STAR TREK™

ROLEPLAYING GAME

WORLDS

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Disclaimer:

While Decipher Inc. has researched extensively to make this the most authentic *Star Trek* Roleplaying Game possible, the depth of information necessary for a fully-realized roleplaying game is not always revealed during a weekly television show. While we have tried to extrapolate logically within the flavor of *Star Trek*, we have taken some liberties and players should remember that only the events, characters and places that appear on the show or in films are canon.

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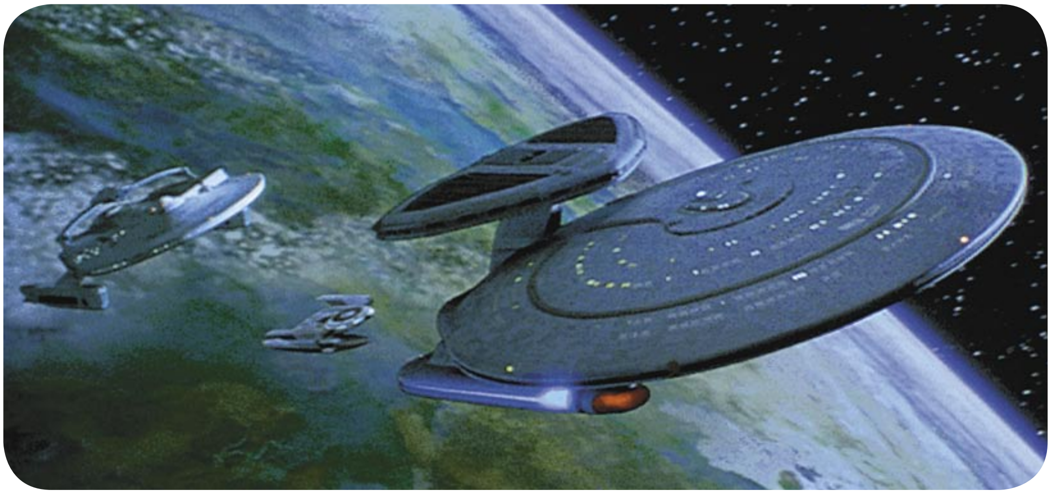


TO SEEK OUT NEW WORLDS...

The very formation of Starfleet, and later the charter of the Federation, paints the idealistic mission of its members: To search the stars for new worlds and new civilizations. Even before any Human starship carried weapons or colonists, the first flights of fancy—starting with Zefram Cochrane's *Phoenix*—were leaps into the unknown, just to see "what's out there." This book is "what's out there."

Countless episodes of *Star Trek* show planet after planet, world after world, and in many cases, they're not so different from ours. Sure, there are gas giants and deserts and icy deathtraps, but there are also jungles and oceans and Eden-like paradises. Every world is a backdrop against which the adventure is set. Whether it's important because it's the source of travail (by being the homeworld of the Founders or the Romulans), or because the environment is a challenge (with poison fruit or firestorms), or because conflict looms over something on the planet (like dilithium crystals or ancient relics), an entire world lies at your fingertips for just one thing: To give you a compelling place to seed your story. After all, the Crew can't spend *all* of their time on a ship.

Of course, as a Narrator for a *Star Trek* game, you have a great advantage over the worlds of the shows: You don't have a limit to your effects budget. Just as you can afford to use truly unusual aliens and creatures, you can place your stories and adventures in the most bizarre, hostile, or surreal worlds of the Galaxy.

The alien (and not-so-alien) worlds of this manual provide templates for use in your stories, so that you know what to expect from the important sites of the Galaxy. After all, players will have an idea of what Vulcan should be like, as informed by its appearance in the shows; this guide tells you about the history and geography of Vulcan, as well as pertinent stellar information. For less-important systems, you'll find it useful to brush up on pertinent events and notable locales. After all, just because one Starfleet captain on television already solved the problem of the week doesn't mean that the entire world packs up and goes away. Your Crew could have to face the next challenge on Bersallis III, or Capella IV, or Nimbus III.

EXPANDED WORLD CREATION

What's better than seeking out strange new worlds? Inventing them, of course. This chapter expands on the Star System and Planetary Design sections on pages 168-176 of the *Narrator's Guide*. Where those pages concentrated on Class-M worlds, this chapter covers all planetary classes, and adds more detail and data to the design process. Although the Planetary Profile (on page 172 of the *Narrator's Guide*) covers all the key points for a planet in an episode or series, some Narrators may want to have more data available, and prefer guidelines to simply making things up.

With that in mind, these rules, charts, and tables are designed with four purposes in mind. First, they present and create worlds similar to those discovered by Starfleet and other explorers in the *Star Trek* universe. Although any random generation system, if it remains useful at all, will have a few blind corners, virtually any planet shown in *Star Trek* can spring from these tables and charts. (And if you have a really specific planetary design goal in mind, you probably don't need the tables and charts, anyway.) Second, where possible, they match the values, results, and probabilities of real-world astrophysics and planetology, or get close enough for gaming. Keep in mind, of course, that early 21st-century astrophysics will likely be as outmoded in two centuries as early 19th-century astrophysics seems now. Even a decade ago, astronomers confidently assumed that Jovian planets (Class-J worlds, to Starfleet) didn't form close to stars—but of the many new planets discovered since then, almost all of them have been Jovian worlds relatively (in some cases amazingly) near their suns. In ten (or fifty, or two hundred) years, perhaps modern astrophysics (with its "rare Earth" assumption that Class-M worlds will be vanishingly thin on the ground) will similarly yield to a *Star Trek* universe where Earthlike planets wait around every corner hoping to be rid of their evil computer overlords. Third, these rules are as compatible as possible with the ones in the core rulebook—they expand on, but do not replace, those systems. As a result, using this system will occasionally ask you to reference a table or rule in the *Narrator's Guide*, rather than reprint material and waste space.

Fourth, and most importantly, this system is *optional*. Never feel that the dice "force" your planet to turn out in a way you don't like—given *Star Trek*'s panoply of ancient meddling super-races, even astrophysics can't force a planet to do that. Feel free to use it to spark creativity where need be; pick what sounds good or what the story requires. Boldly go to whatever strange new world you imagine.

STAR SYSTEMS

Except for rogue planets like Trelane's world or Yonada, worlds depend on stars for light, energy, and life. The very stuff of the planet can vary depending on its stellar parent; before you can build a world, in other words, you need to find a star to steer it by.

System Name

The name of the star system is the name of its primary star. Starfleet assigns names to newly-discovered stars based on a catalog number, or on their coordinates. However, many stars have pre-existing names based on earlier voyages of exploration, older stellar surveys, astronomical observations, and even ancient star maps taken from bas-reliefs at archaeological sites. Human and Andorian star catalogs made up much of the early Federation material; later additions from the Vulcan Science Academy and scientific exchanges with the Klingons left the whole issue of naming in complete incoherence. Indeed, many stars have two or more names. A particularly bright star near a galactic border (such as Betelgeuse) may have as many as fifty names! In practice, the most euphonious name, or the one preferred by the governing power, is the one that gets used. As Narrator, you can make up anything that sounds remotely good; beginning with a Greek letter adds the right note of astrobabble to the proceedings. Using real stars can work if you're sure the body in question matches the story requirements, or if you're sure none of your players will catch you.

EXPANDED STAR SYSTEM CREATION CHECKLIST

- **Pick system name**
- **Determine system affiliation (see *Narrator's Guide*, pages 168-169)**
- **Determine system type (see Table 10.5, *Narrator's Guide*, page 170)**
- **Determine orbital separation (see Table 1.1)**
- **Determine stellar classification (see Table 10.5A, *Narrator's Guide*, page 170)**
- **Derive stellar basic data (see Table 1.2)**
- **Determine number of planets (page 7)**
- **Determine orbital distances for all planets (page 7)**
- **Remove (or explain) "impossible" planets (page 7)**
- **Place any asteroidal and cometary belts (page 8)**
- **Place any other objects in the system (see page 8 and *Narrator's Guide*, pages 170-173)**

System Affiliation

Use the guidelines on pages 168-169 of the Narrator's Guide to help determine this question, or let the story drive it. The system's recent past can help you decide, too. Newly discovered empty worlds are likely to be claimed by their discovering culture—especially if they support life or have a strategic location. Colony worlds usually stay aligned with their parent planets—a Ferengi mining colony is likely to stay in the Ferengi economic sphere, for example. Rebel colonies become neutral, or align with their parent world's enemies—especially if those enemies stuck around after "liberating" the system! Worlds without space flight are almost always neutral or contested; a few may be under quarantine or protection by another world or major power. Spacefaring worlds will be right in the soup of interstellar politics, and even theoretically neutral worlds will likely slant to one or another major power.

Orbital Separation

This value only applies to star systems with multiple stars—binary (two-star), trinary (three-star), and so forth. (To determine the number of stars in the system, consult Table 10.5 on page 170 of the *Narrator's Guide*.) Single-star systems can skip this step. Multiple star systems can be "close" or "distant"; close companion stars orbit at near-planetary distances (within 100 AU), while distant companions are, effectively, other star systems. Of course, a prewarp civilization would find the planets of a companion star a useful stepping stone to true interstellar travel—or a source of rivalry and danger. Use Table 1.1: Orbital Separation to determine the specific values for each pair of the system's components.

Basic Stellar Data

Use Table 10.5A: Stellar Classification, on page 170 of the *Narrator's Guide*, to determine the size and type of the star (or stars) in the system. Based on this determination, consult Table 1.2: Basic Stellar Data to derive the rest of the star's basic data. The brightness and mass of the stars in Table 1.2 are given in terms of Earth's sun; a Type A0 V star is 50 times as bright and 2.7 times as massive as Earth's sun. Orbital zone boundaries (see below) are given in AU from the star; an A0 V star's Yellow Zone begins at 5.5 AU and extends out to 9.3 AU, where its Green Zone begins.

TABLE 1.1: ORBITAL SEPARATION

Roll (1d6)	Separation	Distance (AU)
1-3	Close	2d6 x 10
4-6	Distant	2d6 x 100

AU

The AU, or Astronomical Unit, is the average distance between the Earth and its sun. One AU is 150 million kilometers, or roughly 93 million miles. At full impulse (one-quarter light speed), a starship travels one AU in a little over 33 minutes. Within star systems, AU are a more convenient measure of distance than light-years. There are 63,113 AU in a light-year.

Orbital Zones

Each star is surrounded by five concentric zones in which planets can orbit, out to a system boundary where the star's gravity is no longer strong enough to hold planets. The boundary, and those zones, appear on Table 1.2, in AU. Going from the hottest, innermost zone outward, they are:

Red Zone: Here, the heat and gravity of the star prevent any planets from forming at all.

Yellow Zone: Planets can form, but not liquid water or the components of carbon-based life. Tidally-locked planets (see page 12) in the Yellow Zone might, however, be cold enough on their "night" side to let water, or even ice, exist.

Green Zone: Here, the temperature permits liquid water, and hence, life as we know it. Also known as the biozone, not all planets in this zone are Class-M: atmosphere, gravity, or other factors may still be inimical to humanoid life.

Blue Zone: Planets in this zone are too cold for liquid water, but not for atmospheric ammonia or methane. Life is unlikely here, unless a Class-J world heats a moon by tidal heating or infrared radiation (see page 12).

TABLE 1.2: BASIC STELLAR DATA

Type	Brightness (S)	Mass (S)	Yellow	Green	Blue	Black	Boundary	Age (Years)
Main Sequence Dwarf Stars								
B0 V	13,000	17.5	20	108	148	2,220	12,250	2d6 x 10 million
B5 V	830	8.2	5.5	27.4	37.4	555	2,690	1d6+2 x 100 million
A0 V	50	2.7	1.8	5.5	9.3	140	292	2d6 x 100 million
A5 V	10	1.8	0.8	2.5	4.2	60	130	1d6 x 500 million
F0 V	7	1.6	0.66	2.1	3.5	50	102	1d6 billion
F5 V	2.5	1.3	0.4	1.2	2.1	32	68	1d6 billion
G0 V	1	1	0.25	0.78	1.3	20	40	2d6 billion
G5 V	0.6	0.9	0.2	0.6	1	15	32.4	2d6 billion
K0 V	0.4	0.8	0.16	0.49	0.83	13	25.6	3d6 billion
K5 V	0.1	0.6	0.08	0.25	0.42	6	14.4	2d6 x 2 billion
M0 V	0.01	0.3	0.03	0.08	0.13	2	3.6	2d6 x 2 billion
M5 V	0.001	0.2	0	0.025	0.042	0.63	1.6	2d6 x 2 billion
White Dwarf Stars								
D	0.1	0.8	0.08	0.25	0.42	6	25.6	2d6 billion*
Giants and Subgiants								
F II-IV	10-500	2-5	0.3	2.5-13	3-19	45-285	160-1,000	(1d6+2) x 10 million
A II-IV	100-1,500	3-6	0.4	4-20	6-30	90-450	360-1,440	1d6+3 million
B II-IV	200-8,000	4-10	4	180-250	270-375	440-8,000	640-2000	1d6 million
Type O (all)	10,000-20,000	10-12	13	630-790	950-1,190	14,000-17,000	4,000-5,760	2d6 x 100,000
Supergiant (Ia-Ib)	7,000-100,000	9-18	5	50-200	75-300	1,125-4,500	3,240-12,960	2d6 x 100,000
M I-IV	4,000	2-10	5	60	67	1200	160-4,000	2d x 10 million**

* Planets orbiting a Type D star have normally been cooked or evaporated during its red giant phase.

** Red giants in the main sequence have often cooked or disintegrated their previous inner planets.

Black Zone: Here, water is a mineral, and the sun is just another bright star in the sky. Methane and ammonia are liquids, or even snowy solids.

PLANETARY SYSTEMS

With the basic star type and system zones established, it's time to find out how many planets the system has, and where among those zones they orbit.

Number of Planets

Find the star's type on Table 1.3, and roll dice to determine the number of planets it has. Type O stars and Type B supergiants are too young to have created planetary systems spontaneously. Ancient terraformers, aliens, or other unknown phenomena have placed or seeded planets around some young stars, such as Rigel. For such "seeded" systems, roll 3d6+3 or handcraft the system in question.

Orbital Distances

Determining the orbital distance of planets from their star depends on a fairly intricate mechanism known as Bode's Law. According to Bode's Law, planetary orbits follow a recognizable mathematical pattern of development; this system replicates it. Roll a die to create a "seed" number. (The Sol system's seed number is 3.) Beginning with 0 and then the seed, run a series of doublings out for as many planets as your system has. (For the Sol system, that series is 0, 3, 6, 12, 24, 48, and so on.) Now roll the die again, and add that constant to the seed series. (The Sol Bode's constant is 4, which gives 4, 7, 10, 16, 28, 52, and so on.) Now divide the new series by 10, and that's your planetary orbit pattern in AU. (Again for the Sol system, we get 0.4, Mercury; 0.7, Venus; 1, Earth; 1.6, Mars; 2.8, the asteroid belt; 5.2, Jupiter, and so on.) Even the Sol system pattern breaks down with Neptune, so you can vary the Bode's result if you like.

TABLE 1.3: NUMBER OF PLANETS

Stellar Type	Number of Planets*
A Ia, F Ia, G Ia	3d6+1
A Ib, A II, F Ib, G Ib, K Ia-Ib	3d6
A III, B II-IV, F II, G II, K II	3d6-1
A IV, B V, F III-IV, G III, K III, M Ia-III	3d6-2
A V, F V, G IV, K IV	2d6+3
G V, K V, M V	2d6+2
D, L	1d6+2
O, B Ia-Ib	See text

*Modifiers: Core, cluster, or spiral arm interior, +1; Dark regions -2; Nearby supernova or planetary nebula, +2; 10 billion years or older -5

Impossible Planets

Once you've got your orbital paths set up, remove any worlds that lie in the Red Zone of their star. Then remove any worlds that lie outside the system boundary. Multiple star systems have unstable gravitational stresses that sweep out other orbits; a companion star clears planets out of a zone between one-third and three times its own orbital distance. For example, Alpha Centauri B orbits Alpha Centauri A at 24 AU; therefore, Alpha Centauri A cannot have any planets orbit it between 8 and 72 AU. (The reverse is true, of course: no planets can orbit Alpha Centauri B between 8 and 72 AU, either.) Planets orbiting past that distance are actually orbiting both stars.

Belts

There are two kinds of belts that concern star system designers: asteroid belts and cometary belts. Taking the easiest one first: almost every system has a cometary belt called an Oort Cloud on its outer rim. (See pages 172-173 of the *Narrator's Guide*.) Roll 2d6: on an 11-12, the system's outermost planet becomes an extra-thick Oort Cloud. On a 2-3, the system has an exceptionally scanty Oort Cloud.

Scientifically, asteroid belts should be placed after you have generated all the worlds in the system. The next innermost "planet" from the largest Class-J world in the system becomes an asteroid belt instead. If the innermost planet in the system is a Class-J world, move it out one orbit and add an asteroid belt between it and the star. A non-Class-J world immediately between two large Class-J worlds might become an asteroid belt as well; roll a die, and on a 5 or 6, swap the planet for a belt. A Class-D world in any of the aforementioned orbits becomes the largest body in that asteroid belt. Of course, you can always randomly place asteroid belts as follows: In the Yellow Zone, place an asteroid belt in the first orbit on a 3 or 4 on two dice; in the Green Zone, place an asteroid belt in the first orbit on a 4 or 5 on two dice; in the Blue Zone, place an asteroid belt in the first orbit on a 2 on one die; in the Black Zone, place an asteroid belt in the outermost orbit on a 2 or 3 on one die. Add one to the die roll for each asteroid belt already placed; subtract one for close multiple systems or variable stars. Don't generate planets for any orbit with an asteroid belt in it; the belt takes up one of the star's planetary "slots." (Alternatively, consider any orbit with an asteroid belt to be *also* the orbit of a Class-D planetoid.)

Other Objects

For anomalies of astrophysics, alien artifacts, hidden Romulan bases, and so forth, consult pages 170-173 of the *Narrator's Guide*. You can also roll on Table 10.2 of the Narrator's Guide to decide what kind of odd thing to put there—but not every system should have one. Roll 4d6—on a 24, there's something unusual in the system besides planets and moons.

EXPANDED PLANETARY CREATION CHECKLIST

Pick planetary name (see *Narrator's Guide*, page 173)
Determine orbital characteristics (see page 8)
Determine planetary class (see page 9)
Determine planetary size (see page 9)
Determine gravity (see page 10)
Determine number and type of moons or rings (see page 10)
Determine rotational characteristics (see page 12)
Determine axial tilt (see page 13)
Determine atmosphere (see page 13)
Determine temperature (see page 14)
Determine hydrosphere (see page 16)
Determine tectonics and terrain (see page 17)
Determine life (see page 17)
Establish any resources, and determine their abundance (see *Narrator s Guide*, pages 175-176).

THE JUPITER EFFECT

Some astronomers believe that Jupiter's relatively flat, circular orbit (Jupiter's inclination is lower than 2 degrees, and its eccentricity is less than 5%) stabilizes the other planetary orbits in the Solar system, as its gravity tugs the other planets into less-eccentric, less-inclined orbits. A large Class-J planet on an eccentric or highly inclined path through a star system might well disrupt planetary orbits (or even planetary formation). For any star system, if the largest Class-J planet turns out to have an eccentric orbit, reduce the number of planets by 1d6 and replace half of them with sparse asteroid belts.

PLANETS

With orbits, asteroids, comets, and less definable objects placed, we can now turn to the planets themselves. As always, remember that these are just guidelines rather than inflexible cookie-cutter formulas. Apply them creatively.

Orbital Characteristics

Planets can orbit suns in neat circles, or widely swinging ellipses; lined up in a plane or scattered in a halo. Since most planets form out of a spinning disk of proto-matter, they tend to have a low inclination (less orbital variation from their star's equator) and low eccentricity (more circular orbits). Roll 2d6; a result of 12+ indicates an eccentric, highly-elliptical orbit. (Add +1 for Black Zone worlds.) Use its original orbit as its closest approach; add another 1d6 x 10% of that distance to get its farthest approach. (This may take the planet out of its original Zone—the world will have some cold winters.) Then, roll 3d6; on an 18, the planet is highly-inclined, at 2d6 x 5 degrees out of the ecliptic. Highly-inclined worlds can be missed by careless surveys; until located, sensor checks for such planets are at +5 TN.

Planetary Year

To determine the length of the planetary year, there's nothing for it but to buckle down with one of Kepler's Laws. First, cube the orbital distance (in AU) and divide it by the star's mass (in Suns). In Earth years, the planetary year equals the square root of that quotient. (Multiply by 365 to get the year length in Federation standard days.) For example, Vulcan orbits at 0.754 AU from 40 Eridani A, a star 0.89 times the mass of Sol. The cube of 0.754 is 0.429, which divided by 0.89 is 0.482. The square root of 0.482 is 0.69; Vulcan's 250-day year is 0.69 times as long as Earth's.

PLANETARY CLASSES

Here is a brief summary of the Starfleet planetary classification system. Example planets of each class appear in parentheses.

CLASS-D: Rocky planetoids. (Ceres, Regula)

CLASS-F: Dry, airless worlds. (Luna, Mercury)

CLASS-G: Low to medium gravity, unbreathable atmosphere, icy sludges. (Pluto, Titan)

CLASS-H: Dry, thin atmosphere; terraformable. (Mars, Tau Cygna V)

CLASS-J: Gas giant. (Jupiter, Uranus, Barnard III)

CLASS-K: Earthlike gravity, extreme temperature, poisonous atmosphere. (Venus, Mudd, Elba II, Breen?)

CLASS-L: Earthlike gravity, oxygen-argon atmosphere. (Indri VIII)

CLASS-M: Earthlike gravity, carbon-water chemistry, oxygen-nitrogen atmosphere. (Earth, Vulcan, Andoria, Cardassia Prime)

CLASS-T: Gas giant with significant ring system. (Saturn)

CLASS-Y: High temperature and pressure, corrosive atmosphere, deadly radiation levels. (Excalbia, Tholia?)

For further details, see page 171 of the *Narrator's Guide*.

PLANETARY CLASS

Starfleet classifies new worlds by letter grade (see box). For each world, roll 2d6 and consult Table 1.4: Planetary Class, by cross-referencing the result with its orbital zone (see page 6, above).

PLANETARY SIZE

Planetary size comprises mass, density, and diameter, which together determine gravity. Find the planet's class on Table 1.5: Planetary Masses and derive its mass using the correct formula. The result is in terms of Earth masses; Class-H worlds can range from 0.1 to 0.6 Earths in mass, for example. Table 1.5A gives special values and subclassifications for gas giants, up to the brown dwarf stage, which is the largest any planet can get without becoming a star.

Density

A planet's density depends on its composition, which varies by planetary class. Find the planet's class on Table 1.6: Planetary Densities and roll 2d6 to determine its density. In addition to the densities given in Table 10.6A on page 174 of the *Narrator's Guide*, three new densities appear for non-Earthlike worlds. Ice density worlds have a density of 0.2 and little or no rocky core at all; the planet is essentially an enormous snowball. Hydrogen and gas worlds are two types of Class-J planets: hydrogen (density 0.2) worlds have a highly-compressed metallic hydrogen core and an

TABLE 1.4: PLANETARY CLASS

DIE ROLL (2D6)	YELLOW	GREEN	BLUE	BLACK
2	Y	G	D	D
3	D	F	F	D
4	D	H	J	F
5-6	F	D	D	G
7	K	H	H	J
8-9	K	L	J	J
10	F	J	G	F
11	J	M	L	G
12	H	M	K	J

TABLE 1.5: PLANETARY MASSES

TYPE	MASS (EARTH = 1.0)
D	3d6 x 0.0005
F	3d6 x 0.005
G	3d6 x 0.01; on a 17 or 18, mass is 3d6 x 0.1
H	2d6 x 0.5
J	Roll on Table 1.5A
K, Y	2d6 x 0.1; on a 11 or 12, mass is 2d6 x 0.25
L, M	(2d6+5) x 0.1; on a roll of 11 or 12, mass is 2d6 x 0.25

TABLE 1.5A: CLASS-J PLANETARY MASSES

ROLL (2D6)	CLASS-J SUBTYPE; MASS (EARTH = 1.0)
2-5	Subjovian; 3d6+10
6-8	Jovian; 3d6 x 20
9-10	Superjovian; (2d6-1) x 300
11-12	Brown Dwarf; 2d6 x 1,500; on a roll of 11 or 12, mass is 1d6+2 x 3,000

TABLE 1.6: PLANETARY DENSITIES

CLASS	ROLL (2D6)*
D, F, H	1-7, silica; 8-10, Earth-like; 11+, metal-rich
G	1-7, ice, 8+, rock-ice
J	1-6, hydrogen, 7+, gas
K	1-4, rock-ice**, 5-8, silica, 9-11, Earth-like, 12+, metal-rich
L, M	1-4, rock-ice; 5-6: silica; 7-11 Earth-like; 12+, metal-rich
Y	1-8, Earth-like, 9+, metal-rich

*Modifiers: Yellow Zone +1, Black Zone -1; Type A or B star, +1; Core or spiral arm interior, +1; Type M star, -1; 10 billion years or older, -2.

**Only in Blue Zone; roll again for Class-K worlds in the Yellow Zone immense atmosphere of pure hydrogen and helium; gas (density 0.3) worlds have a compressed-gas core with their bulk being hydrogen, helium, ammonia, and methane.

Diameter

From mass and density, we can calculate the world's diameter as the cube root of mass divided by density. If you don't have a calculator handy, Tables 1.7 and 1.7A give calculated values in Earth diameters, from which you can interpolate. Class-D worlds are trivially small; rather than going to the bother of calculating diameters, simply roll 2d6 and multiply the result by 10 kilometers.

Gravity

Multiply diameter (in Earth diameters) by density to get surface gravity in Earth gravities, or G. For Class-J planets, this is the gravity at the top of the planetary atmosphere, since gas giants have no "surface" to speak of. See the box for some hazards of various gravities, and page 173 of the *Narrator's Guide* for gravity's effect on settlement.

MOONS AND RINGS

Moons are, essentially, tiny planets, and can be described using Starfleet's planetary class system. Different classes of planet attract different classes of moon; find the planet's class on Table 1.10: Moons and determine the number of moons by class available. For example, for a Class-K world the mass of Earth, if the first roll is a 4 and the second a 5, the planet has one Class-D moon and no Class-F moons. If you wish, find the moon's vital statistics (density, gravity, etc.) just as you would a planet of the same class, although no moon can mass more than half its planet's mass. Then

TABLE 1.7: PLANETARY DIAMETERS

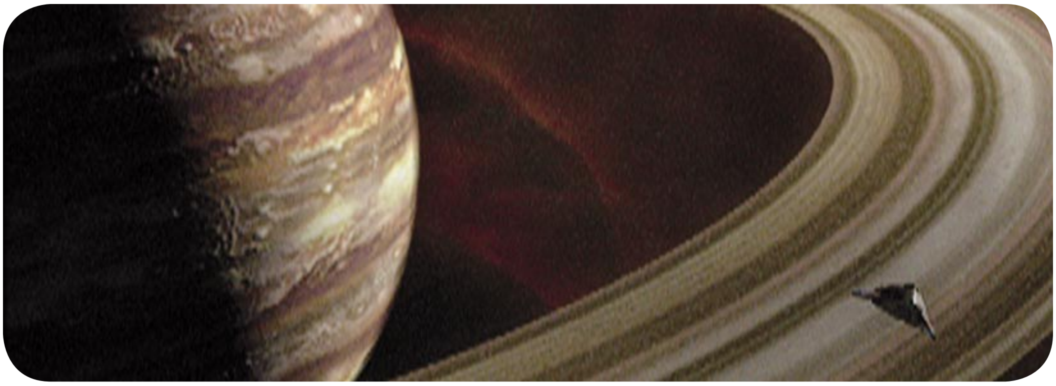
	Mass									
Density	**0.01**	**0.1**	**0.3**	**0.5**	**0.7**	**1**	**1.3**	**1.6**	**2**	**3**
Ice (0.2)	0.37	0.79	1.14	1.36	1.52	1.71	1.87	2.00	2.15	2.47
Rock-ice (0.5)	0.27	0.58	0.84	1.00	1.12	1.26	1.38	1.47	1.59	1.82
Silica (0.66)	0.25	0.53	0.77	0.91	1.02	1.15	1.25	1.34	1.45	1.66
Earthlike (1)	0.22	0.46	0.67	0.79	0.89	1.00	1.09	1.17	1.26	1.44
Metal-rich (1.5)	0.19	0.41	0.58	0.69	0.78	0.87	0.95	1.02	1.10	1.26

Numbers are relative to Earth: mass is measured in Earth masses, density in Earth densities, and diameter in Earth diameters. To derive the diameter of the world in kilometers, multiply the result by 13,000.

TABLE 1.7A: CLASS-J PLANETARY DIAMETERS

	Mass								
Density	**10**	**30**	**70**	**100**	**300**	**700**	**1000**	**2000**	**3000**
Hydrogen (0.2)	3.68	5.31	7.05	7.94	11.45	15.18	17.10	21.54	24.66
Gas (0.3)	3.22	4.64	6.16	6.93	10.00	13.26	14.94	18.82	21.54

Numbers are relative to Earth: mass is measured in Earth masses, density in Earth densities, and diameter in Earth diameters. To derive the diameter of the world in kilometers, multiply the result by 13,000. By comparison, the planet Jupiter is 317.8 Earth masses, has a density of 0.24 Earth densities, and has a diameter of 10.97 Earth diameters.



HAZARDS OF GRAVITY

Operating under gravity different from your home G can be difficult, whether the gravity is relatively higher or lower than what you are used to. Even low gravity can cause mistakes or miscalculations with some physical tests, as the relationship between inertia and weight appears different to someone with differing G-reflexes.

LOW GRAVITY

Under low gravity, reduce falling damage by a percentage equal to the value in G of the gravity field: a fall at 0.5 G does half damage, for example. Jump distances, throwing distances, and other Athletics test values are multiplied by the ratio of local gravity to G: in 0.5 G, a security officer can jump twice as far. Lifting weights and encumbrance loads are similarly modified by gravity: in 0.2 G a load up to Str x 25 kg is considered normal encumbrance, rather than the Str x 5 kg in Earth gravity. Physical tests in low gravity are usually more difficult (see Table 1.8: Physical Test Gravity Modifiers), although the Zero-G Trained trait removes any low-gravity penalties as well. Fatigue in low gravity is the same as normal gravity: the lessened weight of objects is counterbalanced by the stress of unfamiliar muscle operations, even with the Zero-G Trained trait.

HIGH GRAVITY

From a rules perspective, high gravity in many ways is the opposite of low gravity. Falling does more damage, jumps are shorter, encumbrance is higher, and so forth. Physical tests in high gravity also suffer from test modifiers (see Table 1.8: Physical Test Gravity Modifiers). Working in high gravity is also very tiring; treat exertion levels as the increment shown on Table 1.9: High Gravity Fatigue. Under Vulcan's 1.4 G, a Human treats Standard exertion as Demanding, and Demanding exertion as Extreme.

As the table indicates, at still higher gravities, damage may occur each time a fatigue test comes up. You can resist damage from gravity fatigue with a Stamina reaction test of the same TN as the associated fatigue test. So, if you're trying to resist fatigue with a Stamina test (TN 10), you also resist taking any damage with a Stamina test (TN 10).

roll on Table 1.11: Moon Distance to determine the moon's distance from its planet.

Almost any moon within 2.44 radii (a distance known as Roche's Limit) of a planet will break up. (The exceptions are Class-D moons with Earth-like or metal-rich densities.) Replace that moon with a ring. If more than one large moon (Class-F, -G, or -K) of a Class-J planet becomes a ring, the Class-J planet is now a Class-T planet, spectacularly ringed like Saturn in the Solar system. (Class-T worlds remain functionally identical to Class-J worlds throughout this chapter, though.) If a moon winds up in the same orbit as another moon, re-roll (for Class-J worlds) or drop it.

Class-K moons of Class-J worlds may not remain Class-K, depending on their distance from the planet. The energy generated by the planet's tides creates significant internal heat on a moon (and can often result in volcanoes, or even a pure molten surface). In addition, falling helium or hydrogen microfusion causes Class-J worlds to emit considerable infrared (IR) heat over and above the amount they receive or reflect from their star. Consult Table 1.12: Hot Moons of Class-J

TABLE 1.8: PHYSICAL TEST GRAVITY MODIFIERS

% of Home G	Humans	Vulcans	Test Modifier
0%	0 G	0 G	+7 TN
15%	0.15 G	0.21 G	+6 TN
30%	0.3 G	0.42 G	+5 TN
45%	0.45 G	0.63 G	+4 TN
60%	0.6 G	0.84 G	+3 TN
75%	0.75 G	1.05 G	+0 TN
125%	1.25 G	1.75 G	+3 TN
135%	1.35 G	1.89 G	+4 TN
150%	1.5 G	2.1 G	+5 TN
165%	1.65 G	2.31 G	+6 TN
180%	1.8 G	2.52 G	+7 TN

Apply the TN modifier in the direction away from normal gravity; hence, Vulcans operating in 1 G suffer no modifier, Vulcans working in .5 G or 2 G take a +4 TN to physical tests. Humans on Vulcan, with its 1.4 G, suffer the same +4 TN to physical tests.

TABLE 1.9: HIGH GRAVITY FATIGUE

% of Home G	Humans	Vulcans	Exertion	Fatigue Damage
126-175%	1.26-1.75 G	1.76-2.45 G	+1 to exertion level	—
176-225%	1.75-2.25 G	2.46-3.15 G	+2 to exertion level	1 point each fatigue test
226-300%	2.26-3 G	3.16-4.2 G	+3 to exertion level	1d6 points each fatigue test

Planets and determine the amount of heat received by the moon in question by adding tidal heating to the IR column that matches the planet's subclass. Now add the background heat for the planet's orbital zone: 350 Centigrade in the Yellow Zone, 10 Centigrade in the Green Zone, -100 Centigrade in the Blue Zone, and -200 Centigrade in the Black Zone. Total the two figures and apply the result to Table 1.11A: Temperature Driven Moon Classes, and continue to build the moon according to its new class. Note that temperatures taken from Table 1.11 may not equal the final surface temperature of the moon; without an atmosphere, received heat bleeds away rapidly. Jupiter's Class-K moon Io has a molten interior, with frequent volcanic gouts of liquid sulfuric lava—but its surface temperature hovers around -110 degrees Centigrade. Jupiter's Class-G moon Europa, meanwhile, has a surface temperature of -160 degrees Centigrade all across its smooth ice surface—but underneath, it has an enormous ocean of liquid water.

TABLE 1.10: MOONS

PLANET	MOONS BY CLASS*
F, H	D, 1d6-3; F, 1d6-5
G	D, 1d6-4; G, 1d6-5
J	D, 2d6-3; F, 1d6-5; G, 1d6-5**; K, 1d6-5
K, Y	D, 1d6-3; F, 1d6-5
L, M	D, 1d6-2; F, 1d6-5; G, 1d6-5; L, 1d6-5

*Modifiers: Planetary mass under 0.2, -1; planetary mass 1.5-10, +1; planetary mass 10.1-100, +2; planetary mass 100.1-500, +3; planetary mass over 500, +5; more than 12 planets in the system, +1; treat any result less than 1 as a result of "no moons of that type."

** Only in Blue or Black Zone orbits; for Class-J worlds in Yellow or Green Zone, re-roll as Class-F.

TABLE 1.11: MOON DISTANCE

ROLL (1D6)*	ORBIT TYPE (DISTANCE)
0-2	Close orbit (1d6 planetary radii)
3-4	Medium orbit (3d6 planetary radii)
5+	Distant orbit (1d6+1 x 10 planetary radii)

*Modifiers: Class-K moon -1, Class-G moon +1

TABLE 1.11A: TEMPERATURE DRIVEN MOON CLASSES

DEGREES CENTIGRADE	MOON CLASS
750+	Y
100 to 749	K
-10 to 99	Roll 1d6; 1-3, H; 4-5, L; 6, M
-100 to -11	Roll 1d6; 1, K; 2-3, H; 4, F; 5-6, G*
colder than -101	Roll 1d6; 1-3, F; 4-6, G*

* This may represent a Class-F world covered in a sheet of ice, rather than a true Class-G moon, at the Narrator s discretion.

PLANETARY CLIMATE

As indicated on page 174 of the *Narrator's Guide*, the final climate of a planet comes out of mutually-reinforcing interactions between the world's atmosphere, hydrosphere, and basic temperature. In addition, other factors such as the planet's rotation, seasonal variation due to axial tilt (see page 13), magnetic field thickness (which affects the upper atmosphere and electrical storm activity), and so forth can wildly alter the weather both day to day and over millennia. The natural processes of glaciation, solar activity, and planetary aging also change weather patterns. In short, although you can use the following categories to establish some broad guidelines, the weather anywhere on a given planet can be pretty much whatever you want as Narrator.

Planetary Rotation

Roll on Table 1.13: Planetary Rotation to determine the planet's day length, which depends on the speed with which a planet revolves. This speed also affects the planet's weather and climate. In general, the faster the rotation, the worse the weather—storms, hurricanes, and other extreme phenomena are more frequent and more powerful.

Tides, from both moons and the planet's star, can slow its rotation. Planets with distant large moons (those massing over 1% of the planet mass) add 1d6 hours to their day, large moons in medium orbit add 2d6 hours, and large close moons add 3d6 hours to the planetary day. Planets within 0.5 AU of their star multiply their day length by 1d6; worlds within 0.4 further multiply their day length by 10. Worlds within

TABLE 1.12: HOT MOONS OF CLASS-J PLANETS

DISTANCE (RADII)	TIDAL HEATING	JOVIAN IR	SUPERJOVIAN IR	BROWN DWARF IR
5	600	100	700	1,000
6	150	30	250	650
7	50	10	80	210
8	20	0	20	70
9	10	0	0	30

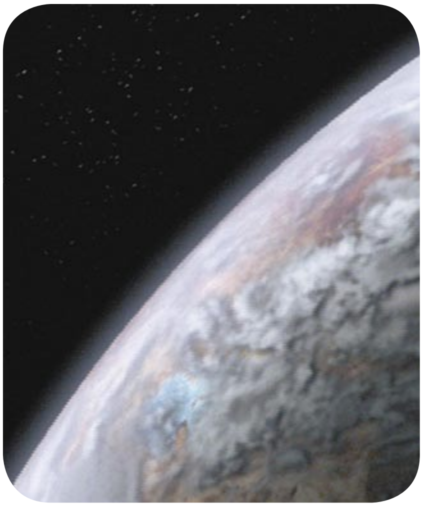
TABLE 1.13: PLANETARY ROTATION

MASS	DAY LENGTH (EARTH HOURS)
<0.5	6d6; tidally locked on 32+
0.5-5	5d6; tidally locked on 30
5.1-49.9	4d6
50+	3d6

TABLE 1.14: AXIAL TILT

ROLL (1D6)	DEGREES OF TILT
1-2	Minimal, 1d6
3-4	Moderate, 2d6+10
5	High, 2d6+20
6	Extreme, 2d6 x 10*

* A tilt greater than 90 degrees indicates retrograde rotation.



0.3 AU are tidally locked, with one face always turned to the sun. Moons are always tidally locked to their planet, although some moons have "libration zones" where the planet seems to rise and set in the sky as the moon wobbles on its axis.

Planetary Axial Tilt

Earth's axial tilt is 23 degrees, giving recognizable summers and winters to wide stretches of both hemispheres in turn. Planets with extreme axial tilts suffer from dangerous, even freakish, weather; those with minimal axial tilt have less arable land since arid regions don't even get seasonal rains, and tundras and taigas remain frozen year-round. Narrators should impose a -1 modifier to population die rolls on Table 10.8 in the *Narrator's Guide*, and a -2 modifier to the resource abundance roll for agricultural resources (see page 176 of the *Narrator's Guide*), for planets with minimal or extreme axial tilts.

Planetary Atmosphere

More than any other factor, atmosphere is the make-or-break determinant of a planet's class and suitability. Liquid water, carbon-based life, and healthy gravity mean nothing if a 1% chlorine level in the air has humanoids choking to death while stumbling around in the grip of peculiar visual distortions.

ATMOSPHERIC COMPOSITION: Roll 1d6-2 to determine the number of major components in the planet's atmosphere, treating any roll of 1 or less as 1. To tell which components, roll as indicated on Table 1.15: Atmospheric Composition, depending on the planet's class. Class-J, -L, and -M planets have predetermined atmospheric makeups, as given in the table. For other classes, determine the percentage of each component in the atmosphere. Roll 1d6+1 x 10% for the first component selected, 2d6+10% for the second component, 2d6% for the third, and 1d6% for the fourth if need be. If you select a component you have already used, roll again (or add more, at your discretion). Once you reach 100%, stop rolling; if you're out of major components and you haven't reached 60% yet, start again and add the new components to the old ones. If you haven't reached 100%, roll on Table 1.15B: Trace Atmospheric Components, adding 1d6% for each element until the atmosphere is full. The "Forbidden" column of Table 1.15B indicates that some components cannot be present in the atmosphere of certain worlds over extremely small (less than a tenth of a percentage point) amounts.

TABLE 1.15: ATMOSPHERIC COMPOSITION

PLANET CLASS	POTENTIAL ATMOSPHERIC COMPONENTS (ROLL 2D6)*
D, F	No atmosphere
G	1-4, Carbon dioxide; 5, Argon; 6-7, Nitrogen; 8-9, Methane; 10+, Ammonia
H, K (Yellow Zone)	1-3, Nitrogen; 4-7, Carbon dioxide; 8-9, Sulfur dioxide; 10, Argon; 11, Fluorine; 12+, Chlorine
H, K	1-3, Nitrogen; 4, Argon; 5-7, Carbon dioxide; 8, Sulfur dioxide; 9, Fluorine; 10, Chlorine; 11, Methane; 12+, Ammonia
J	Hydrogen 3d6+70%, Helium 2d6+10%
L	Argon 3d6+65%, Oxygen 2d6+15%
M	Nitrogen 2d6+65%, Oxygen 2d6+15%
Y	1-4, Carbon dioxide; 5, Carbon monoxide; 6-7, Nitrogen; 8, Oxygen; 9, Sulfur dioxide; 10-11, Fluorine; 12+, Chlorine
Black Zone (any)	1-9, Hydrogen; 10+, Helium

*Modifiers: Giant or supergiant star, -1; Type A or B star, -1; Type M star, +1; Planetary mass under 0.2, -1; Planetary mass over 2, +1; Close moon of Class-J planet, +2.

WHAT COLOR IS THE SKY?

The blue skies of Earth don't come from a blue sun, but from the optical scattering behavior of Earth's atmosphere. Red light shines straight through it, but shorter wavelengths, such as blue light, get refracted all over the sky. Even red suns don't appear red from planetside; they are, after all, considerably more than "white-hot" in real life. But they do emit more red-wavelength light, which will cause the atmosphere to seem redder, or even purplish on worlds toward the edges of the Green Zone. An orange sun might turn the sky somewhat greenish, for analogous reasons. The planet of a white or blue-white sun, meanwhile, would have a bright, azure sky like Earth's tropics. Mars' pink skies, or Vulcan's orange skies, are due to dust particles, not sun color—in thin atmospheres, dust stays up longer (thanks to static electricity and less wind) and colors the sky more thoroughly. Methane, chlorine, or ammonia atmospheres add greens, yellows, and blues—but don't occur on Class-M worlds.

TABLE 1.15A: ATMOSPHERIC THICKNESS

ATMOSPHERE	DENSITY	WORLDS: ROLL (1D6)*
None	0%	D, F
Trace	2d6%	G, H: 1-3
Thin	5d6+50%	G, H: 4-5; K, L: 1; M: 1-2
Standard	(1d6+6 x 10)%	G, H: 6+; K: 2; L: 2-4; M: 3-5
Thick	5d6+120%	K: 3-4; L: 5+; M: 6+
Dense	3d6 x 50%	K: 5
Superdense	2d6 x 100%	J, Y; K: 6+

*Modifiers: Gravity below 0.5 G, -2; Gravity 0.5-0.8 G, -1; Gravity over 1.2 G, +1; Red giant star, -2, Type A star, +1; Type K star, -1; Black Zone, +1, Tidally locked, -2.

TABLE 1.15B: TRACE ATMOSPHERIC COMPONENTS

ROLL (2D6)	COMPONENT	FORBIDDEN
2-3	Nitrous oxide	–
4	Chlorine	Class-L, Class-M
5	Fluorine	Class-L, Class-M
6	Ammonia	Yellow Zone, Class-M
7	Water vapor	Blue or Black Zone, Type B stars
8	Carbon dioxide	–
9	Sulfur dioxide	Class-L, Class-M
10	Methane	Yellow Zone, Class-L, Class-M
11	Argon	–
12	Neon	–

ATMOSPHERIC THICKNESS: Table 1.15A: Atmospheric Thickness gives the thickness of the planetary atmosphere. Roll 1d6, apply any modifiers, and then find the result after the correct world class in the Worlds column. For example, a modified die result of 4 would indicate a thin atmosphere for a Class-G world, a standard atmosphere for a Class-L or Class-M world, or a thick atmosphere for a Class-K world. Class-D, -F, -J, and -Y worlds always have the same atmospheric class, as shown in the table. (Narrators who wish may continue to use Table 10.7 in the *Narrator's Guide* to determine atmospheric thicknesses for Class-L and Class-M planets; the values and probabilities from Table 1.15 are close but not identical.)

Once you've found the correct thickness for the world's atmosphere, determine its atmospheric density as shown in the Density column of Table 1.15. Given the world's atmospheric density, multiply that by its gravity. Multiply the result by 1000 millibars to get air pressure at sea level. Earth has 20% oxygen at 1000 millibars of pressure, which gives a "partial pressure" of 200 millibars (20% of 1000). Humans can tolerate partial pressures between 100 and 400 millibars of oxygen; other species have similar ranges. Pressure also varies by altitude; divide 1000 meters by the local gravity to find the 10% pressure gradient. (On Earth, pressure drops by 10% for every 1000 meters of altitude; on Vulcan, with 1.4 G, it drops by 10% at every 714 meters.) On some large planets with unbreathably thick atmospheres, Humans might be able to colonize high mountaintops!

Planet Temperature

To determine a world's basic temperature (see page 174 of the *Narrator's Guide*), begin with the background heat for the planet's orbital zone: 350 degrees Centigrade in the Yellow Zone, 10 in the Green Zone, -100 in the Blue Zone, and -200 in the Black Zone. Thicker atmospheres reflect more light, and thus cool the planet: standard atmospheres reduce temperature by 5 degrees, and dense ones by 20 degrees. However, thicker atmospheres can also trap heat, if they contain enough greenhouse gases: standard atmospheres raise temperature by a number of degrees equal to twice the percentage of carbon dioxide in the atmosphere, dense ones by 10 degrees for each percentage point of CO2. Worlds with days longer than 10 Earth standard days can get amazingly hot on the day side; add 1d6 x 10 degrees to the temperature. For tidally locked worlds, double the temperature on the day side and halve it on the night side. If the planet is too hot, it has a runaway greenhouse effect going on; oceans steam and boil, pumping the air full of water vapor and adding 1d6 x 100 degrees to temperature. The atmosphere becomes superdense. (Tidally-locked worlds do not get runaway greenhouse effects; all their water becomes glaciers on the night side.) Make sure you compute the temperature for both extremes of an eccentric planet's orbit (page 8).

SURVIVING IN EXTREME TEMPERATURES: If you have the Survival skill, you can try to mitigate the effects of extreme temperature. Make a Survival test (TN 10). On a marginal success, treat the temperature as one category closer to comfortable; on a complete success, move it two categories, and on an extraordinary success, move it three categories. Each Survival test counts until the next fatigue test comes up. Remember, a lack of appropriate tools may cause a penalty to the test. (See Table 6.3: Physical Test modifiers on page 101 of the *Star Trek RPG Player's Guide*.) If you're dropped in the middle of the desert totally unequipped, that worsens the TN by 15—making survival a ridiculously difficult proposition!

Medicine in the 23rd and 24th century can offer partial solutions; injections of special compounds may help to regulate body functions and thus prevent

TABLE 1.16: TEMPERATURE TOLERANCE

RELATIVE TEMPERATURE	EXERTION	DAMAGE
Frigid	+3 to exertion level	1d6 points each fatigue test
Cold	+2 to exertion level	1 point each fatigue test
Cool	+1 to exertion level	—
Comfortable	Normal	—
Warm	+1 to exertion level	—
Hot	+2 to exertion level	1 point each fatigue test
Scorching	+3 to exertion level	1d6 points each fatigue test

HAZARDS OF CLIMATE

Exposed to Vulcan's searing deserts, a Human quickly dehydrates and tires. On Andoria, the freezing snows bring frostbite. Humanoids can often survive in a wide range of climes, but very few species can survive in *all* conditions.

Typically, characters in very hot or very cold climes suffer fatigue more rapidly than normal. Heat leads to exhaustion, heat stroke, prostration, loss of body fluids, and eventually to delirium and death. Cold causes freezing of flesh, muscular coordination problems, desiccation of soft tissues and eventually unconsciousness and death.

Most humanoid species have a comfortable "temperature window" and can function normally within certain ranges. It's not generally necessary to calculate an exact temperature; all that's necessary is for the Narrator to determine where the temperature window lies for a given character. (In temperate-zone Humans, the comfort zone runs between roughly 15 and 30 degrees Centigrade, although warm or well-insulated clothing can extend the comfort zone considerably.) Characters exposed to higher or lower temperatures can suffer from accelerated fatigue and even injury, as shown on the accompanying table. The average Human temperature gradient is about 10 degrees Centigrade: an unprotected temperate-zone Human begins suffering "cool" effects at 5 "cold" effects at -5, and so forth. Many factors can affect these numbers: use the 10-degree increment as a first rule of thumb.

As the table shows, a character in very hot or very cold weather suffers from accelerated fatigue as well as the possibility of damage. In scorching or frigid climes, a character can quickly be incapacitated by the frequent fatigue rolls and accompanying damage. Increases in exertion level make fatigue tests more frequent and difficult—in cool or warm weather, Relaxed exertion becomes Standard instead (see pages 95-96 of the *Narrator's Guide*). Damage occurs each time a fatigue test comes up, if the temperature so indicates. You can resist damage from temperature with a Stamina reaction test of the same TN as the associated fatigue test. So, if you're trying to resist fatigue with a Stamina test (TN 10), you also resist the damage with a Stamina test (TN 10). A successful Stamina test to resist this damage cuts it in half, rounded down, so you'll still eventually succumb to very high temperatures.

temperature exhaustion. This can either count as having specific, precise "equipment" for the job, or in some cases might reduce all temperature penalties by one category for four to eight hours.

ATMOSPHERIC PRESSURE: High- or low-pressure atmospheres can cause difficulty in breathing, "bends" or total system failure. On low-pressure worlds, characters have problems breathing because the atmosphere's simply too thin. By contrast, high-pressure worlds put a strain on circulatory and respiratory systems because the gases strain the limits of the body. In either case, discomfort and death can result.

Variations in pressure can quickly render characters unable to function. There's no real need to go into the specifics of atmospheric pressure values; it's sufficient to determine that a planet is high- or low-pressure compared to a given character's homeworld. (This is especially true because pressure tolerance tends to vary widely from individual to individual.)

In slightly high or low pressure, you tend to become winded more easily, and recover more slowly. Characters from worlds with standard atmospheres suffer these effects on worlds with thin or thick atmospheres; characters from thin or thick atmospheres (who must evolve stronger rib and lung muscles in the first place) suffer them only in thick or thin air, respectively (see page 14 for atmospheric thickness details). A Human suffers these effects on thin-aired Vulcan or thick-atmosphere Ferenginar, for example, but Vulcans would only suffer on Ferenginar and not on Earth. Add one level to all exertions (Relaxed becomes Standard), and it takes twice as long to recover fatigue levels.

In very high or low pressure (trace or dense atmospheres, see page 14), you not only suffer from extreme fatigue, but you eventually suffer from hemorrhaging and other problems. Add two levels to all exertions, and you don't recover fatigue levels at all with rest. Once you collapse from loss of fatigue, you take 1d6 damage at each successive fatigue roll, and even resting isn't enough to stave off further rolls. No Class-M world has very high or low air pressure to any humanoid; worlds with damaging pressure are considered Class-K or Class-H. Superdense atmospheres do one full Wound Level per round (no resistance possible) until the character dies, is rescued, or enters a safe environment.

Surviving in and medically treating pressure differences is a lot harder than dealing with temperature extremes. The most that you can really do is try to pace yourself and hope that an injection of tri-ox or a similar compound can make up for respiration difficulties. No Survival test is possible to negate the penalties for extreme atmospheric pressure. Special compounds from the 23rd and later centuries may mitigate pressure problems for four to eight hours, at the Narrator's discretion (also, see the *Starfleet Operations Manual* for an extended list of medications, some of which may be helpful).

Obviously, a character with an artificial environment regulator (like an EVA suit) doesn't need to worry about the problems of temperature and pressure as long as the environment remains controlled.

TABLE 1.17: HYDROSPHERE

WORLD CLASS	HYDROSPHERE (SURFACE LIQUID %)
D, F, J	None
G, K (Blue Zone)	Dense atmosphere: liquid ammonia/methane oceans equal to % of atmospheric ammonia/methane
Other atmosphere: None	
H, K, Y	1-3, None; 4-5, 1d6%; 6, 3d6%
L, M	Roll on Table 1.17A

Planet Hydrosphere

Consult Table 1.17: Hydrosphere to determine the percentage of the world covered with liquid—water, in the case of Class-M and Class-L worlds. Remember that no world with a temperature above 100 degrees Centigrade can have any liquid water at all.

PLANETARY GEOLOGY

Part scenery, part hazard, part story hook, the geology of a world will affect its look and its usefulness.

Tectonic Activity

Very active worlds will always have at least trace atmospheres (see page 14). Not all worlds have tectonic activity: Class-D and -J worlds have none. Worlds with ice densities can have explosive freezing and cracking—"icequakes" and "water lava"—driven solely by stellar heating, in some cases. Add +1 to the abundance roll for metals and minerals (page 176 of the *Narrator's Guide*) on planets with active geology, and +2 for very active worlds.

TABLE 1.17A: CLASS-L OR -M WORLD HYDROSPHERE

ROLL (2D6)*	HYDROSPHERE (SURFACE WATER %)
0-7	20-90 (multiply roll by 10%)
8-11	99 (an ocean world like Pacifica with only scattered islands)
12+	100 (no dry land at all; there may be polar icecaps)

*Modifiers: Thick or dense atmosphere, +1; Thin atmosphere, -1; More than 4% atmospheric water vapor, +2; Red giant star, -1; Mass over 1.25, +1; Mass below 0.75, -1; Temperature 20 to 50 degrees Centigrade, +1; Temperature 0 to -20 degrees Centigrade, -1; Temperature -20 to -50 OR 50 to 100 degrees Centigrade, -2; Scanty Oort cloud, -1; Thick Oort cloud, +1.

TABLE 1.18: TECTONIC ACTIVITY

Roll (2d6)*	Tectonic Activity Level	Temperature Increase (Centigrade)
1-4	Dead	0
5	Hot spot	1d6 degrees
6	Plastic	1d6+3 degrees
7-10	Active	2d6+3 degrees
11+	Very active	4d6 degrees

*Modifiers: Over 6 billion years old, -1; Less than 2 billion years old, +1; Diameter below 7000 km, -2; Diameter over 16000 km, +1; Mass below 0.5, -1; Silica or rock-ice density, -3; Metal-rich density +1; Yellow Zone, +1; Large moon, +1; Large close moon, +2; Day less than 12 hours, +1; Thick Oort cloud, +1; No hydrosphere, -2; Hydrosphere 1% to 30%, -1; Sulfur dioxide atmosphere over 3%, +2.

Terrain

Although each world's geography may vary widely, most worlds share certain basic terrain types in common: desert, ice cap, tundra, and mountains. Earth's land area, for example, is about 25% desert, 9% ice cap, 10% tundra, and 6% mountains. The rest is relatively flat, plant-covered land: 20% forest, 10% jungle, 18% grassland, and 2% marsh.

As a very general rule of thumb, take the proportion of the planet covered by land, and cover that portion of the land in desert. (Vulcan is 72% land, which would indicate that 72% of that land is desert.) For every 3 degrees of temperature below 50, increase the ice cap and tundra percentages by 1% each. No world can have more ice cap cover than its hydrographic percentage, of course. Multiply the planet's mass by 3% to get the amount of surface covered by mountains, doubled for tectonically active worlds and doubled again for very active worlds. Now, take the hydrospheric coverage, subtract the land ice cap and half the tundra percentage; this equals the percentage of the remaining land that is forest or jungle. (Earth's 75% water, minus 9% ice and 5% tundra, equals 61%. Subtracting Earth's desert, ice, tundra, and mountains gives 50% of the land area. 61% of 50% is 30% land area.) The remainder of the land is marsh or grassland.

This very rough rule of thumb can be altered by the planet's geography; if the sole continent sits on the equator, there may not be any tundra to speak of. Or, of course, by its demographics; populations in the millions or more will clear land for farms and cities.

PLANETARY LIFE

Any world with water and a temperature between -20 and 50 degrees Centigrade is likely to develop some kind of recognizable life—by definition, all Class-L and Class-M worlds have such life, since without it, no oxygen atmospheres could develop. More exotic life such as gaseous-form creatures and beings other than carbon-water life forms (see box) may have other temperature ranges, of course. However, Class-D and Class-F worlds are unlikely to have any indigenous life at all, and Class-G worlds will likely top out at complex bacteria or slimes. Class-H worlds might support lichen or other tough primitive plants; the clouds of some Class-J worlds have fairly complex (though often unrecognizable) ecologies. Life on Class-K and Class-Y worlds is either viral, mineral, or exotic. Constructs and energy beings may exist on any world, even tiny, airless asteroids.

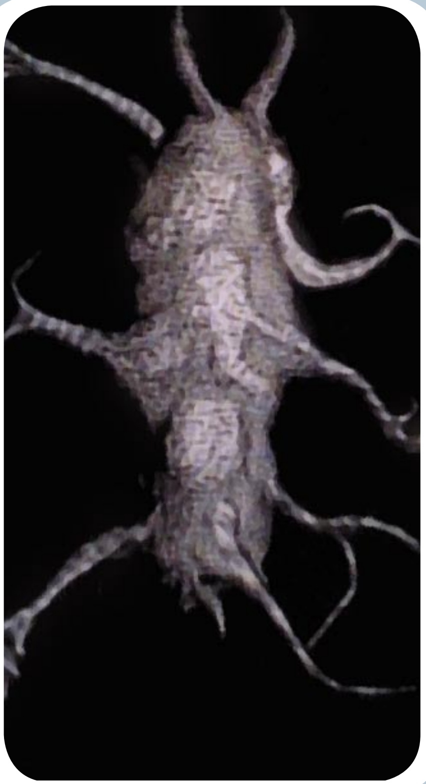


TABLE 1.19: PLANETARY LIFE FORMS

Roll (1d6)	Nature of Life Evolved*
1-3	None
4-6	Seeded by ancient species: 1, Unicellular life; 2-3, Plants; 4-6, Roll on Table 1.19B

* See Table 1.19A

TABLE 1.19A: EVOLVED LIFE FORMS

Planetary Age (years)	Life Forms
1 billion	Prebiotic molecules
2 billion	Unicellular life
3 billion	Lichen, mosses, algae
4 billion+	Roll on Table 1.19B

TABLE 1.19B: ADVANCED LIFE FORMS

Roll (2d6)*	Life Form
0-4	Worms, snails, slime devils, fungi
5-6	Insects, molluscs, trilobites (Intellect 1+), ferns
7	Fishes, colony beings
8	Amphibians, balloon creatures, walking plants
9	Reptiles (Intellect 2+)
10	Mammals (Intellect 3+), flowering plants
11	Dinosaurs, birds, metamorphs
12+	Energy beings, psionic creatures

*Modifiers: Seeded ecology +4; Thick Oort cloud -2

Exotic Life

Starfleet's bold explorers have discovered worlds bearing life forms with radically different chemistry from Class M worlds' water-carbon life. As a kind of intermediate stage between organic and non-organic life, there exist carbon-based life forms that breathe chlorine or even cyanide! Still other creatures, although not organic beings per se, still require organic matter for sustenance—the dikironium cloud creature that attacked the *U.S.S. Farragut* in 2257 drained hemoglobin. However, some chemistries have no connection whatever with conventional water-carbon ecologies. Most exotic life forms depend on a relatively narrow range of temperatures, atmospheres, and other conditions. Although Class M planets are relatively rare, successful life on other types of worlds is rarer yet. In general, life forms with exotic chemistries and living conditions make poor player characters, but can provide interesting scientific, diplomatic, and even military challenges as encountered life forms. All temperature and atmosphere ranges deal only with the environment in which the being evolves—a technological ammonia-breather might be able to live and travel in any environment with the proper suit and breathing apparatus, just as Humans can now live and work in the vacuum of interstellar space.

Fluorine-Silicon: Organisms such as the Excalbians, with a complex body chemistry based on fluorosilicone compounds can evolve on hot Class-K (or even Class-Y) planets with fluorine and carbon dioxide atmospheres. (Plentiful fluorine-silicon life removes all the carbon dioxide from the atmosphere, which might reduce the temperature to the point where fluorocarbon-sulfur life takes over.) They require a temperature range of 400 to 500 degrees Centigrade. The Horta is a fluorine-silicon species that probably evolved near the molten core of its planet, Janus VI—it now ingests radioactives to provide heat. Similar creatures might evolve on any metal-rich world.

Fluorocarbon-Sulfur: Class-K planets with liquid sulfur (requiring a temperature range of 150 to 400 degrees Centigrade) and oxygen-poor, fluorine-rich atmospheres, can produce life forms based on fluorocarbons and sulfur. Given enough time, these organisms may create Human-tolerable atmospheres, as they break oxygen out of carbon dioxide to make complex fluorocarbon molecules. The bacteria with which Starfleet has seeded Venus match this description.

Hydrogen-Sulfur: Under extreme pressures and in temperatures over 400 Centigrade (present only on Class-Y worlds), creatures can evolve in platinum-cyanogen matrices to metabolize hydrogen in a sulfate solvent. Such evolution is almost always sparked by spaceborne proteins seeking stable niches, and traditionally adapts itself to match its environment rather than altering the environment around it. The dichromate mimetic creatures encountered by the *U.S.S. Voyager* exemplify this biology.

Carbon-Ammonia: On frigid (-80 to -30 degrees Centigrade) planets with plentiful liquid ammonia, carbon-based life forms can evolve using ammonia as a solvent rather than water. These beings require a methane-ammonia atmosphere, and can evolve on large Class-G worlds or the Class-G moons of Class-J worlds, in the upper atmosphere of Class-J worlds, or on cold Class-K worlds. Ammonia-based life will break down carbon dioxide and release oxygen, which will break down methane into frozen water and nitrogen.

Carbon-Methane: On still colder worlds (-180 to -160 degrees Centigrade) with liquid methane, carbon-based life forms using a methane solvent can evolve. Carbon-methane life depends on an atmosphere high in methane and hydrogen; it can evolve on the same classes of world as carbon-ammonia life.

Carbon-Hydrogen: At still colder temperatures (-250 to -260 degrees Centigrade), or at higher temperatures under extreme pressure (such as the lower atmosphere of a Class-J world), hydrogen can behave as a solvent for carbon-based life. Such hydrogen-suspension life does not alter its environment because its molecular chains are too delicate to withstand sunlight or other energetic radiation. The Lothra of Opax XIV are the best-known sentient hydrogen-breathers.

Liquid Helium: Far from any sun, in the heart of deepest space, where rogue planets feel only the trace trickles of heat from the Big Bang, helium can exist as a superconductive liquid, at temperatures approaching absolute zero (-270 Centigrade). Organisms based on liquid helium are very alien, and do not cause or even use chemical reactions at all. Since helium is an inert gas, helium-based life does not alter the planetary environment.

Energy Beings and Noncorporeal Entities: Xenobiologists speculatively draw lines between noncorporeal entities (those without a physical form) and energy beings (those composed of, or metabolizing, pure energy rather than chemical energy). Almost all energy beings are noncorporeal, but not all noncorporeal entities are energy beings. There is reason to suspect that most noncorporeal and energy beings somehow evolve from corporeal ones. The Organians, Metrons, and Q have all implied that Humanity (and by extension other species) will some day join them in their immaterial state. Species such as the Melkots, Medusans, Travelers, and so forth may be intermediate stages on such an evolutionary journey. On the other hand, energy beings could evolve from more primitive energy beings just as material species do. However, there do seem to be repeated points of contact between such beings and their material neighbors—rather more, in fact, than between organic species and many other inorganic, though material, species. Some energy beings, such as the anaphasic entity of Caldos Colony, require organic hosts for molecular cohesion. Others, such as the two separate emotion-draining species that attacked the *U.S.S. Enterprise* at Argelius and Beta XII-A simply feed off sentient life in any form. On the other side of the equation, some corporeal beings (such as the Devidians) feed off pure energy (in the Devidians' case, neural energy).

If energy beings are not simply the hyperevolved consciousness of material beings, they may spring from extremely high-temperature environments with strong magnetic fields. The photonic entities encountered in the corona of a protostar in the Delta Quadrant would fit this model. Class-F or Class-K worlds close to stars, especially with thin argon-rich atmospheres, are other likely locations for energy life to evolve. Energy beings can also evolve as distributed consciousnesses in a crystal (often quartz or silicate) matrix; the Crystalline Entity that destroyed the Omicron Theta colony and the water-based electricity-metabolizing microbrains of Velara III are two examples of such life.

PLANETARY RESOURCES

To determine the useful resources, if any, of the world, use the rules and guidelines for Class-M (and Class-L) planet resources on pages 175-176 of the *Narrator's Guide* as a starting point. Some possible resources for various world classes (or moon-based or orbital facilities around them) appear in Table 1.18: Potential Resource Types.

TABLE 1.20: POTENTIAL RESOURCE TYPES

D, F	Metals and minerals; derelict space junk; artifacts; dangerous, hazardous, or explosive material manufacturing
G	Exotic biological species (medicines, spices, poisons, dyes); water; computer equipment or services
H	Artifacts; metals and minerals; raw industrial goods; mercenaries; "used" equipment
J	Helium-3 for fusion plants; elemental hydrogen; gravity-charged devices or gravitics; antimatter; spaceframes and systems
K	Chemicals; exotic biological species (mostly toxic); prisons or other remote facilities
L	Artifacts; exotic minerals and allotropes; industrial goods; personnel
M	Agricultural goods; industrial goods; biological species; medicines; personnel and services; art
Y	Exotic metals or chemicals