

Advantages of an Electronic Lab Notebook using OneNote and the Microsoft Surface Go

Why Electronic Lab Notebooks?

With the 'innovative use of digital learning technologies in curriculum delivery and assessment' and an estimated 77% of jobs requiring technological skills by 2020 (IBIS Global eLearning Investment Review), it is crucial that our students are exposed to the latest technology not only in the actual unit content, but also in the way the content is being delivered.

Electronic Lab Notebooks:

- Improve data accessibility, acquisition and presentation
- Are used for professional practice in research laboratories
- Move towards a paperless work environment

Advantages

- Structured lab report templates (easier for students to complete and focus is on the chemical content not formatting of their lab reports)
- Lab manuals are more interactive and informative (instructions provided not just in text format, but also in diagrams, photos and videos)
- Provides opportunities for collaborative learning
- Full text search across notes, sections & notebooks
- Reports contain sketched diagrams of experimental set-up, photos and videos of chemical reactions

The image displays two screenshots of a digital lab notebook interface. The left screenshot shows the 'RESULTS' section for 'Part 1: Hydrogen Gas' and 'Part 2: Oxygen Gas'. The student has handwritten answers and diagrams. For Part 1, they describe the reaction of magnesium with hydrochloric acid, showing a diagram of a test tube inverted in water with a 'POP' sound. For Part 2, they describe the reaction of potassium chlorate, showing a diagram of a test tube in water with 'bubbles' and 'water'. The right screenshot shows the 'RESULTS' section for 'Part 3: Measurement of Cu(s) from CuSO4 solution'. The student has handwritten answers and a photo of a beaker containing a blue solution and a metal strip. The photo is labeled 'Figure 1: Measurement of copper metal'.

- More information is recorded about each experiment
- Improved engagement during laboratory classes!
- Surface Go stylus pen ideal for drawings, sketches and writing chemical equations
- Ability to perform data analysis in the lab as data is collected using Microsoft Excel
- Lab instructions can be changed on the go
- Marking is more interactive by providing oral feedback not just written feedback
- Students can receive feedback immediately in the lab

SCC1201 S2 2019 LAB Notebook

Experiment 2

Preparation and Analysis of an Iron-Oxalate-Water Complex

DUE DATE: 6.8.19

TOTAL MARKS = 49.5 / 50

AIM OF THIS EXPERIMENT
Answer: The aim of this experiment is to prepare and determine the structure of an iron-oxalate-water complex using scientific methods.

PRE-LAB QUESTIONS

1. What are the common oxidation states of iron?
Answer: Iron can take on any of the states +6, +5, +4, +3 and +2, however the most common of these are +3 and +2. (1 mark)

2. The complex is analysed by carrying out two oxidation-reduction titrations. Write half-equations and a balanced overall equation for each of the following:

a) Iron(II) with permanganate
Half equations: $Fe^{2+}(aq) \rightarrow Fe^{3+}(aq) + e^{-}$ (x 5)
 $MnO_4^{-}(aq) + 8H^{+}(aq) + 5e^{-} \rightarrow Mn^{2+}(aq) + 4H_2O(l)$ (x 1)
Balance equation: $5Fe^{2+}(aq) + MnO_4^{-}(aq) + 8H^{+}(aq) \rightarrow 5Fe^{3+}(aq) + Mn^{2+}(aq) + 4H_2O(l)$

b) Oxalate with permanganate
Half equations: $C_2O_4^{2-}(aq) \rightarrow 2CO_2(g) + 2e^{-}$ (x 5)
 $MnO_4^{-}(aq) + 8H^{+}(aq) + 5e^{-} \rightarrow Mn^{2+}(aq) + 4H_2O(l)$ (x 2)
Balance equation: $2MnO_4^{-}(aq) + 5C_2O_4^{2-}(aq) + 16H^{+}(aq) \rightarrow 10CO_2(g) + 2Mn^{2+}(aq) + 8H_2O(l)$

3. During the analysis of the complex, zinc is added to the iron solution. Write the reaction equation for zinc dust with iron(II) ions.
Reaction equations: $Fe^{2+}(aq) + e^{-} \rightarrow Fe^{2+}(aq)$ (x 2)
 $Zn(s) \rightarrow Zn^{2+}(aq) + 2e^{-}$ (x 1)
Final: $2Fe^{2+}(aq) + Zn(s) \rightarrow 2Fe^{3+}(aq) + Zn^{2+}(aq)$

SCC1123 S2 2019 LAB 2 (1-30pm - 4-...)

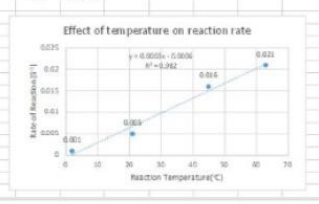
Section 5: Practicing graphing skills

1. Graph
Answer: (4 marks)

Experiment 5 - Spreadsheet

Reaction Temp (°C)	Rate of Reaction (s ⁻¹)
2	0.001
21	0.005
45	0.015
63	0.021

Effect of temperature on reaction rate



2. Slope of line
Answer: (1 mark)
10 0.0025
30 0.01
0.01 - 0.0025 = 0.0075 / 20 = 0.000375

3. Rate of reaction
Answer: (1 mark) When you double the temperature the rate of reaction increases by 1.22 times

Preparation for Use

- Development of structured Electronic Lab Notebook templates
- Provide students with sufficient opportunities to develop familiarity with OneNote and the Microsoft Surface Go

Resources

OneNote training and Electronic Lab Notebook resources are available on the ECU SuperLabs Learning Intranet.

<https://intranet.ecu.edu.au/learning/learning-technologies/superlabs>

Kind thanks to Dr Magdalena Wajrak for providing the above example images and advantages to electronic lab notebooks.