

G631: Electrons in Action – Sample Assignment A2

Unit Name: Electrons in Action	Unit Number: G631
Assignment Title: Production of a Cell of Known Voltage	Assignment Number: G631 Sample Assignment A2
Date Set:	Due Date:
Assessment Objective(s): AO1(b), AO3(a), (b) & (c), (AO1(b) (A) 2(b) part)	

Assignment Brief:

The Research and Development department of a company that manufactures batteries have been asked to produce a cell of a given voltage that can be manufactured at a reasonable cost.

The research team's task is to present a paper outlining the theory involved, information on experimental procedures used, safety precautions necessary and a report containing the results from the experimental work with suitable conclusions. This report will be forwarded to other departments for evaluation including the costs required for development.

In addition, your own evaluation of the research work needs to be included with the report.

Task 1:

AO1(b)

Conventional electrochemical cells are used in a range of commonly used items including calculators, torches and computers. Carry out research into the theory of the production of electrons in electrochemical cells.

Produce a paper outlining the outcomes of your research (use 3.12.2 Principles and Applications of Commercial Cells).

Key words to include in your research paper:

cell battery half cell electrode potential

potential difference standard electrode potential

Include in your paper information on how electrochemical changes are used in providing electric currents for our everyday use.

Task 2:

AO3(a)

Carry out practical work on the effect of changing conditions on the value of the emf of the cell(s) chosen. You should:

- complete a detailed risk assessment for the research work you are going to carry out before you begin or use the risk assessment provided
- follow the standard experimental procedure provided
- adapt the procedure and plan suitable experiments in order to find the effect on the emf of changing the conditions chosen and record and carry out your own procedures
- ask your supervisor to complete the time card indicating the practical work was completed.

Record evidence of your experimental plans and procedures so it can be sent to other departments for evaluation.

Task 3:

AO3(b)

Record all the data collected from your experimental work in a suitable format so that it can be sent to other departments for evaluation.

Task 4:

AO3(b)/(c) (AO2(b) part)

Produce a report for the company which includes:

- the results you obtained
- an analysis of experimental results
- any conclusions which relate to the production of the cell
- an evaluation of the procedures followed
- suggestions of possible alternative follow-up work.

The complete portfolio work for AO3 is made up of 2 assignments. Each can be marked out of 26 and the total divided by 2.

Resources:

- Experimental Detail – Standard procedures for measuring emf of cells.
- Guidelines for 'Production of a Cell of Known Voltage'.

Assignment Guide

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Outline Guidance for G631 Sample Assignment A	Commentary on Mark Allocation
<p>Task 1</p> <p>Research work</p> <p>This should include the theory of the production of electrons in an electrochemical cell.</p> <p>The coverage would be that in 3.12.2.</p> <p>Include description of cell that is chosen to be investigated with reason for choice.</p>	<p>Consideration of the theory should lead to the choice of conditions to change. One of the conditions changed should show no effect if AO3(a) MB3 is to be obtained.</p>
<p>Task 2</p> <p>Risk assessment work to be completed</p> <p>Safety considerations to include:</p> <ul style="list-style-type: none"> • any hazard associated with the metals the salt solutions • the use of the salt bridge. <p>Practical work</p> <p>Students to be presented with the basic experimental details of constructing a cell using two half-cells.</p> <p>Students to complete and record conditions they used and carry out a number of relevant experiments.</p>	<p>No risk assessment included, no marks. Indicate if risk assessments have been independently produced.</p> <p>Language of write-up advised not to use "I".</p> <p>Member of staff to record evidence of completion of the students' practical work (suggested use – a timecard).</p>

Name..... Date.....

Time sheet for Job.....

Experimental procedure

.....

Was completed to Level 1 / 2 / 3

Risk Assessment Information

.....

Results:

Evidence showing conditions changed
included Yes / No

Signature

If only one condition used for
experiment, then only MB1 possible.

Possible discussion

A high resistance voltmeter will be used to measure the potential difference in the cell shown in the diagram. The high resistance stops the cell sending a current round the circuit.

A more accurate way of measuring the emf of a cell is by using a potentiometer. However this is complicated.

It is not possible to measure potential directly. Only potential difference can be measured.

For MB3 discussion on practical techniques will be needed and students need to obtain accurate results from their experimental work.

Procedures that are used to ensure an accurate measurement must be stated and used for MB3, e.g. repetition of measurements, removal of any contaminants.

Reason for choice of cell stated.

Task 3 / Task 4

Results

- tabulated
- displayed graphically.

Suitable analysis of results needs to be included, with a comparison of results linked to the requirements of the original assignment.

The emf of this cell under standard conditions can be calculated using standard E_o values.

(Examples of calculations of emf of various cells using E_o values).

Conclusions

Drawn from the data and applied to the brief.

Accuracy, evaluation of procedures

- discussion of the accuracy of the apparatus used
- limitations of the method
- possible other methods
- discussion of how results could be expected from original theory.

Results suitably presented, to be used by another company.

Must be at least two sets of results in order to achieve MB1.

If help has been given, only MB1 possible.

MB3 requires the data to be tabulated to the accuracy of which the apparatus is capable and the data to be displayed with units etc. and in 'easy-to-read' formats.

Possible contribution to AO2. Actual mark will depend on whether the calculations are straightforward or complex.

MB1 will be given for an obvious conclusion. Conclusion must be related to the theory of cells for MB3.

MB3 is awarded only if alternative methods are suggested.

Standard hydrogen electrode.