Percentage yield = (actual / theoretical) x 100

= (2.47 / 7.975) x 100

= 31%

Determining the percentage purity of hydrated Copper(II) Sulfate

Method

Use a weighing boat to put between 6.00 and 6.30 g of the hydrated copper(II) sulfate prepared above into a 250 cm^3 volumetric flask. Dissolve the solid in distilled water, then make up to the mark using distilled water. Pipette 25 cm^3 of this solution into a 250 cm^3 conical flask and dilute by adding about 25 cm^3 of distilled water. Then use a measuring cylinder to add 30 cm^3 of 10% potassium iodide solution – this reacts to form iodine :

$2\,Cu^{2+} + 4\,I^- \rightarrow 2\,CuI + I_2$

Titrate the iodine formed with 0.100 M sodium thiosulfate in the burette. The following reaction occurs:

$I_2 + 2\,S_2O_3^{2-} \rightarrow S_4O_6^{2-} + 2\,I^-$

Add two or three drops of starch solution near the [illegible] – the pale brown solution will then turn into a blue-black solution. Continue adding sodium thiosulfate until the solution becomes colourless. Repeat the titration until concordant titres are obtained – the titres should be within 0.1 cm^3 of each other.

Results

Mass of hydrated Copper(II) Sulfate = 2.47 g

Titration	Initial volume/cm^3	Final volume/cm^3	Titre/cm^3
1	0	10	10
2	10	15.4	8.4
3	15.4	26.6	8.2
4	26.6	34.7	8.1
5	34.7	42.9	5.2

Calculating the percentage purity of hydrated copper(II) sulfate:

Determining the percentage purity of hydrated copper(II) sulfate:

During the titration, one can misjudge the colour of the indicator near the end point - this is the most common error during this procedure. Not only is the colour change sometime slow, people have different sensitivities to colours – not to mention colour blindness. To reduce the percentage error, a number of people should observe the colour and then come to a final result. The solution should also be swirled for about a minute as the reaction may be slow and the wrong result may be recorded.

Another error in the titration could be misreading the volume due to parallax error; this is when someone reads the volume looking at an angle. When reading the volume on the burette scale it is very common to read an upper or lower value (the lighting condition could also make a difference). Parallax error is when we misinterpret a value when measuring something, not looking at it at eye-level. This would cause the recordings to be inaccurate and the experiment to be invalid and unreliable. To improve the method, when reading the level at which the meniscus fall on, ensure that you are looking at the burette at eye level. This means that you will get an accurate reading and therefore reduce the error.

When using solutions of the wrong concentration the titrant used may have a different concentration. This is because of the error in recording the concentration, the contamination of the distilled water, the titrant decomposition and the solution being partially evaporated. To reduce these errors, record the concentration correctly so that it does not affects the later results. Make sure the distilled water is not contaminated, spill any contaminated distilled water. Do not keep the titrant for too long and make sure the solution should be kept where it belongs and is fully sealed so no water is evaporated.

If a dirty glass is used, as it is not properly cleaned before it is used, it may be contaminated with an old substance; this can react with the new substances which can change the concentration. If all the solids and liquids are not fully transferred, for example part of the solid was left in the funnel during transferring it into the flask or it was lost. Also it may be easy to forget to rinse the glassware after the solution was transferred , for example droplets of the titrant may by formed on the flask wall and is not rinsed with distilled water. In addition, if the pipette is not clean, come of the solution would be left inside in the glass in the form of droplets. To reduce these errors, the glassware must be rinsed properly for about a minute, to be sure that no residue from the last procedure affects the results in the next.

Preparation of aspirin:

Also, when transferring the crystals from the filter paper used in the suction filtration, to the pre-weighed filter paper there would be a loss of product, as some would still be on the previously used filter paper. This means that the recorded mass of the crystals would be less than the actual mass of the crystals. Therefore, the using this mass, the calculated percentage yield would be less than the actual yield that was made. This would cause the recorded percentage yield to be inaccurate. To improve the method, when transferring the crystals from the filter paper used in the suction filtration, to the pre-weighed filter paper, use a spatula and maybe a few drops of water to ensure that you scrape and rinse off as many crystals as possibly. By doing this, you can ensure that your

H = 1 * 1 = 1

Cl = 35.4 * 1 = 35.4

($C_9H_8O_4$ / $C_9H_8O_4$ + HCL) * 100

= (180 / 216.4) * 100

= 83.18%

If you use the alternate method, you will get a difference of approximately 8.18%.

Hydrated copper(II) sulfate:

Hydrated copper(II) sulfate method atom economy:

% atom economy = (RAM of desired product from equation / RAM of reactants from equation) x 100

$CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$

CuO

Cu = 63.5 * 1 = 63.5

O = 16 * 1 = 16

$CuSO_4$:

Cu = 63.5 * 1 = 63.5

S = 32.1 * 1 = 32.1

O4 = 16 * 4 = 64

H_2O:

H2 = 2 * 1 = 2

O = 16 * 1 = 16

H_2SO_4

H2 = 2 * 1 = 2

S = 32.1 * 1 = 32.1

O4 = 16 * 4 = 64