

# Chemistry's Interfaces: The Reality of Nutrition

## Resource Overview

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## Introduction

This resource is designed as an introduction to the some of the most important aspects of chemical biology. The resource achieves this by introducing students to a number of important chemical structures which play major biological roles within human metabolism. Students are placed in the roles of graduate interns to the National Academy of Science. The Academy's internship programme requires students to do a number of closely related jobs including acting as editors for a scientific magazine published by the academy, to act as representatives of the Academy of Science in a radio interview and to produce press releases for use in both scientific and mainstream press.

This activity is written for university level chemistry students with a limited experience of biology. This resource is best suited for early stage university students (years one or two) but given the flexible nature of problem based learning the resource could also be used students at later stages of their education who would be expected to provide more sophisticated solutions.

Criterion	Value
Intended level	Year 1-2
Subject area	Chemical Biology
Contact Hours	3-4 hours
Group size	4-6
Credit value	2 credits (20 hours) without the extension task

Tutor text has been included in this version of the problem. The tutor text is shown in red; this text should not be shown to students.

Outline tutor answers have been provided for the facilitation questions. Please note that these are neither model answers nor guidelines to the amount of content that students should produce. These answers only provide a minimal outline of the concepts being asked and students should go

into more detail and provide examples of each of these concepts.

We recommend that this problem is used with small groups of students (typically group sizes of 4-6 work best). We also recommend that each facilitator guides no more than 2 or 3 groups – if a facilitator has to work with any more groups than this, it is likely to mean that very little time is spent with each group.

We have found that postgraduate students can make good PBL/CBL facilitators if they are given guidance in this style of teaching and the nature of the problem before the start of the module. It is advisable to have at least one staff facilitator on duty during all sessions.

## Background

This primary inspiration for the context of this resource is the authors' dissatisfaction of the portrayal of chemical biology by the media. It is hoped that in addition to learning some key aspects of biological and chemical science, this resource will help encourage students to critically evaluate science they encounter in the media.

This resource makes use of a number of types of assessment which share a common theme of communication. The authors have found that the use of C/PBL resources can be an ideal way of teaching communication skills in a scientific context and it is hoped that this resource will raise awareness of the relevant issues when communicating science to a range of audience types.

## Transferable Skills Development

This resource makes use of a number of types of assessment which share a common theme of communication. The authors have found that the use of C/PBL resources can be an ideal way of teaching communication skills in a scientific context and it is hoped that this resource will raise awareness of the relevant issues when communicating science to a range of audience types. The following transferable skills are encountered in this problem:

- Working in a small group on a mini-project - **Relevant throughout the problem**

- Critical thinking, decision making and independent learning – **Relevant throughout the problem**
- Time management and planning – **Relevant throughout the problem**
- Preparing concise written critiques of active areas of scientific research - **Session 1.**
- Critiquing a piece of scientific writing – **Session 1.**
- Writing short scientific articles for a range of audience types – **Sessions 1 and 4**
- Orally communicate an understanding of an area of scientific research in an interview scenario (such as a radio interview) – **Groups prepare for this between sessions 2 and 3 and are interviewed in session 3.**

## The Scenario

### Editing Nutrition and Health

Students are first asked to proof read a guest editorial in the Academy's 'Nutrition and Health' journal written by a nutritionist who has starred in a number of TV shows and written several best-selling books. The article contains a number of factual inaccuracies which the students need to identify. Students are given three choices:

1. Approve the editorial for printing
2. Correct the mistakes and print the editorial
3. Decide that the editorial is not fit to be printed and suggest another editorial is used

If the students choose option 1 they will receive complaints from readers and the chief editor and will be required to prepare a two page article about the structure and function of proteins to undo some of the damage done by the inaccurate editorial. If students chose option 2 they will receive a letter from Dr Sally's legal team asking for scientific clarification of why they changed her article. If students choose option 3 they will need to write a full scientific explanation of what is wrong with the article and submit this to the chief editor. Although the precise form of the deliverable depends on which option the students

take, the learning outcomes covered and the general format of the deliverable (i.e. a written assignment) remains the same in each case.

### Question Time

In the second part of the problem students are asked to listen to a recording of a recent radio interview that Dr Sally has given. Some of the statements that Dr Sally makes in the interview are a little odd so the radio station has invited the Academy to make a response. The students are asked to go along to the broadcast to be interviewed.

This part of the problem has been written to allow the user to run it in a variety of ways. The original intention was that the interview with the students would be recorded as a podcast (and perhaps peer reviewed by other students) but if that is technically difficult to achieve the task would work just as well by conducting the interview live – perhaps in front of an audience of peers who could assess the process.

A number of suggested questions for the interviewer to ask are given on the following pages.

### Sensors (An Extension Task)

The final (optional) part of the problem requires students to write two articles on the use of fluorescence in chemical biology based on a press release that is provided in this resource. Students need to write separate articles for use in scientific literature and in the popular media.

### Tutor text

The red text in this version of the guide is meant to be seen by the tutor only. This text includes guidance on how the problem can be run, marking criteria, feedback from the trials and some (where appropriate) example answers.

Wk	Session	Topics	Transferable Skills	Assessment	Feedback
1	1 (60-90 minutes)	<ul style="list-style-type: none"> <li>Proteins</li> <li>Enzymes</li> <li>Enzyme Kinetics</li> </ul>	<ul style="list-style-type: none"> <li>Team working</li> <li>Group discussion</li> <li>Independent learning</li> <li>Critical thinking</li> <li>Decision making</li> <li>Written communication</li> </ul>	<ul style="list-style-type: none"> <li>A letter of response to the editor giving details of the decision made regarding the publication of the editorial.</li> <li>A two-page magazine article for publication in a magazine read by biochemists at a range of levels: from interested A-level students to practicing chemistry, biology and biochemistry researchers. This response should include an analysis of the kinetic data provided.</li> </ul>	<p><u>In session:</u></p> <ul style="list-style-type: none"> <li>For students who publish the editorial including some or all of the errors – a copy of the email from the chief editor which includes the complaint from the reader complaint</li> <li>For students who correct Dr Sally's editorial – a copy of the email from Dr Sally's legal team</li> </ul> <p><u>Before next session:</u></p> <p>Receive brief written formative feedback on article prior to the next session</p>
2	2 (60-90 minutes)	<ul style="list-style-type: none"> <li>Nucleic Acids and DNA</li> <li>Fatty Acids and Lipids</li> <li>Polysaccharides and Carbohydrates</li> </ul>	<ul style="list-style-type: none"> <li>Team working</li> <li>Group discussion</li> <li>Independent learning</li> <li>Planning</li> <li>Oral communication</li> <li>Time management</li> </ul>	Students should use part of this session to prepare material for the radio interview (either in the form of a podcast or a live interview given in front of an audience of peers).	<p><u>In session:</u></p> <p>Provide verbal feedback on the students' group debate/practise interview. Encourage the students to answer questions which allow the students to correct statements made by the interviewer.</p>
2	3 (20-30 minutes)	<ul style="list-style-type: none"> <li>Nucleic Acids and DNA</li> <li>Fatty Acids and Lipids</li> <li>Polysaccharides and Carbohydrates</li> </ul>	<ul style="list-style-type: none"> <li>Team working</li> <li>Oral communication</li> <li>Time management</li> </ul>	A mock radio interview to respond to the information provided by Dr Sally in the previous programme, (either in the form of a podcast or a live interview given in front of an audience of peers).	Students should receive formal feedback on the podcast/interview.
Ext. Task	Optional	Use of fluorescence in biological applications	<ul style="list-style-type: none"> <li>Team working</li> <li>Planning</li> <li>Independent Learning</li> <li>Written communication</li> </ul>	To write two articles (one for mainstream newspapers and another for scientific magazines and journals) to convince the public of the merits of biochemical applications of fluorescence (including a simple description of the physical basis of the technique).	Students should receive formal feedback on the two articles.

## Student Outputs

'Chemistry's Frontiers – The Reality of Nutrition' is a group-based exercise. By the end of the module student groups should have produced the following outputs.

### Part 1

Students will produce two outputs for this part of the problem:

- A letter of response to the editor giving details of the decision made regarding the publication of the editorial.
- A two-page magazine article for publication in a magazine read by biochemists at a range of levels: from interested A-level students to practicing chemistry, biology and biochemistry researchers. This response should include an analysis of the kinetic data provided.

### Part 2

Students will give a short (5-10 minute) interview on nutrition and chemical biology based on the points raised in Dr Sally's radio interview. This interview may take the form of a podcast or a live interview.

### Part 3 (Optional extension task)

The students will produce two articles on **(600 words or less)** on the use of fluorescence in biochemical research. These articles should explain the underlying scientific principles and include details on recent research based applications of this technique. The two articles should be pitched at different audiences (a newspaper article for non-experts and a New Scientist/Chemistry World article for an audience with some level of interest and/or expertise in the area).