Starting an Aquarium for the Beginner Fish Keeper

By: Trent Brotzler

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Fish Keeping Introduction

Fish keeping is a very fun, exciting and peaceful hobby; where the joy of the hobby comes from the fish, and you providing the best possible living conditions for them. Through out the course of fish keeping over the years, there have been a lot of new methods in which to keep fish, and new methods on which is the best way to do so. Fish stores all around the world have plenty of good information to give to the daily customer, however; since this is the main source of information the customer is getting, he or she is going to believe them. The fact is fish stores run from a financial standpoint, and not for the wellbeing of the fish. They mostly focus on ways to separate you from your money. There are hundreds, if not thousands, of products out there today that claim they do various things to tank, however, in reality they really do nothing. I'm not saying all fish stores are bad, because some are great. Large franchises are the ones you want to listen to with a grain of salt.

Throughout reading this book, you will come out with the knowledge of which products work, and which don't. That's just the beginning; you will acquire more knowledge from reading this book than just which products you should buy and which ones you should not. There are a lot of traps out there, a lot of methods that are out of date and no good, and things to watch out for and how to know whether or not your friendly fish store staff is feeding you with good information or bad information. Furthermore, you will learn about the proper way how to get started and maintain a healthy aquarium for years to come! Fish keeping is an amazing hobby, and there is no reason why you should not be able to enjoy the hobby to the fullest.

One quick note: Be careful on who you trust at a fish store unless that person has proven themselves an expert. Fish stores operate from a financial stand point and not for the well-being of the fish. The more they can move products, such as fish, the more profit they make.

ppm = parts per million

Getting Started

Well, the day finally came when you decided it's time to get a fish tank. You look at the tanks and the wonderful assortment of fish every time you go out and dream about owning one, but what do I need to get started? Should I ask the staff here on what to get, or are they just going to feed me information that I do not need and make me buy stuff that is irrelevant? Well, here I put together a list of the basic items on what you to need to get started.

Items Needed to get an Aquarium Running

The Aquarium

Size does matter so the bigger the tank, the better. A good rule of thumb is try to get the biggest tank you can get, plus ten more gallons. So, if you want to get a 20 gallon tank, try to get a 30. Trust me; you will be happy you did so! Make sure it is affordable as well; there are plenty of other things that need to be bought after you buy the tank. Do some research before you buy your tank on what kind of fish you want and what their requirements are. Also, try to get a tank with a large surface area. A 20 gallon long tank is not the same as a 20 gallon hexagon tank, where the hexagon will have a smaller surface area. The larger the surface area the better, that is why rectangle tanks are hands down the best. Most people, when starting out, will try to get a small tank because they think a small tank will be easy to maintain. In fact, a small tank is more unstable than a larger tank and will be prone to fluctuations in water quality and temperature. I would recommend at least a 30 gallon tank to start out with. Also, keep in mind of how much the tank, when filled with water will, weigh. This will also help determine the size tank you get and where to place the tank in your house. Below I have posted a list of tanks and how much they weigh when filled with water along with their dimensions.

Tank Size	Exact Outside Dimensions (inches) (L x W x H) (Including frame)	Weight Empty (lbs)	Weight Full (lbs)	Tempered Bottom
2 1/2 mini	12 3/16 x 6 1/8 x 8 1/8	2.6	27	
5 1/2 Gallon	16 3/16 x 8 3/8 x10 1/2	7	62	
10 Leader	20 1/4 x10 1/2 x12 9/16	11	111	
10 Long	24 1/4 x 8 1/2 x12 5/8	16	116	
15 Gallon	24 1/4 x12 1/2 x12 3/4	21	170	
15 High	20 1/4 x10 1/2 x18 3/4	22	170	
15 Show	24 1/4 x 8 1/2 x16 5/8	22	170	
20 High	24 1/4 x12 1/2 x16 3/4	25	225	
20 Long	30 1/4 x12 1/2 x12 3/4	25	225	
25 Gallon	24 1/4 x12 1/2 x20 3/4	32	282	
29 Gallon	30 1/4 x12 1/2 x18 3/4	40	330	
30 Gallon	36 1/4 x12 5/8 x16 3/4	43	343	
30 Breeder	36 3/16 x18 1/4 x12 15/16	48	348	
33 Long	48 1/4 x13 1/2 x12 7/8	52	382	X
37 Gallon	30 1/4 x12 1/2 x22 3/4	45	415	X
38 Gallon	36 1/4 x12 5/8 x19 3/4	47	427	X
40 Breeder	36 3/16 x18 1/4 x16 15/16	58	458	
40 Long	48 1/4 x12 3/4 x16 7/8	55	455	X
45 Gallon	36 1/4 x12 5/8 x23 3/4	66	515	X
45 Long	48 1/4 x12 3/4 x19	60	510	X
50 Gallon	36 7/8 x19 x19 5/8	100	600	
55 Gallon	48 1/4 x12 3/4 x21	78	625	X
60 Gallon	48 3/4 x12 7/8 x23 7/8	111	710	X
65 Gallon	36 7/8 x19 x24 5/8	126	775	
70 Gallon	48 7/8 x19 x21 5/8	165	865	
90 Gallon	48 7/8 x19 x24 5/8	182	1080	
100 Gallon	72 7/8 x19 x19 5/8	189	1180	
120 Gallon	48 7/8 x25 x25 5/8	230	1430	
125 Gallon	72 7/8 x19 x23 5/8	236	1480	
150 Gallon	72 7/8 x19 x28 3/4	358	1850	
180 Gallon	72 7/8 x25 x25 3/4	430	2230	
20 X-High	20 1/4 x10 1/2 x23 3/4	32	232	
30 X-High	24 1/4 x12 1/2 x24 3/4	41	340	
50 X-High	30 1/4 x12 3/4 x30 1/2	98	590	
80 X-High	48 7/8 x14 x30 3/4	200	990	
110 X-High	48 7/8 x19 x30 3/4	228	1320	
10 Hexagon	14 1/2 x12 9/16 x18 3/8	12	110	
20 Hexagon	18 3/4 x16 1/4 x20 5/8	23	220	X
35 Hexagon	23 1/4 x20 3/16 x24 3/4	43	390	X
60 Hexagon	27 1/4 x24 1/8 x29 1/2	110	750	X
26 Flatback	36 1/4 x12 1/2 x16 5/8	42	300	X
4 Designer	8 1/4 x8 1/4 x18 7/8	9	49	
6 Designer	8 1/4 x8 1/4 x24 7/8	10.5	70	
10 Designer	13 5/8 x13 5/8 x19	18.5	115	
15 Designer	13 5/8 x13 5/8 x25	25.5	175	

Tank chart By: Peter J. Stonard

Aquarium Stand

You need a place to put your tank once you get it home, and a shelf or a dresser is not the best idea. Each gallon of water weighs about 8.33 pounds. So even a 10 gallon tank will weigh 83.3 pounds, and that's not including the substrate or décor.

Aquarium Hood

The hood is the cover to the tank; this is where the lights are located as well. Make sure when you buy a hood that it has a fluorescent light fixture and not an incandescent fixture. A fluorescent light is a lot better than an incandescent because there are more options on different types of bulbs you can get. If you decide to have live plants in the tank, it is important that you get the appropriate bulb for the plants; which are easier found in fluorescent bulbs.

Aquarium Heater

You will need to get a good heater. There are many different types of heaters out there on the market and a lot of them are good ones. If it is in your price range, buy it. On the package of the heater, there will be an indication on which size tanks the heater is suitable for.

Thermometer

There are many different types to buy. However, all I ever use are the old fashion thermometers, nothing fancy, and these work just fine.

Aquarium Filter

Here we go! The filter is hands down the most important part to an aquarium, which you will find out why, later. There are a couple different types of filters. There are hang on back filters (HOB), canister filters, wet/dry filters, sponge filters and under gravel filters (UGF). HOB filters are probably the most popular and versatile. They are really suitable for tanks from 5 gallons to 100 gallons. If your tank is bigger than 100 gallons, you should start to look into canister filters. Canister filters have a very large volume for filter media to be place. They also have a very high flow rate and the water is pressed through the filter assembly. Meaning, the only way for the water to get out of the filter once it enters the filter, is to go through all of the filter media. Where a HOB filter you can have "blow-by," where the water may pass around the media before entering the tank again. However, HOB filters have changed in design a lot over the years to eliminate this "blow-by" problem. A really good HOB filter brand to choose from is AquaClear Power Filters. AquaClear filters come in different sizes, and are suitable for a wide range of tank sizes ranging from 5 gallons to 110 gallon tanks. Try to avoid filters that have a "clip-in" filter cartridge. These cartridges tend to fall part really easily and do not provide adequate filtration. So look at AquaClear for a starter filter, you will not be disappointed. One good thing to know about what size filter to get is that you want the filter to have a turnover rate of water at least 5 times in one hour. This means, the filter should be big enough to have all the water in the tank pass through the filter at least 5 times in one hour. Manufactures may say on the filter package what size tank a particular filter is good for. This is a good number to go by but it's always better to look at the flow rate of a filter. It should state, on the package, the flow rate of your filter, in gallons per hour (GPH). You can then use this number to see if this filter is adequate for your tank. Take the rated GPH and divide it by your tank size in gallons. If the answer is 5 or higher, then you are good. Same thing if you are using liters (LPH). Divide the LPH by the size tank in liters.

EX. This certain filter is rated for 500 GPH and I have a 100 gallon tank. So, 500/100 = 5x turn over.

Aerator

It is really good to get a least one aerator in your tank. Don't forget to get air tubing and an air stone. An aerator ensures a healthy amount of oxygen level to be maintained within a tank. It also keeps a steady level of CO2 in the tank as well, which is good for plant growth, but will not harm the fish in any way.

Test Kit

This is another huge thing that needs to be addressed. A test kit is a must for all fish keepers; from the beginner fish keeper to the avid fish keeper, a test kit is always needed. A basic test kit will test for Ammonia, Nitrite, Nitrate and pH. It is very important that you get a liquid reagent base test kit. There are strip test kits available; however, these are extremely inaccurate which could lead to other problems. Do not get a test kit that uses strips to test the water. The API Fresh Water Master Test Kit is a really good liquid test kit found quite readily available in the U.S. for a really good price. I would recommend this test kit, or others that are equivalent.

Water Conditioner

This is another important item to get. Tap water at your house contains harmful elements for fish such as chlorine, and heavy metals. A water conditioner will remove or neutralize these making the water safe for fish. API Stress Coast Plus is a very good water conditioner. Another thing about water conditioners that most people don't know about is that they contain trace nutrients and minerals for the fish. For instance, the API Stress Coat Plus contains Aloe Vera,

which helps the fish with maintaining a healthy layer of their slime coat. A water conditioner is a must, without it the aquarium would fail.

Substrate and Decor

This part I leave up to you. Go ahead and pick out whatever kind of substrate, gravel or sand you want and in any color. Also, get some décor as well. Rocks, fake/live plants and other assortments of décor are good within a tank. In other words, have fun "aqua-scaping" your tank. However, wait until after your tank has cycled, which I will talk about later, to get live plants.

Fish? Nope, not yet. We do not get fish at this point.

Now, go home and setup everything how you like it, but do not put water in the tank, just yet. Become familiar with your filter, as you will be taking it apart every now and then to clean it. Do not put the substrate in at this point. I will go through the methods on how to clean the substrate before you put it in the tank.

How to clean substrate:

As for the substrate you bought, I am going to go through the methods on how you should clean the substrate.

First off, gravel is going to be easier to clean then sand just because gravel is larger than sand. Here are the steps you should take, which are rather easy, to clean gravel before you put it into your tank.

Cleaning Gravel:

Step 1: Open the bag that the gravel came in and put it all in a clean bucket. Make sure the bucket, or any other kind of container you decided to use is free from any type of detergent!

Step 2: Locate another clean bucket or container; this is where you are going to place the gravel once it is cleaned.

Step 3: Now, use a net, which you can pick up your local fish store, and get a decent size of gravel in the net and run it under tap water. When you run it under tap water make sure you try to get all debris off of the gravel. After you have cleaned the gravel as much as possible, you can now put the cleaned gravel in the empty bucket. Do this until you have gone through all the gravel you have.

Step 4: Now comes the time where you can place the gravel in the tank!

Cleaning sand, Bucket method:

The most effective method of cleaning sand is referred to as what is known as the "bucket method."

Step 1: Get a clean bucket that is free from any detergent.

Step 2: Fill the bucket with ¼ sand you want to use.

Step 3: Take a garden hose, if you are outside, or take a shower hose if you are inside and place the hose all the way down into the sand until the hose hits the bottom of the bucket. Note: If you are inside, this is best done in a bathtub or near a drain.

Step 4: Turn the water on. While the water is running out of the hose, stir the sand with the end of the hose while the bucket is filling up with water.

-What this does, is it kicks up any debris within the sand and brings it to surface. Since the sand is usually heavier than the debris, the sand remains at the bottom of the bucket. Allow the bucket to over-flow with water and pour over the edges of the bucket. This brings all the debris up and out of the sand, which flows out as the water over flows the bucket

Step 5: After you have spent some time doing this, and the water begins to clear up, you can now stop the cleaning process. Pour out the remaining water and place the sand in a clean empty bucket. Repeat this process until you have cleaned all the sand you have.

Step 6: Now that the sand is cleaned, you can now put the sand in your tank.

Cleaning sand, Pillow Case Method:

Step 1: Locate a clean pillow case.

Step 2: Fill the pillow case ½ with sand.

Step 3: Locate a hose, a garden hose works best, and place the hose inside the pillow case with the sand and turn the water on. Repeat this method until you have cleaned all the sand you have.

-This washes off any chemicals that may be on the sand. However, this method is not best for freeing the sand of debris. For freeing the sand of debris, please follow the "Sand Cleaning, Bucket Method."

Step 4: Now comes the time when you can place the sand in the tank.

Filling the tank with water:

One thing to take into consideration at this point is to try to get the tank as leveled as possible by using a level and shims to level the tank. It is very hard to level a tank, especially if the tank is very large, when the tank is full of water.

Filling the tank with water for a gravel substrate and how to level a tank:

To fill a tank that has a gravel substrate, it is rather simple; just slowly pour the water in. When you have about ¾ of the tank full of water, this is a good time to stop and make sure the tank is still leveled. If your tank stand is on carpet, then the carpet likes to "give" a little bit in different areas when weight is applied, so it is essential to have the tank leveled on carpet before the tank is fully filled with water. After the tank is "re-leveled" go ahead and fill the tank all the way to the top. It is still a good idea to check and make sure the tank is leveled again at this point.

Filling the tank with water for a sand substrate:

When you have all the sand in the tank, and at the desired level, it is now time to begin to fill the tank with water. The first thing you should do is get a glass plate (dinner plate) and place it face-up on top of the sand. Now, begin pouring the water directly on the plate very slowly, allowing the water to over-flow the plate and begin to fill up the tank. The reason the plate is used is because it does not allow the sand to "stir" up as much and create murky and cloudy water. However, the tank will still be murky for sometime as it takes time for the sand to settle to the bottom of the tank. This is not to worry about, as the tank will soon clear. While filling up the tank, please follow how to level a tank properly in the "Filling the tank with water for a gravel substrate and how to level a tank:" section above.

After the tank is full of water:

This is when you want to add the correct amount of water conditioner to the water to remove any chlorine or other heavy metals and harmful elements. You can also add any décor you want, however I advise against adding any live plants at this point.

Moving ahead:

At this point your tank should be fully up and running, you should be getting your tank temperature set at the right temp for the type of fish you want. A normal tropical tank temperature is around 77-80 degrees F. Your filter should be running and all other equipment should all be running and ready to go. I bet you want to add fish at this point, however; at this point in your aquariums' life, it is not the time to add fish yet. We need to do what is called "cycling" a tank. Cycling a tank is making a tank safe for fish. This is the biggest key factor in a successful, healthy and thriving aquarium! This step should not be over looked or skipped! If one was to skip this step and just add fish, that person would be in a lot of hard work ahead of

them and would witness a lot of fish deaths'. Please follow the next bit of information I am about to explain, as this is the heart of the book!

Cycling a tank, an introduction:

All fish produce ammonia, whether it's from fish waste, left over fish food in the tank or rotting debris, whenever there are fish in a tank there is going to be a source of ammonia. Also, the majority of ammonia in a tank comes from respiration (breathing). When fish breathe, they give of ammonia, and Co2, just like we give of Co2. However, ammonia is deadly to fish if in high concentrations. This is where your test kit comes in handy. If fish are exposed to any ammonia level at or above .25 ppm, this is very little, then that fish(s) may have permanent gill damage and a shorten life. This can be thought about pouring bleach over one's body, it burns, and so does ammonia to fish.

"Well, how do I keep ammonia at low concentrations in my tank" one may ask?

"Should I buy products that claim it removes ammonia?" The answer to this is no!

This is where cycling a tank comes into effect. There are bacteria that are all around us. They are in the very water we drink.

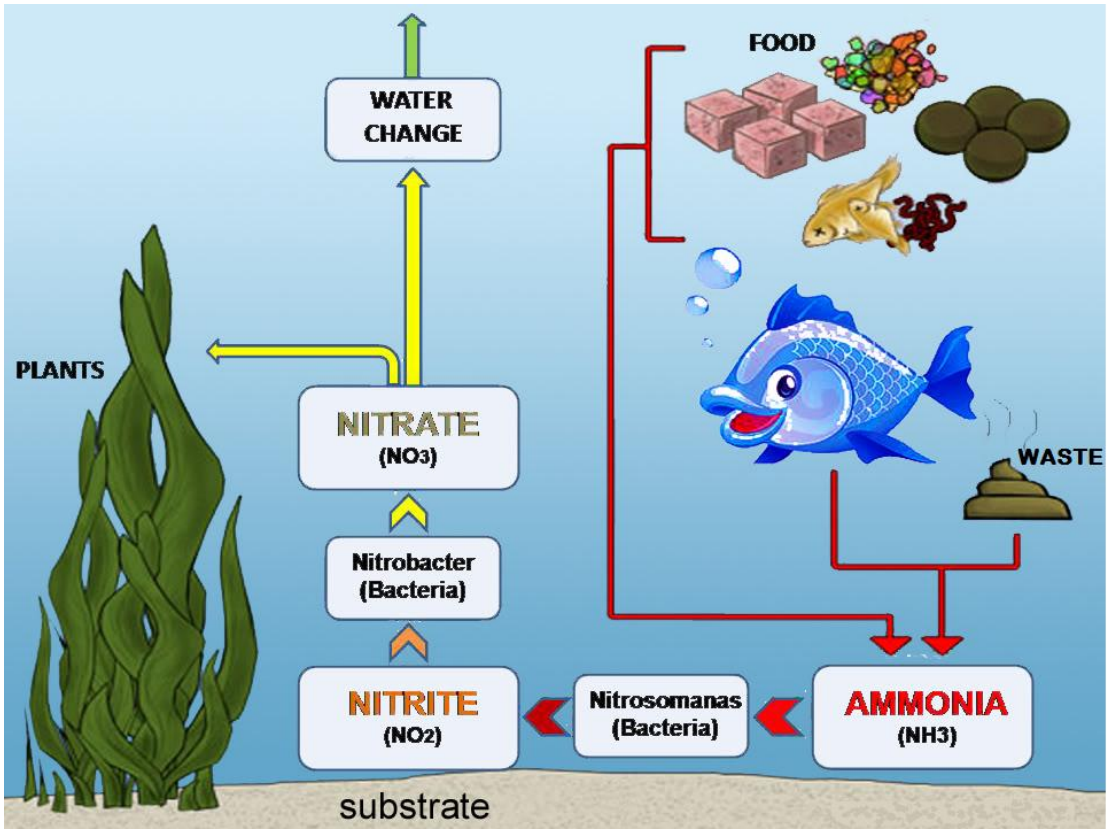
These bacteria are called *Autotrophic* bacteria. These *Autotrophic* bacteria live off of ammonia. Ammonia is their main source of food. Autotrophic bacteria are really small and cannot be seen by the naked eye. These bacteria will colonize naturally in areas that have ammonia in the right concentration for them to utilizes, such as our filters on our tanks. These bacteria will actually eat the ammonia produced by your fish. Yes, that is right; they will eat the ammonia which will keep the ammonia level at a safe level for fish, 0 ppm. However, it takes time for them to colonize in large enough numbers to handle a fully stocked tank of fish.

"Where does the ammonia go after the bacteria eat it?"

After the bacteria begin to process ammonia, the ammonia then turns into nitrite. Again, nitrite is harmful to fish(s) if the level of nitrite is at or above .25 ppm. At this level or above, nitrite may give the fish(s) permanent nerve damage and shorten the fish's life. Yes, you may have guessed it; a second type of *Autotrophic* bacteria will begin to colonize and eat nitrite. This type of bacteria utilizes nitrite as a food source. After this second type of bacteria begins to process nitrite, nitrite then turns into nitrate. However, in a freshwater tank, there are no bacteria that will utilize nitrate as a food source. The good thing about nitrate is that fish can tolerate nitrate in really high concentrations. Studies have proven fish can tolerate nitrate to levels of 400+ ppm, however this is bit extreme and should there be no point in your tanks' life that nitrates should reach these levels. What this shows is that nitrate is extremely less harmful than ammonia or nitrite. In ideal conditions, the nitrate level should not exceed 20 ppm above your nitrate level of your tap water.

The downfall to colonizing enough bacteria to safely handle a full stocking of fish for your tank is time. It takes on average 4-6 weeks to colonize enough bacteria to keep both ammonia and nitrite at 0 ppm. This may seem like a very long time and your local fish store will

most likely never even mention this, but the steps that follow, on how to colonize these bacteria; I urge you to follow them. This whole process, colonizing these bacteria, is what is known as "cycling" a tank. From a scientific stand point, this process is called the *Nitrogen Cycle*.



The best, most effective and humane way to colonize these bacteria for the well-being of the fish, is called "Fishless Cycling." That is exactly what it sounds like; cycling a tank without fish. The steps that follow you will learn how to do this.

Note: I would allow the tank to run for at least one day before starting your cycle. If there are any problems with any of the equipment, or you find out that you want to return something because it is not functioning as you hoped, you can do so within this first day.

A very common occurrence in a newly set up tank is a 'Bacterial Bloom.' This is where the water seems hazy/cloudy. At this point, beginner fish keepers will seek the aid of products that claim they clear "New Tank Syndrome" when in fact they will not. This is what the hazy water is. There is another type of bacteria in our water source, a type of bacteria that is not beneficial to us at all. This type of bacteria is called *Heterotrophic* bacteria. What happens in a newly setup tank is when the fish keeper sets everything up and then adds water conditioner to their tank. The water conditioner quickly enables the water to support life. This allows the *Heterotrophic* bacteria to quickly colonize in large numbers and go to work on the organics in the water. So, the hazy/cloudy water is actually millions of *Heterotrophic* bacteria feeding off the organics in the water; this is relatively harmless. Since *Heterotrophic* bacteria are larger than our friendly *Autotrophic* bacteria, *Heterotrophic's* cannot attach themselves to surfaces, so they

are free-swimming and that is why we can see them. Over the course of a few days, the *Heterotrophic* bacteria will soon die off and the water will be clear again.

Fishless cycling:

Since fish produce ammonia and since ammonia is what the *Autotrophic* bacteria need to start the nitrogen cycle, why can we not just buy a bottle of ammonia to simulate fish?

***It is a really good idea to start a log of your tank for a fishless cycle.* So for each day you take a reading of ammonia, nitrite, nitrate and pH, you can then put that in your log so you can see how the cycle is coming along.**

Step 1: Buy a bottle of ammonia, usually ammonia comes in bottles with 9.5% or 10% diluted ammonia, both will work. Ammonia like this can usually be found at your local hardware store. What is very important about what ammonia you select is that it must only contain ammonia and water. Other additives will hinder the ammonia useless and will not allow the bacteria to grow. If the bottle of ammonia does not list ingredients, then that bottle of ammonia is most likely okay to use, but to make sure give the bottle a good shake. If the ammonia foams up, it is no good. If there are a few air bubbles, then that is nothing to worry about.

Step 2: Add up to 5 ppm of ammonia to your tank by looking at the table below. It is very important that you add the ammonia on a 24 hour schedule.

Note: If your tank size does not appear, then simply choose the tank size that is closest to yours. Slight variations like this will not matter all that much.

*Below is a standard bottle of ammonia you can pick up at your local hardware store.

Ammonia Dosage Table

Desired ammonia level in ml (9.5% diluted ammonia solution)

Tank Size	1 ppm	2 ppm	3 ppm	4 ppm	5 ppm
5 gallons	0.2	0.4	0.6	0.8	1
10 gallons	0.4	0.8	1.2	1.59	1.99
15 gallons	0.6	1.2	1.79	2.39	2.99
20 gallons	0.8	1.59	2.39	3.19	3.98
25 gallons	1	1.99	2.99	3.98	4.98
29 gallons	1.16	2.31	3.47	4.62	5.78
30 gallons	1.2	2.39	3.59	4.78	5.98
33 gallons	1.31	2.63	3.94	5.36	6.57
37 gallons	1.47	2.95	4.42	5.9	7.37
38 gallons	1.51	3.03	4.54	6.06	7.57
40 gallons	1.59	3.19	4.78	6.38	7.97
45 gallons	1.79	3.59	5.38	7.17	8.97
50 gallons	1.99	3.98	5.98	7.97	9.96
55 gallons	2.19	4.38	6.57	8.77	10.96
60 gallons	2.39	4.78	7.17	9.56	11.95
65 gallons	2.59	5.18	7.77	10.36	12.95
70 gallons	2.79	5.58	8.37	11.16	13.95
90 gallons	3.59	7.17	10.76	14.34	17.93
100 gallons	3.98	7.97	11.95	15.94	19.92
125 gallons	4.98	9.96	14.94	19.92	24.9
150 gallons	5.98	11.95	17.93	23.91	29.88
180 gallons	7.17	14.34	21.54	28.69	35.86

Desired ammonia level in ml (10% ammonia diluted solution)

Tank Size	1 ppm	2 ppm	3 ppm	4 ppm	5 ppm
5 gallons	0.19	0.38	0.57	0.76	0.95
10 gallons	0.38	0.76	1.14	1.51	1.89
15 gallons	0.57	1.14	1.7	2.27	2.84
20 gallons	0.76	1.51	2.27	3.03	3.79
25 gallons	0.95	1.89	2.84	3.79	4.73
29 gallons	1.1	2.2	3.29	4.39	5.49
30 gallons	1.14	2.27	3.41	4.54	5.68
33 gallons	1.25	2.5	3.75	5	6.25
37 gallons	1.4	2.8	4.2	5.6	7.0
38 gallons	1.44	2.88	4.32	5.75	7.19
40 gallons	1.51	3.03	4.54	6.06	7.57
45 gallons	1.7	3.41	5.11	6.81	8.52
50 gallons	1.89	3.79	5.68	7.57	9.46
55 gallons	2.08	4.16	6.25	8.33	10.41
60 gallons	2.27	4.54	6.81	9.08	11.36
65 gallons	2.46	4.92	7.38	9.84	12.3
70 gallons	2.65	5.3	7.95	10.6	13.25
90 gallons	3.41	6.81	10.22	13.63	17.03
100 gallons	3.79	7.57	11.36	15.14	18.93
125 gallons	4.73	9.46	14.2	18.93	23.66
150 gallons	5.68	11.36	17.03	22.71	28.39
180 gallons	6.81	13.63	20.44	27.25	34.07

Step 3: Check the ammonia level by using your test kit to make sure you have added the correct amount of ammonia.

Step 4: Check the ammonia level every day at the 24 hour mark. If the ammonia at the 24 hour mark starts to go down, this means that you are starting to colonize bacteria that process ammonia. At which point the nitrite level will begin to rise. You can then use your nitrite test kit to monitor your nitrite level.

Step 5: At the 24 hour mark, if your ammonia level is nearing 0 ppm, add ammonia back up to 5 ppm. You will soon see that your ammonia level is dropping faster and faster and that your nitrite level is rising. Over time, after adding ammonia back up to 5 ppm at the 24 hour mark for a couple weeks, you will begin to see your ammonia level will soon go down and hit 0 ppm at every 24 hour mark and your nitrite will be either rising, or starting to fall. At this point your nitrate will start to rise.

Step 6: If your ammonia and nitrite are at 0 ppm every 24 hours, then it is time to start taking ammonia and nitrite readings every 12 hours. So let's say you add ammonia back up to 5 ppm at the 24 hour mark, and then 12 hours later you test your ammonia and nitrite, this is where you will be able to tell if your tank is cycled or not. At this point, your nitrate level will be at a pretty high level, but do not worry about this yet.

NOTE: It is VERY important to ONLY add ammonia at the original 24 hour mark! Not the 12 hour mark! If you are reading 0 ppm of ammonia at 12 hours, then wait until the 24 hour mark (12 hours later) to add ammonia back up to 5 ppm.

Step 7: Once your tank is reading 0 ppm of ammonia and 0 ppm of nitrite at 12 hours, (12 hours after the 24 hour mark) you are nearly there! At this point, continue dosing ammonia up to 5 ppm at the 24 hour mark for one more week! This last week is called the "qualification week." During this week you may have a slight nitrite spike; this is why you should always perform the "qualifying week." Once the week is over, and you are getting both 0 ppm of ammonia and 0 ppm of nitrite (double 0's) then you are cycled!

Step 8: Now do a 90% water change, this is to lower the level of nitrate. Add water back up to full in your tank and add the proper amount of water conditioner. Then you are ready to add your full stocking of fish!

Here is a little example on what I mean about the 24 and 12 hour marks.

Let's say you start your fishless cycle at 8:00 pm. This means you add your first batch of ammonia up to 5 ppm. The next time you check your ammonia level then would be the following day at 8:00 pm (24 hour later, hence the "24 hour mark"). When your ammonia level starts to drop near 0 ppm at the 24 hour mark (8:00 pm) then go ahead and dose the ammonia back up to 5 ppm. If you are consistently getting a reading of 0 ppm of ammonia every 24 hours after you have added the ammonia back up to 5 ppm the following day, then go ahead and start test for ammonia at 12 hours. EX. Add ammonia up to 5 ppm at 8:00 pm, then at 8:00 am check the level of ammonia. If the level of ammonia is at 0 ppm at 8:00 am, DO NOT add ammonia until the 24 hour mark (8:00 pm).

How to properly add fish:

Step 1: Open the bag with the fish and float the bag in your tank.

Step 2: After 15 minutes of the bag floating in the water, add a very little amount of tank water to the bag where the fish is. This allows the pH to match. Once every 15 minutes for 1 hour,

continue on adding tank water very slowly to the bag where the fish is. Once the hour is up, you can then safely remove the fish by using a net, never dump the fish with the bag water directly into your tank, and put the fish in your tank.

You can now enjoy your fish knowing they are not being harmed by ammonia or nitrite!

Congratulations! You just completed a Fishless Cycle.

The second method of cycling a tank is a method I do not recommend. Since most people will take their local fish store's advice and get fish right away, this is really the only method they have left to follow. This method is known as a "Fish-in Cycle," where the fish are the ammonia producers during the cycle, and not a bottle of ammonia. These fish will also be presented to ammonia and nitrite above safe levels; this is why this method is not advised simply because it puts the fish in harm's way.

Fish-in Cycling:

Step 1: Buy some hardy fish; usually your local fish store staff will know which ones are best for this, as this is the only method they really know how to cycle a tank.

Step 2: Begin to monitor your ammonia level immediately because your fish are going to start to produce ammonia as soon as you add them to the tank. It is best to monitor your ammonia and nitrite levels twice a day; once in the morning and once in the evening.

Step 3: Perform water changes accordingly so that your ammonia and/or nitrite level do not go over .25 ppm. If your ammonia and/or nitrite level(s) are above .25 ppm, an immediate water change is in order to lower the ammonia and/or nitrite as close to 0 ppm as possible.

Note: You will most likely be doing at least two 50% water changes daily, if not more, for some time.

"Won't doing water changes remove the bacteria I am trying to colonize?" The answer is no; because these bacteria colonize in the filter, not in the water column. So by removing water you are not removing the bacteria you are trying to colonize.

Step 4: Over time you will see that your ammonia and/or nitrite levels are not as high as often and are taking longer to rise to dangerous levels. This is because you are beginning to colonize the *Autotrophic* bacteria in your filter to handle the ammonia and nitrite levels.

Step 5: When it seems that your ammonia and nitrite levels are reaming at 0 ppm without doing any water changes, then you are nearly cycled. Once your tank can go for one week without a single water change, meaning your ammonia and nitrite levels are remaining at 0 ppm, then you can consider yourself cycled!

Note: During this time, since your fish are going to experience dangerous levels of either ammonia and/or nitrite, you are going to lose some fish due to this. This is the main reason I do

not advise to perform a fish-in cycle. Another main reason why I do not recommend a fish-in cycle is because you will need to perform, at least two daily, very large water changes, which become a hassle very quickly!

Depending on which method you chose to do, at this point your tank should be cycled!

This is how the nitrogen cycle works in a fresh water tank:

Ammonia -> Nitrite -> Nitrate -> Water change.

Regular Maintenance:

Periodic tests should be taken of ammonia, nitrite, nitrate and pH, just so you know what everything in your tank is doing. This will depend on how comfortable you feel with your tank.

One very key factor in a healthy tank is weekly water changes! This means changing a certain percentage of water once a week to maintain good water quality. Since there are no bacteria that can utilize nitrate as a food source, the only way, in a freshwater tank, for nitrate to be removed from the water is through weekly water changes. Like I stated earlier, nitrate should not exceed that of 20 ppm above your tap water nitrate reading. On average you should perform at least a 20% water change weekly. Do not forget to add water conditioner to the new water! Any chlorine, in the new water, could easily wipe out your bacteria colony that you worked so hard to achieve. When you perform your weekly water change, make sure you use a gravel vacuum (siphon) to suck up any debris or fish waste left over on the bottom of your tank. If there is enough rotting debris and/or fish waste left in the tank for a period of time, this could very easily trigger a sudden ammonia spike, one in which your bacteria would not be able to cope with right away. This is no good as an ammonia spike could wipe out some fish.

Other than removing debris and lowering the nitrate level in your tank, weekly water changes bring with them their own benefits. Water, along with a good water conditioner, has a lot of beneficial minerals and nutrients that fish will thrive off of if replenished frequently. "When in doubt, do a water change," as an old saying goes. In nature, there is an endless source of freshwater pouring into rivers, lakes and streams, where these trace minerals can be found in abundance. However, in an aquarium, these minerals will only re-enter a tank through water changes. This is why weekly water changes are so essential for a healthy tank!

Filter cleaning:

Regular cleaning of the filter will ensure the filter will perform admirably at all times.

Cleaning the filter media:

The manufacture may say on the package that you should change the filter media on a regular basis, however this is not true. If you change the filter media say, once a month, then you are throwing away all those beneficial bacteria you worked so hard to established, and you

would be left with an un-cycled tank! Yikes! This is how to properly clean your filter media and should be done so once a month.

Step 1: Drain some *tank* water into a clean bucket. Preferably the same bucket you use when you do water changes.

Step2: Turn off the filter.

Step 3: Remove all the filter media and place the media in the bucket with the *tank* water.

Step 4: Begin to gently squeeze your filter media in the bucket of *tank* water. You will notice the water will begin to turn dark very quickly; this is because you are removing debris from the filter media.

Step 5: Once you have cleaned your media, which should not take that long, you can them place the media back into your filter. Restart your filter and you are ready to go.

Step 6: Fill your tank back up using water with the appropriate amount of water conditioner added.

Note: A good color for the filter media when cleaned is a golden brown color. This is the color of the bio-films the beneficial bacteria have made so they can colonize on the media.

While you have the filter turned off and emptied, this is also a good time to take the filter apart and clean all the parts of the filter.

"Why are we supposed to use *tank* water to clean the filter media in? Why can we not use tap water?" The reason why we use tank water and not tap water is because tap water contains chlorine and other harmful elements that can wipe out the bacteria colony.

The only time you should replace your filter media is when it is actually falling apart. When you do replace your filter media, try not to replace more than 1/3 of it at a time.

At this point you should now have a very nice tank running, with the thought in mind that you are doing everything right!

This next part I am going to go a little in depth about how pH will affect the *Autotrophic* bacteria.

There are two different types of bacteria in our filters. One type, which utilizes ammonia for a food source, is nitrosifyers from the genus *Nitrosomonas*, while the other type that utilizes nitrite for a food source are called Nitrifying bacteria, from the genus *Nitrobacter*. Just as long as we know the real names and where they come from, I will be referring to the two different types of bacteria as either *Nitrosomonas* for the ammonia bacteria, and *Nitrobacter* for the Nitrifying bacteria. We can also refer to both of these types of bacteria as Autotrophic Bacteria as a whole.

Autotrophic Bacteria are extremely important in our tanks. They not only keep the ammonia and nitrite levels down, but they also produce nitrate, as an end result to the nitrogen cycle, which plants can utilize for an extra source of nutrients. Autotrophic Bacteria are essential to all life because they are the primary producers at the base of all food chains. Autotrophic Bacteria are everywhere; they are in the very water we drink and the water we swim in when we go to the lake. So, it is in our best interest to have ideal environments in our tanks in order to allow these bacteria to thrive and colonize. This will allow our tanks to run to their full potential. The fact is there are multiple factors that can affect how these bacteria grow. When we cycle a tank, especially if it is for the first time, most people want the tank to cycle as fast as possible so they can add fish. However, there is one factor that I am going to talk about, and that is how the pH of the water supply, you are using for your tank, can affect the colonization of these Autotrophic Bacteria.

All water has a pH level, either it is acidic, neutral or basic, there is going to be a level of which your pH is. An acidic pH is a pH level that is below 7.0, while a basic pH level is above 7.0, and yes, you guessed it, a pH of 7.0 is neutral. Most fish can adapt to a fairly wide range of pH, however; Autotrophic bacteria can do the same, but in most cases it takes a long time for the Autotrophic bacteria to adapt to a lower level of pH. Instead, depending on the pH level of your water, your Autotrophic Bacteria are going to act differently, until they have adapted to a certain pH level. Even further, it takes time for the Autotrophic bacteria to adapt to a pH level outside their normally operating pH range, in which case if your pH drops down below 6.0, you may experience some problems. Having a pH of 8.0-8.4 is optimal for the colonization of these bacteria, but not required, especially if the temperature is at or around 84 degrees F, or 29 degrees C. It is this pH range that is going to yield the greatest growth rates for the Autotrophic Bacteria. While most water has a pH in the mid 7's, this is still really good and will still have fairly good growth rates. Between a pH of 6.6 to 7.0, the growth and consumption rates of these bacteria will gradually decrease, but will still yield good results at the processing of ammonia and nitrite . At a 6.5 pH level, *Nitrosomonas* growth is inhibited. This means that the process of breaking down ammonia is going to be extremely slow. The bacteria at this state are just processing enough ammonia to stay alive, not grow or colonize to meet higher ammonia levels. Also, all nitrification is inhibited if the pH drops to 6.0 or less. This means that the nitrite processing will be extremely slow, as well. So, with this is mind, it is extremely important to know the pH of your tank, and keep an eye on it. If the pH drops close to 6.5, immediate action should be taken. Note: when the pH drops this low, and the Autotrophic bacteria drastically slow down the processing of ammonia or nitrite, this does not mean that the Bacteria have died off at all. In fact, this means that the Bacteria have simply gone into a "dormant" state where they process the ammonia and nitrite at extremely slow rates, and when the pH raises back up above 6.5 or so, the bacteria will then resume production on ammonia and nitrite at their previous capacity. However, like I stated before, Autotrophic bacteria can, and will adapt to lower pH levels, but it takes time to do so. Under optimal conditions, Nitrosomonas may double every 7 hours and *Nitrobacter* every 13 hours. More realistically, they will double every 15-20 hours.

How softness or hardness of water can affect the pH.

The pH of water is always prone to changes or fluctuations, especially when we start to cycle a tank. When ammonia is added to the tank, the pH can take some nasty turns, which could

ultimately affect the Autotrophic Bacteria. When water is hard, or has a high mineral content, the water has a higher buffering capacity. This means, since the water is harder, that the pH is not as susceptible to changes, as if the water was soft. If you have soft water, this means that the mineral content in the water is low, or has a low buffering capacity. This will usually make the pH drop, or make the pH fluctuate a lot more. As the cycle progresses and you start to produce nitrate more and more in your tank, your pH might start to drop. As nitrate, the end product in the nitrogen cycle, is a little more acidic, meaning it may drive your pH down. Depending on how soft your water is, the nitrate that is being produced could potentially make your tank have a pH crash. A pH "crash" is when your pH drops below a safe level for the Autotrophic bacteria, usually 6.5, and your Autotrophic bacteria begin to slow down or stop in production all together. If this happens, follow the steps below to raise the pH level. A pH of 6.5 or less is not necessarily unsafe for fish however. Certain fish will thrive at lower pH levels, however; these Autotrophic bacteria will go into a dormant state if the pH drops below that point, usually it is a pH of 6.0 or less for extreme cases.

How can I have fish that thrive in a pH below 6.0, where the Autotrophic bacteria's production rates have decreased, if the ammonia level is going to be high because of the lack of production?

Since plants use Ammonia as a source of nutrients, having a really heavily planted tank will prevent the ammonia level to rise above a safe limit. Also, if you start off cycling your tank with a low pH, the bacteria within the tank will adapt to the lower pH value, but to do so, it will take a lot longer than having a pH above 6.0-6.5.

What are some ways to raise the pH of my tank water if it drops too low?

A large water change may be the best option if you are cycling the tank. When you do a water change, the pH in your tap water will be higher than that in the tank. So, when the new water enters the tank, the two different pH levels will reach an equilibrium. This means that the higher pH in the tap water and the lower pH in the tank will average out to a new pH, hopefully higher than before. However, since your pH dropped low in the first place, that is a good indicator that your water may have a low buffering capability, or low KH. The following steps will show ways to raise the KH of your water, ultimately raising the pH. With constant changes in the ammonia level during a cycle, the pH can be really susceptible to change. Until you get the tank cycled and your ammonia level zeroed out, the pH will most likely change a little. This is not to worry about that much, because after the cycle the pH should be pretty stable. Here is what to do if the pH is still unstable after the cycle. PH, more or less, has a direct relation with the hardness of your water. It is really important to purchase a GH/KH test kit to know the hardness of your water. If you have soft water, your pH is going to be more susceptible to fluctuations. This means, minor things added to the tank, as little as an ammonia spike, can change the pH of your water. It is best to raise the hardness of your water a little, which would make your pH less susceptible to fluctuations. There are a couple ways to raise the pH and hardness, and they are adding sodium bicarbonate (baking soda), sea shells, limestone rocks, chunks of marble or some little pieces of coral to the tank. You can even buy substrate, which is made ideally for Cichlids, that contains parts of sea shells. Any of these can increase the pH of water.

In conclusion:

It is best not to let the pH drop too low, which is usually around 6.5 or lower. If the pH drops

that low the Autotrophic bacteria's production rates are going to decrease dramatically until the bacteria have adapted to the lower pH level. Like I said earlier, this takes time to do so, so it's best not to let the pH drop that low in the first place. In other words, if you are cycling a tank, and the pH drops that low, the cycle will most likely stall.

Hopefully now you will have a basic idea on how the pH level can affect how the Autotrophic Bacteria colonize and process ammonia and nitrite within a tank.