University of Glasgow

School of Chemistry

Interactive Teaching Units – Applying Lecture Content to Real World Problems through Active Learning

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What is an Interactive Teaching Unit (ITU)?

- Level 2 chemistry
- Aim:
  - To apply chemistry knowledge to a real world problem in an industrial context.
  - To develop transferrable skills
- 12 students + 1 staff member
- 3 hour session

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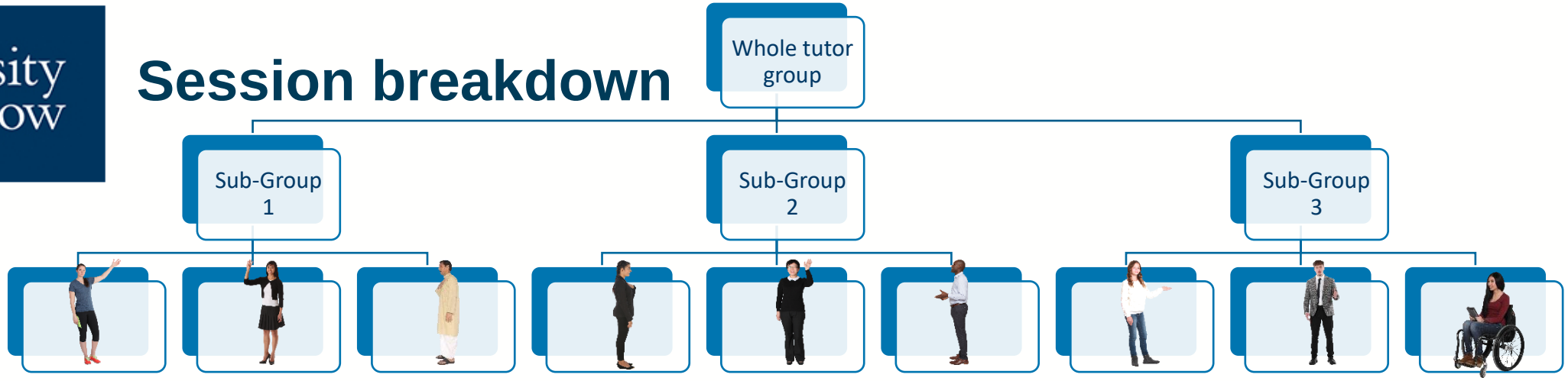
Session breakdown



Welcome (2pm)	All together with tutor, create breakout rooms for sub-groups		
Section A **INTRODUCTION**	read introduction, answer questions, choose speaker	read introduction, answer questions, choose speaker	read introduction, answer questions, choose speaker
	Speaker presents answers to other groups		
Section B **CAPTURE TECHNOLOGIES**	read about **MOFs**, answer questions, choose *different* speaker	read about **Amines**, answer questions, choose *different* speaker	read about **Photosynthesis**, answer questions, choose *different* speaker
	Speaker presents answers to other groups		
Section C **…**	group work etc.	group work etc.	group work etc.
	Speaker presents answers to other groups etc.		
etc.	etc.		

Listening to student feedback

- Previous negative feedback
  - Lack of relevance
  - Unsure about engaging with scientific literature and writing essays
  - Prefer working on their own in a traditional format, e.g. lectures

- Modifications this year
  - Pre-ITU task – graduate attributes
  - New ITU on COP26 days before the conference started
  - Signposted connections to lecture courses.
  - Post-ITU video
    - Interviews with PhD students in the School of Chemistry about their research in this area.
    - Carrying out a literature search
    - Referencing

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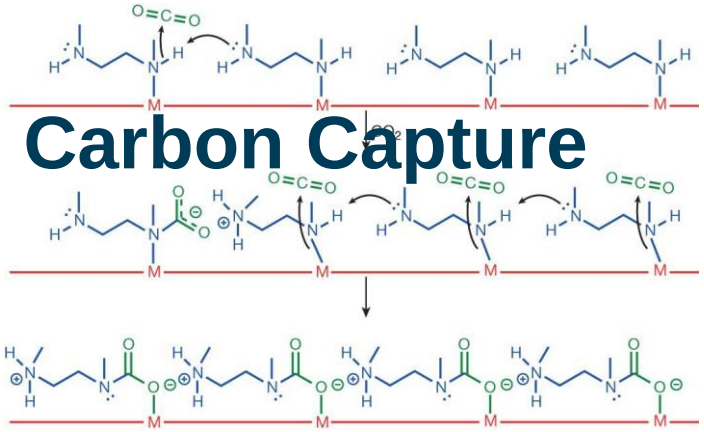
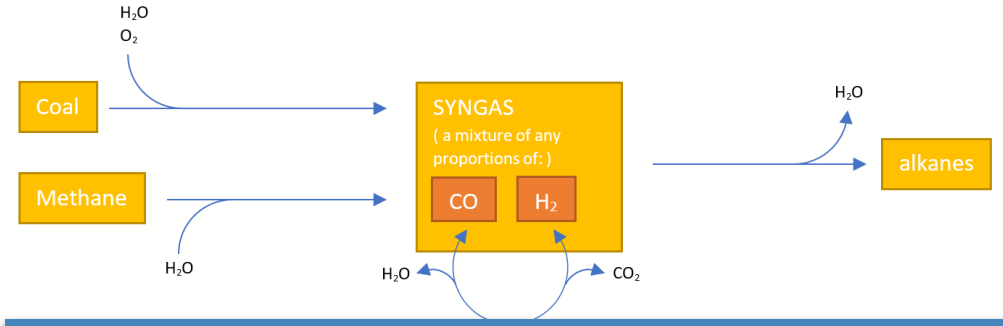
ITU on Carbon Capture

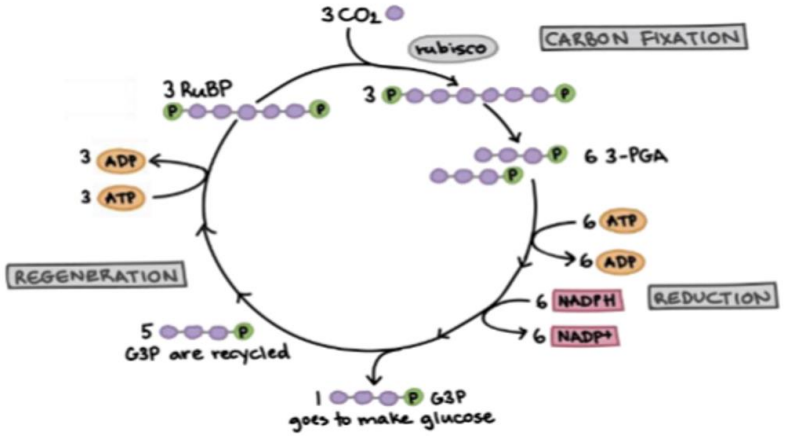


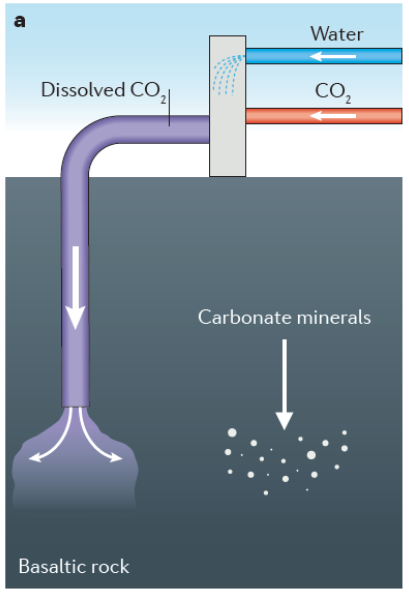
Session	Sub-group 1	Sub-group 2	Sub-group 3
Capture	MOFs	Amines as scrubbers	Photosynthesis
Sequestration	Geological carbonates	Enhanced Oil Recovery	Algae to carbon fibres
Utilisation	Concrete	Synthetic fuels	Biodiesel



Overall message

- No *single* solution: we need all of these + renewable power generation + more
- Focus on the interesting chemistry in CC processes





Using OneNote

OneNote — ITU Thurs Group C — FD

File | Home | Insert | Draw | View | Help | Open in Desktop App | Tell me what you want to do | Share

Calibri 11 | Styles | Tags | Feed

ITU Thurs Group C

- Section A
- Section B Capture
- Section C Sequestrati...
- Section D Use
- Section E

- Section B Room 1 Reading
- Section B Room 2 Reading
- Section B Room 3 Reading
- Section B Room 1 Questi...
- Section B Room 2 Questi...
- Section B Room 3 Questi...

Add section | Add page

Section B Group 1

Metal organic frameworks (MOFs)

> Metal-organic frameworks (MOFs) are organic-inorganic hybrid crystalline porous materials that consist of a regular array of positively charged metal ions surrounded by organic 'linker' molecules. The metal ions form nodes that bind the arms of the linkers together to form a repeating, cage-like structure. Due to this hollow structure, MOFs have an extraordinarily large internal surface area. [1]

An example of a recently-reported MOF that contains calcium cations is shown in Figure 1 below, alongside the chemical structures of the organic linkers. Can you identify the pores, organic molecules and metal centers in the ball-and-stick image?

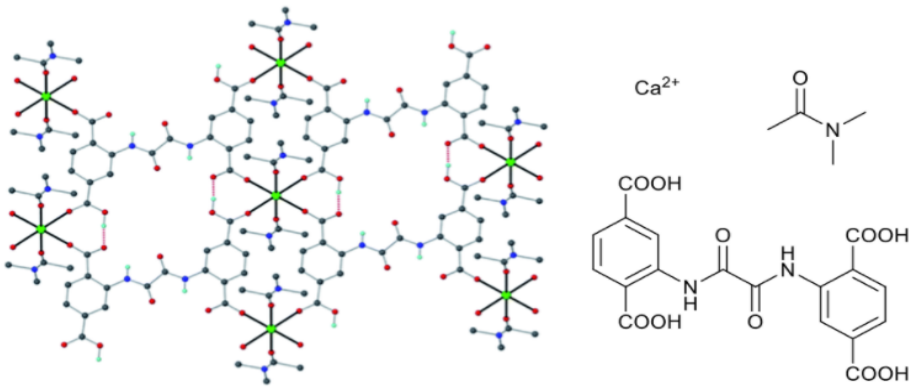
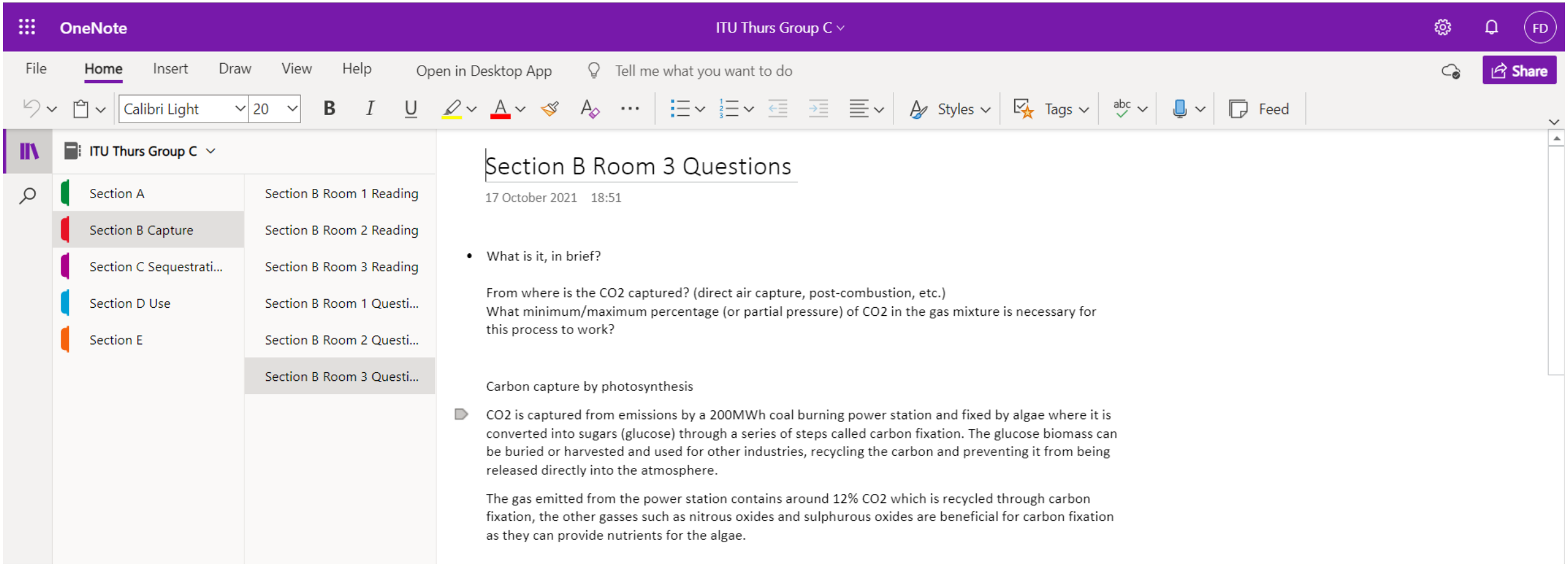
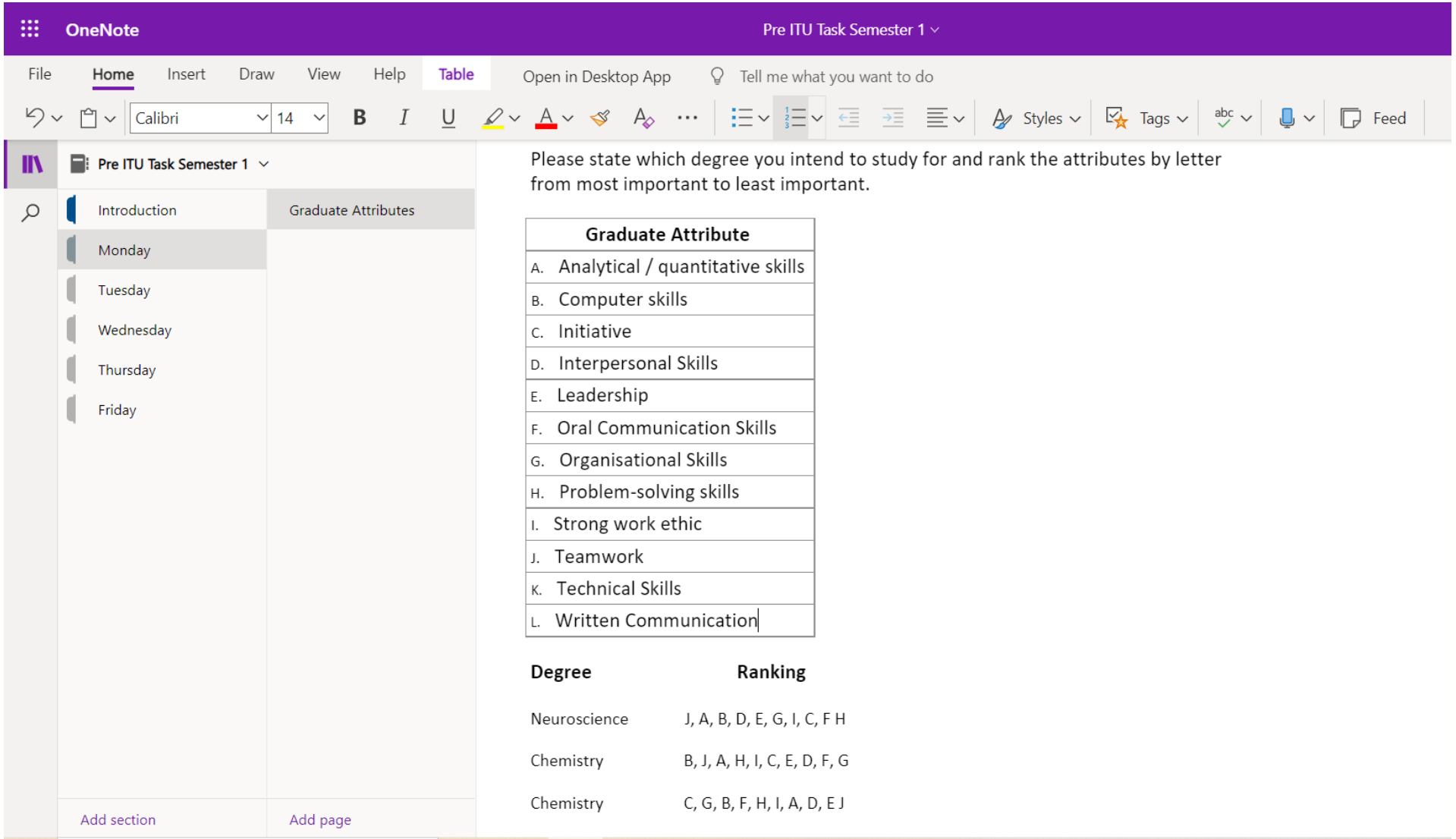


Figure 1. Left: Structure of a calcium-containing MOF named **Ca-MOF**. (Ca green, C grey, O red, N blue, and H cyan).[2] Right: structure of the components, including dimethylacetaminde, which acted as a solvent during synthesis but has been incorporated into the structure.

Using OneNote to create a shared resource



Graduate attributes – pre-ITU task

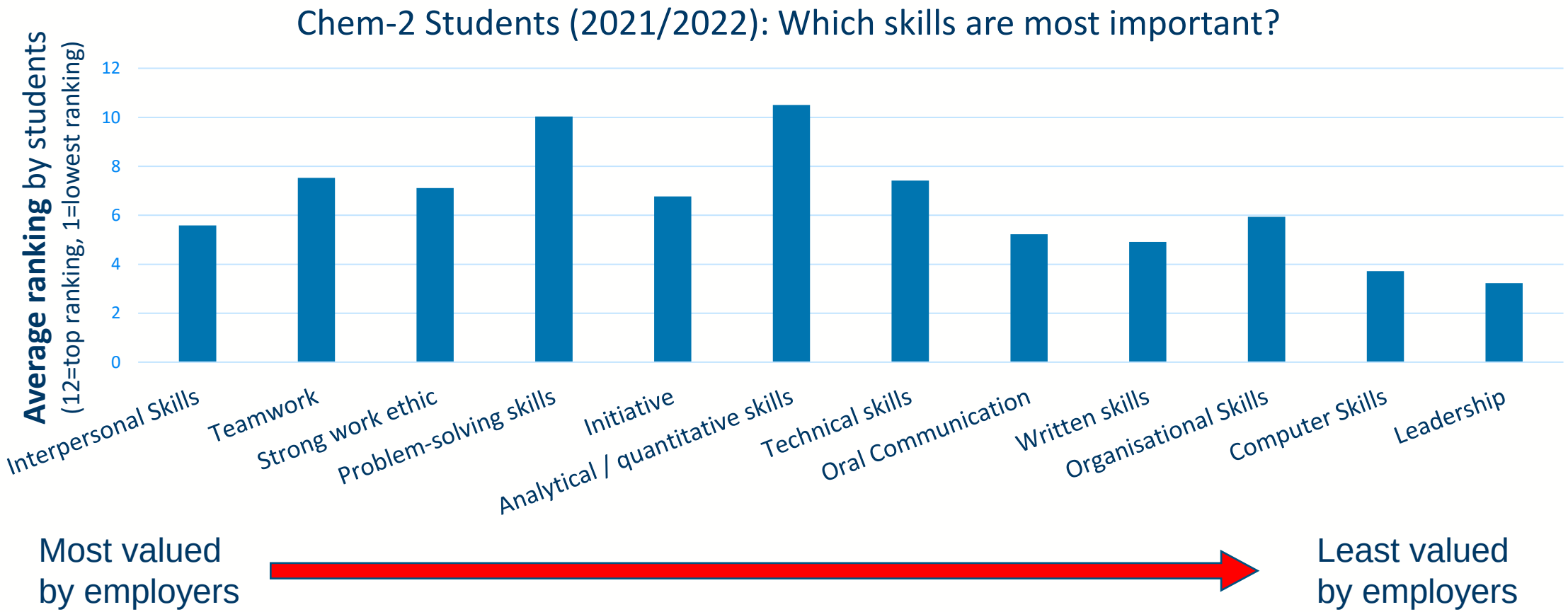


Please state which degree you intend to study for and rank the attributes by letter from most important to least important.

Graduate Attribute
A. Analytical / quantitative skills
B. Computer skills
C. Initiative
D. Interpersonal Skills
E. Leadership
F. Oral Communication Skills
G. Organisational Skills
H. Problem-solving skills
I. Strong work ethic
J. Teamwork
K. Technical Skills
L. Written Communication

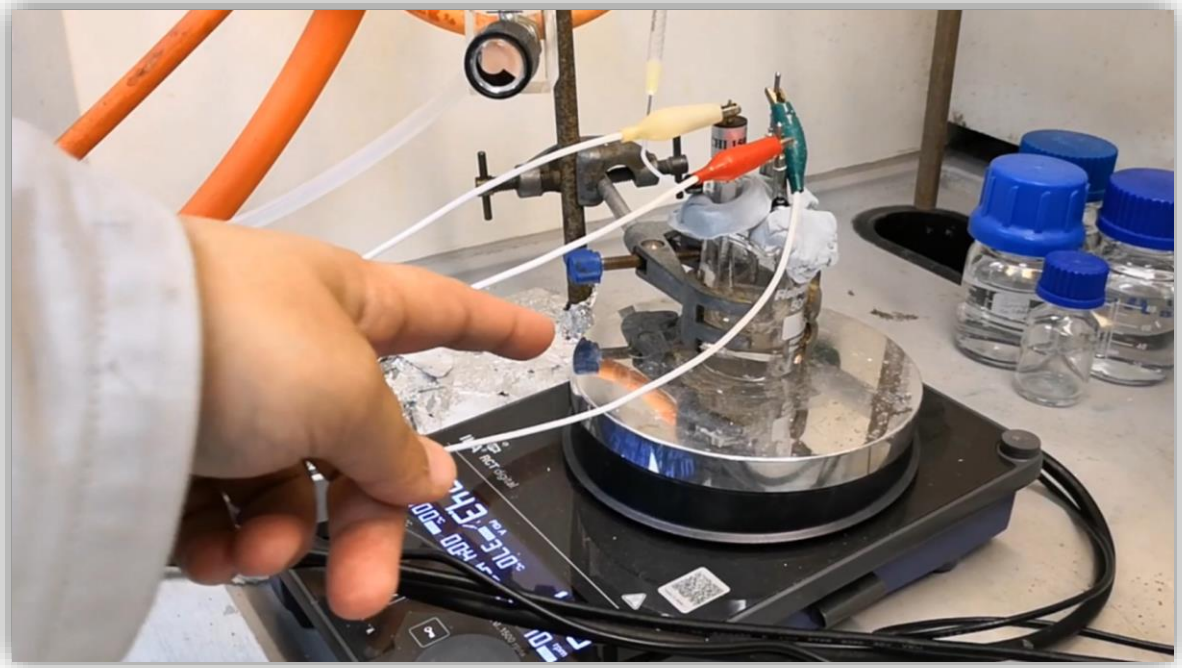
Degree	Ranking
Neuroscience	J, A, B, D, E, G, I, C, F H
Chemistry	B, J, A, H, I, C, E, D, F, G
Chemistry	C, G, B, F, H, I, A, D, E J

Graduate attributes – evaluation



Cf. *Insight into the chemistry skills gap: The duality between expected and desired skills*. Kondo and Fair (2017). *J. Chem. Educ.*, 94, 304–310

Linking students to research (1)



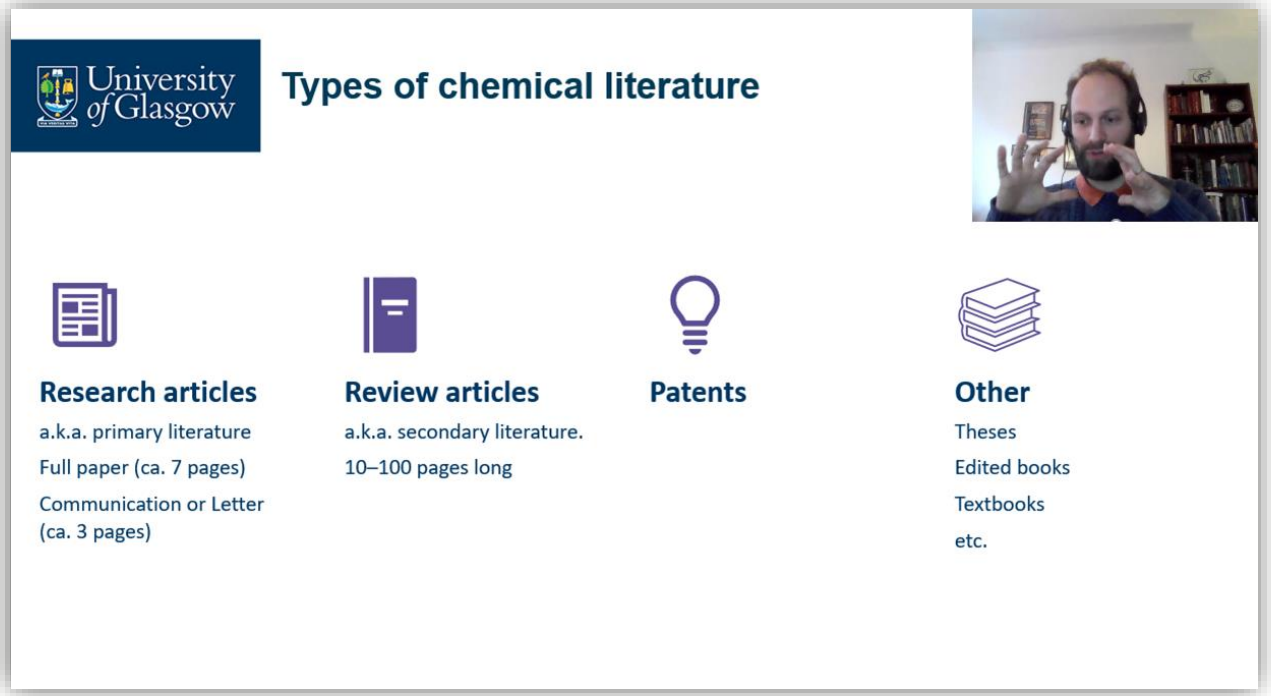
Video
with UofG PhD students undertaking Carbon Capture research was shared at end of ITU session.

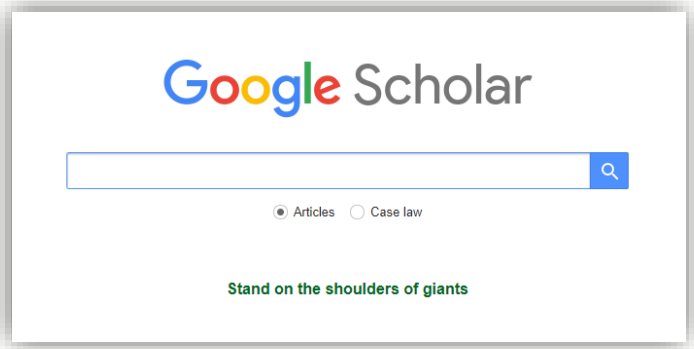
Inspired by: *A Connected Curriculum for Higher Education.* Dilly Fung (2017). London, UCL Press. DOI: 10.14324/111.9781911576358

Linking students to research (2)

Post-ITU assessment task

- Research the chemical literature
- Choose a recent research paper
- 500–600 word essay on one method of carbon capture





Guidance video / screencast with member of staff explaining how to use Google Scholar

Initial feedback

Really **enjoyed** today's session. Was nice to interact with other students and learn from them. The tasks were easy to follow and allowed a **lot of discussion**. Thank you.

It is certainly **topical** and certainly seemed to interest the students a lot more than refrigeration.
– Staff Member

The more critical feedback centred around the length of material students were asked to get through – this will be reduced and streamlined next year.

Themes covered were really **interesting** and covered a range of applications (from experimental to already applied).

Discussing it through with my group was really helpful and it's also nice to get some **interactive** learning.

Next steps

- Analyse feedback
- New ITU for 2022/23
  - Anti-viral drug discovery
  - Alternative assessment?

Thank you for listening!

Questions? Comments?
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