# Knowledge Assessment

**Assessment event 1 of 2**

## Criteria

### Unit code, name and release number

MSL973014 - Prepare working solutions (1)

### Qualification/Course code, name and release number

MSL30118 - Certificate III in Laboratory Skills (1)

MSL40118 - Certificate IV in Laboratory Techniques (1)

\*\*Amend the qualification box before distributing to the student. The information here should only contain the qualification the student is enrolled in\*\*

## Student details

### Student number

### Student name

## Assessment Declaration

* This assessment is my original work and no part of it has been copied from any other source except where due acknowledgement is made.
* No part of this assessment has been written for me by any other person except where such collaboration has been authorised by the assessor concerned.
* I understand that plagiarism is the presentation of the work, idea or creation of another person as though it is my own. Plagiarism occurs when the origin of the material used is not appropriately cited. No part of this assessment is plagiarised.

### Student signature and Date

Version: 1.0

Date created: 13/06/2019

Date modified: 11/11/2019

For queries, please contact:

Innovative Manufacturing, Robotics and Science SkillsPoint

Hamilton Campus

© 2019 TAFE NSW, Sydney  
RTO Provider Number 90003 | CRICOS Provider Code: 00591E

This assessment can be found in the: [Learning Bank](https://share.tafensw.edu.au/share/access/searching.do?doc=%3Cxml%2F%3E&in=P7ac4831b-430a-4b8d-8b56-f7b32ed5b9cf&q=&type=standard&sort=rank&dr=AFTER)

The contents of this document are copyright © TAFE NSW 2019, and should not be reproduced without the permission of the TAFE NSW. Information contained in this document is correct at time of printing: 11 November 2019. For current information please refer to our website or your teacher as appropriate.

## Assessment instructions

Table 1 Assessment instructions

| Assessment details | Instructions |
| --- | --- |
| **Assessment overview** | The objective of this assessment is to assess your knowledge as would be required to:   * Make up working solutions * Check existing stock of solutions * Maintain a safe work environment |
| **Assessment Event number** | 1 of 2 |
| **Instructions for this assessment** | This is a written assessment and it will be assessing you on your knowledge of the unit.  This assessment document is in four sections:   1. Multiple choice questions (Questions 1 – 17) 2. True or False questions (Questions 18 – 39) 3. Short answer questions (Questions 40- 59) 4. Assessment feedback.   You are permitted to bring into the assessment a double sided A4 student prepared study notes.  The Appendices contain a:   * Periodic table * Table of common ions * Data sheet of common calculations   The Assessor will provide any other documentation required to complete the assessment. |
| **Submission instructions** | On completion of this assessment, you are required to upload it or hand it to your trainer for marking.  It is important that you keep a copy of all electronic and hardcopy assessments submitted to TAFE and complete the assessment declaration when submitting the assessment.  All the appendices must be returned with your Assessment Task. |
| **What do I need to do to achieve a satisfactory result?** | To achieve a satisfactory result for this assessment all questions must be answered correctly. |
| **What do I need to provide?** | Calculator, pens, measuring equipment, student study notes |
| **Due date/time allowed** | Three hours |
| **Assessment feedback, review or appeals** | Appeals are addressed in accordance with Every Student’s Guide to Assessment. |

## Part 1: Multiple choice

Read the question and each answer carefully. Put an X in the table next to your chosen answer.

1. Which one of the following is a measure of the accuracy of a result?

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. Error |  |
| 1. Uncertainty |  |
| 1. Repeatability |  |
| 1. Traceability |  |

1. An analytical balance can measure up to ± 0.0001 g. This is a measure of -

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. Traceability |  |
| 1. Repeatability |  |
| 1. Uncertainty |  |
| 1. Error |  |

1. Which of the following is a measure of the precision of a result?

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. Uncertainty |  |
| 1. Repeatability |  |
| 1. Traceability |  |
| 1. Error |  |

1. If the SOP states “to accurately weigh approximately 1 gram of NaCl” it means to use:

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. a top pan balance and weigh exactly 1.00 gram of NaCl. |  |
| 1. an analytical balance and weigh exactly 1.000 gram of NaCl. |  |
| 1. a top pan balance and weigh close to but not necessarily 1.00 g of NaCl. |  |
| 1. an analytical balance and weigh close to but not necessarily 1.000 g of NaCl and record the exact amount taken |  |

1. If the SOP states to prepare “standard” solutions of 0.1000g of potassium hydrogen phthalate it means to use:

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. a top pan balance to weigh the analyte and use a volumetric flask to make up the solution with deionised water. |  |
| 1. an analytical balance and use a volumetric flask to make up the solution with deionised water. |  |
| 1. a top pan balance to weigh the analyte and use a volumetric flask to make up the solution with tap water. |  |
| 1. an analytical balance and use a volumetric flask to make up the solution with tap water. |  |

1. After you have obtained your reagents and solvents to make up solutions, you find that you have a small amount of excess which you no longer need. What do you with it?

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. Always be put back into the original reagent container(s) and store as per laboratory protocol to save money. |  |
| 1. Discard the excess as per laboratory protocol. |  |
| 1. Save them in separate containers, re-label as original and store as per laboratory protocol for later use. |  |
| 1. Use the excess to make up more solutions as per laboratory protocol just in case you have a need for them in the future. |  |

1. What would you do when you have finished using glassware such as pipettes, beakers and volumetric flasks for the day?

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. Leave them on the bench for other technical staff to clean up. |  |
| 1. Leave them soaking in the sink until the next day or when you have the time. |  |
| 1. Rinse well with tap water, allow to soak in tubs for specific glassware if required and load onto the commercial glassware washer and when finished, dry and store. |  |
| 1. Rinse then well with tap water and detergent, dry in an oven at 80-100 oC and then put away in the cupboard. |  |

1. The PPE you ***always*** have to wear in a chemical laboratory?

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. Laboratory coat, fully enclosed non porous shoes, safety glasses disposable gloves. |  |
| 1. Laboratory coat and fully enclosed non porous shoes. |  |
| 1. Laboratory coat, fully enclosed non porous shoes, disposable gloves. |  |
| 1. Laboratory coat, fully enclosed non porous shoes, safety glasses. |  |

1. How should you dispose of 150 mL 0.1M HCl?

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. Down the sink followed with copious amounts of tap water. |  |
| 1. In a capped solvent reagent waste bottle next to the sink. |  |
| 1. In a labelled capped solvent waste bottle in the fume cupboard. |  |
| 1. In a reagent capped solvent bottle and then dispose in the waste bin. |  |

1. How should you dispose of used or excess trichloromethane (chloroform) solvent?

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. Pour down the sink followed with copious amounts of tap water. |  |
| 1. Pour in a solvent waste bottle next to the sink. |  |
| 1. Pour in a labelled solvent waste bottle in the fume cupboard. |  |
| 1. Pour in a reagent capped solvent bottle and then dispose in the waste bin. |  |

1. The atomic number of an element is the number of:

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. protons |  |
| 1. neutrons |  |
| 1. electrons |  |
| 1. protons and neutrons combined |  |

1. Cations are formed by:

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. gaining a proton |  |
| 1. gaining an electron |  |
| 1. losing an electron |  |
| 1. losing a proton |  |

1. Non-metals are mostly found:

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. on the right-hand side of the periodic table |  |
| 1. on the left-hand side of the periodic table |  |
| 1. in elements numbers 58 to 103 |  |
| 1. in Group 1 |  |

1. The formula for iron II sulfate is:

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. FeSO4 |  |
| 1. Fe2SO4 |  |
| 1. Fe2(SO4)3 |  |
| 1. Fe(SO4)3 |  |

1. The following table contains a selection of cations and anions

|  |  |
| --- | --- |
| cations | anions |
| Fe3+ | NO3- |
| Ag+ | SO42- |
| Cu2+ | PO43- |

The set of correct formulas derived from these ions is:

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. Fe2(SO4)3 Ag2NO3 Cu3(PO4)2 |  |
| 1. AgNO3 Fe2(SO4)3 CuPO4 |  |
| 1. CuSO4 Ag3PO4 Fe3NO3 |  |
| 1. Ag2SO4 FePO4 Cu(NO3)2 |  |

1. Potassium hexacyanoferrate has the formula K3Fe(CN)6. Which of the following statements is correct?

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. There are four different elements in the compound |  |
| 1. There are only three different elements in the compound |  |
| 1. Potassium makes up one third of the mass of the substance |  |
| 1. In one molecule of the substance there are six iron atoms |  |

1. If used correctly which of the following has only quantitative volumetric glassware?

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. Volumetric flask, beaker, bulb pipette |  |
| 1. Bulb pipette, burette, conical flask |  |
| 1. Conical beaker, measuring, cylinder, volumetric flask |  |
| 1. Burette, volumetric flask, bulb pipette |  |

## Part 2: True or false

Read the question and then write **True** or **False** in the space provided.

Table 3 True or false

| Question | Write *True* or *False* |
| --- | --- |
| 1. All measurements are estimates. |  |
| 1. As you increase temperature, you increase the solubility of solids, gases and liquids. |  |
| 1. If you want to dissolve an ionic substance such as CaCO3 you should use a relatively non-polar organic solvent such as hexane because substances of opposite polarities attract and dissolve in each other. |  |
| 1. Aqueous and organic solvents tend to be different in polarity. |  |
| 1. pH is a measure of how acidic or basic a solution is. |  |
| 1. The pH scale goes from 1 to 10. |  |
| 1. pH is expressed as log [H+]. |  |
| 1. pH below 7 generally indicates an alkaline solution. |  |
| 1. A compound is composed of more than one type of element chemically combined in a fixed ratio. |  |
| 1. A solution that resists change to pH when an acid or base is added to it is termed a buffer. |  |
| 1. As a technician, you have received an unlabelled reagent solution from which you have to prepare working solutions. You need to reject and not use this. |  |
| 1. As long as you complete your laboratory task as required it is not important to consider the ethnic and religious differences of work colleagues. |  |
| 1. A measuring cylinder is just as accurate as using a volumetric flask when making up a solution. |  |
| 1. The correct equipment to quantitatively prepare 100 mL of 25 mg/L HCl from a 100 mg/L HCl solution would be a 25.0 mL bulb pipette and a 100 mL volumetric flask. |  |
| 1. A graduated pipette is more accurate than a bulb pipette when preparing solutions. |  |
| 1. The ash analysis for a sample of coal gave a value of 12.5% w/w. This means there would be 125 kg of ash in one tonne of coal |  |
| 1. A 15% w/v solution of NaCl would contain 15 g NaCl in 1 L of solution. |  |
| 1. A salt is an ionic compound formed from a cation such as potassium and an anion such as sulfate. |  |
| 1. When making up working solutions, one can use tap water as a solvent as they need not need to have exact molarities. |  |
| 1. A neutralisation reaction is one where an acid and a base react together completely. |  |
| 1. The International system of units (SI) is important is recognised around the world for reporting laboratory results |  |
| 1. Safety Data Sheets (SDS) are a legal requirement for every chemical located in the laboratory and should be consulted prior to working on any chemical in the laboratory. |  |

## Part 3: Short answer

Read the question carefully. Your responses can be up to 150 words for each question or part of a question.

1. Metrology is the study of measurement. The function of a laboratory is to measure something and report a result. How are the following relevant to your laboratory?
2. Sources of error:
3. Uncertainty:
4. Precision:
5. Repeatability:
6. Accuracy:
7. Significant figures:
8. Give two sources of error when weighing Na2SO4 using an analyticalbalance in your laboratory.
9. Give two sources of error possible when making up a quantitative dilution of 1.00 M NaOH using quantitative glassware.
10. A technician prepared two 200 mg/100 mL ascorbic acid solutions labelled “A” and “B”. He tested each solution three times using the same instrument and obtained the following results for the solutions.

|  | Conc Ascorbic Acid (mg/100 mL) | |
| --- | --- | --- |
|  | **A** | **B** |
| **1** | 188 | 210 |
| **2** | 190 | 200 |
| **3** | 191 | 190 |
| **Range** | 3 | 20 |
| **Relative Precision %** | 0.8 | 5 |
| **Relative Error %** | 5 | 0 |

1. Which solution, A or B is the most accurate and why?
2. Which solution, A or B is the more precise and why?
3. The Globally Harmonised System (GHS) of classification is now an important consideration in all laboratories. Briefly explain how this system determines how a chemical should be labelled.
4. You discover a solution in the storeroom of your laboratory and the label has fallen off the bottle. There is a label sitting on the bench nearby. There are a number of other solutions (all labelled) on the bench with the unlabelled bottle. What should you do?
5. What action should you take if someone working close to you in the laboratory gets acid on their skin or in their eyes?
6. Explain why it is extremely dangerous to add water to a concentrated acid.
7. What is the difference between aqueous and organic solutions?
8. Write the name or formula and determine the formula weight for the following elements and compounds.

| Formula | Name | Formula weight |
| --- | --- | --- |
| Ag |  |  |
|  | Nitrogen dioxide |  |
| Mg(NO3)2 |  |  |
|  | Copper II sulfate |  |
| PCl3 |  |  |

1. Jonah is a lab assistant at a food processing factory. He is required to prepare 0.5 L of 1 M sodium hydroxide solution, starting from solid sodium hydroxide. He has access to a copy of the Safety Data Sheet.

His SI Data book indicates the molar mass of sodium hydroxide is 40.

Answer the following questions:

a) How many grams of sodium hydroxide are required?

b) What safety measures must be taken when preparing this solution?

c) Jonah has 1 L of 0.5 M sodium hydroxide already prepared. Could he prepare the required solution by diluting what he has? Explain.

1. You need to make up 250.0 mL of 0.200 M solution from a stock of 0.500 M solution. What volume of the 0.500 M solution do you need to place into the 250 mL volumetric flask (show or explain working)?
2. What is the percentage by volume of ethanol in the final solution when 75 ml of ethanol is diluted to a volume of 500 ml with distilled water? Show your working.
3. Why is tap water generally not appropriate for making up solutions for chemical analysis?
4. Why is solvent purity important when making up solutions in your laboratory?
5. Describe the procedure you follow to monitor the shelf life of working solutions in your laboratory.
6. Describe the approved method for disposal of used solutions in your laboratory
7. What methods can be used to determine if old solutions are still fit for purpose.
8. List two environmentally sustainable practises that all laboratory technician should practise.
9. Good Laboratory Practice is to ensure traceability of a sample and all the processes it is subjected to prior to a test result being released. Explain how solutions can be traced in your workplace.

## Part 4: Assessment Feedback

*NOTE: This section* ***must*** *have the assessor signature and student signature to complete the feedback.*

### Assessment outcome

Satisfactory

Unsatisfactory

### Assessor Feedback

Was the assessment event successfully completed?

If no, was the resubmission/re-assessment successfully completed?

Was reasonable adjustment in place for this assessment event?  
*If yes, ensure it is detailed on the assessment document.*

Comments:

### Assessor name, signature and date:

### Student acknowledgement of assessment outcome

Would you like to make any comments about this assessment?

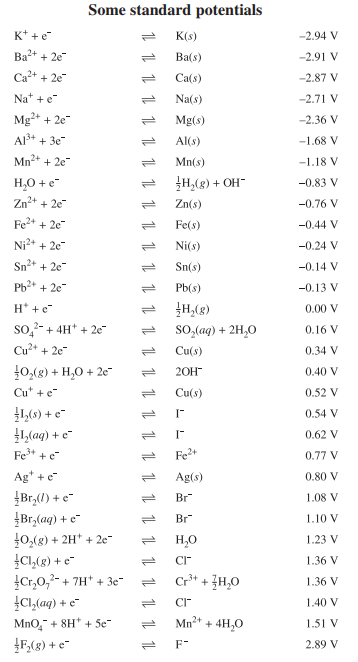
### Student name, signature and date

***NOTE: Make sure you have written your name at the bottom of each page of your submission before attaching the cover sheet and submitting to your assessor for marking.***

Appendices

***Common ions and their charges***

| +1 | +2 | +3 | +4 | -1 | -2 | -3 |
| --- | --- | --- | --- | --- | --- | --- |
| ammonium  NH4+ | barium  Ba2+ | aluminium  Al3+ | Lead (IV)  Pb4+ | acetate (ethanonate)  CH3COO - | carbonate  CO32- | phosphate  PO43- |
| potassium  K+ | calcium  Ca2+ | iron (III)  Fe3+ | tin (IV)  Sn4+ | bromide  Br - | chromate  CrO42- | phosphide  P3- |
| silver  Ag+ | Copper (II)  Cu2+ |  |  | chlorate  ClO3 - | dichromate  Cr2O72- | nitride  N3- |
| sodium  Na+ | iron (II)  Fe2+ |  |  | chloride  Cl - | oxide  O2- |  |
| Hydrogen  H+ | lead (II)  Pb2+ |  |  | fluoride  F - | peroxide  O22- |  |
|  | magnesium  Mg2+ |  |  | hydrogen carbonate HCO3- | sulfate  SO42- |  |
|  | mercury(II)  Hg2+ |  |  | hydrogen sulfate  HSO4 - | sulfite  SO32- |  |
|  | nickel  Ni2+ |  |  | hydroxide  OH - | sulfide  S2- |  |
|  | tin (II)  Sn2+ |  |  | iodide  I - |  |  |
|  |  |  |  | nitrate  NO3 - |  |  |
|  |  |  |  | nitrite  NO2 - |  |  |
|  |  |  |  | permanganate  MnO4- |  |  |



Aylward and Findlay, SI Chemical Data (5th Edition) is the principal source of data for this examination paper. Some data may have been modified for examination purposes.

### 