

# Learning, Teaching and Assessment of School-based Assessment – **Practical Related Tasks**

**Meaningful**

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# What and Why



# School-based Assessment

- **Role of Students:**
  - Gaining marks for the public examination
  - **Learning chemistry**
- **Role of Teachers:**
  - Managing the practical activities in schools
  - Gathering accurate assessment data for HKEAA
  - **Providing timely and accurate feedbacks to your students**
- **Role of Laboratory Technicians:**
  - Conducting risk assessment
  - **Providing appropriate support to students / teachers**

# Practical Activities in S4-6 Chemistry

- Chemistry is an experimental science?
  - SBA is a burden due to the limited available teaching hours?
  - Playing video clips of practical activities help students to learn?
  - Practical activities can strengthen the learning and teaching of chemistry?
- Need to conduct only 8 experiments in S5-6 in order to fulfill the SBA Requirements (20% of overall assessment)?
  - Fulfill SBA requirements  $\equiv$  Chemistry practical work in school?
- SBA is separated from the written examination?



**How**

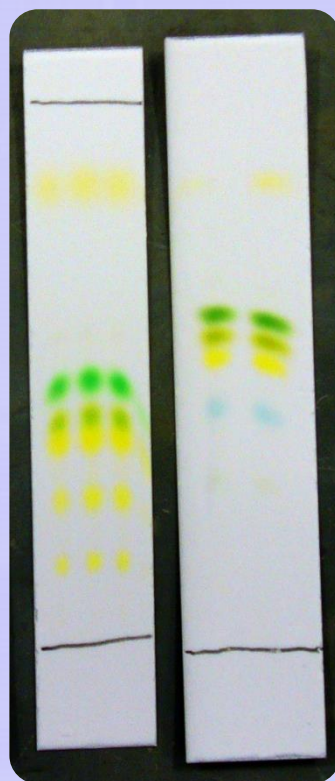
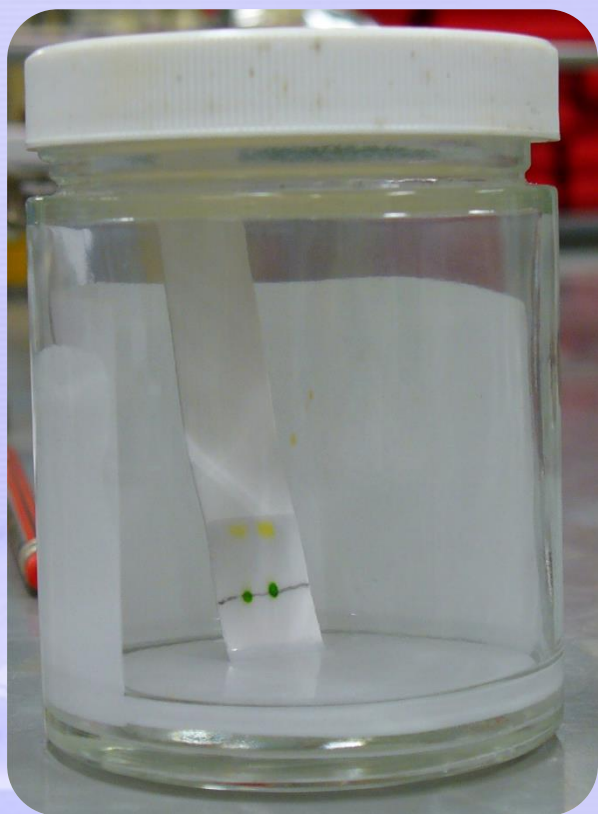




# EXAMPLE 1

# MicroScale Chemistry for SBA

The diagram below shows the set-up and results of an TLC analysis of a spinach juice. **What do you think students will learn?**



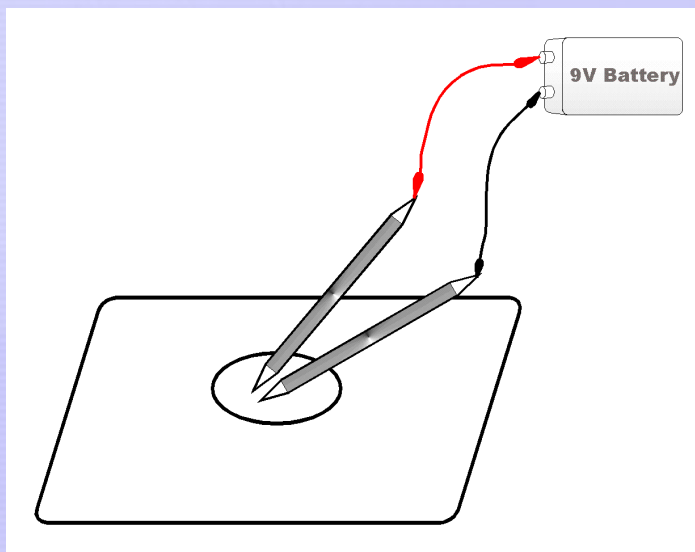


## EXAMPLE 2



# MicroScale Chemistry for SBA

The diagram below shows the set-up used in an investigation on the electrolysis of a solution, in the presence of universal indicator. **What do you think students will learn?**



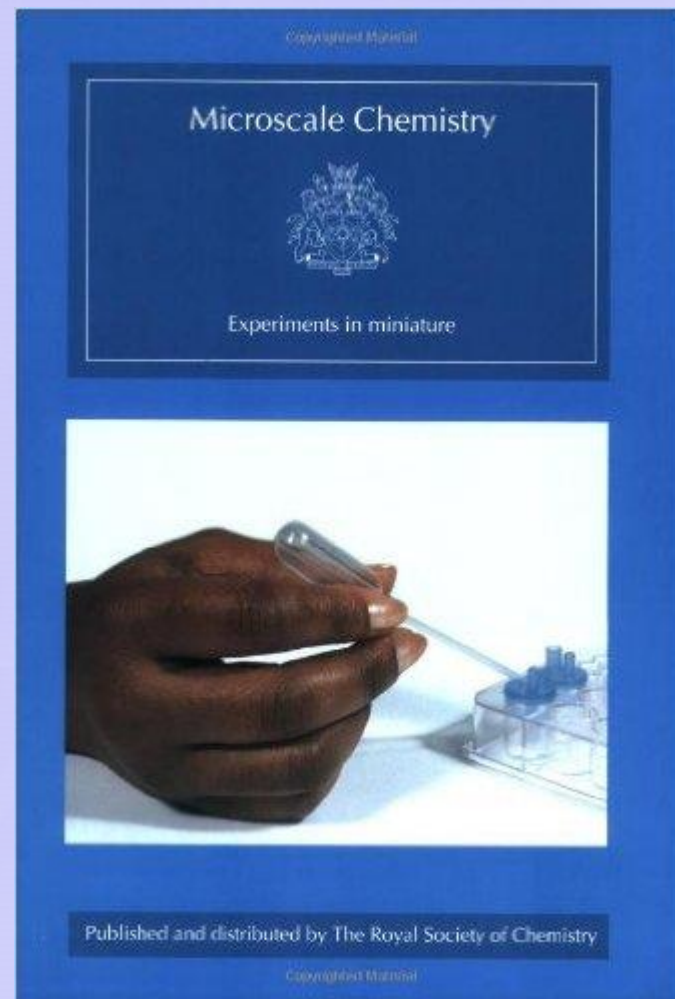
- $\text{NaCl(aq)}$
- $\text{KCl(aq)}$
- $\text{CuSO}_4\text{(aq)}$
- $\text{NiCl}_2\text{(aq)}$
- ...
- ...
- $\text{H}_2\text{O}$  with a few drops of mineral acid

[View video](#)

- (a) State and explain the expected observation around “carbon” electrodes during the electrolysis. Write relevant chemical equations (at least 2)
- (b) Predict the change in observation, if any, when the positive electrode is replaced by a copper electrode in the investigation? Explain.

# Reference:

- Microscale Chemistry
  - The Royal Society of Chemistry



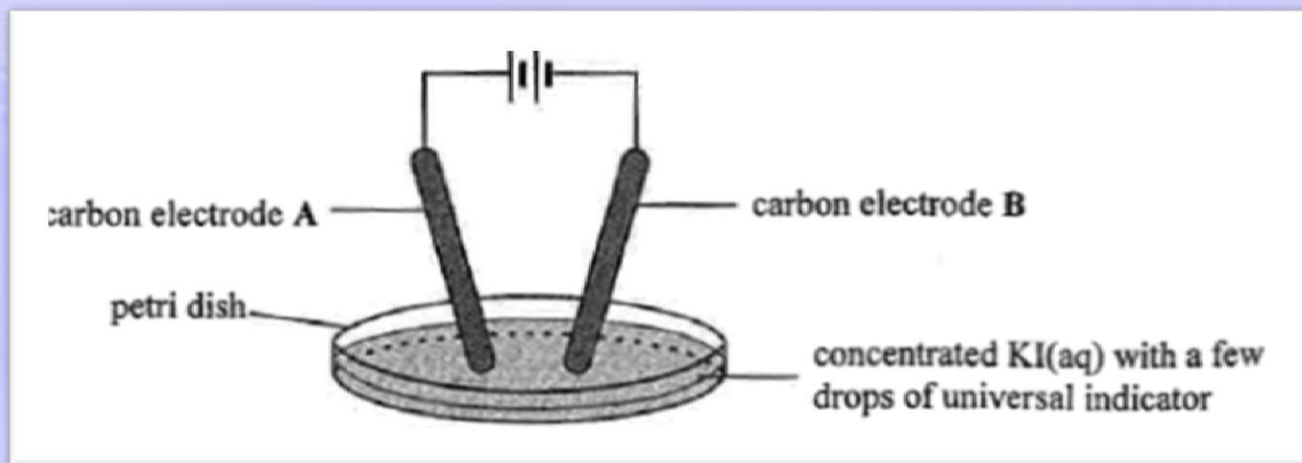


## EXAMPLE 3

# The Easy Way of Learning Chemistry

Effective

The diagram below shows the set-up used in an investigation on the electrolysis of concentrated potassium iodide solution. **What do you think students will learn?**



- (a) State and explain the expected observation around carbon electrode A during the electrolysis.
- (b) Would there be any change in observation if carbon electrode B is replaced by a copper electrode in the investigation? Explain.

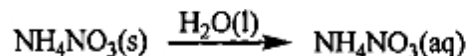


# What will you do?

- Ask your students to memorise all facts and concepts in the electrolysis?
- Provide learning experience and help them to make educated guesses? (High Level of Learning – Exploration, Interpretation, Generalisation, ... )
- In your laboratory:
  - Allow different groups of students to explore the chemistry by using different combinations of electrodes / electrodes and observe what happen.
  - Make appropriate interpretations, share and discuss. Teacher to provide feedback before the lesson ends.

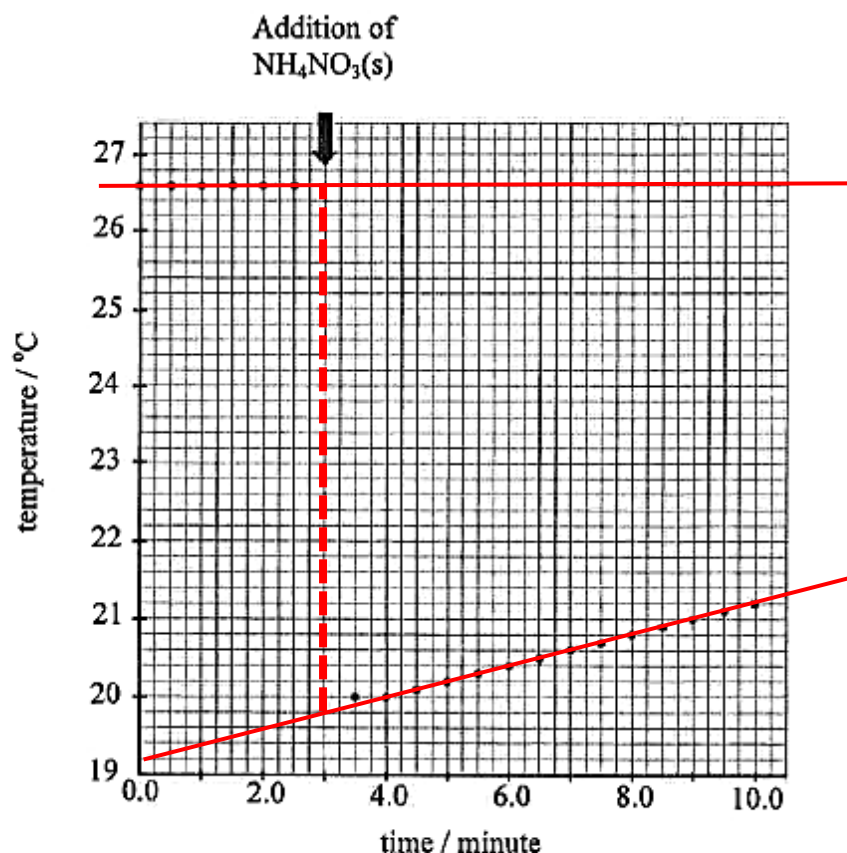


5. The following experiment was carried out to determine the enthalpy change of solution of ammonium nitrate:



A certain volume of water was placed in an expanded polystyrene cup. The temperature of the water in the cup was measured with a thermometer at half-minute intervals. Right at the third minute, 2.0 g of  $\text{NH}_4\text{NO}_3(\text{s})$  was added to the cup. The solution in the cup was then stirred thoroughly and its temperature was measured for an additional 7 minutes.

The recordings of temperature are shown in the graph below:



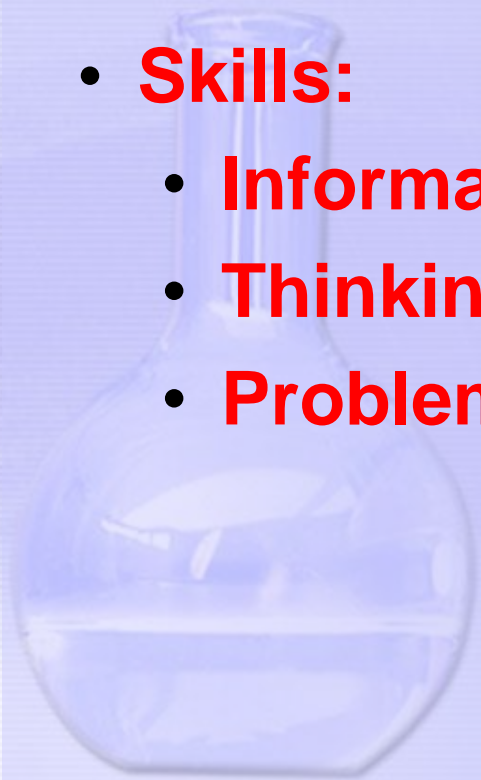
**Unfamiliar situation:**

**How / When / Where to facilitate your students to answer this type of question?**

- (a) (i) From the graph, estimate the greatest temperature drop of the solution in the cup.

# What will you do?

- **Knowledge:**
  - Chemistry of this type of experiments
  - Mole concept?
- **Skills:**
  - Information skills
  - Thinking skills
  - Problem solving skills / calculation



# Adopt a Variety of Assessment Methods

	Practical Related Tasks		
	BCA		EXPT
	Basic Chemical Analysis		Experiment
Task content (student's work)	<ul style="list-style-type: none"> <li>Volumetric Analysis</li> <li>Worksheet</li> </ul>	<ul style="list-style-type: none"> <li>Detection of cations or anions or both</li> </ul>	<ul style="list-style-type: none"> <li>Perform experiments suggested in the Curriculum and Assessment Guide (other than Volumetric Analysis &amp; Detection of ions)</li> <li>Simple report / ... experiments</li> <li>OR Quiz on ... involved.</li> </ul>
Group/Individual	<ul style="list-style-type: none"> <li>Individual</li> </ul>	Worksheet	<ul style="list-style-type: none"> <li>Group EXPT</li> <li>Individual worksheet/report/quiz</li> </ul>
<del>In-class time</del>	<del>80 mins</del>	<del>20 mins</del>	<del>80 mins</del>
Out-of-school time	0 mins	0 mins	0 – 60 mins
Means of assessment (teacher's work)	Mark worksheet	Mark worksheet	Mark worksheet / simple report / detailed report / quiz
<del>Hand in worksheets in class time</del>	<del>Hand in the following in class time:</del>		
Authentication	<ul style="list-style-type: none"> <li>worksheet / simple report / raw data sheet (if detailed report to be finished at home)</li> <li>AND/OR</li> <li>quiz</li> </ul>		

Observations

# Assessments Methods of TAS vs SBA

## HKALE (TAS)

- Area A (Performance)
- Area B (Reports)
- Area C (Attitude)

## HKDSE (SBA)

- Worksheets / Reports / Quiz
- Do not need to assess students' bench performance?
- Not allowed to assess students' bench performance?





# Assessment Criteria

## (from Chemistry SBA Handbook)

VA

### Criteria for assessment of volumetric analysis

Teachers are required to mark the worksheets submitted by their students. Teachers may also assess student performance during practical lessons if circumstances allow. The criteria involved are as follows:

- (a) The number of accurate titration readings is adequate and there is an inclusion of the trial run.
- (b) There is an accurate detection / recording of colour change.
- (c) Calculations are shown clearly and concisely.

- Include a marking criteria for “accuracy”.
- Provide unknown samples of different concentrations to different groups students.
- (Possible?) Ask students to take a snapshot of the end-point and attach it to the report / Ask students to show you the end-point



# Assessment Criteria

## (For VA Accuracy)

VA

### Titration Result (as a suggested example):

Marks allocated to result accuracy = 3

- Results **within 1%** error: full mark **(3 marks)**
- Results with **1% – 2%** error: **2 marks**
- Results with **2% - 4%** error: **1 mark**
- Results **larger than 4%** error: **0 mark**

**Explicitly include a check  
box for the accuracy mark  
in the worksheet**

# Assessment Criteria

(from Chemistry SBA Handbook)

QA

## Criteria for assessment of qualitative analysis

Teachers are required to mark the worksheets submitted by their students. Teachers may also assess student performance during practical lessons if circumstances allow. The criteria involved are as follows:

- (a) Results are recorded and described accurately.
  - (b) Unknowns are deduced in a systematic and logical way.
  - (c) Due consideration has been given to laboratory safety.
- (Possible?) Ask students to take a snapshot with a digit camera / mobile phone of the chemical test result and attach it to the report.



# Enriching the Assessment Methods

## For Other Experiments

**Preparative experiments:** product yield, accuracy of physical data obtained, quality/appearance of the product obtained.

**Kinetic / heat of reaction experiments:** consistency / accuracy of the data obtained.

**When**





# Planning Assessment

Early  
S5

Late S5  
& Early  
S6

Late  
S6

Inform your students as well as laboratory technician the “plan”

	Practical Related			
	BCA		EXPT	
	Basic Chemical Analysis		Experiment	
Task content (student's work)	<ul style="list-style-type: none"> <li>• Volumetric Analysis</li> <li>• Worksheet</li> </ul>	<ul style="list-style-type: none"> <li>• Detection of cations or anions or both</li> <li>• Worksheet</li> </ul>	<ul style="list-style-type: none"> <li>• Perform experiments suggested in the Curriculum and Assessment Guide (other than Volumetric Analysis &amp; ...)</li> <li>• Work done ...</li> </ul>	
Group/Individual	<ul style="list-style-type: none"> <li>• Individual BCA</li> <li>• Individual worksheet</li> </ul>		<ul style="list-style-type: none"> <li>• Group ...</li> <li>• Individual worksheet/report/quiz</li> </ul>	
In-class time	80 mins	20 mins	80 mins	
Out-of-school time	0 mins	0 mins	0 – 60 mins	
			<ul style="list-style-type: none"> <li>• Mark worksheet / simple report / detailed report / quiz</li> </ul>	
Authentication	time		hand in the following in class time: <ul style="list-style-type: none"> <li>• worksheet / simple report / raw data sheet (if detailed report to be finished at home)</li> <li>AND/OR</li> <li>• quiz</li> </ul>	

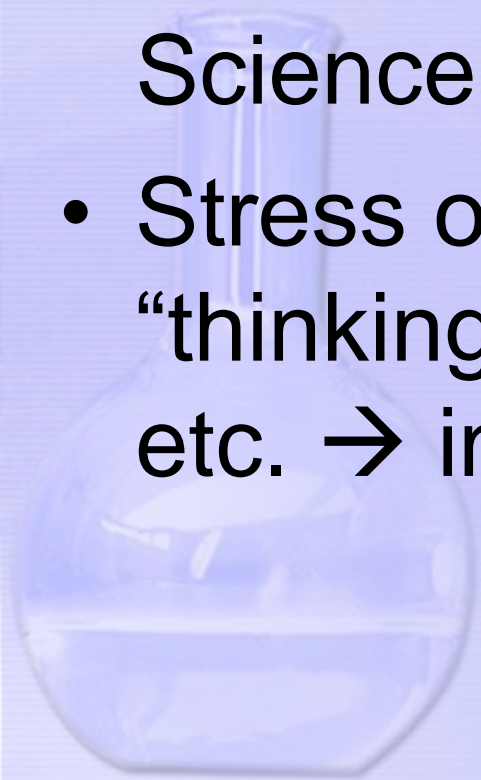


# Some Opinions

- The marks do (can) not reflect students' ability in carrying out experiments.
- For VA (volumetric analysis) experiment, students may get very high marks for correct calculations, even though their experimental skills are far from satisfactory.
- For QA (qualitative analysis) experiment, students can complete the worksheets and get high marks from standard answers from books / web sources.
- SBA is not assessing students' ability in performing experiments, it just assesses whether students can produce good quality written work / perform well in written tasks.
- Drilling is required

## Key Remarks

- Learning is the key component of SBA.
- SBA entails only the basic process skills of the SS Chemistry / Combined Science (Chemistry part)
- Stress on “problem solving skills”, “thinking skills”, “communication skills”, etc. → investigative study



# Resources



# Resources to Support L&T of Practical Work and SBA

- Chemistry EdBlog
  - <http://edblog.hkedcity.net/nsschem> or
  - <http://goo.gl/YWUfX>



# Resources to Support L&T of Practical Work and SBA

- School-based Assessment Sample Tasks
  - [http://www.hkeaa.edu.hk/en/sba/sub\\_info\\_sba/dse\\_subject.html?7&3](http://www.hkeaa.edu.hk/en/sba/sub_info_sba/dse_subject.html?7&3)
- 校本評核樣本課業
  - [http://www.hkeaa.edu.hk/tc/sba/sub\\_info\\_sba/dse\\_subject.html?7&3](http://www.hkeaa.edu.hk/tc/sba/sub_info_sba/dse_subject.html?7&3)





# Resources to Support L&T of Practical Work & SBA

## Chemistry Experimental Techniques (化學實驗技巧)

Chemistry Experimental Techniques (化學實驗技巧) HkedCity > Chemistry E

**Introduction**

Chemistry is a practical oriented discipline of science. In the NSS Chemistry and Combined Science (Chemistry Part) curricula, students are expected to develop understanding of various experimental techniques and chemical analyses through different learning and teaching activities. Other than real-time demonstration and hands-on experience in practical lessons, instruction in mode of multimedia can also serve as a useful tool to familiarise students with the experimental techniques and methods.

The videos included here have demonstrated the procedures of the selected experimental methods supplementing with the simple theoretical description. They can be used by students for familiarizing themselves with the corresponding experimental techniques and methods before conducting experiments, practical tests of School-based Assessment and the investigative study, as well as used by teachers for teaching and pre-experiment instruction.




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(English) <http://minisite.proj.hkedcity.net/chemtech/eng/index.html>

(Chinese) <http://minisite.proj.hkedcity.net/chemtech/cht/index.html>

# YouTube Channel – “CHEM EDB”



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Date added (newest - oldest)

Grid




用去離子水及樣本溶液

3:03

滴定(第二部分)

4 views 1 week ago

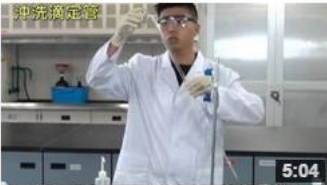


Have a beaker ready and containing deionised water

5:04

Titration (Part 1)

No views 1 week ago




沖洗滴定管

5:04

滴定 (第一部分)


2 views 1 week ago



5:19

Titration (Part 3)

No views 1 week ago




Draw a small amount of deionised water

6:14

Preparation of Standard Solution (Part 2)

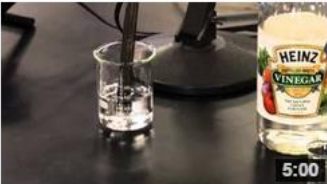
1 view 1 week ago



5:44

Determination of the Melting and Boiling Points of...

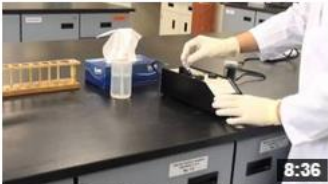
1 view 1 week ago



5:00

使用酸鹼度計(pH計)

No views 1 week ago



8:36

Use of Colorimeter

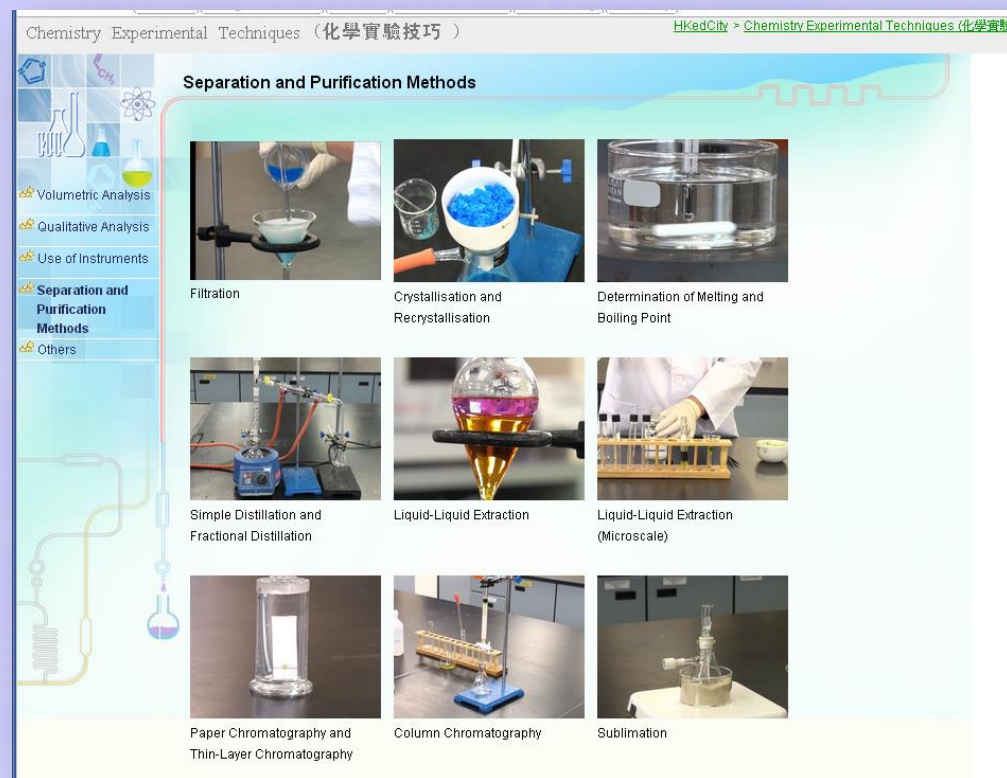
1 view 1 week ago

1. Volumetric Analysis
2. Qualitative Analysis
3. Use of Instruments
4. Separation and Purification Methods
5. Others

22 Videos – 170 mins

### Bilingual versions

- English voice-over with English subtitles
- Cantonese voice-over with Chinese subtitles





## **Volumetric Analysis:**

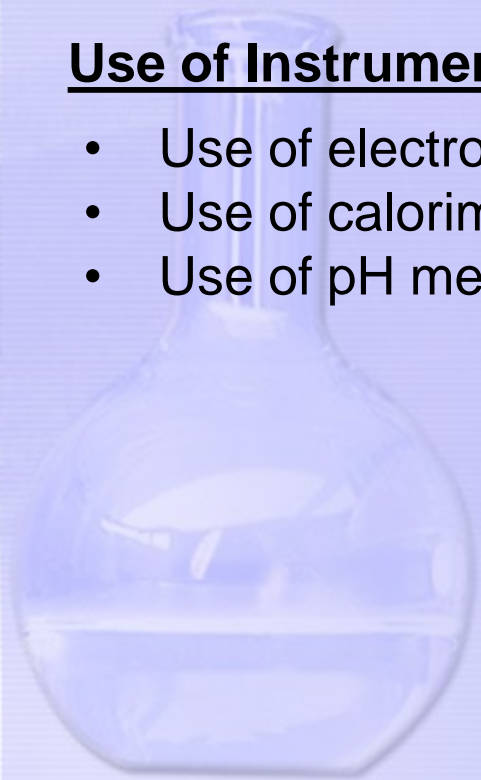
- Preparation of a standard solution (2 parts)
- Titration (3 parts)

## **Qualitative Analysis:**

- Flame test
- Qualitative analysis of cations
- Qualitative analysis of anions
- Test for carbonyl compounds using Tollens' reagent

## **Use of Instruments:**

- Use of electronic balance and weighing substances
- Use of calorimeter
- Use of pH meter



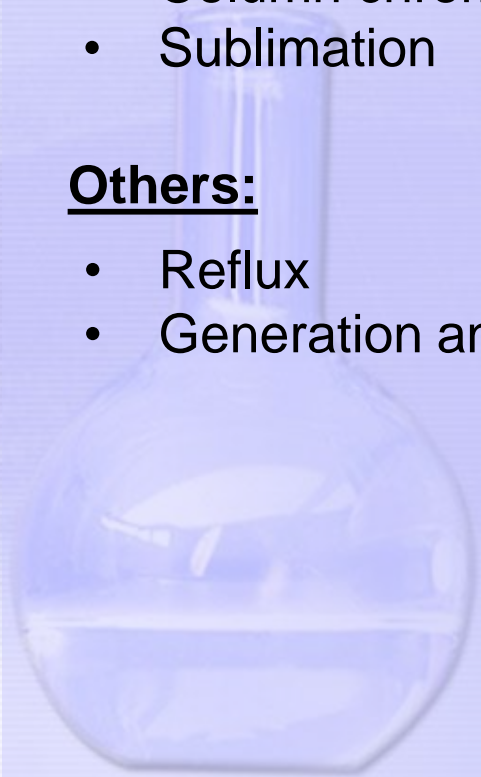


## **Separation and Purification Methods:**

- Filtration
- Crystallisation and recrystallisation
- Determination of melting and boiling point
- Simple distillation and fractional distillation
- Liquid-liquid extraction (miniscale)
- Liquid-liquid extraction (microscale)
- Paper chromatography and thin-layer chromatography
- Column chromatography
- Sublimation

## **Others:**

- Reflux
- Generation and collection of gases



- Facilitate students to make preparations before coming to the lab for performing experiments.

- Encourage students to conduct pre-lab briefings.


- Reinforce the techniques after finished

- Not interfere with the students' experience.

**HOW TO USE THE CLIPS?  
BEFORE & AFTER LESSONS**



# Using Video Resources to supplement Chemistry Practical-based learning


$$\begin{array}{rcl} & \text{Chemical Technique Video Clips} & \\ + & \text{Follow-up Assessment Tasks} & \\ + & \text{Practical Experiment} & \\ \hline = & \text{Consolidation of Chemical} & \\ & \text{Knowledge} & \end{array}$$

## **Advantages:**

**Paper-free / Reusable / timely feedback /  
Saving Time / Versatile to many devices ....**

# Example: “Google Form”



[https://docs.google.com/forms/d/1UhT\\_vtBGO0U4qeMd69Tw9YqLxqaDFZia1kNvZ5X0mM0/viewform?usp=send\\_form](https://docs.google.com/forms/d/1UhT_vtBGO0U4qeMd69Tw9YqLxqaDFZia1kNvZ5X0mM0/viewform?usp=send_form)



**Thank you!**

