

# ASK THE EXPERT



How mediation tasks have been used to assess ESAP language competence  
Aaron Woodcock

**ESAP Conference 2019: Something old, something new: mediation in the context of ESAP**  
Ruhr-Universität Bochum on 11 May 2019

# OVERVIEW

- Context
- Language assessment
- Discussion

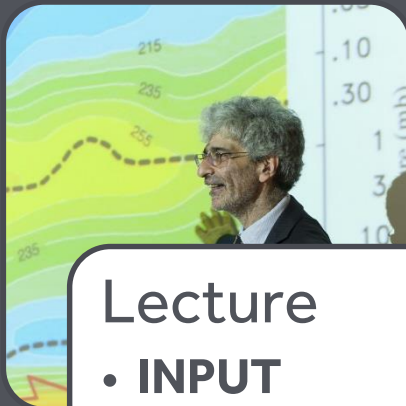


“learning of science is a **discursive process**, with scientific concepts and ways of reasoning being learned through **engagement** in practical enquiry and **social interaction**”

(Mercer, Dawes, Wegerif, & Sams, 2004 – emphasis added)



# LEARNING CYCLE IN CHEMISTRY



## Lecture

- **INPUT**
- Listening
- Begin learning



## Lab / Tutorial

- **COGNITION**
- Interacting
- Consolidate learning



## Report / Exam

- **OUTPUT**
- Writing
- Demonstrate learning

# GRADUATE JOBS

Jobs directly related to degree :

- Analytical chemist
- Biotechnologist
- Chemical engineer
- Healthcare scientist, clinical biochemistry
- Forensic scientist
- Nanotechnologist
- Pharmacologist
- Researcher/Lecturer
- Scientific laboratory technician
- Toxicologist

Jobs where a chemistry degree would be useful include:

- Civil service
- Environmental consultant
- Further education lecturer
- Management consultant
- Nuclear engineer
- Patent attorney
- Science writer
- Secondary school teacher





## GRADUATE ATTRIBUTES

- Ability to communicate effectively in an increasingly digital world for a **variety of purposes and audiences**, and through a range of appropriate media

# AUTHENTIC SCENARIOS

What mediation scenarios might a chemistry student find themselves in...

- ...during their studies?
- ...during their career?

During studies:

- Tutorials
- Labs
- Presentations
- Exam

During career:

- Presenting at interdisciplinary conferences
- Teaching
- Promoting science to general public

# ENGLISH FOR CHEMISTS MODULE

- 5 ECTS credits / 3 contact hours + 7 independent study hours per week
- Specifically for BSc Applied Chemistry (3+1) students from China
- Students typically CEFR B2 in general English, but B1 in Chemistry
- To prepare and support students for fully communicating in English in
  - a chemical laboratory,
  - tutorials and presentations
  - scientific and exam writing
- Supports students in the development of transferable skills



# MODULE AIMS + OUTCOMES

The aims of this module are to develop and enhance students':

- ability to **communicate** scientific **ideas** in English, both in writing and orally
- productive knowledge of chemistry-specific **vocabulary**
- ability to **use information** and library resources

On completing this module, students should be able to:

- communicate scientific ideas more effectively in English in a variety of situations and to a variety of audiences
- communicate using a wider range of chemistry-specific lexis with more fluency and accuracy
- communicate scientific ideas from outside sources more effectively in their own words

# LANGUAGE ASSESSMENT

- 'Ask the expert' column (25%)
  - explain a familiar chemical idea effectively in English in a magazine to a lay audience
  - use (and explain) a range of chemistry-specific lexis with fluency
- Public lecture on experiences in the lab (25%)
  - recount a familiar experiment effectively in English in a public talk to a lay audience
  - use (and explain) a range of chemistry-specific lexis with accuracy
- Poster showcasing research (50%)
  - communicate scientific ideas from outside sources effectively in their own words

You see the announcement below a national newspaper.

## ASK AN EXPERT

Are you an expert in your in chemistry? Are you able to explain the chemistry behind everyday phenomena to our readers?

We are looking for a chemist to join our team of experts writing for our 'Ask An Expert' column. If you think you have what it takes, submit a short article answering one of the reader questions below.

We are looking for articles that are engaging and contain clear explanations of chemistry concepts using a combination of diagrams and explanatory text.

Choosing **ONE** of the reader questions on the next page (Page 15), write your answer in around **500** words in an appropriate style on the separate answer booklet.

# 'ASK THE EXPERT' COLUMN (P.14)

Dear experts,

With winter on its way, I wonder if you could answer a question that has been bothering me for years. Why do people put salt on the roads? Does it do any good? How does it work? Are all salts equally effective?

Best wishes,

Robert (73, retired businessman)

Dear experts,

I love cooking, but I hate chopping onions. Why do onions make you cry? Is there anything I can do to prevent the tears?

Yours,

Ben (32, lawyer)

Dear experts,

My 14-year-old daughter is fascinated by chemistry and wants to know how soap cleans. Can you explain how soap works?

Many thanks,

Sarah (43, engineer)

Dear experts,

How do leaves change colour? I know that chlorophyll is the pigment that makes them appear green, but it can't be the only pigment present. Do you know what affects the colour of leaves?

All the best,

Jenny (64, photographer)

Dear experts,

My 12-year-old son seems to have outgrown the chemistry set he got for Christmas. He's convinced he can get rich by turning lead into gold. Can you explain to him why this is both possible and impractical?

With thanks,

John (78, historian)

(P.15)

Your group have been asked to give a presentation at a university open day for prospective undergraduate students. The aim of the open day is to generate interest in studying a degree in chemistry and to increase their understanding of core laboratory procedures.

You and your group should base your presentation on one of the experiments you have done this term in your Advanced Laboratory Skills module.

You should (not necessarily in this order):

- Outline the experimental process
- Compare what you expected to happen with what actually happened
- Explain what you learnt from the experiment

Speak for 3-4 minutes per person and allow an additional 1 minute per person at the end for questions.

Use language and style appropriate to the situation.

# PUBLIC LECTURE ON EXPERIENCES IN THE LAB



You have been invited to create a poster to display at a university open day for prospective undergraduate students. The aim of the open day is to generate interest in studying a degree in chemistry at the University of Reading.

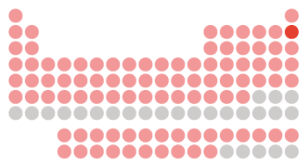
Design a poster that explains an important or recent piece of published research done by your university.

You should refer to the original research paper, but you should use your own words as far as possible.

Use language and style appropriate to the situation.

# POSTER SHOWCASING RESEARCH

# CAPTURING NEON IN A METAL-ORGANIC FRAMEWORK



## ELEMENTS IN ORGANIC CRYSTAL STRUCTURES

- Not yet observed in organic crystal structure
- Previously observed in organic crystal structure
- Neon (not previously observed until this study)

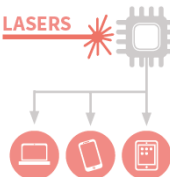
Neon is one of the least reactive elements in the periodic table. No neutral molecules containing neon have ever been synthesised and it is the only stable element not to have been previously observed in an organic crystal structure.

Neon is known for its use in neon signs. It's also used in lasers to etch semiconductor chips, which are important components in computers, tablets, and mobile phones.

## NEON'S USES

### NEON SIGNS

### LASERS



Metal-organic frameworks are structures composed of metal ions and organic (carbon-based) links. They are often porous meaning they can be used to store gases. Additionally, they can be used to selectively adsorb particular gases.

## METAL-ORGANIC FRAMEWORKS EXPLAINED

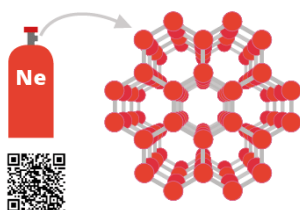


## EXPERIMENT CONDITIONS

**PRESSURE: 100 BAR**  
**TEMPERATURE: -173°C**

*These conditions increase the interaction of neon atoms with the framework*

**FIRST OBSERVED DIRECT INTERACTION BETWEEN NEON AND A TRANSITION METAL**



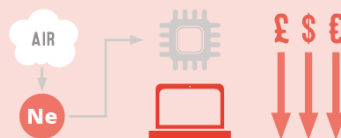
### NICKEL-CONTAINING FRAMEWORK

In this experiment a nickel-containing metal-organic framework, containing porous hexagonal channels, was one of those used. The adsorption of neon was studied using X-ray diffraction, showing clear interactions between neon atoms and nickel atoms in the framework.

This is the first time neon has been captured in a porous framework, and could lead to new extraction methods.

## WHY DOES THIS RESEARCH MATTER?

Tailored frameworks for neon extraction could reduce the cost of computer semiconductor manufacturing. The next step is making them more selective for neon over other atmospheric gases.



*Capturing Neon - The first experimental structure of neon trapped within a metal organic environment*  
P A Wood, A A Sarjeant, A A Yakovenko, S C Ward, C R Groom, Chem. Commun. (2016), DOI: 10.1039/C6CC04808K

# MODEL POSTER

- Linking to previous knowledge
- Adapting language
- Amplifying a dense text
- Streamlining a text

# ASSESSMENT CRITERIA

	Excellent 100-70	Good 69-60	Competent 59-50	Basic 49-40	Unsatisfactory 39-0
Content (20%) Communicating relevant scientific information to the target reader	All content is relevant to the task with a good level of detail. Target reader is fully informed.	All or most content is relevant to the task with some level of detail, but minor irrelevances or omissions may be present. Target reader is on the whole informed.	Most content is relevant to the task, but detail may be limited or irrelevances and misinterpretation may be present. Target reader is partially informed.	Some content is relevant to the task, but detail is limited and irrelevances or misinterpretation are present. Target reader is minimally informed.	Limited content with very little attempt to address the task. Significant irrelevances, omissions or misinterpretation of the task are present. Target reader is not informed.
Communication (20%) Communicating complex ideas clearly and using genre conventions effectively	Uses the conventions of posters to effectively hold the target reader's attention and clearly communicate complex ideas.	Uses the conventions of posters to generally hold the target reader's attention and communicate complex ideas generally clearly.	Uses most conventions of posters appropriately, but does not always hold target reader's attention or communicate complex ideas clearly.	Uses some conventions of posters appropriately, but does not effectively hold target reader's attention or communicate complex ideas clearly.	Uses few, if any, conventions of posters appropriately and does not communicate complex ideas.
Organisation (20%) Organising written tasks logically and using cohesive devices effectively	Text is well organised and coherent, using a variety of cohesive devices and organisational patterns to generally good effect.	Text is generally well organised and coherent, using a variety of linking words and cohesive devices.	Text is connected using basic linking words and a limited number of cohesive devices. Coherence is sometimes lost and connections sometimes unclear.	Text is connected using basic, high-frequency linking words. Coherence is often lost and connections often unclear.	Text is poorly connected and disorganised. It is not a coherent whole.

	Excellent 100-70	Good 69-60	Competent 59-50	Basic 49-40	Unsatisfactory 39-0
Language (20%) Using chemistry-specific lexis and grammar with control	Uses a range of scientific vocabulary appropriately. Uses simple and complex grammatical forms with control and flexibility. Occasional errors may be present but do not impede communication.	Uses common scientific vocabulary appropriately, with occasional inappropriate use of less common scientific lexis. Uses simple and some complex grammatical forms with a good degree of control. Errors do not impede communication.	Uses scientific vocabulary generally appropriately, but some gaps in lexical knowledge is evident. Uses simple grammatical forms with a good degree of control. While errors are noticeable, meaning can still be determined.	Uses basic scientific vocabulary reasonably appropriately, but gaps in lexical knowledge evident. Uses simple grammatical forms with some degree of control. Errors may impede meaning at times.	Uses little scientific vocabulary appropriately, demonstrating significant gaps in lexical knowledge. Uses grammatical forms with little control. Errors often impede meaning.
Source Use (20%) Using information from outside sources appropriately	Information from sources is written in your own words in a clear voice. All sources are referenced clearly in the RSC style, although there may be the occasional minor error.	Information from sources is generally written in your own words, but your voice may not always be clear. All sources are referenced, but there may be minor inaccuracies or it may not be in the RSC style.	Information from sources is generally written in your own words, but there are minor stretches of text that are too closely paraphrased. The majority of sources are referenced, but there may be minor omissions or inaccuracies.	EITHER Information from sources is generally written in your own words, but referencing is inaccurate or missing OR Information from sources is referenced generally correctly, but paraphrasing is often too close to the original.	EITHER No information from sources is used OR Most (if not all) information from sources is too closely paraphrased or not referenced.

# ASSESSMENT CRITERIA

# Use FT-IR to Analyse Archaeological Samples

## Target Sample

- **Coprolite samples**  
which are pieces of fossilised dung and were found in Neolithic site of C,atalhöyük in Turkey
- **Pottery samples**  
which were found in Roman site of Silchester, UK & the Bronze Age site of Gatas, Spain
- **Unidentified black residues samples**  
Which are found in Neolithic site of C,atalhöyük in Turkey



## FT-IR Technology

- FT-IR is short for "Fourier-transform Infrared Spectroscopy", which is a modern technology to gain the infrared spectroscopy of the sample.
- The molecules can absorb the specific frequencies which can characterise their structure. Therefore, the IR spectra can give a match between the absorbed radiation and the vibrational frequency of the molecular.



## Advantages of the Method

- **Cheap**  
The cost of the FT-IR analysis is much lower than other archaeological analysis method such as GC-MS.
- **Quick**  
Both of the preparation and characterise process of FT-IR is very quick which can be finished even in A few minutes.



## Analysis Process

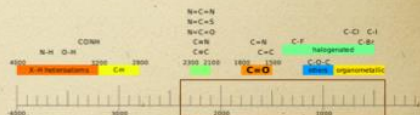
- **Step1**  
Prepare the sample: Coprolite samples, pottery samples and resin samples. Then grind them into powder.
- **Step2**  
Scan the baseline to gain the background IR spectrum.
- **Step3**  
Put the powder of sample into the FT-IR machine.
- **Step4**  
Use the software to scan the final IR spectra of the sample. Then analyse it.

## Meaning of the Research

- A new method has been introduced to analysis archaeological samples, which can be widely used in current cases with a better performance than other methods.

## Analysis Results

- **Coprolite samples**  
Obvious phosphate peaks in FT-IR spectra can be easily found around 2400-400  $\text{cm}^{-1}$ , which was a significant symbol to separate them out.
- **Pottery samples**  
Organic and non-organic residues can be clearly distinguished with FT-IR, which proved it is useful to analysis suspected archaeological adhesives.
- **Unidentified black residues samples**  
Subtle C-H absorption differences were shown in the spectra, which indicated that had different organic component from other pottery samples and it needed further GC-MS analysis.



Position of Phosphate Peaks



L. Shillito, M. Almond, K. Wicks, L. Marshall and W. Matthews, *Spectrochim. Acta, Part A*, 2009, 72, 120-125.

# SUCCESSFUL EXAMPLE



# Cyclic Lipopeptide Daptomycin

It interferes with the biosynthesis of peptidoglycan in the cell wall of bacteria by disrupting the transport of amino acids in the cell membrane, and changes the properties of the cytoplasmic membrane. It can damage the cell membrane function in many aspects and rapidly kill gram-positive bacteria. In vitro, it has strong activity against isolates that have presented a variety of drug resistance, which is of great clinical significance for critically infected patients.



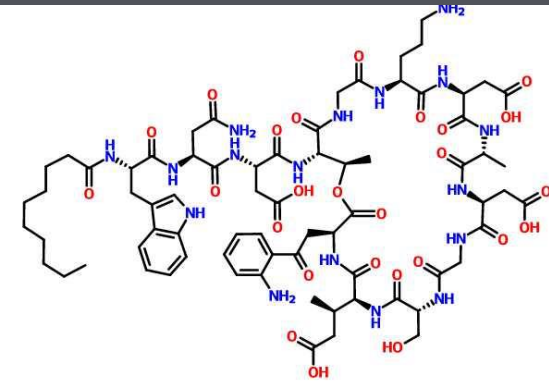
CAS No. 103060-53-3

Molecular formula:  $C_{72}H_{101}N_{17}O_{26}$

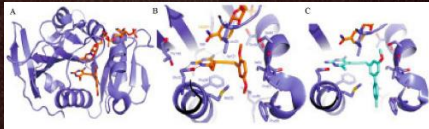
Molecular weight: 1620.67000

Color: colourless to faint yellow

Solubility in methanol: 5mg/mL



## APPLICATION



- 2003.09: FDA (the U.S. food and drug administration) first approved the use of daptomycin for the treatment of severe skin infections
- 2006.03: approved for use in infectious diseases
- 2006.01: approved by the European commission for the treatment of complex skin and soft tissue infections caused by certain gram-positive bacteria
- 2007.09.06 the pharmaceutical company Cubist has announced that the European Union has approved its antibacterial drug daptomycin for injection (Cubicin) for the treatment of cubicle.

**Antibiotics**

**Bacteriostatic action**  
(toxicology;)

**Pharmacokinetics;**

**Drug resistance;**

**Drug interaction**



## STRUCTURE

A polypeptide chain

=


Ten cyclic structures + three formative chains

## TO BE CONTINUED

**Company:** tradename triclin

It's a lipoprotein antibiotic, use to treat threatening infections caused by gram-positive bacteria.

The polypeptide chain does self-assemble to become glue. Then adding calcium chloride (calcium ions) for biological mineralization. After gluing, the performance is better

 Continue to study its **genotoxicity & reproductive toxicity** & **carcinogenicity** (not tested in animals yet)

# LESS SUCCESSFUL STUDENT EXAMPLE

# DISCUSSION

## **Authenticity and applicability**

- How authentic are these tasks?
- Could such tasks be used for other subjects (e.g. maths, economics or law)?
- What would the benefits and drawbacks be?

## **Focusing on mediation**

- How could the learning outcomes and assessment criteria be changed to accommodate mediation?
- Which activities and strategies listed on the CEFR CV would be most appropriate?
- What benefits and drawbacks would such a change bring?

# MEDIATION ACTIVITIES

- Relaying specific information in writing
- [B2] Can relay in writing in general English the relevant point(s) contained in an article written in academic English from an academic or professional journal
- Explaining data in speech
- [B2] Can interpret and describe reliably in general English detailed information contained in complex diagrams, charts and other visually organised information with text in academic English on topics in his/her fields of interest

# MEDIATION STRATEGIES

- Linking to previous knowledge
- [B2] Can explain a new concept or procedure by comparing and contrasting it to one that people are already familiar with
- Adapting language
- [B2] Can make accessible for others the main contents of a spoken or written text on a subject of interest (e.g. an essay, a forum discussion, a presentation) by paraphrasing in simpler language
- Amplifying a dense text
- [B2] Can make the content of a text on a subject in his/her fields of interest more accessible to a target audience by adding examples, reasoning and explanatory comments
- Streamlining a text
- [B2] Can simplify a source text by excluding non-relevant or repetitive information and taking into