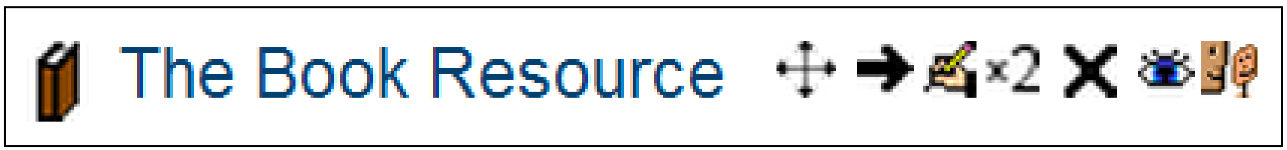
Magic with Moodle

Moving a printed Laboratory Manual into Moodle:



Dr. Rossana Wright
School of Chemistry
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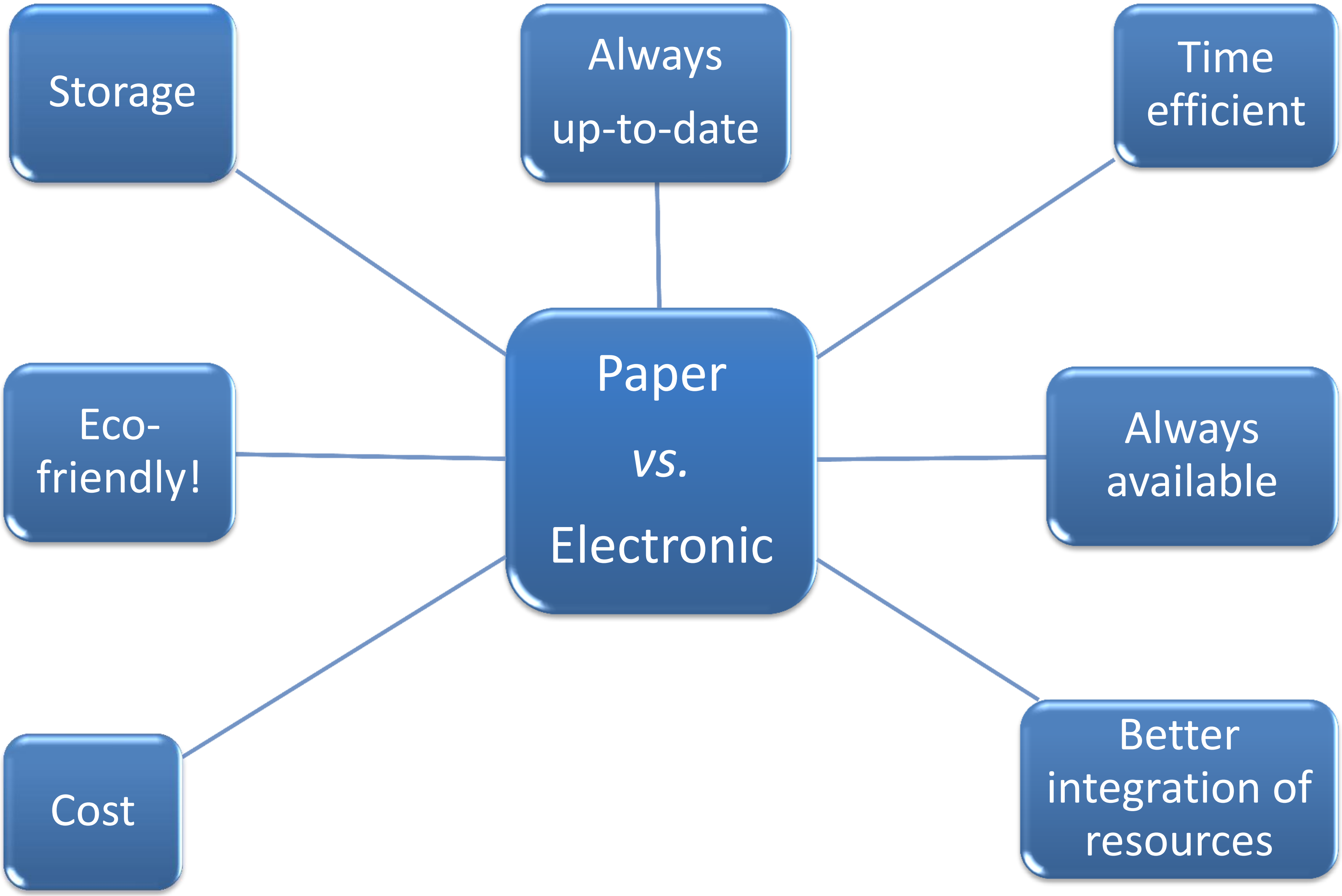
Storage
Always up-to-date
Time efficient
Eco-friendly!
Paper vs. Electronic
Always available
Cost
Better integration of resources

Background: Print & Store

- Students receive a lab manual for each lab ~ 1500 manuals sent for printing per year.
- Students print their lab reports (~ 1 per week!)
- Lab reports must be stored

a quarter of the manuals for the year

~ 1/9 of the lab reports submitted each year

Online Lab:

- Online Manual
- Online Prelabs
- Online Report
- Online Marking


YEAR 2
EXPERIMENT 5
Grant
Grant


INSTRUMENT PC

The *online* Manual:

- How is it done?

Book resource (not pdf file) in Moodle.

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Physical Chemistry Labs - Year 1 (UK) (12-13)

PHYSICAL CHEMISTRY TEACHING LABORATORY

Welcome

In these pages you will find information and all the documentation related to your work in the Physical Chemistry Laboratory.

Follow the links below to find out about:

- Safety in the Physical Chemistry Laboratory
- Laboratory Map -find the location of experiments

  - Back to First Year Laboratory Home Page

Module news

2 Online Manual

Click on the links below to access all the information needed for the appropriate experiment.

- Experiment 1
- Experiment 2
- Experiment 3
- Experiment 4
- Experiment 5
- Experiment 6
- Experiment 7
- Experiment 8
- Experiment 9

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Experiment 1: Gas Viscosities and Atomic/Molecular Diameters

In this experiment you will perform measurements that will enable you to deduce the molecular diameter of several molecules.

Introduction

The kinetic theory of gases is based on a model in which the gas molecules are in constant random motion. Despite its simplicity the kinetic theory can be used successfully to rationalize the bulk properties of gases in terms of molecular motion. In this practical you will use the theory to establish a simple relationship between the viscosity of a gas and the diameter of its molecules. You will then measure flow rates, and hence deduce the viscosities of two gases — carbon dioxide and helium — by comparison with that of a third, oxygen. From these viscosities you will then calculate their diameters.

Background Reading

Kinetic Model of Gases : Section 20.1 - Atkins' Physical Chemistry, 9th ed.

Insert videos

Theory

(Note that in the text below, "molecule" will be used to mean an atom or a molecule.)

Molecular Diameters and Viscosity

The kinetic theory of gases gives the viscosity as

$$\eta = \tfrac{1}{3} N_v m \lambda \bar{c}$$

Formulae & symbols: LaTeX

[1]

where $N_v = N/V$, is the number density of the molecules, $\bar{c}$ is their mean speed, m is the mass of a molecule in kg and λ is the "mean free path", which is the average distance a molecule travels between collisions.
The mean speed is given by:

$$\bar{c} = \sqrt{\frac{8 k_B T}{\pi\, m}}$$

[2]

where T is the temperature in K, and k_B is Boltzmann's constant, 1.38×10^{-23} J K^{-1}. The mean free path is related to the molecular diameter, d, by

$$\lambda = \frac{k_B T}{\sqrt{2}\,\pi\, d^2 p}$$

[3]

where p is the pressure.
Using these equations, and $pV = Nk_BT$, it is possible to predict how the viscosity varies with molecular diameter and mass according to

$$\eta = \frac{2}{3}\sqrt{\frac{k_B T}{\pi^3}}\,\frac{\sqrt{m}}{d^2}$$

[4]

The method for measuring viscosity used in this experiment is based on Poiseuille's formula for the rate of gas flow dn/dt through a tube of radius r.

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COSHH Assessment

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COSHH Assessment

CHEMICAL	HAZARD	PRECAUTIONS	DISPOSAL
Helium (gas)	Suffocation in very large volumes	Make sure you handle the pressurised cylinder correctly.	N/A
Carbon dioxide (gas)	Suffocation in very large volumes.	Make sure you handle the pressurised cylinder correctly. Maintain good ventilation during use.	N/A
Oxygen (gas)	Vigorously supports combustion.	Make sure you handle the pressurised cylinder correctly.	N/A

Tables
(HTML)

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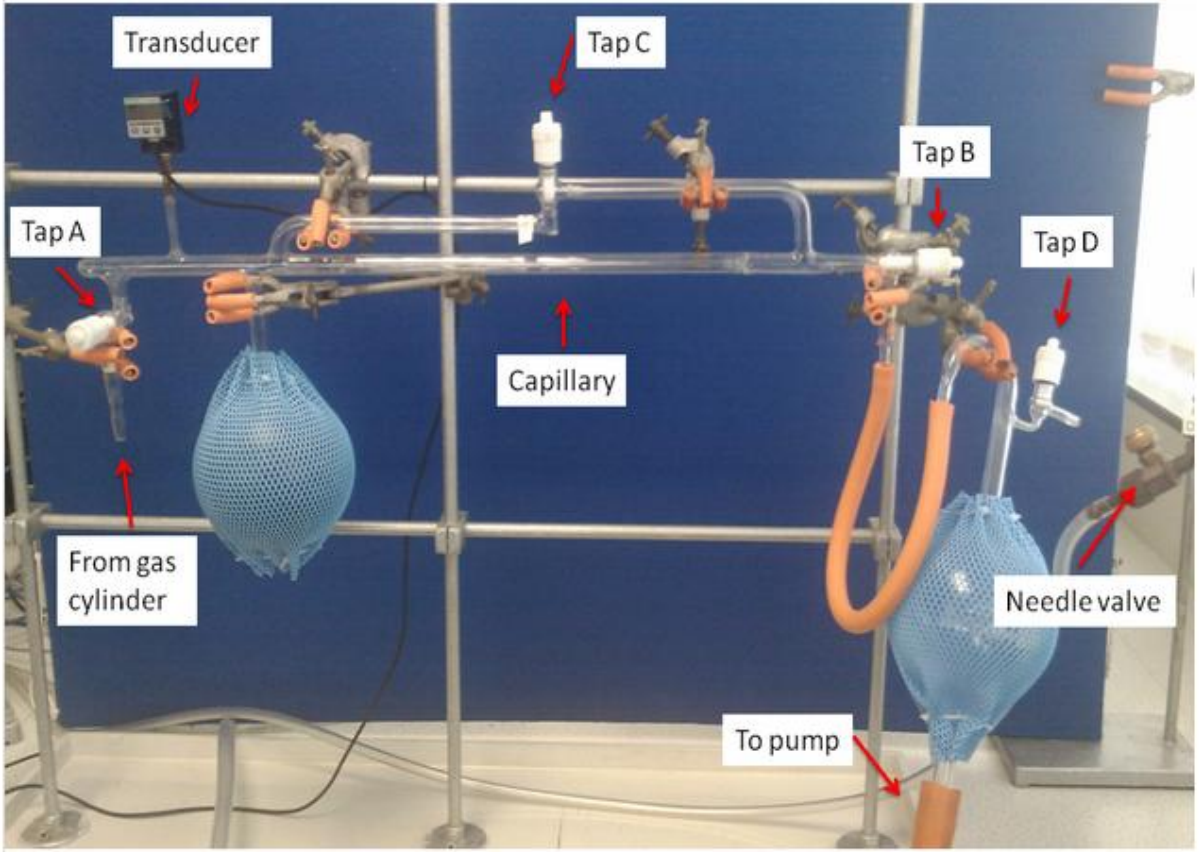
Experimental Setup



Photos

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Links: external, other moodle pages, *etc.*

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Experimental Procedure

Open the Report File for this experiment from this link and work your way through it, inserting the data required (measured values, plots, *etc.*) and answering all questions. Having done the Introductory Exercise, you should be familiar with how to insert equations, calculations and plots in the Report File. If you have any questions or need to remind yourself, check this link again Editing the Report File. For instructions on how to use Excel, refer to this link Using Excel

Refer to the Experimental setup for this procedure.

The electrolysis cell is contained in a Dewar vessel (a bit like a vacuum flask) in order to minimize heat losses. The hydrogen and oxygen gas produced by the electrolysis pass into a water-filled gas burette which can be used to measure the volume of gas evolved using the graduated markings. In this experiment you require measurements of gas volume under constant pressure. It is important to adjust the height of the water reservoir so that it is the same as the level in the gas burette every time you record a value for the volume. This ensures there is no extra pressure on the evolved gas from a head of water, and hence that you are working at **constant** pressure.

The electrodes are connected to an electrical power supply with meters to measure the current and the voltage. The current flowing through the cell must be large enough (~0.5 A, which should correspond to a voltage of ~5-6 V), and the electrolysis must be fast enough to prevent inaccuracies from heat losses or gas leaks. On the other hand, too large a current will cause bubbles of gas to form on the electrodes, resulting in fluctuations in the rate of evolution of gas. The electrolysis cell actually contains 1 M sulfuric acid.

- Measure the atmospheric pressure and the laboratory (room) temperature, using the digital barometers available in the laboratory (ask a demonstrator), and record these values onto the Report File.
- The apparatus can be connected to atmosphere directly via opening of the needle valve, which is about halfway along the tube between the electrolysis cell and the water reservoir. When you arrive in the lab, the needle valve should be open -*check*! At the start of each experiment, **you should adjust the water levels to be both equal and at the zero mark on the burette**. Note that turning **CL**ockwise = **CL**osed for the needle valve.
- Check the apparatus for leaks by closing the needle valve and applying a small positive pressure (by lifting the water reservoir of the gas burette by a few centimetres) and ascertaining that the water meniscus does not move significantly over a period of two minutes.
- Open the needle valve and then adjust the water levels so that they are equal and one of them is on the zero mark at the top of the burette: from here to the bottom of the graduations the volume is equal to 100 cm^3.
- Ensure that the temperature is stable to 0.1 K over two minutes and record the initial temperature.
- Switch on the magnetic stirrer, and ensure it is running smoothly.
- Close the needle valve. Switch on the power supply and start your timer.

Note that, as shown in the video in the introduction, when recording a measurement, you must ensure that the water levels are the same.

- Record, at intervals of approximately 2 minutes, readings of the time, current, voltage, temperature and gas volume (when it can be measured on the graduated burette), until approximately 100 cm^3 of gas has been evolved. Note that your readings of current and voltage should not change significantly over time (**if they do, consult a demonstrator**).
- Note the overall temperature change. The overall temperature rises you will measure in this practical are typically less than 2 K. **If any of your changes are much higher than this, consult with a demonstrator.** Note that these can all be input directly into the Report File.
- Estimate the average value of the current and voltage and record the total time taken and volume of evolved gas.

Check your values with a demonstrator before repeating. Repeat the whole procedure at least three times.

The *online* Manual:

- Students don’t mind (even prefer) reading on-screen

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16 May 2013 Last updated at 07:35

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Young people 'prefer to read on screen'

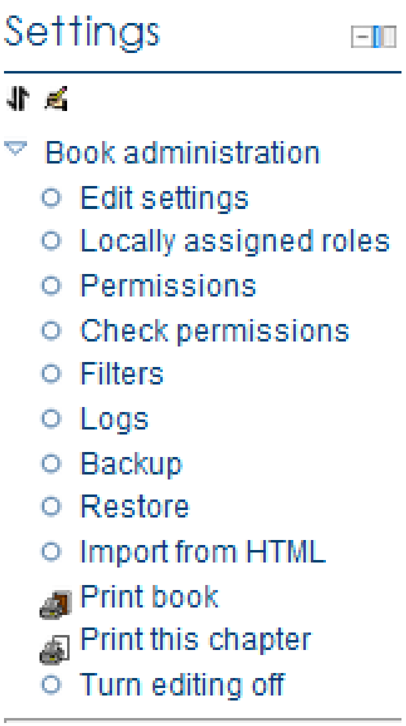
By Sean Coughlan
BBC News education correspondent

Young people are now much more likely to prefer to read on a computer screen rather than a printed book or magazine, according to a UK survey.

The National Literary Trust studied almost

The *online* Manual:

- Students don’t mind (even prefer) reading on-screen
- Book resource: **easily printable → pdf**



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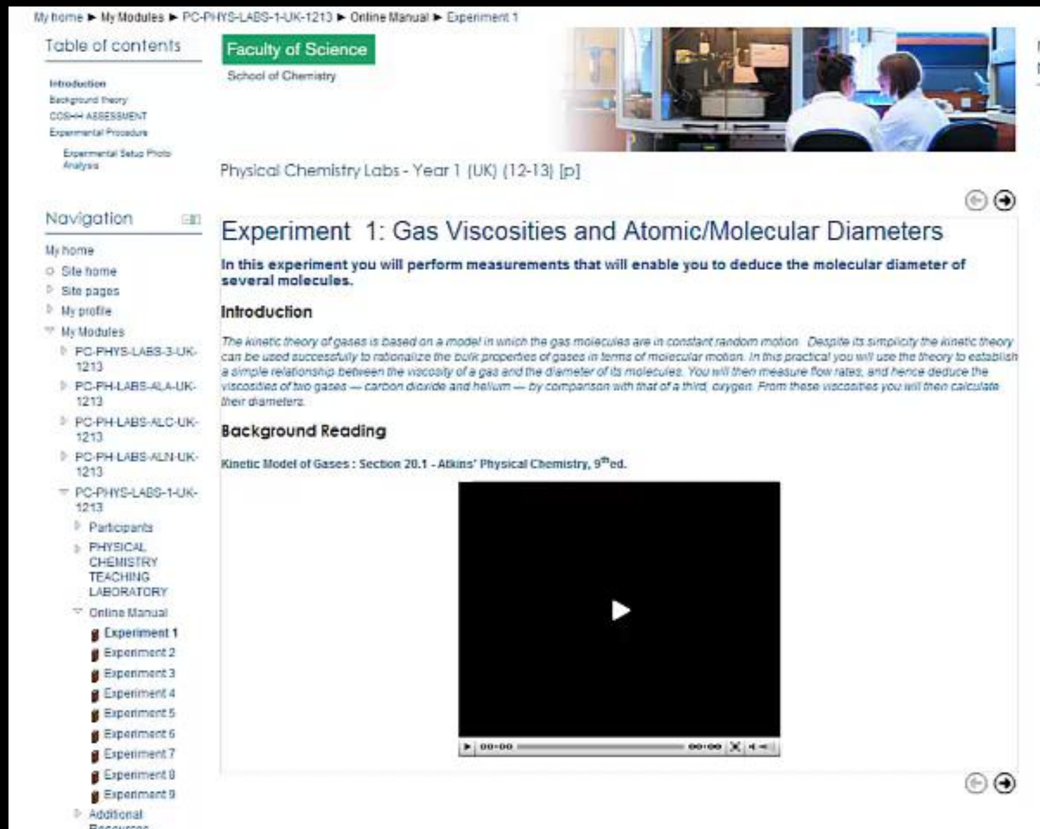

The Book Resource

- Very easy to create and maintain
- Perfect for
  - ✓ putting a lot of material in Moodle courses avoiding the “Scroll of death”.
  - ✓ interactive; not just text but photos, videos, links
- Easily printable → pdf

Further information

How to achieve this

- Moodle Help - **How to create a Book**
  https://workspace.nottingham.ac.uk/display/Moodlehelp/How+to+create+a+Book

- Elearning community video of Rossana Wright (forthcoming but provisionally at http://www.nottingham.ac.uk/teaching/event/elc-20130605-moodle.aspx)

Learning Team Support

learning-team-support@nottingham.ac.uk

Blog: bit.ly/ltnottingham

Moodle Help: bit.ly/uonmoodlehelp

(or search Workspace for “Moodle help”)