Technical Education, Vocational and Entrepreneurship Training Authority (TEVETA)

**DIPLOMA IN SCIENCE LABORATORY TECHNOLOGY**

**YEAR I**

# Chemistry Techniques I

## Record of Practical Assessment

Learner`s Name:________________________________________

Learner`s NRC no.:_____________________________________

Learner`s TEVETA No.:__________________________________

Assessment Period:_____________________________________

## PREFACE

The Technical Education, Vocational and Entrepreneurship Training Authority (TEVETA) is an institution created under the Technical Education, Vocational and Entrepreneurship Training Act Number13 of 1998, as amended by the Technical Education, Vocational and Entrepreneurship Training (Amendment) Act Number 11 of 2005.

The Act among other things provides that TEVETA shall:

(a) regulate and conduct national examinations and assessments relating to technical education, vocational and entrepreneurship training;

(b) charge and collect fees in respect of examinations, assessments and other services provided by the Authority;

(c) award certificates to persons who succeed in examinations and assessments undertaken under this Act

(d) do all such things connected with or incidental to the functions of the Authority under this Act.

Through this mandate, the Assessment and Qualifications Division of TEVETA has developed Practical Assessment Tool Kits to enable learners achieve the competences that are congruent with the demand of the workplace tasks. These tool kits in part are also intended to ensure that similar conditions under which all students in TEVET are assessed and examined apply wherever the course is undertaken in Zambia.

The Trainers shall work with the Learnersto collect evidence of competence, using the benchmarks provided by the unit standards. During the year, the Learners shall be required to undertake a series of practical assessment tasks. It is the sum of all these assessments tasks that deems a Learner to be competent (or not).

This approach to assessment is not a one-off event but one that gives learners many opportunities to demonstrate skill and allow for the capturing and recording of these demonstrations.

For the Learner to be deemed competent, they must demonstrate competency in every aspect of the practical tasks being undertaken. It must however be understood by the Trainer that Competency does not mean expert. It means that the candidate has attained sufficient skill and knowledge to perform the activity or service to a degree and quality that is acceptable to the industry and the customer in a time within which a competent person at the level could reasonably be expected to perform the task.

While this will be undertaken at institutional level, it is therefore envisaged that the Assessment principles of VALIDITY, RELIABILITY, FAIRENESS and FLEXIBILITY shall at all times be adhered to.

## Pre-Assessment

| | |
|---|---|
| Assessment process explained to the employee (✓ if Yes). | ☐ |
| Any appeal relating to the outcome of the assessment or the way in which the assessment was conducted shall be made through the company's *fair treatmentpolicy* as explained to the employee (✓ if Yes). | ☐ |

<table>
<tr><td>Employee/Trainee<br><br>Employee/Trainee name:<br>_______________________________ (Print)<br><br>Employee/Trainee comments:</td><td colspan="2">Assessor<br><br>Assessor name:<br>_______________________________ (Print)<br><br>Assessor comments:</td></tr>
<tr><td>I fully understand the assessment and appeals process.</td><td>Theory assessment sighted and checked as satisfactory.</td><td>☐</td></tr>
<tr><td>Signature: ____________________________<br><br>Date: ________________________________</td><td colspan="2">Signature: ____________________________<br><br>Date: ________________________________</td></tr>
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| **1.0 PERFORM AN EXPERIMENT ON SAFETY IN A LABORATORY** | **Satisfactory** | | | **Not Satisfactory** | | |
|---|---|---|---|---|---|---|
| During observation of work activities, the candidate demonstrated that they can: | | | | | | |
| a. Identify the apparatus correctly. This may include:<br>☐ Dust mask<br>☐ Safety goggles<br>☐ Fume hood<br>☐ Latex gloves<br>☐ Gas mask (aspirators)<br>☐ Acid-resistant Laboratory coat<br>☐ Acid-resistant Safety shoes<br>☐ Fire extinguishers<br>☐ Fire blanket<br>☐ First-aid box<br>(No loose clothing, no long hair, no open shoes) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| b. Set up apparatus correctly. This may include:<br>☐ Cleaning the identified pieces of apparatus<br>☐ Assembling the identified pieces of apparatus | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| c. Run the experiment correctly. This may include:<br>☐ Applying Dos and DONT's of the equipment and experiment<br>☐ Being alert of what is going on during the experiment<br>☐ Identifying the use of each equipment/apparatus | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| d. Interpret the results correctly. This may include:<br>☐ Appreciating the use and care of the equipment and apparatus | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| e. Identify the errors that may affect the experiment and how they can be avoided. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

Assessor comments:

Signed: Assessor: Trainee:

| 2 PERFORMING AN EXPERIMENT ON USING MEASURING INSTRUMENTS | Satisfactory | | | Not Satisfactory | | |
|---|---|---|---|---|---|---|
| During observation of work activities, the candidate demonstrated that they can: | | | | | | |
| a. Identify the apparatus correctly.This may include:<br>- Analytical balance<br>- Top pan balance | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| b. Set up the apparatus correctly.  This may include:<br>- Placing the balances on the a strong and thick horizontal bench or concrete block<br>- Plugging in and switching on the balances<br>- Ensuring that the balance is on a horizontal surface by checking the bubble in the spirit level being in the centre of the circle. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| c. Run the experiment correctly. This may include:<br>- Zeroing the apparatus when the sliding doors are closed<br>- Calibrating using the standard mass pieces<br>- Weighing out any material that is within the maximum load that the balance can withstand<br>- Weighing the mass either by taring or by difference<br>- Record the mass<br>- Repeating the process for four more materials and recording the masses | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| d. Interpret the results correctly. This may include:<br>- Checking the tolerance limits, deciding which is accurate or precise<br>- Checking for any bias in the measurement. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| e. Identify the errors that may affect the experiment and how they can be avoided | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

Assessor comments:

Signed: Assessor: Trainee:

| **3 PERFORM AN EXPERIMENT TO DETERMINE THE WATER OF CRYSTALLISATION IN HYDRATED COPPER (II) SULPHATE** | **Satisfactory** | | | **Not Satisfactory** | | |
|---|---|---|---|---|---|---|
| During observation of work activities, the candidate demonstrated that they can: | | | | | | |
| a. Identify the apparatuscorrectly. This may include:<br>☐ Clean dry porcelain crucible and lid<br>☐ Analytical balance<br>☐ Tripod stand and clay triangle or wire gauze<br>☐ Desiccator<br>☐ Clean crucible tongs<br>☐ Bunsen burner<br>☐ Gas cylinder<br>☐ Spatula<br>☐ Copper (II) sulphatepentahydrate | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| b. Set up the apparatus correctly. This may include:<br>☐ Arranging the apparatus and materials in order<br>☐ Obtaining a clean crucible and lid.<br>☐ Checking the crucible for fractures. If none are found, support the crucible and lid on a clay triangle or wire gauze on a tripod stand<br>☐ Connecting the burner to the gas tap | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

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| c. Run the experiment correctly. This may include:<br>☐ Turning the gas on from the gas cylinder and lighting the Bunsen burner. Adjusting the air inlet vent until the flame is blue and the heat is intense<br>☐ Heating the crucible and lid for 5 minutes. Removing from the heat and placing in a desiccator to cool. Do not place on a laboratory bench to avoid contamination. Do not touch the crucible and lid as hot and cool crucibles look the same. Hence, handle them with crucible tongs. Handle the crucible and lid with the crucible tongs for the remainder of the experiment<br>☐ Determining the mass of the cool crucible and lid on an analytical balance and recording it, $m_{1.}$<br>☐ Weighing 3 g of hydrated copper (II) sulphate and transferring it to the crucible.<br>☐ Weighing and recording the combined mass of the crucible, lid and the hydrated copper (II) sulphate, $m_{2,}$<br>☐ Calculating the mass of the hydrated salt<br>☐ Returning the crucible (use crucible tongs only) with the sample to the clay triangle; set the lid just off the lip of the crucible to allow the evolved water molecules to escape on heating<br>☐ Heating the sample. Initially heating the sample slowly and then gradually intensifying the heat. Do not allow the crucible to become red hot. This may cause the anhydrous salt to decompose as well.<br>☐ Maintaining the high temperature on the sample for 10 minutes. Removing from the heat and placing in a desiccator to cool<br>☐ Determining the combined mass of the crucible, lid and anhydrous salt on the same balance used for earlier measurements, $m_{3.}$<br>☐ Determining if all the water has been removed by reheating the sample for 2 minutes, but do not intensify the flame<br>☐ Removing from the heat and placing in a desiccator to cool<br>☐ Measuring the combined mass again. If the second mass measurement of the anhydrous salt disagrees by greater than +/- 0.010 g from the first, repeat the process of reheating the sample. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

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| d. Interpret the results correctly. This may include:<br>- Calculating the percentage of the water of crystallization as follows:<br>- Mass of water of crystallization $= m_2 - m_3$<br>- Mass of hydrated copper (II) sulphate $= m_2 - m_1$<br><br>% of water of crystallization = $\frac{m_2 - m_3}{m_2 - m_1}$ 100% | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

Assessor comments:

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Signed: Assessor: ____________________ Trainee: ______________

<table>
<tr><th>4PERFORMING AN EXPERIMENT ON HOW TO USE VOLUMETRIC GLASSWARE.</th><th colspan="5">Satisfactory</th><th>Not Satisfactory</th></tr>
<tr><td colspan="7">During observation of work activities, the candidate demonstrated that they can:</td></tr>
<tr><td>a. Identifying the apparatus correctly.This may include:<br>☐ Pyrex<br>☐ Borosilicate<br>☐ Non-pyrex</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td></tr>
<tr><td>b. Set up the apparatus correctly. This may include:<br>☐ Cleaning with industrial detergent<br>☐ Washing with running tap water<br>☐ Rinsing with deionised water of distilled water<br>☐ Drying where necessary.</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td></tr>
<tr><td>c. Run the experiment correctly. This may include:<br>☐ Filling the glassware with bigger volume requires transferring a liquid using a big beaker up to where the neck starts. Then topping up using a wash bottle to just slightly below the engraved graduation mark. Then finally using a jet to make up to the mark.<br>☐ Shaking well to homogenise the liquid<br>☐ Repeating the procedure for other types of volumetric glassware.<br>☐ Transferring the liquids into stoppered glass bottles<br>☐ Labelling includes:<br>➢ Identity of the liquid<br>➢ Identity of a person who prepared<br>➢ Concentration of liquid where necessary<br>➢ Date of preparation<br>➢ Expiry date</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td></tr>
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| d. Interpret the results correctly. This may include:<br>• Storing the prepared solutions in respective places.<br>• Checking the expiry date.<br>• Comparing the results from the solutions or liquids from time to time if necessary against secondary standard | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| e. Identify the errors that may affect the experiment and how they can be avoided.<br>**NOTE: Do not in any way subject volumetric glassware to heat.** | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

Assessor comments:

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Signed: Assessor: ____________________ Trainee: ______________

| 5 PERFORM AN EXPERIMENT ON WEIGHING USING AN ANALYTICAL BALANCE | Satisfactory | | | Not Satisfactory | | |
|---|---|---|---|---|---|---|
| During observation of work activities, the candidate demonstrated that they can: | | | | | | |
| a. Identify the apparatus/materials correctly. This may include:<br>☐ Analytical balance<br>☐ spatula,<br>☐ weighing boat or pan,<br>☐ beaker,<br>☐ stirring rod,<br>☐ suitable volumetric flask,<br>☐ distilled or deionised water,<br>☐ camel hair brush<br>☐ Primary standard eganalar anhydrous sodium carbonate, | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| b. Set up apparatus/ materials correctly. This may include:<br>☐ Calculating the mass of the primary standard material to be weighed based on relative atomic masses of the constituent atoms.<br>☐ Placing the balances on the a strong and thick horizontal bench or concrete block in a room where there are no air currents<br>☐ Plugging in the and switching on the balance<br>☐ Ensuring that the balance is on a horizontal surface by checking the bubble in the spirit level being in the centre of the circle. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

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| c. Run the experiment correctly. This may include:<br>□ Placing the analytical balance on a horizontal surface by adjusting the screws on its base until the bubble on the spirit level is in the centre<br>□ Weighing by taring includes<br>➢ Zeroing the balance,<br>➢ weighing the empty receptacle,<br>➢ Zeroing again<br>➢ Putting the primary standard into the receptacle<br>➢ Closing the sliding door<br>➢ Waiting for the display to stabilize<br>➢ Taking the reading<br>➢ Recording the reading of the mass of the primary standard<br>□ Transferring the primary standard quantitatively into a clean dry beaker<br>□ Dissolving it with minimum amount of distilled water<br>□ Transferring the dissolved primary standard into a volumetric flask quantitatively<br>□ Using distilled water from a clean beaker to add enough water until just below the neck of the volumetric flask<br>□ Using a wash bottle to add more water to just below the engraved graduation mark.<br>□ Using a jet to fill up to the graduation mark<br>□ Shaking well to homogenise the solution Transferring the liquids into stoppered glass bottles<br>□ Labelling includes:<br>➢ Identity of the liquid<br>➢ Identity of a person who prepared<br>➢ Concentration of liquid where necessary<br>➢ Date of preparation<br>➢ Expiry date | □ | □ | □ | □ | □ | □ |

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|---|---|---|---|---|---|---|
| d. Interpret the results correctly. This may include:<br>☐ Storing the prepared solutions in respective places.<br>☐ Checking the expiry date.<br>☐ Comparing the results from the solutions or liquids from time to time if necessary against secondary standard | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| e. Identify the errors that may affect the experiment and how they can be avoided | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

Assessor comments:

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Signed: Assessor: ____________________ Trainee: ______________

| 6 PERFORMING AN EXPERIMENT ON PREPARATION OF A STANDARD SOLUTION | Satisfactory | | | Not Satisfactory | | |
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| During observation of work activities, the candidate demonstrated that they can: | | | | | | |
| a. Identify the apparatus /materials correctly. This may include:<br><br>- Beaker<br>- Stirring rod,<br>- Suitable<br>- Volumetric flask,<br>- Funnel.<br>- Primary standard materials eganalar anhydrous sodium carbonate,<br>- Distilled or deionised water | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| b. Set up the apparatus correctly. This may include:<br><br>- Calculating the mass of the required standard from relative atomic masses.<br>- The weighed primary standard material (from the procedure on weighing) is transferred to another clean beaker where it is dissolved in the minimum amount of distilled or deionised water<br>- Selecting an appropriate volumetric flask and placing a clean ordinary funnel in its mouth with a piece of clean folded paper to serve as a wedge at its opening. This allows air to be easily expelled from the volumetric flask when the solution is poured into it. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

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| c. Run the experiment correctly. This may include:<br>- Pouring the solution from the beaker into the funnel taking care not to spill any.<br>- Rinsing out the beaker with small portions of the water and adding to the volumetric flask each washing until everything has been washed out from the beaker.<br>- Rinsing, similarly, the funnel with several small amounts of water in a circular motion. Do not add such amounts so as to fill the volumetric flask.<br>- Removing the funnel from the volumetric flask and carefully and slowly adding enough distilled water to take the lowest point of the meniscus level with the engraved circular line on the neck of the flask.<br>- Using of a small jet of water is recommended when nearing the engraved line.<br>- Making an allowance for water from above the line especially on the inside of the neck to roll down as ignoring this may lead to overshooting.<br>- Stoppering the volumetric flask and shaking vigorously in order to prepare a homogeneous solution. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| d. Interpret the results correctly. This may include:<br>- Titrating against secondary standards | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| e. Identify the errors that may affect the experiment and how they may be avoided | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

Assessor comments:

Signed: Assessor: ____________________ Trainee: ____________

<table>
<tr><th>7. PERFORMING AN EXPERIMENT TO STANDARDISE A SECONDARY STANDARD AGAINST A PRIMARY SRANDARD.</th><th colspan="3">Satisfactory</th><th colspan="3">Not Satisfactory</th></tr>
<tr><td>During observation of work activities, the candidate demonstrated that they can:</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>a. Identify the apparatus correctly. This may include:<br>☐ Pipette<br>☐ Burette<br>☐ Conical flasks<br>☐ Volumetric flask<br>☐ Measuring cylinder<br>☐ Pipette filler<br>☐ Beakers including 1 litre beaker for diluting<br>☐ Clamp and stand<br>☐ White tile<br>☐ Concentrated sulphuric acid (from which to prepare the secondary standard)<br>☐ Sodium carbonate standard solution – primary standard<br>☐ Phenolphthalein indicator (other suitable indicators like methyl orange or methyl red may be used)<br>☐ Distilled water</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td></tr>
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|---|---|---|---|---|---|---|
| b. Set up the experiment correctly. This may include:<br>☐ Cleaning apparatus using industrial detergent<br>☐ Rinsing apparatus using running tap water<br>☐ Rinsing apparatus using distilled water<br>☐ Drying apparatus where necessary<br>☐ Assembling apparatus<br>☐ Most concentrated acid bottles have the following data on their labels;<br>☐ Percentage purity, specific gravity SG, and molecular weight of that particular acid.<br>☐ Thus, the following formula is used to calculate the concentration of the concentrated acid.<br>☐ Molarity = %purity XSG X1000/molecular weight<br>☐ Using the dilution $M_1V_1 = M_2V_2$ where the left side refers to the concentrated solution while the right side pertainsto the dilute solution. M represents the molarities while V represents the volumes.<br>☐ **Note to the lecturer: dilution of sulphuric acid is quite dangerous.** | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

<table>
<tr><td>
c. Run the experiment correctly. This may include:

- Using a pipette with a pipette filler to draw three 25 ml aliquots from the dilute solution and placing them in clean, dry separate conical flasks. Adding 2 to 3 drops of phenolphthalein indicator to each of the conical flasks.
- Fillinga clean burette with the sodium carbonate solution from tip to top.
- Adjusting the volume to 0.00 ml on the burette. Placing a white tile or white piece of paper below the burette on the base of the clamp.
- Placing a conical flask below the tip of the burette and continuing titrating until a persistent faint pink colour appears in the conical flask. The stopcock should be closed immediately at this point and the volume of the sodium carbonate solution dispensed from the burette read off immediately. The eyes should be at $90^o$to the burette at the point where the meniscus is. Repeating the procedure with the remaining two conical flasks.The volume readings should be entered in a table as shown below and they should agree to within 0.05 ml of each other.
- Running, slowly, the sodium carbonate solution into the conical flask while swirling all the time. The right hand should handle the conical flask while the left hand should operate the stopcock
</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td></tr>
<tr><td>
d. Interpret the results correctly. This may include:

| | Initial volume, ml | Final volume, ml | Actual volume, ml |
|---|---|---|---|
| Trial 1 | | | |
| Trial 2 | | | |
| Trial 3 | | | |

- Use the following chemical equation for the calculations:

$Na_2CO_{3(aq)} + H_2SO_{4(aq)} \rightarrow Na_2SO_{4(aq)} + H_2O_{(l)} + CO_{2(g)}$
</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td></tr>
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Assessor comments:

Signed: Assessor: Trainee:

| **8 PERFORMING AN EXPERIMENT TO DETERMINE THE CONCENTRATION OF SODIUM HYDROXIDE BY TITRATING WITH A HYDROCHLORIC ACID STANDARD SOLUTION.** | **Satisfactory** | | | **Not Satisfactory** | | |
|---|---|---|---|---|---|---|
| During observation of work activities, the candidate demonstrated that they can: | | | | | | |
| a.Identify the apparatus correctly. This may include:<br>☐ Analytical balance<br>☐ Burette<br>☐ Pipette<br>☐ Pipette filler<br>☐ Beakers, different sizes<br>☐ Funnel<br>☐ Stirring glass rod<br>☐ Concentrated hydrochloric acid<br>☐ Sodium hydroxide pellets<br>☐ Distilled water<br>☐ Phenolphthalein indicator (or methyl orange or methyl red)<br><br>Calculating the concentration or molarity of the concentrated acid:<br>☐ Using the following equation:<br>☐ Molarity = %purityXSGX1000/Moí. Wt<br>☐ Then use the dilution formula $M_1V_1 = M_2V_2$, where the left side refers to the concentrated solution while the right side pertains to the dilute solution. M represents the molarities while V represents the volumes. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

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| b. Set up apparatus correctly. This may include:<br>- Cleaning apparatus using industrial detergent<br>- Rinsing apparatus using running tap water<br>- Rinsing apparatus using distilled water<br>- Drying apparatus where necessary<br>- Assembling apparatus<br>- Most concentrated acid bottles have the following data on their label<br>- Percentage purity, specific gravity SG, and molecular weight of that particular acid.<br>- Thus, the following formula is used to calculate the concentration of the concentrated acid.<br>- Molarity = %purity XG X1000/molecular weight<br>  - Using the dilution $M_1V_1 = M_2V_2$ where the left side refer to the concentrated solution while the right side pertain to the dilute solution. M represents the molarities while V represents the volumes.<br>  - Removing $V_1$, that is, the calculated volume of the concentrated acid that should be taken and diluted. Adding the acid to the glass funnel in small quantities with constant stirring with a glass rod before adding the next instalment. Continuing stirring for some time and leaving to cool.<br>  - Transferring to a 1 litre volumetric flask and making up to volume with distilled water.<br>  - Shaking the flask well to homogenise the solution.<br>  - The concentration of the final solution should be 0.50 M. This is just a guide as other concentration may be prepared depending on the requirement<br>  - Preparing the sodium hydroxide solution:<br>  - Weighing about 20 g of sodium hydroxide on a watch glass or small clean dry beaker quickly as sodium hydroxide absorbs moisture from the atmosphere.<br>  - Transferring the pellets to another clean beaker and dissolving in the minimum amount of distilled water.<br>  - Transferring the sodium hydroxide solution to a clean 1 litre volumetric flask and adding enough distilled water to make up to the mark.<br>  - Shake the volumetric flask well to homogenise. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

<table>
<tr>
<td>
c. Run the experiment correctly. This may include:
<ul>
<li>Using a pipette with a pipette filler to draw three 25 ml aliquots from the dilute solution of sodium hydroxide and placing them in clean, dry separate conical flasks. Adding 2 to 3 drops of phenolphthalein indicator to each of the conical flasks. The colour of the solution will change to pink.</li>
<li>Filling a clean burette with the hydrochloric acid standard solution from tip to top.</li>
<li>Adjusting the volume to 0.00 ml on the burette. Placing a white tile or white piece of paper below the burette on the base of the clamp.</li>
<li>Placing a conical flask below the tip of the burette and slowly running the hydrochloric acid solution into the conical flask while swirling all the time. The right hand should handle the conical flask while the left hand should operate the stopcock.</li>
<li>Continuing titrating until there is a distinct colour change in the conical flask, i.e the solution becomes colourless.  The stop cork should be closed immediately at this point and the volume of the hydrochloric acid solution dispensed from the burette read-off immediately. The eyes should be at $90^o$ to the burette at the bottom of the meniscus.</li>
<li>Repeating the procedure with the remaining two conical flasks. The volume reading should be entered in a table as shown below and they should agree to within 0.05 ml of each other</li>
<li>Note that due to advances there existsautotitrators and other means of indicating the end other than indicators.</li>
</ul>
<table>
<tr><th></th><th>Initial volume ,ml</th><th>Final volume, ml</th><th>Actual volume, ml</th></tr>
<tr><td>Trial 1</td><td></td><td></td><td></td></tr>
<tr><td>Trial 2</td><td></td><td></td><td></td></tr>
<tr><td>Trial 3</td><td></td><td></td><td></td></tr>
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| d. Interpret the results correctly. This may include:<br><br>Use the equation:<br><br>$NaOH_{(aq)} + HCl_{(aq)} \rightarrow NaCl_{(aq)} + H_2O_{(l)}$<br><br>- Examining the individual volumes for precision.<br>- Calculating individual results for each volume<br>- Comparing the individual results for precision | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| e. Identify the error that may affect the experiment and how they may be avoided | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

Assessor comments:

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Signed: Assessor: ____________________ Trainee: _____________

<table>
<tr><th>9PERFORMING AN EXPERIMENT ON THE SUBLIMATION OF AMMONIUM CHLORIDE</th><th colspan="3">Satisfactory</th><th colspan="3">Not Satisfactory</th></tr>
<tr><td colspan="7">During observation of work activities, the candidate demonstrated that they can:</td></tr>
<tr><td>a. Identify the apparatus correctly. This may include:<br>☐ Pyrex test-tube<br>☐ Analytical balance<br>☐ Small clean beaker<br>☐ Bunsen burner or spirit lamp<br>☐ Clamp and stand<br>☐ Gas cylinder:<br>☐ Anhydrous ammonium chloride powder<br>☐ Box of matches<br>☐ Sand</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td></tr>
<tr><td>b.Set up the apparatus correctly. This mayinclude:<br>☐ Weighing about 0.5 g of ammonium chloride in a small clean and dry beaker<br>☐ Transferring quantitative the ammonium chloride to a clean dry test-tube<br>☐ Clamping the test-tube above the Bunsen burner<br>☐ Turning the gas on from the gas cylinder<br>☐ Bringing the lit match stick close to the top of the Bunsen burner to light the gas<br>☐ Adjusting the air inlet vent at the base of the burner until you have a bluish flame</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td></tr>
<tr><td>c. Run the experiment correctly. This may include:<br>☐ Heating gently the bottom of the test-tube. The ammonium chloride will disappear completely from the bottom of the test-tube after a while. Some escapes as vapour but condenses on the upper wall of the test-tube.<br>☐ Repeating the experiment with the ammonium chloride mixed with 1 g of sand and noting your observations.</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td></tr>
<tr><td>d. Interpret the results correctly. This may include:</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td></tr>
<tr><td>e. Identify the errors that may have affected the experiment and how they can be avoided.</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td></tr>
</table>

Assessor comments:

Signed: Assessor: Trainee:

| 10 PERFORMING AN EXPERIMENT TO SHOW THAT A CHEMICAL REACTION CAUSES NO CHANGE IN WEIGHT | Satisfactory | | | Not Satisfactory | | |
|---|---|---|---|---|---|---|
| During observation of work activities, the candidate demonstrated that they can: | | | | | | |
| a. Identifythe apparatus correctly. This may include:<br>☐ Analytical balance<br>☐ Small clean test-tube<br>☐ Clean 600 ml beaker<br>☐ Flexible thin wire<br>☐ Small clean beaker<br>☐ Barium chloride or barium nitrate<br>☐ Sodium sulphate<br>☐ Distilled or deionised water | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| b. Set up the apparatus correctly. This may include:<br>☐ Cleaning some apparatus industrial detergent<br>☐ Rinsing some apparatus with running tap water<br>☐ Rinsing some apparatus with distilled water<br>☐ Assembling some apparatus<br>☐ Weighing | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

| | | | | | | |
|---|---|---|---|---|---|---|
| c. Running the experiment. This may include:<br>☐ Weighing the 600 ml beaker<br>☐ Adding about 3 g of barium chloride to the beaker and record the weight<br>☐ Weighing the small test-tube<br>☐ Weighing about 3 g of sodium sulphate and transferring it to the small test-tube<br>☐ Weighing the test-tube again and record the new weight<br>☐ Dissolving the barium chloride in the minimum quantity of water. Weighing the beaker again and recording the weight<br>☐ Dissolving the sodium sulphate in the minimum amount of water<br>☐ Tying the flexible thin wire around the upper part of the test-tube<br>☐ Placing the test-tube in the beaker in an inclined positon taking care not to bring the two solutions into contact. Hooking one end of the wire on the rim of the 600 ml beaker<br>☐ Weighing carefully this assembly again and recording the mass, $m_1$.<br>☐ Removing the assembly from the balance<br>☐ Unhooking the wire and letting all the contents of the test-tube to come into contact with the barium chloride solution in the beaker.A white precipitate will form. Wait for 10 minutes and reweigh the beaker and everything in it again, $m_2$. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| d. Interpret data correctly. This may include:<br>☐ Comparing $m_1$ and $m_2$<br>☐ $m_1$ and $m_2$ should agree | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| e. Identify errors that may affected the experiment and how they can be avoided | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

Assessor comments:

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Signed: Assessor: ____________________ Trainee: ______________

| 11 PERFORMING AN EXPERIMENT ON THE SEPARATION OF SAND AND SODIUM CHLORIDE. | Satisfactory | | | Not Satisfactory | | |
|---|---|---|---|---|---|---|
| During observation of work activities, the candidate demonstrated that they can: | | | | | | |
| a. Identify the apparatuscorrectly.Thismayinclude:<br>☐ Analytical balance<br>☐ Conical flask<br>☐ Evaporating dish<br>☐ Ordinary funnel<br>☐ Beakers<br>☐ Filter paper<br>☐ Clean evaporating dish (optional)<br>☐ Spirit lamp (optional)<br>☐ Tripod stand and wire gauze (optional)<br>☐ Sodium chloride powder<br>☐ Finely divided sand<br>☐ Distilled or deionised water<br><br>☐ oven may be used for speedy drying. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| b. Set up the apparatus correctly. This may include:<br>☐ Washing some apparatus with industrial detergent<br>☐ Rinsing some apparatus with running tap water<br>☐ Rinsing some apparatus with distilled water<br>☐ Drying some apparatus<br>☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

| | | | | | | |
|---|---|---|---|---|---|---|
| c. Run the experiment correctly. This may include:<br> Weighingabout 3 g of sodium chloride in a beaker<br> Weighing 3 g of sand and it to beaker with the sodium chloride solution.<br> Adding more water to the beaker until half way up.<br> Putting a clean funnel on the conical flask with a small clean folded piece of paper to serve as a wedge for easy expulsion of air from the conical flask.<br> Folding a clean filter paper and place it on the funnel with the cone resting at the base. The filter paper should be of such quality that it will retain the particles of sand. Agitating the sodium chloride/sand mixture.<br> Pouring carefully out the mixture onto the filter paper. The sand will tend to remain in the beaker so agitate every time before pouring onto to the filter paper. Whatever remains in the beaker should be washed out with small quantities of water until everything has been transferred from the beaker.<br> If solid sodium chloride is required, transfer the filtrate in the conical flask to an evaporating dish and heat on wire gauze to drive out most of the water. Do not heat to dryness. Remove the evaporating dish from the heat and leave it in a cool place where it won't be disturbed for 4 hours. After cooling, crystals will form. Decant any excess water and transfer the crystals to another clean filter paper and leave to dry. If dry sand is required, transfer the residue to a watch glass or filter paper and leave to dry. An oven may be used for speedy drying | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| d. Interpret the data correctly. This may include: | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| e. Identify errors that may have affected the experiment and how they can be avoided. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

Assessor comments:

Signed: Assessor: Trainee:

Final Assessment Summary

**Practical assessment summary**

Note: refer to mapping document if required

| | | Satisfactory | Not Satisfactory |
|---|---|---|---|
| 1. | Safety in the Laboratory | ☐ | ☐ |
| 2. | Measurements | ☐ | ☐ |
| 3. | Determine The Water of Crystallisation Of Hydrated Copper (II) Sulphate | ☐ | ☐ |
| 4. | Using Volumetric Glassware | ☐ | ☐ |
| 5. | Weighing On An Analytical Balance | ☐ | ☐ |
| 6. | Preparation Of A Primary Standard Solution | ☐ | ☐ |
| 7. | Standardising A Secondary Standard | ☐ | ☐ |
| 8. | Determining The Concentration Of Sodium Hydroxide | ☐ | ☐ |
| 9. | Sublimation Of Ammonium Chloride | ☐ | ☐ |
| 10. | A Chemical Reaction Causes No Change In Mass | ☐ | ☐ |
| 11. | Separation Of Sand And Sodium Chloride | ☐ | ☐ |

Assessor comments:

Signed: Assessor: ____________________ Trainee: ______________

Assessment Outcome

Satisfactory ☐

Not Satisfactory ☐

| Employee/Trainee | Assessor |
|---|---|
| Employee/Trainee name:<br>____________________________ (Print) | Assessor name:<br>____________________________ (Print) |
| **Employee/Trainee comments:** | **Assessor comments:** |
| | |
| Signature: ____________________________<br>Date: ____________________________ | Signature: ____________________________<br>Date: ____________________________ |

## VALIDATION OF THE ASSESSMENT

NAME:………………………………………….. DATE:………………………………………..

POSITION: **PRINCIPAL/HEAD OF INSTITUTION** SIGNATURE:……………………………..

NAME INSTITUTION:………………………………………….

STAMP: