominant pyroxene fragments are fragments of coarse-grained basalts. Brownish pyroxene with very fine exsolution is present.

Y-790114, 81-1: Eucrite

Blocky small stone with scattered fusion crusts. This breccia is dominated by large fragments of single subophitic eucrites with dark mesostasis, but very small fragments of a dark vitric clast with pyroxene phenocrysts and pyroxene fragments of fine exsolution lamellae on (001) are also present. Large pyroxene phenocrysts in a clast have fractures filled with fayalite, and lath-shaped plagioclase in crystals contain thin core of pyroxene. These features are same as those of the pristine eucrites, Y-75011, 84.

Y-790118, 51-1: Diogenite

This diogenite shows the same granoblastic recrystallized fine grained texture as those of the Y-74013-type diogenite. The pyroxenes include fine dusty inclusions alligned along certain direction, but coarsely recrystallized vein-like area are devoide of dusty inclusions and contain large opaque crystals.

Y-790122, 80-1: Eucrite

Two sides of the meteorite are broken, and one side is covered with black fusion crust. It is a polymict eucrite with abundant crystalline clasts. Some basaltic clasts show laths of plagioclase and others are brown to dark brown coarse lithic clasts about 1cm in diameter.

The PTS, 80-1 consists of four different clasts ranging in size from 2mm to 4.5mm, with narrow veins of brecciated matrix between them. S: A medium-grained subophitic basalt with dark troilite-rich mesostasis contains chemically zoned pyroxenes; I: A very fine-grained subophitic to intersertal basalt with slightly zoned pigeonites (Ca12Mg38Fe50) and plagioclase (An89); E: A coarse-grained equigranular clast with slightly zoned pigeonites; A: An aphanitic clast includes subrounded fine-grained pyroxene Ca14Mg35Fe51 and plagioclase clasts (An89-An93) in a dark matrix. No inverted pigeonite from cumulate eucrites is found in the matrix. This polymict eucrite is a clast-rich type. The chemical compositions of pyroxenes in the matrix and the four different clasts are different.

Pyroxenes in clast E look like that of some eucrites, but they show slight compositional zoning and their bulk chemical composition is slightly Mg-rich than those in the ordinary eucrites.

Y-790260, 71-2

An oblong almost complete stone with considerable fusion crust covering most of the meteorite. Two sides have less fusion crust, where abundant lithic and mineral clasts can be seen. The textures of clasts range from fine-grained, variolitic to coarse-grained, ophitic to subophitic. The largest clast reaches 1.5cm in diameter. Mineral clasts include white angular plagioclases and honey brown pyroxenes.

Thin section Y-790260, 71-1 reveals a breccia with plagioclase and pyroxene fragments in a dark matrix which appears to be partly shock-recrystallized. Many pyroxene fragments do not show distinct outer shape and their rims merge into the matrix, making angular plagioclase fragments more prominent. One large plagioclase clast reaches 3mm in the longest dimension. Very large pyroxene fragments up to 5mm in diameter are common. They have uniform cores rich in Mg(Ca7Mg64Fe29) and dark brown rims (Ca9Mg45Fe46), and reveal many dark fractures filled with Fe-rich olivines (Fa66). These pyroxenes filled with olivine veins resemble those of the Y-75011, 84 clast. Pyroxene with exsolution textures are rare. One clast consists of fine-grained irregular aggregates of pyroxene rich in opaque inclusions and elongates patches of plagioclase, which do not show well-defined outer shape. One basaltic clast 1mm in diameter shows a subophitic texture and contains chemically zoned pyroxenes of the Pasamonte type.

Y-790266, 61-1: Eucrite

An angular stone covered with thin fusion crust, which is partly lost. The interior is difficult to see but it is rich in clasts. About half of this meteorite consists of a medium-

grained crystalline eucrite clast, but it is essentially polymict with a small amount of matrix, because some small clasts show coarse-grained texture and the others fine-grained ophitic texture. Mineral fragments are not abundant.

The thin section of matrix-rich portion (Y-790266, 92) shows a fine-grained breccia of angular fragments of pyroxene and plagioclase, in a matrix of comminuted pyroxene and plagioclase with accessary opaque minerals. However, some portions may be brecciated medium-grained basalt, which is the most common clast in this eucrite. Pyroxenes in strongly shocked areas show fine-grained granoblastic texture with elongated or deformed plagioclase. Vitric clasts with zoned pyroxene phenocrysts and dark aphanitic clasts are also present. The thin section of a medium-grained basalt (Y-61-2) with subophitic to intergranular texture consists of stubby plagioclase laths with intergranular pyroxenes. Microprobe analyses show pyroxene ranging in composition from core pigeonite Ca6Mg36Fe58 to rim augite Ca28Mg32Fe40 and plagioclase Ab15An84Or1 to Ab23An75Or2. A few large pyroxenes have a Mg-rich core Ca5Mg67Fe28 zoned toward Fe-rich pigeonite. Fragments of this type basalt are common in the brecciated matrix. PTS, 61-1 contains a Stannern-like clast and large dark brown pyroxenes.

Y-790447, 51-1: Eucrite

A small broken piece similar to polymict eucrite, but more fragmented. The bottom flat face seems to be abrased. Black fusion crusts are preserved on the top portion. Finer-grained lithic clasts with white laths of plagioclases and gray pyroxenes are abundant.

A eucritic breccia composed of nearly equigranular pyroxene crystals of dark brown rim and subrounded to short prismatic plagioclase crystals with dusty appearance, and a few opaque minerals. The boundaries between lithic clasts and mineral fragments are not easily recognized, as the pyroxene-rich matrices have dark colored sintered appearance and lack fine grained fragmental materials. In one area, dark yellowish brown pyroxene form continuous domains with a few scattered fragments of plagioclase. Some pyroxene crystals have light colored cores with brownish rims, as in the Y-790266 eucrite. In some areas, a basaltic crystalline texture is preserved, but in other areas such textures are disturbed and matrix looks like fine-grained compacted or sintered dark pyroxenes.

A large pyroxene crystal reaches up to 1mm in length, a light colored pyroxene fragment includes euhedral chromites. Pyroxenes with exsolution or dark striation also present. The chemical compositions of pyroxene include Mg-rich components up to Mg/(Mg+Fe)=97, but it is not clear whether they represent diogenitic components or survival of unhomogenized Mg-rich cores of zoned pyroxenes as in Y-790266. The plagioclase composition ranges from An77 to An95.

Y-790727, 52-2: Howardite

This specimen was originally listed as a polymict eucrite in the first catalog of the Yamato-79 collection (Kojima and Yanai, 1981), but greenish yellow pyroxenes exposed on the surface of the specimen were confirmed to be orthopyroxene of the howardite-type by single crystal X-ray diffraction. The bulk chemical compositions plot in the middle of the diogenite-eucrite trend in the Al2O3 vs. CaO diagram, and is close to that of cumulate eucrite, Binda.

This is an angular stone covered by black shiny fusion crust. Irregular deep pits are distributed unevenly, where a slightly stained gray matrix of fine mineral fragments can be seen. At the bottom of a large hole, a relatively coarse lithic clast is observed. Similar vugs have been described in Allan Hills collections.

The thin section is rich in mineral fragments and shows complex breccia of angular fragments, up to 1.7mm long, of orthopyroxene, inverted pigeonite, pigeonite, olivine, and plagioclase, with a few lithic clasts, set in a matrix of comminuted pyroxene, olivine and plagioclase. This texture and mineralogy are typical of howardites. Accessory chromite and ilmenite and trace amounts of troilite and nickel-iron are present. The lithic clasts are holocrystalline orthopyroxenite and pyroxene-plagioclase aggregates, and range in texture from dunite, coarse-grained orthopyroxenitic and gabbroic to fine-grained basaltic types. Dark aphanitic clasts are also present.

Microprobe analyses show a wide range in pyroxene composition. Pyroxenes similar in composition to those in diogenite and eucrites are common, but some pyroxene compositions extend beyond the most Mg-rich diogenite to nearly Ca1Mg81Fe17, and there are inverted pigeonites with Fe/(Mg+Fe) between 0.3 to 0.6. The olivine compositions range from Fa11 to Fa29. Plagioclase ranges from An94 to An 82 and averages An88. The presence of orthopyroxene has been confirmed by the single crystal X-ray diffraction. The largest clast in the thin section, 1.7x1.4mm in size, shows a fine-grained granoblastic texture of orthopyroxene and includes minor fine chromite grains. The texture is similar to some portions of the Y-74013-type diogenites with granoblastic texture. Another recrystallized orthopyroxenite clast 0.8x0.7mm in size, contains very fine rectangular to lath shaped crystals, but there remains in one area, an unrecrystallized coarse orthopyroxene crystal. No olivine was present. The fine texture suggests a part of orthopyroxene was molten and cooled rapidly to produce the fine-grained texture. More Mg-rich compositions of the melted portion are in agreement with this interpretation.

A basaltic clast 0.53x0.36mm in size consists of slightly radiating subparallel laths of alternating pigeonite and plagioclase. The pyroxenes with the eucritic composition show augite exsolution with (001) in common with the host.

Y-790981: Ureilite

About 1/8 fragment bound by three intersecting flat fractured faces and one round face with partly weathered black crust, which shows polygonal fractures characteristic of ureilites. Round dark crystals with relatively coarse-grained size can be seen on the fractured surface with some spaces between the crystals. White needle crystals are found in the cavities of the surface. Y-790981, 42-5 is predominantly composed of anhedral to euhedral olivine (87%) and pigeonite (8%) with dark carbonaceous (C) matrix (5%) at the grain boundaries. The olivine crystals display fracturing and undulatory extinction and subgrain boundaries. Average olivine core composition is Fa21, and in contact with C matrix the composition is enriched in Mg by reduction, and sometimes a Fe-free pigeonite is produced at the rim. The pigeonites have some tiny inclusions. The pigeonite composition Ca8Mg74Fe18 is similar to those of Y-74123 and is rich in Al2O3 (1.1 wt%) and Cr2O3 (1.1 wt%). In some crystals there are inclusions of diopside Ca37Mg58Fe5, more Mg-rich than that expected from the coexisting pair. The most notable texture of the pigeonite is dusty dark appearance.

Y-790991, 71-3: Howardite

This is a polymict HED breccia rich in angular pyroxene fragments, including diogenitic pyroxenes, a partly inverted pigeonite with coarse exsolution lamellae as in Moore County, attached by small plagioclase, set in a more communited matrix. Fragments of lava-like eucrite are rare.

Y-791000, 82-1: Diogenite

Large fragments of pyroxene, often partly including dark glassy appearance are set in glassy matrix with more comminuted pyroxene fragments. Some pyroxenes include fine lamellae, or blebby augites. Small rounded fragments of plagioclase are rarely found in the glassy matrix. This specimen is texturally very similar to Y-75032. Large coase-crystalline clasts and comminuted pyroxene fragments are set in a very dark brown glassy matrix with an aluminous pigeonite composition. The alumina contents range from 4-8 wt%. The amount of glass varies from one place to the other, and the normative plagioclase in the glass is 19%. The pyroxene texture and chemistry are the same as those of Y-75032. Orthopyroxene with high-Ca bulk composition and abundant oriented blebby inclusions of augite may have originally been law-Ca pigeonite, but other grains with fine regular lamellae of augite are probably primary orthopyroxene.

Plagioclase and chromite grains are present in both the clasts and matrix. Although inverted pigeonite is present, this specimen is on the diogenite side of the continuum between diogenite and cumulate eucrite. The modal abundance of plagioclase is less than 3%. Because there is 3% plagioclase in Rhoda and more in diogenites containing basalt clasts, this specimen may be regarded as a special diogenite. A pyroxene clast,

2.3x2.0mm in size contains a few grains of pyroxene (bulk composition Ca5Mg64Fe31) with blebby augite inclusions in a few areas and angular interstitial plagioclase with An contents (avg 90) from 87 to 92. This clast is similar to that in Y-75032. Another pyroxene clast, 1.8mm in diameter, consists of two pyroxene grains with scattered augite blebs and fine regular augite lamellae with (100) in common. The fine augite lamellae nucleated on the blebs. Plagioclase is not found in some pyroxene clasts.