Resources on Learning and Teaching of Chemistry

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Science Education Section,

Education Bureau

Chemistry EdBlog 化學科網誌

1. Learning to Write

- Writing with Chemistry Specific Genres 化學科專科語體寫作

- http://resources.edb.gov.hk/~science/genre/index.html

Writing with Chemistry Specific Genres Teaching Guide (1) - Descriptive Report

Writing with Chemistry Specific Genres Teaching Guide (2) - Procedural Account

Writing with Chemistry Specific Genres Teaching Guide (3) - Causal Explanation

Writing with Chemistry Specific Genres Teaching Guide (4) - Comparison

2. Investigative Study in Chemistry

- Investigative Study in Chemistry – Exemplars of Learning and Teaching Activities化學的探究研習－學習活動示例
  - http://cd1.edb.hkedcity.net/cd/science/chemistry/nss/is/nss_is_eng.pdf
  - http://cd1.edb.hkedcity.net/cd/science/chemistry/nss/is/nss_is_chi.pdf
- 教育電視－高中化學探究研習
  - http://resources.hkedcity.net/resource_detail.php?rid=207401800

3. Practical Chemistry

Chemistry EdBlog 化學科網誌

- http://edblog.hkedcity.net/nsschem
- Use "SEARCH"
  - Synthesis of benzoic acid from ethyl benzoate
  - Thin layer chromatography of painkillers
  - Isolation of chlorophyll from spinach
  - Decomposition of baking soda $NaHCO_3(s)$

Chemistry Experimental Techniques 化學實驗技巧

Chemistry Experimental Techniques 化學實驗技巧

- http://minisite.proj.hkedcity.net/chemtech/cht/index.html

  1. Volumetric Analysis
  2. Qualitative Analysis
  3. Use of Instrument
  4. Separation and purification techniques
  5. Others

Microscale Chemistry Experiments 微型化學實驗

- http://www.hkbu.edu.hk/~micschem/material.html
  - Chemical Cells
  - Generation of NO_2: A Case of Air Pollution
  - Analysis of iron in commercial iron tablet
  - …

Microscale Experiment – Solubility of Group II Compounds

	IO_3^-	SO_4^{2-}	$C_2O_4^{2-}$	CO_3^{2-}	H_2O
$MgCl_2$	○	○	○	○	○	○
$CaCl_2$	○	○	○	○	○	○
$SrCl_2$	○	○	○	○	○	○
$BaCl_2$	○	○	○	○	○	○

Note: All are aqueous solutions, 0.1 mol dm^{-3}, 1 cm^3 each

Reference:

- Flinn Scientific Youtube Channel
- https://www.youtube.com/user/FlinnScientific

Assessment for Learning (AfL)

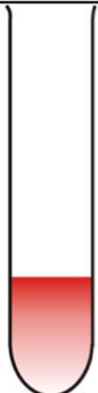With reference to the first experiment set-up shown below, deduce which results in A, B and C is/are reasonable? Explain your choice(s) briefly.

Set-up	Experiment	A	B	C
Chemicals added	• 5 mL 2 M NaOH(aq) • 0.05 mL 0.1% phenolphthalein solution	• 3 mL 2 M NaOH(aq) • 2 mL 2 M NaCl(aq) • 0.05 mL 0.1% phenolphthalein solution	• 5 mL 2 M NaOH(aq) • 0.05 mL 0.1% phenolphthalein solution	• 5 mL 2 M NaOH(aq) • 0.05 mL 0.1% phenolphthalein solution
Temperature / °C	0	0	25	50
Time for the pink colour disappear /s	220	198	218	25

Nuffield Foundation - Practical Chemistry

4. PhET Simulations

eLearning, e.g. PhET Simulations
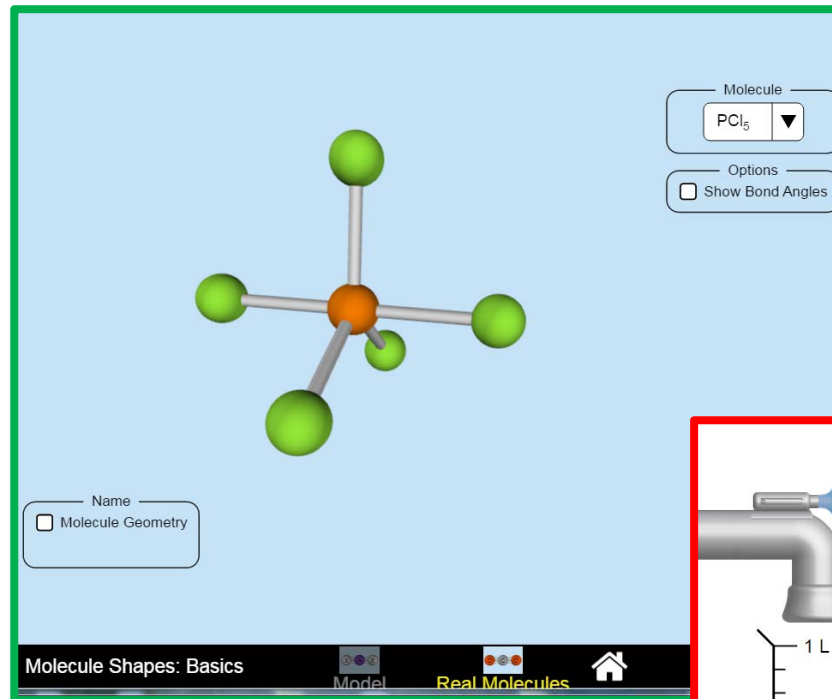
(Can be used offline on mobile devices)
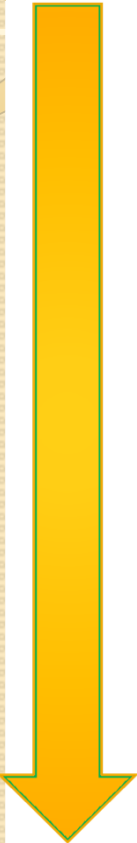
5. eLearning & eAssessment

eL and eA

- Online Voting Systems
  - Socrative
  - Ping Pong / Kahoot / Plickers / …
- Google Forms / Doc
  - Integrating online learning and assessment?
- Learning Management Systems
  - Schoology
  - Edmodo
- Nearpod, …

eL & eA

- To promote the use of e-learning (eL) and / or e-assessment (eA) in SS Chemistry / SS Combined Science (Chemistry part) curricula, a learning community, with the support from Science Education Section of EDB, will be formed, from September 2015 to August 2016.
- Please join the learning community.
  - http://goo.gl/forms/c468uNASx9

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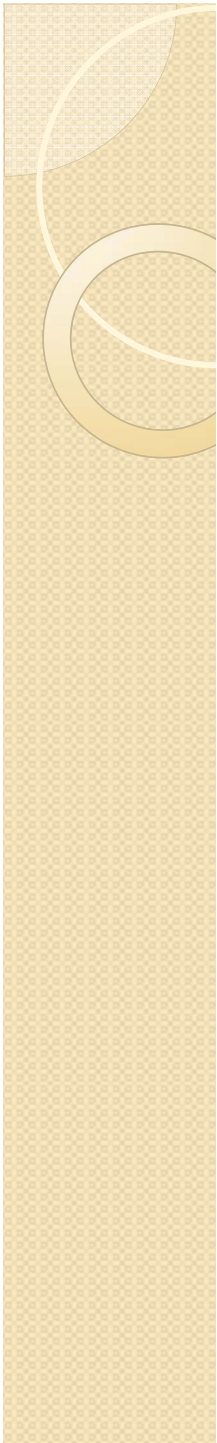
Thank You!

Example of demonstration

Demonstration: Acid-based Neutralization of Magnesium Carbonate Light [MCL, $3MgCO_3.Mg(OH)_2.3H_2O$] against dilute HCl(aq) (1 M)

1. Add 5 g MCL to 500 mL deionized water in a 1000 mL beaker

2. Add 5 mL universal indicator solution, a stirrer bar and then a pH probe (interfaced to a datalogger unit)

3. Put the beaker with the mixture on a magnetic stirrer unit, and start stirring

4. Add a sample of 10 mL 1 M HCl(aq) to the stirred mixture

5. Observe careful the pH and colour changes

6. Repeat step 4 and 5 for several times, i.e. up to about a total of 70 or 80 mL HCl(aq)

Chemicals and Apparatus

- Magnetic stirrer unit X 1
- Stirrer bar X 1
- Stand and clamp X 1
- 1,000 mL beaker X 1
- universal indicator 5 mL each X 2
- 10 mL measuring cylinder X 1
- hydrochloric acid, 1 M about 70 mL each X 2
- 100 mL beaker X 1
- 10 mL measuring cylinder X 1
- 100 mL measuring cylinder X 1
- plastic dropper X 1
- deionised water 500 mL each X 2

- $3MgCO_3.Mg(OH)_2.3H_2O$ 5 gram each
- USB link
- pH probe (Sensor)
- Notebook computer with Datastudio

Set-up 1

batches of dilute HCl(aq)

pH probe connected to a datalogger

MCL with universal indicator

stirrer bar

HEAT   STIR
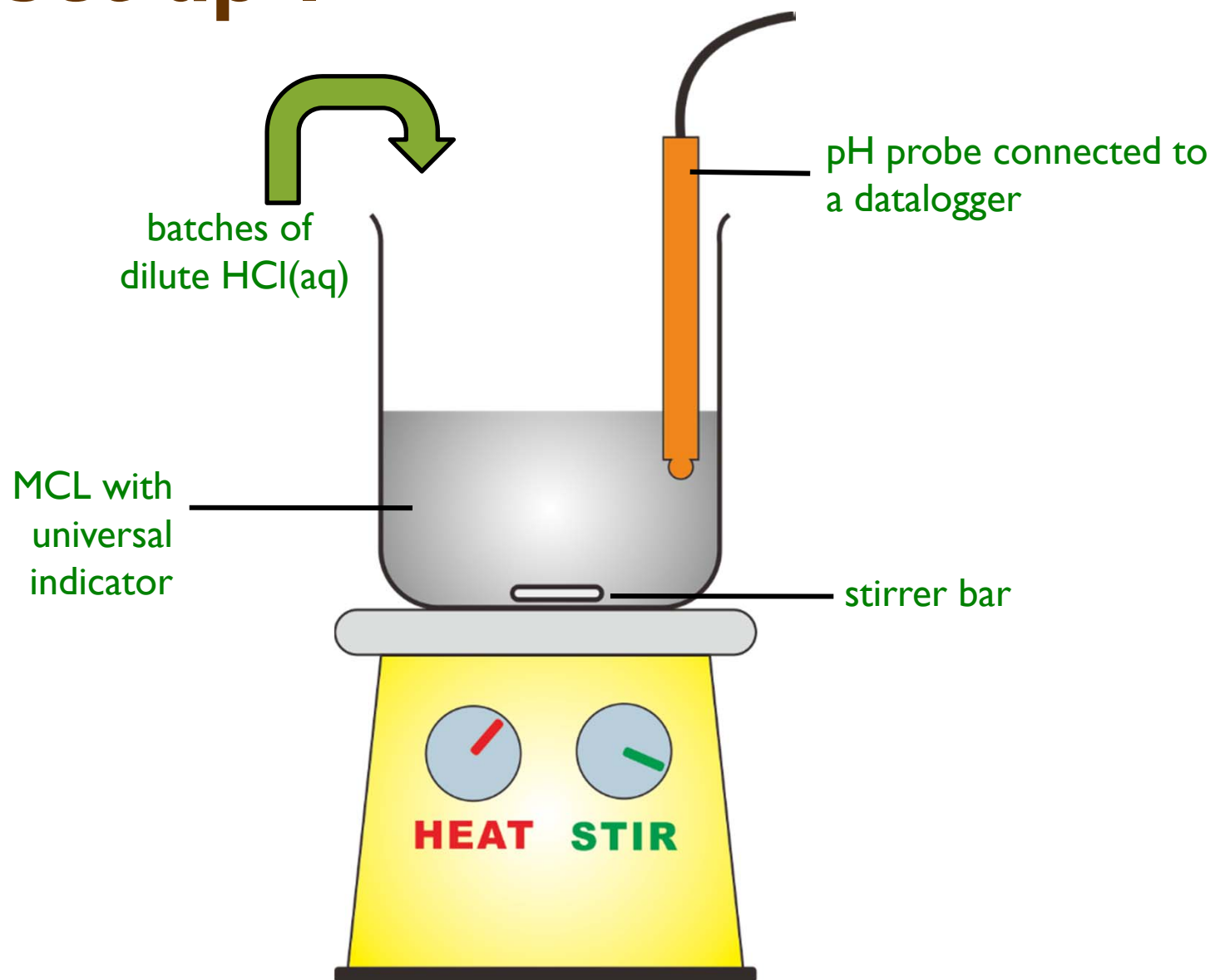
Set-up 2
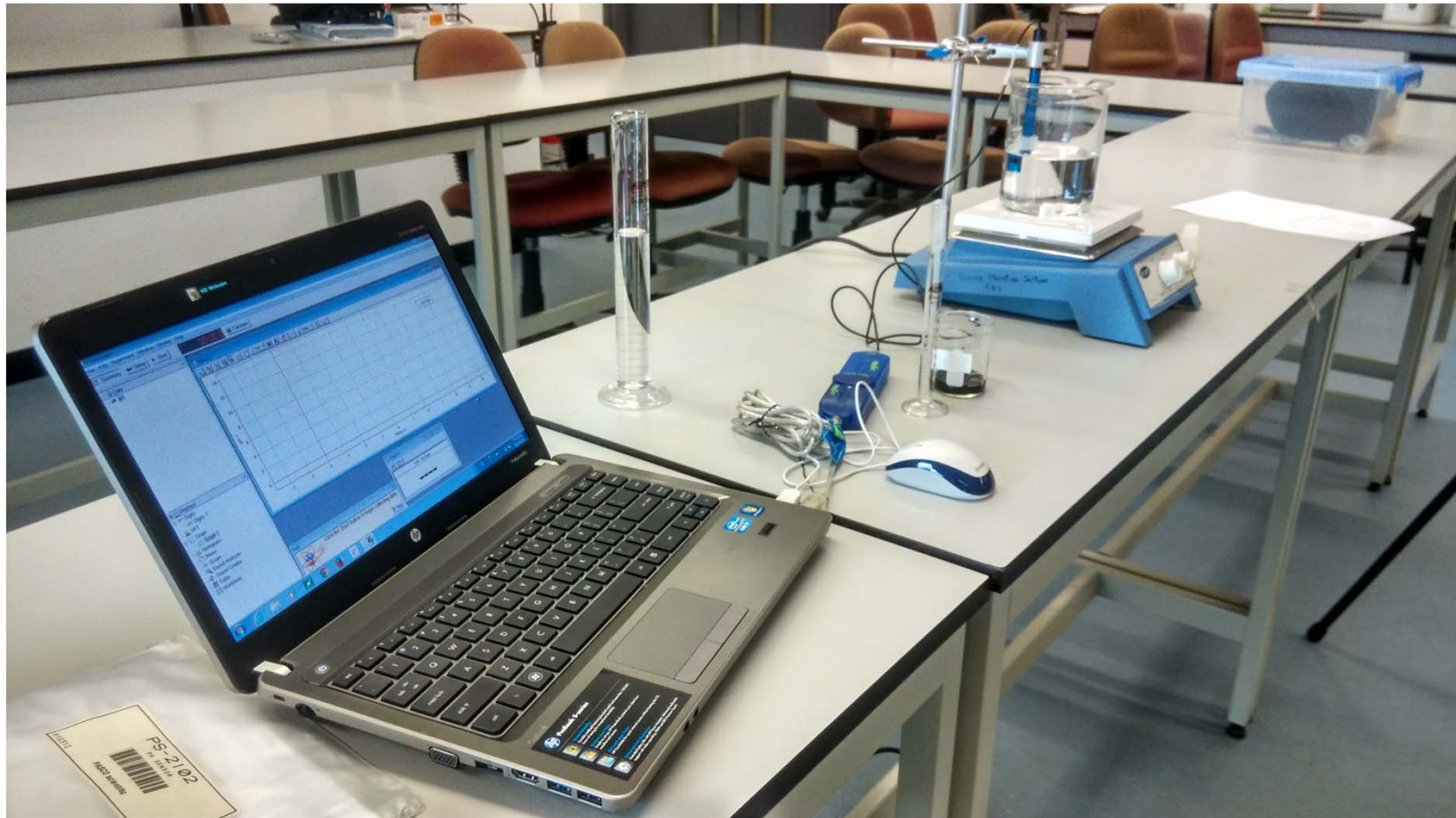
Pedagogy

- Predict (P) – Observe (O) – Explain (E)
  - (P)
    - Predict the initial pH of the MCL (suspension)
    - Predict how the colour of the mixture change upon the addition of the first batch of dilute HCl(aq)
    - Predict how the pH of the mixture change upon the addition of the first batch of dilute HCl(aq)
    - … second batch … third batch … etc.
  - (O)
    - Record the colour of the mixture throughout the demonstration
    - Read the graph showing variation of pH of the mixture upon the addition of dilute HCl(aq) throughout the demonstration
    - …
  - (E)   Exercise and / or Assessment
    - Describe the relation of pH values and the colour of the mixture
    - Explain the variation of the colour of the mixture upon the addition of dilute HCl(aq)
    - Explain whether MCL can be used as an antacid
    - …

Sample Results (11/3/2015)