Star System Generator

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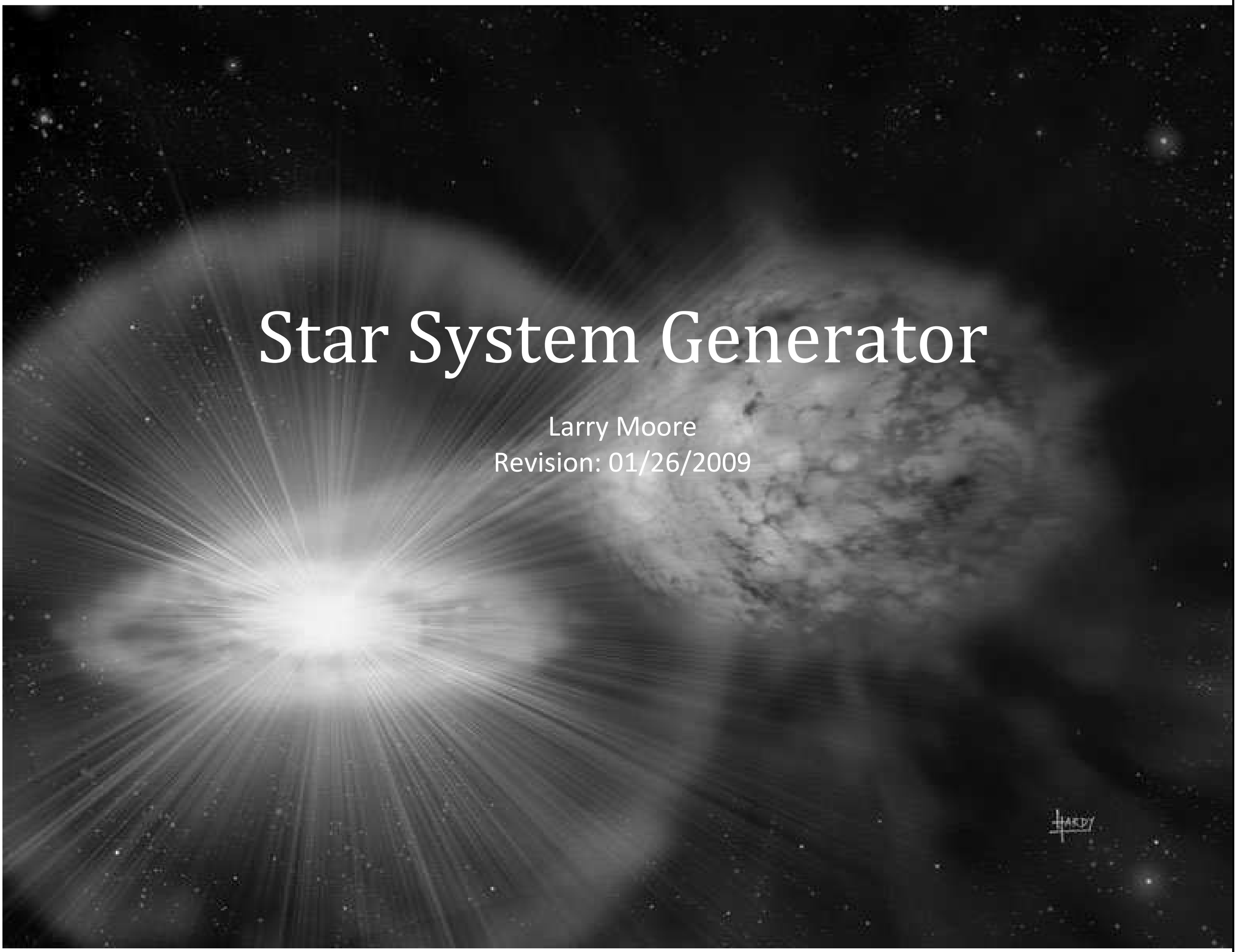


Artwork: David A. Hardy

1: Introduction

This system is based on current astronomical knowledge and leans towards more randomness in a campaign setting. This author believes that we are unique in the universe and it's highly unlikely a star system would contain the astronomical thresholds to sustain complex life; therefore you will find several deviations from known science in many areas. It's science fiction after all. Enjoy and have fun playing with friends and family.

1.1: Overview

Generating a system is basically rolling on a series of tables and recording the results. If you need a single planet for your campaign you do not need to start 'at the top' of the tables and roll your way down. Simply pick the section of this document that relates to the planet or feature you desire. Don't be a slave to the dice!

I have broken the sections down as follows;

- 2) Number and Type of stars
- 3) Number of Zones and Distance of each Zone
- 4) Astronomical Objects in each Zone (planet, asteroid belt, etc…)
- 5) Common Planetary Tables
  - Mass, Diameter, Gravity, Moons, Rings and Features
- 6)Habitable Planet Tables
  - Length of day, Land/Water percentages, Atmospheric conditions, Radiation levels and Climate
- 7)Example star system
- Star System Record Sheet (Separate print out)

2: Stars

The following tables cover the *number of stars* in a system and the *type of each star*.

2.1: Number of stars table

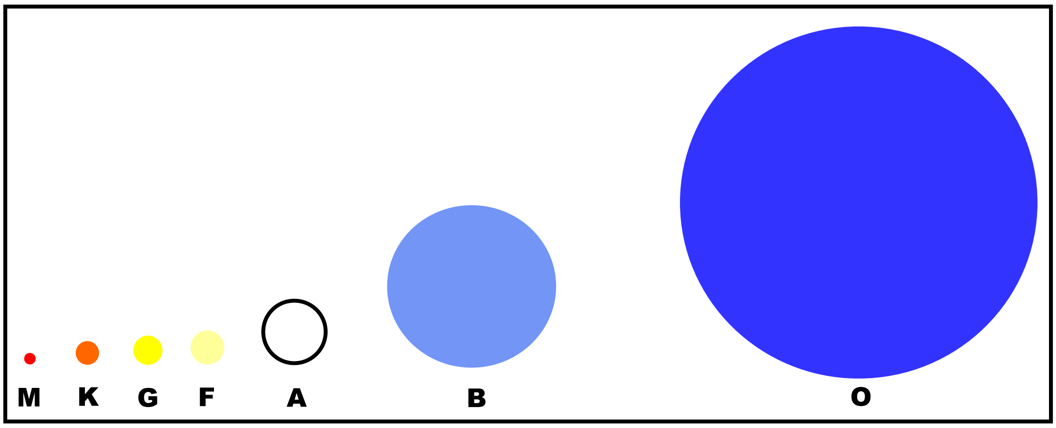
d100	Number of stars
01-62	Single
63-91	Double
92-97	Triple
98-99	Quadruple
100	1d5+4 Stars

For each star roll d100 and consult the table below.

2.2: Stellar classification table

d100	Star type	Color	Number of Zones Die Code	Habitable Zone Number
01-05	0	Blue	1d10+6	11
06-13	B	Blue-white	1d10+4	9
14-25	A	White	1d10+2	7
26-45	F	Yellowish-white	1d10+2	5
46-70	G	Yellow	1d10+2	3
71-90	K	Orange	1d5+2	2
91-00	M	Red	1d5	1

2.3: Star color and relative size chart



3: Zones

3.1: Number of zones

Next we need to determine how many orbital zones are in the star system. Roll the die code determined in table 2.2.

> *For instance, if you rolled 22 and got an A star, you would roll 1d10+2 for the number of zones in this star system.*

3.2: Zone Distance

Next we determine the distance each zone is from the home star. The table below lists the zone range, chose a value between the ranges. This is the zones distance in AUs. If you roll up binary planet, they can follow the same orbit or each can have a separate orbit. As long as they are in the zone range given in the table.

How to read the Zone Distance Table.

- **Numbers** represent the distance from the star (in AU) the orbital zone resides.
- **Red** represents zones whose worlds tend to be infernos.
- **Orange** represents zones whose worlds tend to be quite hot.
- **Green** represents a habitable zone. If a terrestrial world (or a large enough moon to a Jovian) exists here with the right conditions, it can be habitable.
- **Light blue** represents zones that have a tendency - due to distance from the star - to have cold worlds.
- **Dark blue** represents zones that have a tendency for very cold worlds/ice rocks.
- The zone colors have the following terms (Near, Inner, Habitable, Outer and far);
  Red = Near
  Orange = Inner
  Green = Habitable
  Light Blue = Outer
  Dark Blue = Far

3.3: Zone Distance Table (in AU)

Zone#	O	B	A	F	G	K	M
1	20.0 - 29.9	10.0 - 14.9	0.7 - 1.3	0.2 - 0.3	0.4 - 0.5	0.2 - 0.3	0.2 - 0.3
2	30.0 - 44.9	15.0 - 22.4	1.4 - 2.7	0.4 - 0.5	0.6 - 0.8	0.4 - 0.7	0.4 - 0.7
3	45.0 - 67.4	22.5 - 33.7	2.8 - 5.5	0.6 - 1.0	0.9 - 1.3	0.8 - 1.5	0.8 - 1.5
4	67.5 - 101.2	33.8 - 50.5	5.6 - 11.1	1.1 - 1.8	1.4 - 1.9	1.6 - 3.1	1.6 - 3.1
5	101.3 - 151.8	50.6 - 75.8	11.2 - 22.3	1.9 - 3.2	2.0 - 2.9	3.2 - 6.3	3.2 - 6.3
6	151.9 - 227.7	75.9 - 113.8	22.4 - 44.7	3.3 - 5.6	3.0 - 4.5	6.4 - 12.7	
7	227.8 - 341.6	113.9 - 170.8	44.8 - 89.5	5.7 - 10.0	4.6 - 6.7	12.8 - 25.5	
8	341.7 - 512.5	170.9 - 256.2	89.6 - 179.1	10.1 - 17.5	6.8 - 10.2		
9	512.6 - 768.8	256.3 - 384.3	179.2 - 358.3	17.6 - 30.7	10.3 - 15.3		
10	768.9 - 1,153.2	384.4 - 576.6	358.4 - 716.7	30.8 - 53.8	15.4 - 23.0		
11	1,153.3 - 1,729.9	576.7 - 864.9	716.8 - 1,433.5	53.9 - 94.2	23.1 - 34.5		
12	1,730.0 - 2,594.8	865.0 - 1,297.4	1,433.6 - 2,867.1	94.3 - 164.9	34.6 - 51.8		
13	2,594.9 - 3,892.3	1,297.5 - 1,946.1					
14	3,892.4 - 5,838.5	1,946.2 - 2,919.2					
15	5,838.6 - 8,757.8						
16	8,757.9 - 13,136.7						

* Colors indicate the distances of Near, Inner, Habitable, Outer and Far.

4: Astronomical Objects

Now that we have zones, let's fill them. Zones can be filled with dwarf, terrestrial, habitable, Jovian planets or asteroid belts.

4.1: Astronomical Object Table

d100	Astronomical Object
01-12	Empty
13-24	Asteroid Belt
25-42	Dwarf
43-70	Terrestrial (If in Habitable zone, planet may be habitable.)
71-94	Jovian (Roll d10, even = Ice, odd = Gas)
95-00	Binary planet, co-populated: Roll twice

* Jovian planets that are located in zone one are always gas. They are sometimes referred to as "Hot Jovian" due to the temperature from the home star.

4.2: Asteroid Belt Tables

D10	Size
1-2	Tiny
3-4	Small
5-6	Medium
7-8	Large
9-0	Huge

D10	Population Density
1-2	Sparse
3-4	Light
5-6	Moderate
7-8	Dense
9-0	Very Dense

* This table is optional and is used to determine the size and population density of an asteroid belt.

5: Common Planetary Tables

Before the four races encountered each other they used their home planet as the stick by which to measure their own solar system. As the races encountered one another, each had a unique and distinct world, they needed a standard. Thus the planetary galactic standard was born and is noted as "Galactic Standard".

1.0 Galactic Standard **AU** = 150,000,000 km

1.0 Galactic Standard **Mass** = 5.9E+24 kg

1.0 Galactic Standard **Diameter** = 12,467 km

1.0 Galactic Standard **Gravity** = 9.8m/s^2 (Escape velocity (km/s) = 11.186)

1.0 Galactic Standard **Year =** 365.25 Galactic Standard days

1.0 Galactic Standard **Day** = 24 Galactic Standard hours

1.0 Galactic Standard **Hour** = 60 Galactic Standard minutes

1.0 Galactic Standard **Minute** = 60 Galactic Standard seconds

1.0 Galactic Standard **Radiation Exposure** = 2.4 millisievert (mSv) per year.

1.0 Galactic Standard **Atmospheric Pressure** = 1.033 kg/m^3

At this point it's time to define mass, diameter, and gravity to length of day, atmospheric conditions and so forth for each planet. Referee's can define statistics on the following tables for each planet or define only the ones that are important to the campaign, (they can always be defined later if needed). Note that we have provided a list of pre-rolled planets in section **5.2**.

5.1: Mass, Diameter and Gravity Table

In FrontierSpace(TM) there are 4 categories of planets. Dwarf, Jovian, Terrestrial and Habitable. Jovian's are further broken down into Ice Jovians and Gas Jovians. Each planet has the following common characteristics; Mass, Diameter and Gravity. Now that you have filled in each zone use the table below for each type of astronomical object.

Type		Mass, Diameter and Gravity*
Jovian, Ice	Gravity	d100 x 0.05
	Diameter	(1d10+12) /4
	Mass	Gravity * Diameter * Diameter
	Moons	Moon Table
Jovian, Gas	Gravity	d100 x 0.05
	Diameter	(1d10+15) / 2
	Mass	Gravity * Diameter * Diameter
	Moons	Moon Table
Dwarf	Gravity	d100 / 30
	Diameter	6d10 x 0.01
	Mass	Gravity * Diameter * Diameter
	Moons	Moon Table
Terrestrial	Gravity	(2d10+2) / 10
	Diameter	(1d100+40) / 70
	Mass	Gravity * Diameter * Diameter
	Moons	Moon Table
		* If habitable Gravity = .7 to .1.5

** All ratings are in Galactic Standard Masses / Diameters / Gravities.*

*** Optional Gas Giant Resources and Precious Resources tables are located below.*

- **Jovian** planets are large planets that are not primarily composed of silicates or other solid matter and lack a clearly defined surface. They are subdivided into two categories, gas giants and ice giants. Gas giants are primarily composed of hydrogen and helium while ice giants are mostly composed of water, ammonia and methane.

- **Dwarf** planets are typically smaller than terrestrial planets, do not have secondary atmospheres and have not cleared their orbital path of all other bodies. Sometimes, dwarf planets can be found as moons orbiting larger planets (especially large gas giants) and in these cases, if conditions are right, may be habitable.

- **Terrestrial** planets have roughly the same structure: a central metallic core (mostly iron) with a surrounding silicate mantle. These planets have canyons, craters, mountains and volcanoes. Terrestrial planets possess secondary atmospheres unlike Jovian (gas giants) which possess primary atmospheres. Terrestrial planets are also called “rocky planets”.

5.2: Pre-Defined Planets

Note that some values are not expressed in the tables because they are dependant on the orbital zone. Radiation, Temperature, and Length of Year will need to be determined separately if that is important to your planet. Also be aware that depending on where the planet lies in the zones; land, water and ice percentages may not apply. For instance planets in the Near or Inner zones would have their water and ice burned off due to heat from the star. Planets in the Outer and Far zones would have mostly ice if water was present.

Dwarf

d10	Gravity	Diameter	Mass	#Moons	Day	Land	Ice	Liquid	Pressure	Toxicity	Axial Tilt
1	1.3	0.43	0.24	--	20hrs	60%	11%	29%	Very Thin	Trace Toxins	0 deg
2	0.3	0.39	0.04	--	18hrs	32%	15%	53%	Very Thin	Moderately Toxic	1 deg
3	1.0	0.33	0.11	--	21hrs	68%	19%	13%	Thin	Trace Toxins	25 deg
4	1.9	0.35	0.23	--	644hrs	20%	13%	67%	Thin	Trace Toxins	1 deg
5	0.9	0.42	0.15	--	22hrs	48%	10%	42%	Very Thin	Non-toxic	38 deg
6	1.1	0.27	0.08	4	96hrs	28%	12%	60%	Very Thin	Trace Toxins	27 deg
7	0.3	0.24	0.01	--	27hrs	72%	17%	11%	Very Thin	Trace Toxins	45 deg
8	0.2	0.35	0.03	1	26hrs	72%	15%	13%	Very Thin	Lethally Toxic	41 deg
9	1.7	0.32	0.17	--	16hrs	80%	8%	12%	Very Thin	Non-toxic	9 deg
10	0.3	0.48	0.07	--	12hrs	60%	19%	21%	Very Thin	Trace Toxins	9 deg

Terrestrial

d10	Gravity	Diameter	Mass	#Moons	Day	Land	Ice	Liquid	Pressure	Toxicity	Axial Tilt
1	1.8	0.87	1.37	1	729hrs	80%	12%	8%	Dense	Trace Toxins	25 deg
2	1.4	0.91	1.17	1	396hrs	40%	11%	49%	Dense	Trace Toxins	37 deg
3	0.8	0.73	0.42	1	11hrs	75%	12%	13%	Very Thin	Severely Toxic	40 deg
4	0.5	1.66	1.37	1	430hrs	20%	16%	64%	Moderate	Lethally Toxic	13 deg
5	1.7	0.80	1.09	--	19hrs	15%	6%	79%	Moderate	Trace Toxins	32 deg
6	0.6	0.80	0.38	1	5.5hrs	55%	8%	37%	Thin	Non-toxic	45 deg
7	1.7	0.59	0.58	--	23hrs	15%	5%	80%	Thin	Non-toxic	25 deg
8	1.3	1.49	2.87	--	24hrs	60%	5%	35%	Very Dense	Severely Toxic	11 deg
9	1.0	2.00	4.00	--	248hrs	45%	19%	36%	Dense	Lethally Toxic	27 deg
10	1.0	0.73	0.53	2	32hrs	45%	4%	51%	Thin	Trace Toxins	19 deg

Jovian, Ice

d10	Gravity	Diameter	Mass	#Moons	Day	Land	Ice	Liquid	Pressure	Toxicity	Axial Tilt
1	2.35	4.25	42.45	52	43hrs	%	%	%	Dense	Severely Toxic	0 deg
2	5	5.5	151.25	62	10hrs	%	%	%	Dense	Lethally Toxic	22 deg
3	1.05	3.75	14.77	0	15hrs	%	%	%	Very Dense	Severely Toxic	12 deg

4	2.25	3.25	23.77	16	55hrs	%	%	%	Very Dense	Lethally Toxic	40 deg
5	3.2	5.25	88.2	48	26hrs	%	%	%	Dense	Severely Toxic	11 deg
6	0.9	3.25	9.51	6	30hrs	%	%	%	Very Dense	Lethally Toxic	25 deg
7	1.65	4.25	28.80	24	10hrs	%	%	%	Very Dense	Severely Toxic	35 deg
8	3.8	5	95	64	288hrs	%	%	%	Very Dense	Severely Toxic	15 deg
9	2.2	4.75	49.64	54	37hrs	%	%	%	Dense	Lethally Toxic	17 deg
10	1.4	3.5	17.15	18	200hrs	%	%	%	Very Dense	Severely Toxic	27 deg

Jovian, Gas

d10	Gravity	Diameter	Mass	#Moons	Day	Land	Ice	Liquid	Pressure	Toxicity	Axial Tilt
1	2.95	12.5	460.94	44	29hrs	%	%	%	Very Dense	Severely Toxic	30 deg
2	1.1	9.5	99.28	70	23hrs	%	%	%	Dense	Lethally Toxic	0 deg
3	1.8	11	217.8	40	32hrs	%	%	%	Very Dense	Severely Toxic	29 deg
4	3.85	8	246.4	48	15hrs	%	%	%	Very Dense	Severely Toxic	17 deg
5	2.1	9.5	189.53	38	370hrs	%	%	%	Dense	Severely Toxic	31 deg
6	4.55	12.5	710.94	24	434hrs	%	%	%	Very Dense	Severely Toxic	25 deg
7	3.1	9	251.1	64	54hrs	%	%	%	Very Dense	Severely Toxic	3 deg
8	2.1	10.5	231.53	42	29hrs	%	%	%	Dense	Severely Toxic	26 deg
9	.65	11	78.65	24	8hrs	%	%	%	Very Dense	Severely Toxic	13 deg
10	2.65	10	265	38	190hrs	%	%	%	Very Dense	Severely Toxic	10 deg

5.3: Moon, Rings and Features

Once the mass has been determined consult the following table to determine the moons, rings and features orbiting the planet.

5.3.1: Moon Table

Mass	d10	Result
0-2	01-05	No moon
	06-08	A single moon
	09	1d5 moons
	10	1d5 moons + Feature Table
2.1-14.99	01-02	No moon or ring
	03-05	1d5 moons
	06-07	1d5 +1 moons + 20% chance of a ring
	08-09	1d5 moons + Feature Table
	10	1d10 moons + Feature Table
15-25	01-02	1d10 x 2 moons
	03-06	2d10 x 2 moons + 30% of a ring of 1d5 rings
	07-09	2d10 x 3 moons + Feature Table
	10	3d10 x 2 moons + 30% 1d5 rings + Feature Table
26-130	01-05	4d10 x 2 moons + 30% chance of 1d5 rings
	06-09	5d10 x 2 moons + 1d10 rings
	10	Feature Table + 4d10 x 2 Moon + 1d10 Ring

130+	01-05	4d10 x 2 moons + 1d10 rings
	06-09	Feature Table + 4d10 x 2 Moon + 1d10 Ring
	10	5d10 x 2 moons + 1d10 rings

5.3.2: Habitable Moons

Some moons are large enough to be considered a minor planet and may in fact sustain life. Use the Dwarf table (5.1) to determine mass, diameter, and gravity. If conditions are sufficient (and the planet this moon orbits is in its star's habitable zone) then this moon may support life.

5.3.3: Feature Table

d100	Result	Description
01-10	Alien deep-space life form	Some unknown creature, able to life in deep-space without the need for life-support is found.
11-20	Ancient Ruins	Ruins and remnants of ancient civilization that predates current cultures by (roll 1d100x100) years. Roll d10: 01-04 on planet, 05-09 on moon, 10 both
21-30	Alien artifact	An alien device floats in space. Possibilities are mines, ships, hulks, probe, etc...
31-40	Doomsday planet	A large comet or rogue world passes by every (1d100x10) years. It is calculated that in (1d100x100) years, it will collide with the either the planet or its moon, either of which is disastrous for this world.
41-50	Roll twice more	
51-60	Artificial moon	The moon has been drastically altered or manufactured by unknown beings. There is a 10% chance this is a Dyson moon.
61-70	Ringed Moon	The moon collided with a large meteor several thousand years ago. The debris from it has been caught by the mass of the moon and looks like a ring when viewed from the planet's surface. The debris has value (roll on the mineral resource table).
71-80	Derelict ship	A spacecraft in deep space. Possibilities include a ship abandoned after a pirate attack, a lost STL (slow than light) ship configured as a colony, research or probe.
81-90	Electromagnetic atmospheric conditions	The planet has atmospheric reactions to the presence of one or more of its moons. As the moon streaks across the sky, the atmosphere produces aurora borealis-like light shows.
91-00	Glowing Moon	Natural photoluminescent aluminate minerals are present on one of this world's moon's surfaces. It glows in the dark rather than just reflecting light, never letting the world see complete darkness.

** The following tables are optional and are used to determine if anything of value is located on gas and terrestrial planets.

5.3.4: Gas Giant Resource Table (optional)

If mining gas giants is important to your campaign this table is for you.

d10	Main Gas	%	Trace Gas
1	Hydrogen, Helium	90/10	Water, Methane, Ammonia
2	Hydrogen	99	Helium, Water, Methane, Ammonia
3	Carbon dioxide, Hydrogen, Helium	20/60/20	Ammonia, Fluorine, Argon
4	Hydrogen, Methane	90/10	Hydrogen deuteride
5	Complete Mix	--	--
6	Fluorine, Methane, Ammonia	33/33/33	Water, Ethane
7	Hydrogen, Helium	10/90	Water, Ammonia
8	Neon/Argon	25/75	Water, Methane, Ethane, Ammonia, Fluorine
9	Hydrogen, Helium	80/20	Water, Methane, Ammonia
10	Water, Ammonia, Methane	30/30/40	Hydrogen

5.3.5: Terrestrial Precious Resource Table (optional)

d10	Type
1	Metal Ore (low grade)
2	Precious Metal(s)
3	Radioactive Ore
4	Metal ore (high grade)
5	Precious Gem(s)
6	Silicates (no mineral value)
7	Raw crystals
8	Minerals (high grade)
9	Metal Ore (low grade)
10	Roll twice more

* A Referee can roll d1000 to determine the quantity.

1,000 kilograms = 1 ton = 2000 lbs

6: Planetary Features

Use this set of tables to determine very specific information about a planet. Mostly for Terrestrial worlds, this process can be used to determine facts about Dwarf planets and moons of Jovians too.

Terrestrial planets have a central metallic core (mostly iron) with a surrounding silicate mantle. These planets have canyons, craters, mountains and volcanoes. If a terrestrial planet is in the habitable zone of a star system there is a chance that it can support life. Note that if your goal is a habitable planet use values in the tables below that will support life.

6.1 Length of Day

The length of day is often confused with "rotation period" (the time it takes a planet to complete one revolution around its axis of rotations relative to the background stars). Length of day refers to the average time (in Galactic Standard Hours) for the planet's star to move from the noon position in the sky at a point on the equator back to the same position. To determine this value, roll on the following table (then roll for the number of hours in the day):

1d10	Result	Galactic Standard Hours
1	Very fast length of day	2d10/2 hours
2-3	Fast length of day	2d10 hours
4-7	Moderate length of day	4d10+2 hours
8-9	Slow length of day	1d100x1d10 hours
10	Very slow length of day	1d100x1d100 hours

6.2 Land Mass Percentages

Each planet has a different biosphere that is a result of the percentages of land, water and ice. Use the following formulas to determine each value. Don't be a slave to the dice, feel free to mix and match as you see fit.

Percentage of Liquid = 2d10 x 5 (could be water, or other liquids)
Percentage of Ice = 2d10 (frozen water or other frozen liquids)
Percentage of Land = Remainder of Water and Ice

6.3 Atmosphere Conditions

This section covers a planet atmosphere conditions and is broken down info Pressure, Radiation, Toxicity, Average Surface Temperature and Climate Range. Go through each of these steps, in order shown, to determine each effect.

6.3.1: Atmospheric Pressure

This is the force exerted against a surface by the weight of the atmosphere. Thin atmospheres are barely noticeable while dense atmospheres require special equipment to withstand the pressure. Think of it as diving deep into the water, the further you go the more pressure you feel on your skin. Atmospheric pressure is determined by a planet's Mass and by some randomization:

Mass	1-2	3-8	9-0
Less than 0.3	Very Thin	Very Thin	Thin
.3 to .75	Very Thin	Thin	Moderate
.76 to 1.25	Thin	Moderate	Dense
1.26 to 10	Moderate	Dense	Very Dense

Higher than 10	Dense	Very Dense	Very Dense

- **Very Thin**
  Anyone exposed to these types atmospheres will find it very difficult to breath and must wear vacsuits or spacesuits with an oxygen supply. Atmospheric pressure is from negligible/vacuum up to .2 Galactic Standard Pressures.
  - Use (1d100 * 0.02).
  - If a character finds himself in this environment without a vacsuit or spacesuit to equalize pressure, he'll suffer from Major Environmental Extremes (that is, 1d5 damage per minute and hourly rate of travel divided by two).
  - If the pressure is .05 or less, consider exposure to be Lethal Environmental Extremes (that is, 1d5 damage per turn, and must make an END check each turn or fall unconscious).
  - Life cannot exist in planets with Very Thin atmospheric pressure.
- **Thin**
  Breathing is difficult but not impossible. Characters will have a difficult time maintaining any extracurricular activity for more than a few minutes. Atmospheric pressure is between 0.3 and 0.5 Galactic Standard Pressure.
  - Use (1d10/50+0.3).
  - If a character finds himself in the thin environment without breathing assistance, he suffers from Mild Environmental Extremes (that is, -10 to all actions and hourly rate of travel divided by two).
  - If pressure is below 0.35 times the Galactic Standard Pressure, characters would suffer from Moderate Environmental Extremes (that is, 1d5 damage per hour of exposure and hourly rate of travel divided by two).
  - Life can exist on worlds with thin atmospheric pressure.
- **Moderate**
  Standard atmospheres that do not require any special gear to breath. Atmospheric pressure is between 0.6 and 1.5 Galactic Standard Pressure.
  - Use (1d10+5)/10.
  - Life can exist on worlds with Moderate atmospheric pressure.
- **Dense**
  Breathing is difficult but not impossible. Characters will have a difficult time maintaining any extracurricular activity for more than a few minutes. Atmospheric pressure is between 1.6 and 16 times the Galactic Standard Pressure.
  - Use (1d100 x .16).

    - If a character finds himself in the dense environment without breathing assistance, he suffers from Mild Environmental Extremes (that is, -10 to all actions and hourly rate of travel divided by two).
    - If pressure is above 12 times the Galactic Standard Pressure, characters would suffer from Moderate Environmental Extremes (that is, 1d5 damage per hour of exposure and hourly rate of travel divided by two).
    - Life can exist on worlds with Dense atmospheric pressure.
- **Very Dense**
  Anyone exposed to these types atmospheres will find it very difficult to breath and must wear vacsuits or spacesuits with an oxygen supply. Atmospheric pressure is between 16 and 160 times the Galactic Standard Pressure.
    - Use (1d100 x 16).
    - If a character finds himself in this environment without a vacsuit or spacesuit to equalize pressure, he'll suffer from Major Environmental Extremes (that is, 1d5 damage per minute and hourly rate of travel divided by two).
    - If the pressure is 100 or more, consider exposure to be Lethal Environmental Extremes (that is, 1d5 damage per turn, and must make an END check each turn or fall unconscious).
    - Life cannot exist in planets with Very Dense atmospheric pressure.

Pressure	Vacsuit Required?	Galactic Standard Pressure	Effect
Very Thin	Yes	1d100 x 0.02	**Major**: 1d5 damage per minute. Hourly Travel Rate/2 **Lethal**: (Pressure is 0.05 or less): 1d5 damage per turn, and must make an END check each turn or fall unconscious.
Thin	n/a	(1d10/50)+0.3	**Mild**: -10 to all actions. Hourly Travel Rate/2 **Moderate**: (Pressure is below 0.35): 1d5 damage per hour. Hourly Travel Rate/2
Moderate	n/a	(1d10+5)/10	n/a
Dense	n/a	1d100 x .16	**Mild**: -10 to all actions. Hourly Travel Rate/2 **Moderate**: (Pressure is more than 12): 1d5 damage per hour. Hourly Travel Rate/2
Very Dense	Yes	1d100x6	**Major**: 1d5 damage per minute. Hourly Travel Rate/2 **Lethal**: (Pressure is more than 100): 1d5 damage per turn, and make an END check each turn or fall unconscious.

6.3.2: Atmospheric Radiation Levels

Radiation can be deadly to complex and simple life forms alike, but most life can tolerate some amount of it.

Proximity to the planet's star determines base radiation exposure, but the planet can vary this dramatically (the planet's core can generate radiation, while its atmospheric density – if it contains enough water – might act to reduce radiation exposure on the planet's surface).

To determine radiation level, start with the planet's proximity to the star (use the colored proximity results from the zone distance table). Use the Percentage of Liquid (derived from Step 6.2) to cross reference against the atmospheric pressure column determined from step 6.3.1.

6.3.2.1: Base Radiation Table

Proximity	Percentage of Liquid	Very Thin Atmospheric Pressure	Thin Atmospheric Pressure	Moderate Atmospheric Pressure	Dense Atmospheric Pressure	Very Dense Atmospheric Pressure
Near	01-25	Lethal	Lethal	Lethal	Major	Moderate
	26-75	Lethal	Lethal	Major	Moderate	Mild
	76-00	Lethal	Major	Moderate	Mild	Low
Inner	01-25	Lethal	Lethal	Major	Moderate	Mild
	26-75	Lethal	Major	Moderate	Mild	Low
	76-00	Major	Moderate	Mild	Low	Low
Habitable	01-25	Lethal	Major	Moderate	Mild	Mild
	26-75	Major	Moderate	Mild	Low	Low
	76-00	Moderate	Mild	Low	Low	Low
Outer	01-25	Major	Moderate	Mild	Mild	Mild
	26-75	Moderate	Mild	Low	Low	Low
	76-00	Mild	Low	Low	Low	Low
Far	01-25	Moderate	Mild	Moderate	Low	Low
	26-75	Mild	Low	Low	Low	Low
	76-00	Low	Low	Low	Low	Low

Now that you have a base radiation level determined by proximity to the primary star of the system, atmospheric pressure, and percentage of surface liquid, you can adjust it based on a die roll on the table below (to determine base planetary core radioactivity). Cross reference the value from table 6.3.2.1 and roll on the table below.

6.3.2.2: Adjusted Radiation Level

d10	Core Radioactivity	Low	Mild	Moderate	Major	Lethal
1	None	Low	Low	Low	Mild	Moderate
2-3	Some	Low	Low	Mild	Moderate	Major
4-7	Typical	Low	Mild	Moderate	Major	Lethal
8-9	Severe	Mild	Moderate	Major	Lethal	Lethal
10	Extreme	Moderate	Major	Lethal	Lethal	Lethal

- **Low**
  Planets with Low radiation either have a thick enough atmosphere to filter out the radiation from the star, have very little water present in the atmosphere, have lower core planetary radioactivity, or are far enough away from the system's star that radiation just isn't a factor.
  - Radiation can be expressed as 0.001 to 0.1 Galactic Standard Radiation (use 1d100 * 0.001).
  - There is no ill effect on characters exposed to this level of radiation.
  - Life can exist on a planet with Low radiation exposure
- **Mild**
  Planets with mild radiation exposure experience some trace amount of

radiation. The atmosphere isn't strong enough to filter all of it, or the planetary core is generating it. In either case, living characters can manage just fine. The galactic standard radiation exposure level falls within this category.
  - Radiation can be expressed as 0.2 to 2.0 Galactic Standard Radiation (use 2d10 * 0.1)
  - Assume no ill effect on characters exposed to this level of radiation.
  - Life can exist on a planet with Mild radiation exposure.
- **Moderate**
  Planets with moderate radiation exposure are being hit with more extremes. Either it is in close proximity to its star or it lacks much water-based atmosphere. Such planets are hostile to biological things.
  - Radiation can be expressed as 2 to 20 Galactic Standard Radiation (use 2d10)
  - Assume characters exposed to this level of radiation without some type of environmental or vacsuit become ill and suffer a radiation value of -10/10days (meaning, they have -10 to everything they do because of illness, which continues for 10 days after exposure is done). Although not normally fatal, very long exposure or multiple many exposure hours in a year might have more serious consequences (Referee's choice).
  - Life cannot exist unassisted on a planet with Moderate radiation exposure.
- **Major**
  These planets are bombarded constantly with high levels of radiation. Nothing biological can last long.
  - Radiation can be expressed as 20 to 200 Galactic Standard Radiation (use 2d10x10)
  - Assume characters exposed to this level of radiation without some level of environmental or vacsuit become very ill and suffer a radiation value of -20/20days (meaning, they have -20 to everything they do because of this debilitating illness, which continues for 20 days after exposure is done). If exposure is too long, Referees can consider more permanent damage effects.
  - Life cannot exist unassisted on a planet with Major radiation exposure.
- **Lethal**
  The planet is a hot spot of radioactivity, deadly to all in, on, or around it.
  - Radiation can be expressed as 200 or more Galactic Standard Radiation (use 2d10x100)
  - Assume characters exposed to even one turn at this level of radiation without some level of environmental or vacsuit become very ill and suffer a radiation value of -20/20days/fatal (meaning, they have -20 to everything they do because of this debilitating illness, which continues

for 20 days after exposure is done, and 20 days after initial exposure the character dies).

- Life cannot exist unassisted on a planet with Lethal radiation exposure.

Radiation	Vacsuit	Galactic Standard Radiation	Effect
Low	Yes	1d100 * 0.001	There is no ill effect on characters exposed to this level of radiation. Life can exist on a planet with Low radiation exposure
Mild	n/a	2d10 * 0.1	Assume no ill effect on characters exposed to this level of radiation. Life can exist on a planet with Mild radiation exposure.
Moderate	Yes	2d10	Without a vacsuit characters become ill and suffer a radiation value of -10/10days (meaning, they have -10 to everything they do because of illness, which continues for 10 days after exposure is done). Although not normally fatal, very long exposure or multiple many exposure hours in a year might have more serious consequences (Referee's choice). Life cannot exist unassisted on a planet with Moderate radiation exposure.
Major	Yes	2d10x10	Without a vacsuit become very ill and suffer a radiation value of -20/20days (meaning, they have -20 to everything they do because of this debilitating illness, which continues for 20 days after exposure is done). If exposure is too long, Referees can consider more permanent damage effects. Life cannot exist unassisted on a planet with Major radiation exposure
Lethal	Yes	2d10x100	Without a vacsuit become very ill and suffer a radiation value of -20/20days/fatal (meaning, they have -20 to everything they do because of this debilitating illness, which continues for 20 days after exposure is done, and 20 days after initial exposure the character dies). Life cannot exist unassisted on a planet with Lethal radiation exposure.

6.3.3: Atmospheric Toxicity

The presence of an atmosphere does not guarantee that the air is breathable. Roll 1d10 on the following table (refer to the Toxicity section of the core rules document for a better understanding of the toxin ratings). If toxins are present, arbitrarily assume they are some combination of ammonia, chlorine, fluorine, hydrogen, methane, or some other non-inert element:

1d10 Roll	Result	Toxin
1-2	No Toxicity	No danger from exposure
3-4	Trace Toxins	inhale/-10nausia/1minute
5-6	Moderate Toxins	inhale/1d10/1hour
7-8	Severe Toxins	inhale/1d10/3turns
9-0	Lethal Toxins	inhale/1d10/5turns/fatal

6.3.4: Average Surface Temperature

This represent the most common temperature found on the planet and is measured in Celsius. The following text is guidelines to represent this value.

6.3.4.1: Base Temperature Table

Proximity	Very Dense Atmospheric Pressure	Dense Atmospheric Pressure	Moderate Atmospheric Pressure	Thin Atmospheric Pressure	Very Thin Atmospheric Pressure
Near	Inferno	Inferno	Hot	Hot	Moderate
Inner	Inferno	Hot	Hot	Hot	Moderate
Habitable	Hot	Moderate	Moderate	Moderate	Cold
Outer	Moderate	Cold	Cold	Cold	Frozen
Far	Moderate	Cold	Cold	Frozen	Frozen

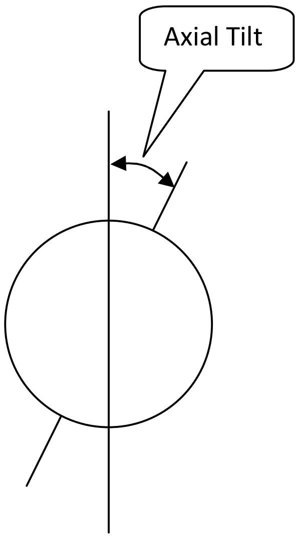
- **Frozen**
  -100 to -200 degrees Celsius (use 1d100-200)
  No life can exist at this temperature extreme.
- **Cold**
  -100 to 0 degrees Celsius (use 1d100-100)
  Life can exist but only in certain areas
- **Moderate**
  0 to 20 degrees Celsius (use 1d100/5)
  Planet's average annual surface temperature is acceptable for life to thrive.
- **Hot**
  20 to 200 degrees Celsius (use 2d10x1d10)
  Life can exist but only in certain areas.
- **Inferno**
  200 to 600 degrees Celsius (use 4d10x1d10+200)
  No life can exist at this temperature.

6.4 Climate Range

Finally you can describe the climate ranges found on the planet. Simply roll 1d10 and consult the table below. For instance, if you rolled a 6, you would record an axial tilt of (2d10) 18 degrees and would allow the average temperature to vary by +/-10 degrees Celsius.

d10	Axial Tilt (in degrees)	Effect	Temperature Change For Each Hemisphere
1-2	1d5-1	No significant seasons	0^{o} Celsius
3-4	1d10+5	Mild	-5^{o} / $+5^{o}$ Celsius
5-6	1d10+15	Moderate	-10^{o} / $+10^{o}$ Celsius
7-8	1d10+25	Strong	-15^{o} / $+15^{o}$ Celsius
9-0	1d10+35	Extreme	-20^{o} / $+20^{o}$ Celsius

A planets axial tilt is the angle of inclination in relation to its orbital plane. The greater the tilt the greater the seasonal effect on the planet. While one hemisphere is enjoying the summer months the opposite will be cooler. The polar caps will also be affected by the tilt; “days” will stretch out for months at a time while “nights” for the opposite polar cap will be in continuous “night”



Climate Summaries:

You can, if desired, round out your planetary climate with a sentence or two defining anything interesting. Some options include:

- Cool, frequent hurricane activity along the thirtieth parallel.
- Temperate climate with violent hurricane activity along southern latitudes.
- The planet has a completely temperate climate.
- The planet is rainy and cold in the winter, rainy and hot in the summer.
- A glacial planet that is slowly being terra-formed into a cool temperate planet.
- Troubled by sweeping dust winds along the equator.
- Tornados are common in the lowlands nearest the shores
- Dark clouds with greenish coloration represent trace amounts of ionized copper molecules often found in the upper atmosphere.
- Planet is plagued by frequent hailstorms that form without warning
- No cloud cover over land, lunar effect keeps cloud cover stationary over water.

6.4: Length of Year

Determining how long a planet's year is can be as easy as a lookup or as complicated as you would like it to be. Although both are simplified for game sake, you can use either of the following two optional methods:

6.4.1: (option 1) Quick look-up

Using this method, the star is assumed to be a stellar classification of 2 with a code of "V". Therefore if you rolled a type M star, it's a M2-V star. With this in mind, you can simply use the following lengths of years (in Galactic Standard Days). Note, however, that these represent mid-ranged values. Your actual length of year can vary. For instance, if you rolled a habitable planet in the third zone of your G star, it doesn't have to have a length of year of exactly 420. It can be above or below this number slightly, as you see fit.

6.4.1.1: Quick Length of Year Table

Zone #	O	B	A	F	G	K	M
1	4,672	4,861	230	37	110	55	73
2	8,587	8,945	679	91	215	179	234
3	15,790	16,480	1,954	212	420	537	712
4	29,030	30,276	5,574	522	774	1,574	2,082
5	53,348	55,584	15,837	1,213	1,399	4,518	5,979
6	97,989	102,197	44,889	2,798	2,652	12,882	17,043
7	180,017	187,896	127,114	6,560	4,905	36,583	48,396
8	330,767	345,245	359,731	15,289	9,051	103,680	
9	607,729	634,180	1,017,755	35,393	16,725	293,533	
10	1,116,471	1,165,246	2,879,047	82,046	30,728	830,644	
11	2,051,142	2,140,913	8,143,738	190,036	56,453		
12	3,768,186	3,933,111	23,034,772	439,998	103,709		
13	6,922,602	7,225,584					
14	12,717,830	13,274,244					
15	23,364,261						
16	42,922,891						

6.4.2: (option 2) Calculating Length of Year

Before you can actually calculate the length of year, you need to know the Stellar Mass of the star. Simply look it up on the table below. For instance, if you have a star of type G and roll a 2, then you have a star of stellar class G2 with a Mass of 1.0.

Note that this table assumes all stars are in their main sequence (a code of V). If you wish your star to be older (weaker) or newer (more massive), the stellar mass will be different and the orbital zones determined in Table 3.3 will differ dramatically.

6.4.2.1: Stellar Mass Tables

Stellar Class O		Stellar Class B		Stellar Class A		Stellar Class F		Stellar Class G		Stellar Class K		Stellar Class M	
O0	100.0	**B0**	17.5	**A0**	2.9	**F0**	1.6	**G0**	1.1	**K0**	0.8	**M0**	0.5
O1	97.5	**B1**	14.2	**A1**	2.7	**F1**	1.6	**G1**	1.0	**K1**	0.8	**M1**	0.5
O2	95.0	**B2**	10.9	**A2**	2.5	**F2**	1.5	**G2**	1.0	**K2**	0.7	**M2**	0.4
O3	92.5	**B3**	7.6	**A3**	2.4	**F3**	1.5	**G3**	1.0	**K3**	0.7	**M3**	0.3
O4	90.0	**B4**	6.7	**A4**	2.1	**F4**	1.4	**G4**	0.9	**K4**	0.7	**M4**	0.3
O5	60.0	**B5**	5.9	**A5**	1.9	**F5**	1.4	**G5**	0.9	**K5**	0.7	**M5**	0.2
O6	37.0	**B6**	5.2	**A6**	1.8	**F6**	1.3	**G6**	0.9	**K6**	0.6	**M6**	0.2
O7	30.0	**B7**	4.5	**A7**	1.8	**F7**	1.3	**G7**	0.9	**K7**	0.6	**M7**	0.1
O8	23.0	**B8**	3.8	**A8**	1.8	**F8**	1.2	**G8**	0.8	**K8**	0.6	**M8**	0.1
O9	20.0	**B9**	3.4	**A9**	1.7	**F9**	1.1	**G9**	0.8	**K9**	0.5	**M9**	0.1

6.4.2.2: Calculate

Use the following simplified formula:

$$Y = 365.25 \times \sqrt{\frac{A^3}{M}}$$

Where:

Y = Length of year (in Galactic Standard Days)
A = Distance from star (AUs determined in Table 3.3)
M = Mass of star (in Galactic Standard Stellar Masses. See table 6.4.2.1)

7: Example Star System

Now that you have read through the document lets roll up a system.

7.1: Number of Star

Roll d100, result is 41. ***Single***

7.2: Type of Star

Roll d100, result is 47. ***G***

(Note the Number of Zones Modifier is +2)

7.3: Number of Zones

Roll d10 and add 2 results in 7. ***7***

7.4: Zone Distance

We consult table 3.3 (Zone Distance Table) and cross reference our star. For each zone we pick a value between the numbers shown. Note the habitable zone is number 3.

Zone	**1**	**2**	**3**	**4**	**5**	**6**	**7**
AU	.5	.7	1.1	1.8	2.4	3.7	5.9

7.5: Astronomical Object

Now it's time to populate each zone. We roll seven times on table 4.1. I rolled a Jovian for zone 1, which is always considered a gas giant (Hot Jovian). The next significant roll is zone 3, I rolled a dwarf. Since this is the system habitable zone I decided to place a terrestrial planet in the zone. In zone seven I rolled a binary planet. Rolling twice more I get terrestrial planets. I could choose to two separate orbital paths within this zone which would be between 4.6 and 6.7 AU's. Instead I decided these planets will orbit each other. Finally I use table 4.2 to define the asteroid belt. I roll a 3 and 6; small asteroids that are moderately spaced.

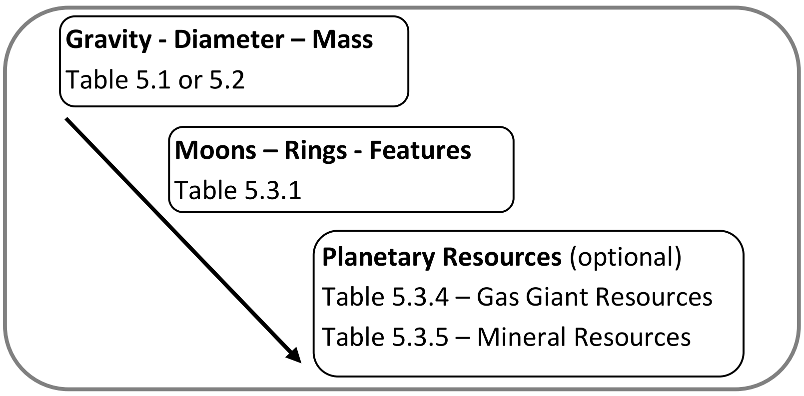
Zone	1	2	3	4	5	6	7
AU	.5	.7	1.1	1.8	2.4	3.7	5.9, 6.3
Object	Jovian, Gas	Terrestrial	Terrestrial	Asteroid Belt (small, moderately spaced)	Terrestrial	Jovian	(Binary) Terrestrial, Terrestrial

7.6: Define the Astronomical Objects

Once we know what objects are in each zone we can define them by rolling on table 5.1 for each planet or use table 5.2 if were in a hurry. In this example I will roll one planet using table 5.1 and the rest (excluding the habitable zone) on table 5.2.

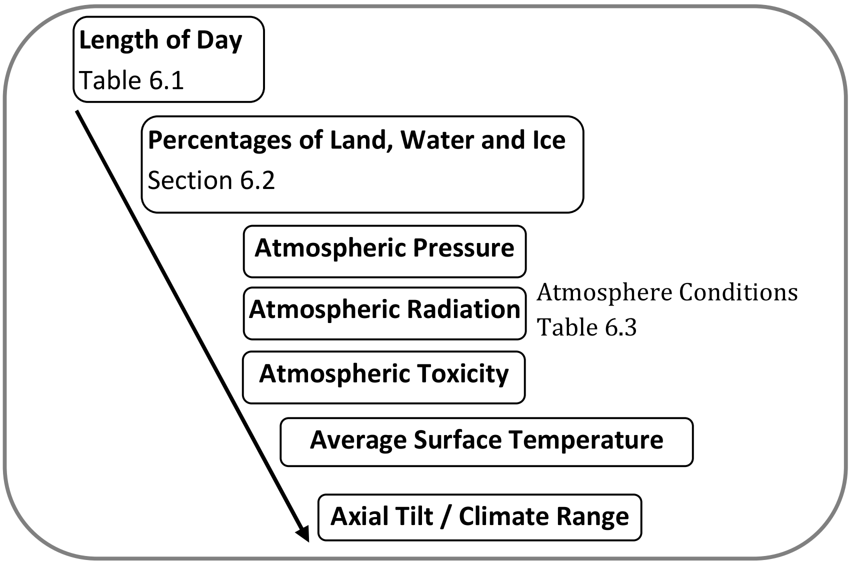
7.6.1: Creation Summary

Common Planetary Creation Summary:



Detailed Planetary Creation Summary

(used for habitable planets, moons and terrestrials)



7.6.2: Planetary Statistics

Table 5.1 instructs which formulas to use for each planet type.

Zone 1 - Jovian, Gas

Gravity	4.05	I roll 81. (81 x .05) = 4.05
Diameter	7	I roll 4. (4+12) /4 = 7
Mass	198.45	7 * 7 * 4.05 = 198.45
Moons	I roll 9 and consult table 5.3.1	

- Ancient ruins and remnants of ancient civilization that predates current cultures by 9,800 years are located on one of the moons. Additional I roll 47 moons and a single ring.

Zone 2, 5, 6 and 7

Defining every planet in this system is not important to my campaign, so I will finish off the rest of the zones (with the exception of the habitable zone) using tables in section 5.2 and recording them on the Star System Record Sheet. Remember Zone 4 is an asteroid belt I rolled in section 7.5

Zone	Gravity	Diameter	Mass	#Moons	Day	Land	Ice	Liquid	Pressure	Toxicity	Axial Tilt
1(J)	See 7.6.2 above										
2(T)	0.8	0.73	0.42	1	11hrs	75%	12%	13%	Very Thin	Severely Toxic	40 deg
3(T)	See 7.6.3 below										
4(A)	Asteroid Belt										
5(T)	1.0	2.00	4.00	--	248hrs	45%	19%	36%	Dense	Lethally Toxic	27 deg
6(J)	1.1	9.5	99.28	70	23hrs	%	%	%	Dense	Lethally Toxic	0 deg
7(T)	1.7	0.80	1.09	--	19hrs	15%	6%	79%	Moderate	Trace Toxins	32 deg
7(T)	1.0	0.73	0.53	2	32hrs	45%	4%	51%	Thin	Trace Toxins	19 deg

* Zone 6 is a Jovian, Table 4.1 instructs us to roll a d10, even = Ice, odd = Gas. I roll 9, odd so we use the Jovian gas table in section 5.2

Zone 2

This terrestrial planet is in the Near zone, (orange) of our G type star which tells us it's quite hot. The liquid and ice would have long since scorched off and the very thin atmosphere could have been swept away by the stars solar wind. Nothing would be left but a hot dust ball. Companies wishing to drill or exploit the planets natural resources would need to consider protection.

Zone 5

The planets dense atmosphere is lethally toxic, most of the water has probably settled to the lower atmosphere since the planet is in the OUTER zone and could possible be in a semi-frozen state.

Zone 6

Typical Jovian gas giant.

Zone 7

Remember in section 7.5 I had decided to have one planet orbit the other? Interesting eh? The planets are tidally locked, orbiting each other. Huge craters can be found on each planet, perhaps during the formation of this system they each had a separate orbital path and somehow became locked in each others gravity well. If any moons were present it would explain the huge craters littering the surfaces. The planets revolve on the same plain, each planet eclipse the other.

7.6.2.1: Habitable Planetary Statistics

Zone 3

Terrestrial, Habitable

Here is where I do not want to pick the vales but let the dice roll them up. Note that I'm not a slave to the dice, if the dice roll a value that would make the planet uninhabitable I simply discard the roll and pick off the table. Let's start rolling.

Common Planetary Statistics

Gravity	1.2	11.76m/s^2
Diameter	1.79	22,315 km
Mass	3.84	2.2656E+25 kg
Moons	4	

Length of Day

I roll 3 – Fast length of day. Using the formula 2d10 hours I roll 12.

12 hours

Land Mass Percentage

Water – 41%
Ice – 15%
Land – 44%

The percentage of ice is a little high for the type of planet I want, so I reduce it to 5% and use the reminder for land.

Water – 41%
Ice – 5%
Land – 54%

Atmospheric Pressure
I choose "Moderate" from table 6.3.1 and roll (1d10+5) /10

0.8 kg/m²

Atmospheric Radiation
Using table 6.3.2.1 we cross-reference the atmospheric pressure and percentage of water; Mild. Table 6.3.2.2 instructs me to roll a d10, I get 1. Our planet has a Low radiation level (1d100 * 0.001)

0.012 mSv

Atmospheric Toxicity
Since we want a habitable planet with no ill effects we ignore this table.

Average Surface Temperature
Cross-reference atmospheric pressure with the planets proximity; Moderate. (1d100/5)

8.4 degrees Celsius

Axial Tilt / Climate Range

4 degrees
No seasonal effects

Length of Year
I'm gong to use table 6.4.2.1 to determine the stellar mass which will effect the Length of year. I see that the table shows 0 – 9 for each star type, that's a d10 roll. I get 7. We know now the star is a G7. Now let's plug in the formula.

y = 365.25 x sqrt(1.1^3 /0.9)

444.18 Length of Year