UNIVERSITY OF LEEDS

Discovering Science: Medicinal Chemistry

Scheme of Work

	Lesson 1	Lesson 2	Lesson 3
Length	Approx. 1 hour	Approx. 1 hour	Approx. 1 hour
Objectives	To explore the origins of cancer chemotherapy and identify key milestones in its history To understand the basics of how chemotherapy works. To research the field of epigenetics and compose pertinent interview questions which demonstrate knowledge of the subject.	To explain different imaging techniques, the chemicals used in them and how they work. To define the chelate effect. To present complex information on medicinal chemistry in a simple way.	To consider the challenges and drawbacks of using diagnostic imaging techniques in relation to specific scenarios. To reflect on the ethical issues related to the future of diagnostic imaging.

Lesson plans for each session can be found on the following pages.

Discovering Science: Medicinal Chemistry

Lesson 1 plan

<table>
<tr><th>Starter activity</th><th>Learning objectives</th></tr>
<tr><td>Watch the videos in Step 1.4 and 1.5 (Discovering chemotherapy). Ask students to take notes, including definitions of any new terms they encounter, as well as a timeline of the development of chemotherapy.

After watching the video, ask a student to share their timeline, and briefly check understanding of key terms such as ‘molecular target’ and ‘kinase’.</td><td>• To explore the origins of cancer chemotherapy and identify key milestones in its history

• To understand the basics of how chemotherapy works.

• To research the field of epigenetics and compose pertinent interview questions which demonstrate knowledge of the subject.</td></tr>
<tr><th>Main activities</th><th>Resources required</th></tr>
<tr><td rowspan="5">In small groups, students perform research to find out what they can about epigenetics, including:

• What are the recent developments in epigenetics?
• Why do they matter?
• How will they be used in the future?
• Who is doing the work?

After they have researched, ask the groups to imagine they are science reporters, and they are going to interview an expert on the topic of epigenetics. They should formulate five questions they would like to ask the expert.

Questions should be well-researched, relevant and demonstrate an understanding of the topic.

As a class, share and discuss some of the questions composed by the groups. What makes a good question?</td><td>1. Devices for watching videos.
2. Devices and materials for research (e.g. relevant articles and books on epigenetics if possible).
3. Copies of PDF from Step 1.14.</td></tr>
<tr><th>Assessment for Learning</th></tr>
<tr><td>Timelines, key term definitions, research output and interview questions.</td></tr>
<tr><th>Differentiation</th></tr>
<tr><td>SEND: Videos have subtitles.
Low ability: Peer-learning.
Gifted and Talented: Peer-teaching.</td></tr>
<tr><th>Plenary</th></tr>
<tr><td>Hand out the PDF ‘Richard’s explanation of epigenetics’ from Step 1.14.

Each group should read through and identify where any of their questions have been answered, and which questions remain unanswered.</td></tr>
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Discovering Science: Medicinal Chemistry

Lesson 2 plan

<table>
<tr><th>Starter activity</th><th>Learning objectives</th></tr>
<tr><td>As a class, watch the video in Step 2.3 (Imaging techniques). Explain that the class will be researching imaging techniques, so students should take detailed notes.</td><td>• To explain different imaging techniques, the chemicals used in them and how they work.

• To define the chelate effect.

• To convey and present complex information on medicinal chemistry in a simple way.</td></tr>
<tr><th>Main activities</th><th>Resources required</th></tr>
<tr><td rowspan="5">Split the class into four groups. Each group will research and produce an informative poster on one of the following:

1. X-ray
2. Ultrasound
3. MRI
4. Radioisotope imaging

When conducting research and producing their posters, groups should consider the following:

• How does this imaging technique work?
• Which chemical elements are involved in this process?
• What is the chelate effect and how does it relate to this technique?

Posters should be as simple and easy to understand as possible. Information and links provided in Steps 2.3 and 2.4 will be useful.

Each group should then present their poster to the class.</td><td>1. Devices for watching video and conducting research.
2. Creative materials for producing posters.
3. Materials for individual reflections (if done in class).</td></tr>
<tr><th>Assessment for Learning</th></tr>
<tr><td>Group posters, individual reflections.</td></tr>
<tr><th>Differentiation</th></tr>
<tr><td>SEND: Videos have subtitles.
Low ability: Peer-learning.
Gifted and Talented: Peer-teaching.</td></tr>
<tr><th>Plenary</th></tr>
<tr><td>After all four posters have been presented, conduct a quick poll of the class, asking students which technique they would be most comfortable with, and why.

As an additional task if time, or homework, ask students to write a brief individual reflection on the following:

• Why do you think it is important for patients to understand how imaging techniques work?</td></tr>
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Discovering Science: Medicinal Chemistry

Lesson 3 plan

<table>
<tr><th>Starter activity</th><th>Learning objectives</th></tr>
<tr><td>Divide the class into small groups. From Step 2.10, give half of the class Linda's scenario and the other half Taylor's scenario. Ensure the questions for each scenario are included on the handout.

Ask groups to discuss and debate the questions. Lead a class discussion, with students sharing a few points from each scenario.</td><td>• To consider the challenges and drawbacks of using diagnostic imaging techniques in relation to specific scenarios.

• To reflect on the ethical issues related to the future of diagnostic imaging.</td></tr>
<tr><th>Main activities</th><th>Resources required</th></tr>
<tr><td rowspan="4">In their groups, students research and write a short video script which outlines the ethical issues surrounding the future of medical imaging. The video will be 2-3 minutes, roughly 150-200 words. In producing their scripts, students should:
• demonstrate scientific understanding of the selected topic
• present a fair and balanced overview of the topic for the intended audience and provide sufficient context
• indicate an understanding of the key 'story'.

Students should also consider the 'who, what, why, where, when, how?' questions which help to tell a story effectively.

If time permits, or as homework, groups can film their videos if they wish using phones or other devices.</td><td>1. Copies of scenarios (with questions) from Step 2.10.
2. Devices/material for conducting research.
3. Materials for writing video scripts.
4. Devices to film videos (optional).</td></tr>
<tr><th>Assessment for Learning</th></tr>
<tr><td>Debate contributions, video scripts.</td></tr>
<tr><th>Differentiation</th></tr>
<tr><td>SEND: Teacher-led support.
Low ability: Peer-learning.
Gifted and Talented: Peer-teaching.</td></tr>
<tr><th>Plenary</th></tr>
<tr><td>Each group should swap scripts (or videos if made) with another. Groups will give each other feedback, considering:
• Was the script well written and the information presented in a logical order?
• Was the script scientifically accurate?
• Did it answer the 'who, what, why, where, when, how?' questions?</td></tr>
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