National Certificate of Educational Achievement
TAUMATA MĀTAURANGA Ā-MOTU KUA TAEA

Exemplar for Internal Achievement Standard

Chemistry Level 2

This exemplar supports assessment against:

Achievement Standard 91911

Carry out an investigation into chemical species present in a sample using qualitative analysis

An annotated exemplar is an extract of student evidence, with a commentary, to explain key aspects of the standard. It assists teachers to make assessment judgements at the grade boundaries.

New Zealand Qualifications Authority

To support internal assessment

	Grade Boundary: Low Excellence
1.	For Excellence, the student needs to carry out a comprehensive investigation into chemical species present in a sample using qualitative analysis. This involves justifying the identification of chemical species present by linking secondary data and chemical principles to the reactions occurring during the analysis, and discussing the significance of an identified chemical species for people and/or the environment. This student has made links between the secondary data and chemical principles to justify the identification of the species in the solution (1). They have also provided a limited discussion on the significance of copper ions for humans (2). For a more secure Excellence, the student could provide further discussion of the significance of copper ions for humans and/or the environment. Since the concentration of copper ions in the sample is unknown, the significance of the copper ions could vary. Further linking showing that if the concentration of copper ions is low, then it will have a minimal effect on people for a short exposure, but could still have serious effects as continual exposure can lead to bioaccumulation (3).

Student 1: Low Excellence

Intended for teacher use only

Analysis of cation in Sample B:

Take 1mL of sample B and add 2 drops of NaOH solution. A blue precipitate forms. This eliminated Na^{+} as no precipitate will have formed and also Fe^{2+}, Fe^{3+}, Mg^{2+}, Ba^{2+}, Zn^{2+}, Pb^{2+}, Al^{3+} as these would have formed precipitates of different colours.

$Cu^{2+}{}_{(aq)} + 2OH^{-}{}_{(aq)} \rightarrow Cu(OH)_{2\ (s)}$

The solubility rules state that all hydroxides are insoluble except potassium and sodium. This shows that copper hydroxide is insoluble and would make the precipitate I saw. (1)

Take a new sample of B, add 2 drops of NH_3/NH_4OH then add excess. A blue precipitate forms with the 2 drops which turns to a deep blue solution and the precipitates disappears in excess. This eliminates Ag^{+} as this would have formed a brown precipitate, we can confirm the unknown cation in sample B is Cu^{2+}. Because the blue precipitate dissolved we know this is a complex ion once excess was added.

Equation for sample B and 2 drops of NH_3/NH_4OH

$Cu^{2+}{}_{(aq)} + 2OH^{-}{}_{(aq)} \rightarrow Cu(OH)_{2\ (s)}$

The solubility rules I talked about above are why this causes a precipitate too, copper hydroxide is insoluble so I saw a precipitate.

Equations for adding excess NH_3/NH_4OH

$Cu^{2+} + 4NH_3 \rightarrow [Cu(NH_3)_4]^{2+}{}_{(aq)}$

The precipitate of copper hydroxide dissolves because the Cu^{2+} cation in copper hydroxide formed a complex ion with the NH_3 which is soluble so the precipitate dissolved. (1)

Significance of an identified species:

Copper enters drinking water mainly from corrosion of household plumbing and faucets. copper is commonly used in pipes of older houses. Older copper pipes tend to corrode which can cause a blueish stain in basins.

Acidic water in New Zealand can cause metals to dissolve. This reaction copper has with the water causes it to enter water supply. Another common way that copper contaminates our water is through metallic brake pads.

When brakes are activated in vehicles, fine particles of copper and other metals flake off and are deposited on roads. When these particles are washed away by rain, they enter stormwater systems where they are distributed into our rivers and lakes which is how higher
amounts of copper enter our water supply. If a normal amount of copper is consumed by a (3)
human through food or water, it is generally non-toxic to humans. If too much copper is consumed such as accidental poisoning, the ion can cause vomiting or in some cases where a human is exposed to it in a workplace such as copper salts, can cause skin, eye, and lung irritation. Effects of the ion are heavily concentrated related and if copper is diluted side
effects will be much less than that of higher concentrated consumption of copper. High (2)
amounts of copper in our natural water supply such as lakes and rivers can cause great damage to the aquatic life. it has very high toxicity for fish and other aquatic organisms as it is attracted to the gills of fish and quickly binds to them which stops it being able to effectively control water absorption. It is also highly toxic to algae and is commonly used as an algicide which is positive only in the case of an armful algal bloom. However, algae are an integral part of the aquatic ecosystem supplying food and habitat for aquatic organisms. Accidental killing of algae from copper getting into waterways is harmful to the aquatic life significantly.

	Grade Boundary: High Merit
2.	For Merit, the student needs to carry out an in-depth investigation into chemical species present in a sample using qualitative analysis. This involves explaining the identification of chemical species present by linking the primary data to the procedure, writing relevant equations to explain all the changes occurring during the identification procedure, and explaining the significance of an identified chemical species for people and/or the environment. This student has linked the data to the procedure used (1), and written equations for all the changes that occurred (2). The learner has also made links between the presence of magnesium ions and the impact on people (3). To reach Excellence, the student could justify the chemical species present by linking secondary data and chemical principles to the reactions. For example, the formation of the complex ion caused the precipitate to dissolve, since the metal cation from the precipitate formed the complex ion, which is soluble in the solution (4). Furthermore, linking the formation of the magnesium hydroxide precipitate to the solubility rules to justify the identification of the species (5).

Student 2: High Merit

Intended for teacher use only

I found the ions Magnesium (Mg^{2+}) and Chloride (Cl^-). Together they make Magnesium Chloride ($MgCl_2$)

$MgCl_2$

I tested the cation first.

First I added two drops of Sodium-hydroxide. The solution turned white and cloudy. This means a white precipitate formed. This means that the ion can't be Na^+, Fe^{2+}, Fe^{3+}, Cu^{2+} or Ag^+ as they don't form white precipitates with Hydroxide. Ag^+ does technically form a white precipitate with hydroxide but it is unstable and turns into water and the brown silver-oxide we see. (5)

White precipitate with hydroxide and magnesium.

$Mg^{2+} + 2OH^- \rightarrow Mg(OH)_2$ (2)

Next I added excess Sodium-hydroxide. Nothing happened. This means the ion can't be Zn^{2+}, Pb^{2+} or Al^{3+} as they form complex ions with excess hydroxide. The ion must be Mg^{2+} or Ba^{2+}.

I added sulfuric acid to a new sample. Nothing happened. (1)

Then I tested the anion.

First I put a piece of red litmus paper in the solution. The paper remained red. This means that the ion is not alkaline. This means that the ion isn't CO_3^{2-} or OH^- as they are both alkaline.

Next I added some Silver-nitrate. The solution turned cloudy white. This means a precipitate formed. This means that the ion is Chloride or Iodide as their rule states that most chlorides and iodides are soluble except with silver or lead. All nitrates are soluble as are all sulfates except calcium, barium and lead.

White precipitate with Silver and Chloride

$Ag^+ + Cl^- \rightarrow AgCl$ (2)

Finally I added excess Ammonia. The solution turned clear and colourless. This means that a complex ion formed. A complex ion won't form from silver iodide but will from silver chloride. (4)
The complex ion is $Ag(NH_3)_2^{1+}$

Complex ion with silver and ammonia

$Ag^+ + 2NH_3 \rightarrow [Ag(NH_3)_2]^+$ (2)

The contamination of magnesium in our water supply is not worrying. Although an excess of magnesium can cause hypermagnesemia which has symptoms like low blood pressure, nausea, vomiting, headaches and confusion along with others it usually doesn't affect a person with functioning kidneys. Excess magnesium can also cause diarrhoea but this usually only occurs with supplements (magnesium pills) but not in a diet.

A more common issue related to magnesium is the lack of it in our body. Magnesium is (3)
important for around 350 different enzymes of which many are used to make energy. It is also important in the making of nucleic acids and sensitivity to insulin. It is the fourth most common cation in the human body. Magnesium deficiency has been related to chronic drinking and lack of absorption through the gut. Some drugs used for medical purposes have been found to increase the loss of magnesium as well. Magnesium deficiency can cause: nausea, vomiting, loss of appetite, fatigue, muscle weakness, cramps and twitches, irregular heartbeats and mineral deficiency (particularly low potassium and calcium). 60 percent of the roughly 25 grams of magnesium is in our bones. Low levels of magnesium can cause weaker, less dense bones. In fact magnesium is used medically. As it is needed for insulin sensitivity it can be used to help control type two diabetes. Magnesium has also been correlated with a lack of certain heart diseases, type two diabetes and eclampsia. Other medical conditions have been correlated to magnesium but the tests aren't confirmed. Magnesium has also been shown to protect against atherosclerosis in animals.

The effects of the magnesium will only be seen if the magnesium is in high concentration however. I have only tested for what ion it is not how concentrated it is.

	Grade Boundary: Low Merit
3.	For Merit, the student needs to carry out an in-depth investigation into chemical species present in a sample using qualitative analysis. This involves explaining the identification of chemical species present by linking the primary data to the procedure, writing relevant equations to explain all the changes occurring during the identification procedure, and explaining the significance of an identified chemical species for people and/or the environment. This student has identified the chemical compound (1) based on the collected data and the procedure used (2). The student has written the equations for all the changes that occurred (3), and given explanations of the significance of magnesium ions for the environment (4). For a more secure Merit, the student could link all the primary data to the procedure to identify both species. For example, the addition of H_2SO_4 to a new sample of sample A results in no change to the solution, and this can be linked to the identification Mg^{2+} in the sample (5).

Student 3: Low Merit

Intended for teacher use only

Sulfate (SO_4^{2-})

Tested with red litmus → litmus stayed red/no change

Possible anions Cl^-, I^-, SO_4^{2-}, NO_3^-

Ruled out anions OH^-; CO_3^{2-}

New sample add $Ba(NO_3)_2$ → white ppt occured → $BaSO_4$ (2)

$Ba^{2+}_{(aq)} + SO_4^{2-}{}_{(aq)} \rightarrow BaSO_{4(s)}$ (3)

Solubility rule → Most sulfates are soluble except for calcium sulfate, barium sulfate, and lead sulfate. Insoluble

Magnesium (Mg^{2+})

Add 2 drops NaOH → white ppt occured → $Mg(OH)_2$ (3)

$Mg^{2+}_{(aq)} + 2OH^-_{(aq)} \rightarrow Mg(OH)_{2(s)}$

Add excess NaOH → white ppt remained → $Mg(OH)_2$

$Mg^{2+}_{(aq)} + 2OH^-_{(aq)} \rightarrow Mg(OH)_{2(s)}$

New sample add dilute H_2SO_4 → white ppt dissapear. (5)

Solubility rule → All oxides, hydroxides are insoluble except those of group 1 and ammonium ion. Insoluble.

Magnesium Sulphate. (1)

$Mg^{2+}_{(aq)} + SO_4^{2-}{}_{(aq)} \longrightarrow MgSO_{4(s)}$

Cows require magnesium ion during winter and spring periods because cold weather means slowly grass growth and cow intake, there is a high demand for magnesium ion over calving and lactation and low magnesium ion levels in spring pasture.

Magnesium ion deficiency in dairy cows occurs when cows are in late pregnancy and early lactation. High producing cows are more likely to lack a higher amount of magnesium ion but all cows to some extent are deficient in magnesium ion in the time period of late pregnancy and early ~~lactation~~ lactation. Magnesium ion assist with the production of hormones that help with absorption of calcium. Cows do store magnesium ion in ~~there~~ their body they are not able to acess these, Therefore, cows only gain magnesium through their diet and suppliments. It is ~~recommend~~ recommended that dry cows have a diet containing 0.35% magnesium whereas lactating cows have a diet of 0.28% of magnesium. By giving cows either magnesium sulphate or magnesium chloride before calving ~~to~~ are more likely to not get milk fever. than using magnesium oxide. It can be difficult to supply the cows with enough magnesium sulphate or chloride so by using magnesium oxide as well means the cows will receive enough magnesium not just the correct type in small amounts. Magnesium ion can be suppliment to cows by a range of methods. Some are more affective than others and all depends (4) on the type of cow. Drenching is the most affective. All three of magnesium compounds (eg. magnesium sulphate, chloride, oxide.) can be delivered in drenching. But although magnesium oxide is the cheapest it ~~[illegible]~~ ~~to~~ is poorly soluble in water which can cause difficulty ~~to~~ with the drench. Next affective is pasture dusting. Pasture dusting only works with magnesium oxide. The required amount of magnesium oxide is doubled when applied because of the affect of wind and rain. Hay treatment once ~~[illegible]~~ again only works with magnesium oxide. By applying a mixture of magnesium oxide to hay and being feed out to no more than 15 cows a bale. Can also be mixed with molasses to be more palatable. Next affective is through a water trough. This can be done with magnesium chloride and magnesium sulphate. This is a prefered option only if dusting and mixed in the feed/hay treatment is not possible. A dispenser is used and the trough needs to be monitored over a two to three week period time. Lastly are magnesium bullets. These only provide a small amount of magnesium ion over a period of 9-12 weeks. This is not very affective as it does not reach the requirements that a cow needs during the ~~pre~~ late pregnancy and early lactation stage. if cows do not recieve enough magnesium ion then they ~~will~~ may develope milk fever also nervousness and excitability in the cow. Whereas if a cow gets to much of magnesium ion they become more lathargic and has a sedated effect. Also a lack of magnesium ion can cause blood magnesium ion levels to fall which can lead to ~~[illegible]~~ hypomagnesaemia. This can

	Grade Boundary: High Achieved
4.	For Achieved, the student needs to carry out an investigation into chemical species present in a sample using qualitative analysis. This involves collecting primary data using an identification procedure, identifying chemical species present by matching primary data to the procedure, linking the chemical species to the compound present in the sample, and describing the significance of an identified chemical species for people and/or the environment. This student has collected data using the procedure (1), applied this to identify the compound present (2), and described the significance of citric acid for people and the environment (3). To reach Merit, the student could write the relevant equations for all the changes that occurred in the identification process. For example, writing the correctly balanced equation for the addition of Lucas reagent (including water as a product), and the actual structural formulae of organic reactants and products (4).

Student 4: High Achieved

Intended for teacher use only

When ~~lucas~~ reagent was added to Sample A, two layers instantly formed, one of which was cloudy, meaning a tertiary alcohol group is present. When Sample A was warmed with acidified potassium dichromate no reaction occured meaning no primary or secondary alcohol groups are present, when Sample A was heated with Benedicts no reaction occured meaning no aldehyde groups are present. When Sample A and Bromine water were shaken together in a test tube no reaction occured meaning no carbon to carbon Double Bond is present. No reaction occured when copper sulfate was added to Sample A meaning no amine functional group. When Sodium carbonate was added to Sample A, it fizzed indicating a carboxylic acid functional group is present. ~~litmus~~ Red litmus paper stayed red when Sample A was added meaning and blue litmus turned red when Sample A was added meaning it is an acid. Universal indicator turned orange/red meaning Sample A has a pH of 3-4. As Sample A only has a tertiary alcohol functional group and a carboxylic acid functional group, it must be Citric Acid. 1

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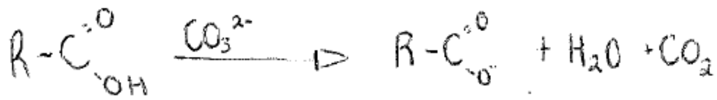
The alcohol group is replaced by a chlorine atom. ~~This is a Substitution reaction. In a Substitution reaction one group is exchanged/substituted for another.~~ This is a Substitution reaction were one group is Substituted for another. By replacing the alcohol group with a halide (in this case chlorine) the product is insoluble meaning it repels water resulting in the formation of two layers in the test tube. This happens rapidly for tertiary alcohols.

The formation of H_3O^+ ions is due to the dissociation of carboxylic acid in water. The organic product is the carboxylate of the ~~carbo~~ acid. This reaction can be classified as an acid-base reaction or dissociation.



The reaction with Sodium Carbonate to produce carbon dioxide is also an acid-base reaction.

Citric acid

2

Citric acid is a tri-carboxylic acid most commonly found in citric fruits. Its molecular formula is $C_6H_8O_7$. Citric acid gives citric fruits, mainly lemons and limes, their sour taste. The manufactured form of citric acid is commonly used as an additive in food, cleaning agents, nutritional supplements and cosmetics, particularly skin care. It is also an alpha-hydroxy acid (AHA) as it has an alcohol group next to a carboxylic acid functional group.

As citric acid is an AHA (member of the alpha hydroxy family) it is commonly used in skin care products. Citric acid is used to exfoliate the skin meaning it removes dead skin cells, it also helps with acne by cleaning out blocked pores as it is an acid that doesn't normally irritate skin.

As citric acid is an acid it is used in the food industry to boost acidity, enhance flavour and preserve ingredients. It is added to canned produce (normally fruit and vegetables) to protect against botulism, a serious but rare illness. Its most common use is in candy and soft drink to add a sour, tart taste to counter act the overly sweet flavour. 3

Citric acid is a useful disinfectant against many viruses and bacteria. It is commercially sold for the removal of soap scum, hard water stains, lime and rust. This could be because it is an acid or because it has an alcohol group present meaning it is good at disinfecting.

Citric acid enhances the absorbtion of nutrients in the body. This is because it enhances the bioavailability of minerals. It may also help protect the body against kidney stones by breaking already formed kidney stones down and preventing new ones forming. This occurs when in the form of potassium citrate but by consuming foods with high natural acid (like citrus fruits) it may have a similar effect.

	Grade Boundary: Low Achieved
5.	For Achieved, the student needs to carry out an investigation into chemical species present in a sample using qualitative analysis. This involves collecting primary data using an identification procedure, identifying chemical species present by matching primary data to the procedure, linking the chemical species to the compound present in the sample, and describing the significance of an identified chemical species for people and/or the environment. This student has collected primary data and matched this to the identification procedure used to identify chemical species (1). They have also linked the chemical species to the compound present in the sample (2), and provided a weak description of the significance of glycerol (3). For a more secure Achieved, the student could further describe the significance of glycerol for people and/or the environment.

Student 5: Low Achieved

Intended for teacher use only

Description of tests	Observations	Identification
Dipped damp blue litmus paper into the solution.	The litmus turned red.	Indicates an acidic pH.
In a test tube, we added a marble chip to a new sample of solution.	There was some slight bubbling around the edges of the chip	Confirmed the pH of the solution is acidic.
In a test tube, we added a small squirt {<10mL) of copper sulfate to a new sample of solution.	No reaction was observed.	Indicates the solution does not contain the amine functional group. (1)
In a test tube, we added a small amount {<10ml) of acidified dichromate to a new sample of solution.	No reaction was observed.	Indicates the solution is not a 1° or 2° alcohol or aldehyde.
In a test tube, we added a small amount {<10ml) of bromine water to a new sample of solution.	After swirling the test tube to mix the bromine water and solution together, we noticed the solution lightened in colour, from a slightly dark orange to a lighter yellow shade.	Indicates the solution is an alkene.

Description of tests	Observations	Identification
Dipped damp blue litmus paper into the solution.	The litmus paper stayed blue, there was no colour change.	Indicates possibly either a neutral pH or a basic pH.
Dipped damp red litmus paper into the solution.	The litmus paper stayed red again there was no colour change.	Confirmed our solution has a neutral pH not basic.
In a test tube, we added a small amount (<10mL) of copper sulfate to a new sample of our solution.	No reaction was observed.	Indicates that the solution does not contain the amine functional group. (1)
In a new test tube we added a small amount (<10mL) of acidified dichromate to a new sample of our solution.	The solution turned a dark murky green.	Indicated the solution may be a 1° or 2° alcohol or aldehyde.
In a new test tube we added a small amount {<10ml) of benedict's solution to a new sample of our solution.	No reaction was observed.	This indicated to us that the solution is a 1° or 2° alcohol, not an aldehyde.
In a new test tube we added a small amount (<10ml) of bromine water to a new sample of our solution.	No reaction was observed and the solution stayed orange.	This indicates to us that our solution is an alkane.

Unknown liquid sample A

The compound I was able to identify for the unknown powder sample A, was Maleic acid.

Unknown liquid sample B 2

The compound I was able to identify for the unknown liquid sample B, was glycerol. It's chemical formula is $C_3H_80_3$. It's shorthand formula, which I will refer to in this report, is

To summarise my observations, the solution has a neutral pH due to no colour change on the damp blue and red litmus papers. It does not contain an amine functional group as it did not turn a dark blue colour when I added copper sulfate. The solution did turn a dark murky green colour when I added acidified dichromate, which indicated that it may contain a 1° or 2° alcohol or aldehyde. But when I added benedict's solution, no colour change was observed, which confirmed the solution does contain a 1° or 2° alcohol. The solution is also an alkane due to no reaction being observed when I added bromine water.

Glycerol is what's known as a 'polyol' compound, containing three hydroxyl groups (where one oxygen atom is covalently bonded to one hydrogen atom). A polyol is an alcohol that contains more than one hydroxyl group, like what we see in glycerol.

It is also an alkane, specifically containing 3 carbon atoms to make it a propane.

Equations

Glycerol + acidified dichromate:

$C_3H_8O_3 + H^+/Cr_2O_7^{2-} \rightarrow$

The alcohol in glycerol has been oxidised by the oxidising agent, in this case the acidified dichromate, to form a ketone. A ketone is a functional group that contains a carbonyl group.

One of the H atoms in glycerol ($C_3H_80_3$) is replaced with an oxygen atom, as a result of the oxidation, but is then lost due to the high number of bonds. That oxygen atom becomes double bonded to a carbon atom: forming a carbonyl group. The resulting product is also a carboxylic acid, where a carbon atom is double bonded to an oxygen atom.

Sources

Glycerol is a colourless, odourless, syrup-like substance that tastes sweet. It is not to be confused with glycerine, which is very similar but typically is the commercially-sold, purified version of glycerol; their uses are non interchangeable.

Glycerol can be extracted from the plant sources of soybeans or palm, or animal fat "tallow". It can also be produced as a co-product from fat or oil splitting. For example, triglycerides, which are found in human body fat, can be what's called 'saponified', which is a chemical reaction where hydroxides break bonds between the fatty acids and glycerol to form and separate the free fatty acids and glycerol- more basically, the triglycerides, or fats, are broken down chemically to separate and form two by products, fatty acids and glycerol.

Uses

Glycerol has many uses across a few industries.

In the food industry glycerol is favoured for it's sweetness and also it's ability to preserve,
sweeten and thicken: it can be used to preserve plant leaves, can be used as a sweetener 3
but without harmful tooth decay effects, to thicken food substances and is added to frosting
to stop it from setting hard.

	Grade Boundary: High Not Achieved
6.	For Achieved, the student needs to carry out an investigation into chemical species present in a sample using qualitative analysis. This involves collecting primary data using an identification procedure, identifying chemical species present by matching primary data to the procedure, linking the chemical species to the compound present in the sample, and describing the significance of an identified chemical species for people and/or the environment. This student has collected primary data and matched this to the identification procedure used to identify chemical species (1). The student has also described the significance of an identified species (2). To reach Achieved, the student could use the procedure and the primary data to identify the compound present in the sample, $CuSO_4$ (3).

Student 6: High Not Achieved

Intended for teacher use only

Sample A The **anion** present is: SO_4^{2-}

Description of test(s) carried out	Observations	Name (or formula) of any precipitate(s) or complex ions formed	Balanced Equations
Add red Litmus to unknown Sample...	Litmus Stayed Red	—	—
Add $Ba(NO_3)_2$ Solution.	White precipitate formed.	~~Sulphate.~~ Barium Sulphate.	$Ba^{2+} + SO_4^{2-} \rightarrow BaSO_4$

1

Explanation for deciding on the anion:

Solubility rules State that all Sulphates are Soluble except for Ca, Ba and Pb Sulphate. (SO_4)

Sample A The **cation** present is: Cu^{2+}

Description of test(s) carried out	Observations	Name (or formula) of any precipitate(s) or complex ions formed	Balanced Equations
Add 2drops dilute NaOH Solution.	Blue Precipitate formed.	Copper Hydroxide	$Cu^{2+} + 2OH^- \rightarrow Cu(OH)_2$ ~~copper Hydroxide~~
new sample. add 2 drops NH_3, then excess.	Blue precipitate formed, then became a deep blue ~~with~~ Solution ~~excess solution.~~ with excess.	Copper Hydroxide Copper Ammonium.	$Cu^{2+} + 2OH^- \rightarrow Cu(OH)_2$ ~~copper Hydroxide~~ $Cu^{2+} + 4NH_3$ $[Cu(NH_3)_4]$

1

Explanation for deciding on the cation:

Solubility rules States that all Ammonium Compounds Are Soluble. and that all Hydroxides are Insoluble except for. those In Group one or with NH_4^+ ion

Solution A.

The Cation found in solution A was Cu^{2+} (Copper (II)ion) and the anion present in solution a was $SO4^{2-}$ (Sulphate ion). ③

What does having copper in our water mean?

FOR US:

Copper is actually a mineral/metal that we need to consume. Although it is a small amount (2-3 mg in an adult human per day) most of the copper our body obtains is through food, and a small amount (around 10% of our daily intake) is obtained from drinking water.

Although intaking large amounts of copper can be dangerous for the human body.
"Consumption of high levels of copper can cause nausea, vomiting, diarrhoea, gastric (stomach) complaints and headaches."
-https://ww2.health.wa.gov.au/Articles/A_E/Copper-in-drinking-water ②
Long term exposure to large amounts of copper could lead to liver failure. And potentially even death
Copper can be found naturally in all water sources. Although drinking water runs through old copper pipes can have a higher content of copper.

"A high level of copper in your drinking water will leave a metallic or bitter taste. This water may not be safe to drink and you should contact your drinking water provider or have the water professionally tested."
-https://ww2.health.wa.gov.au/Articles/A_E/Copper-in-drinking-water

Copper is found naturally in water sources, and the amount of copper that we intake through water is not lethal or unhealthy unless you're piping or waterways have a higher than normal copper content.
FOR ENVIRONMENT:
Copper is a requirement for many marine animals and life. Which also need a daily intake of the substance. Therefore for our environment small manageable concentrations of copper in our water is absolutely necessary.
Copper can also be found in brake pads, which copper dust/residue could end up in waterways and streams (ie. Witherford reserve and shepard's park beach) leading to an unusually high concentration of copper in the water.