

Good water quality is essential for successful fish keeping. It is estimated that 90% of ornamental fish diseases resulting in death are caused by poor water quality and lack of maintenance. Poor water quality suppresses fish immune systems, allowing disease to take hold. Therefore it is vital to ensure fish are well looked after and proper water quality provided.

Different species of fish also require different water quality; species from different geographic regions with differing vegetation and soil or rock have evolved and adapted to different ecosystems and their water chemistry. If fish are kept outside these parameters stress and disease may be the result.

In the aquarium we need to manage water quality through filtration, water changes and other preventative maintenance. Water quality consists of many different parameters, a number of which are not easily tested for but can have a major effect on fish health (e.g. Heavy metals). The more important parameters are listed in the table.

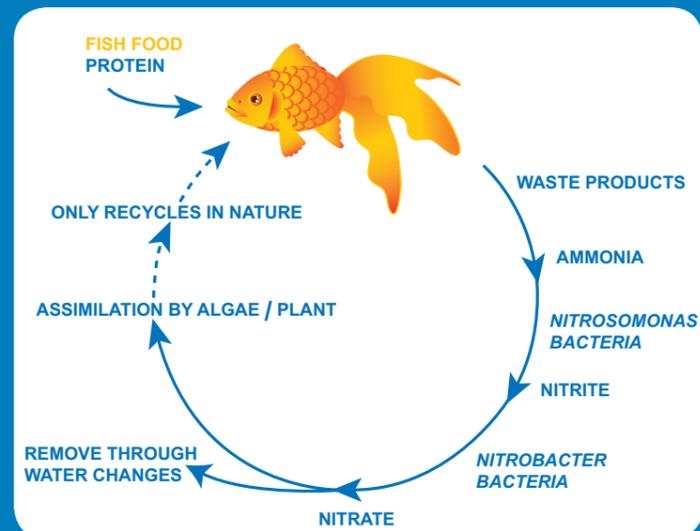
Common water quality parameters

pH	Measure of the acid/alkali nature of the water. The pH is the concentration of hydrogen ions and is logarithmic. This means that a shift of 1 pH unit is actually a ten-fold change: therefore a change of 1 pH unit is a significant change. pH 7.0 is neutral, below 7 is acid, above 7 is alkaline. Test with pH kit or a pH meter 2 times per week.	TDS / Conductivity	These are a measure of all dissolved solids in water and can be used to measure salt. This is great for checking purity of water for breeding and for monitoring salt levels when it has been added to aquariums. TDS and Conductivity are interchangeable. TDS to conductivity: TDS/.53 or Conductivity to TDS: Conductivity/1.88. Test: periodically or after water change using a meter.
Temperature	Fish are cold blooded and need adequate temperatures to function properly. Temperatures outside their normal range make them more susceptible to disease. Check temperature regularly with a thermometer.	DO or Dissolved Oxygen	Not normally measured but is essential for aquatic life. Oxygen is provided through airstones or pumps that create water movement. Fish 'breathing' at surface is a sign of low oxygen and additional aeration is needed.
General Hardness	Measure of the amount of minerals such as calcium and magnesium in the water. Incorrect levels will affect the ability to maintain correct water and salt balance leading to stress and disease. Test after a water change with a test kit.	Carbonate Hardness (KH) or Alkalinity	Measure of the buffering capacity in water or the water's ability to maintain a pH level. The higher the KH the better water will maintain its pH. This should not be confused with General Hardness. Stable KH is good for maintaining pH, allows better plant growth and reduces stress on fish. Test: Periodically and only after water change using a test kit.
Nitrogenous Compounds	If left without filtration or water changes, nitrogenous compounds will build up quickly to toxic levels. Ammonia and nitrite are highly toxic causing severe gill and skin damage as well as neural toxins particularly when setting up new tanks (see below left). Nitrates will build-up in tanks and are removed through water changes and having aquatic plants. Recommended levels: Ammonia – 0ppm, Nitrite 0ppm, Nitrate less than 20ppm. Test: Ammonia and nitrite at least weekly for new tanks. Nitrates monthly or after water change.	Salinity and Specific Gravity	Salinity and Specific Gravity are measures of the amount of 'salts' in seawater. Salinity is a measure of all the dissolved solids in seawater (98% of which is sodium chloride) measured in parts per thousand (ppt) or grams of 'salt' contained in 1 kilogram of seawater. Natural sea water has 35 grams of salt per kilogram of seawater or 35 ppt, whereas distilled water has a salinity of 0ppt. Specific Gravity is an indirect measure of the salinity and refers to the weight of dissolved solids or density in seawater. SG is generally used by hobbyists due to the ease of testing compared to testing for salinity. Test: weekly or after water change.

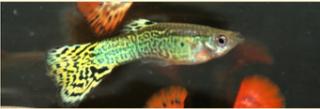
The Nitrogen Cycle

Ammonia is the main waste product from fish or uneaten food that will 'poison' fish. Ammonia will damage gills and is a neurotoxin affecting the brain. Special bacteria called nitrifying bacteria are able to manage this waste via a process called Nitrification or the Nitrogen Cycle. It is essential to establish this process in an aquarium to prevent ammonia building up to toxic levels.

In a newly established aquarium it may take up to a month to establish this cycle and care must be taken during this time to prevent toxic levels of Ammonia and nitrite. This can be done by increasing fish stocks slowly, adding nitrifying bacteria or 'seeded' filter material to the tank, minimal feeding, frequent water changes, maintaining a pH below 7.0 to detoxify ammonia and testing regularly.



General Water Quality Guidelines for Fish

Type		pH	Temp	GH	Nitrites	Ammonia	S.G	KH
Brackish water fish Eg. Archerfish, Mono Sebae, Barramundi		7.5-8.0	22-26°C	250-300 ppm	0ppm	0ppm	1.005-1.012 (8-20ppt)	120-200 ppm
Goldfish		7.0-7.5	16-22°C	150 ppm	0ppm	0ppm	NA	60-120 ppm
Livebearers Eg. Guppies, Swordtails, Mollies, Platys		7.0-7.5	22-26°C	205-300 ppm	0ppm	0ppm	NA	120-200 ppm
Marine Eg. Clownfish, Damsel fish		8.0-8.4	22-26°C	NA	0ppm	0ppm	1.021-1.024 (32-35ppt)	200+ppm
Misc tropical Eg Barbs, Gouramis, Catfish		7.0	22-26°C	100-150 ppm	0ppm	0ppm	NA	60-120 ppm
Rift Lake Cichlids Eg. Tropheus, Electric yellow		7.5-8.0	24-26°C	300-400 ppm	0ppm	0ppm	NA	120-200 ppm
Tetras and Discus Eg Cardinal Tetra, Hockeystick, Neon Tetra		6.5-7.0	Tetras 22-26°C Discus 28-30°C	50-150 ppm	0ppm	0ppm	NA	30-60 ppm
Test Frequency		Weekly. Test kit or pH meter	Daily. Thermometer	After water change or weekly. Test kit	Weekly. Test kit	Weekly. Test kit	After water change or weekly. Hydrometer	After water change or weekly. Test kit

Why Water Change?



Water changes help reduce chemicals which are harmful to fish (such as Nitrates) as well as removing debris (uneaten food and faeces).

It is also a Cure All – when in doubt, perform a partial water change.

Important tips:

- If gravel is used in your tank, use a gravel siphon to remove debris.
- Always use a quality water conditioner in the replacement water – this will make the water suitable for fish by removing toxic metals, chlorine and chloramine, as well as adding other important minerals.
- Water changes can lower the temperature of your water, which may stress or even kill your fish. Consider pre-heating the water you add.
- The more fish you have in a tank, the more frequently you'll need to change the water. A good rule of thumb: Change 20% - 30% of the water every week. (More for heavy loads).
- After a water change, always test for pH and GH. Make any changes necessary.