

Unit 14 Science in Medicine: Contents

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 2 Microbes and disease
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Scheme of Work**Functional Skills and PLTS**

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Overview

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

P1 Carry out investigations into biological and physical procedures used to diagnose illness	M1 Explain the scientific principles underlying the biological and physical procedures used to diagnose illness	D1 Evaluate the advantages and disadvantages of using biological and physical procedures to diagnose illness	Lessons 1 to 10
P2 Carry out investigations into the scientific principles of therapeutic drugs used to treat given illnesses	M2 Describe how the therapeutic drugs would be used to treat given illnesses	D2 Explain why the actions of therapeutic drugs are used to treat given illnesses	Lessons 11 to 14
P3 Carry out investigations into the scientific principles of physical therapies used to treat given conditions	M3 Describe how physical therapies would be used to treat given conditions	D3 Assess, using scientific and other evidence, which physical therapies are effective in the treatment of conditions	Lessons 15 to 21
P4 Identify the general risks of specified treatments	M4 Describe, using scientific evidence, the particular risks involved in specified types of treatments	D4 Explain why some individuals may choose not to take advantage of all types of available treatments	Lessons 22 to 26
P5 Identify other factors affecting the choice and availability of treatments to patients	M5 Describe controversial decisions in prescribing treatments	D5 Explain why decisions to give prescription drugs to some and not to others are always controversial	Lessons 27 to 30

Introduction to this unit

Assignment 14.1: Lessons 1 to 10 (approximately 19 hours)

Students take the role of student doctors on placement at an NHS clinic, working alongside a doctor and observing and helping with diagnostic procedures. To provide evidence for criterion P1, they need to do a number of different practical and research tasks to show that they understand the use in diagnosis of patient questioning, temperature and blood pressure checks, diagnostic imaging techniques, blood tests, urine tests and microbial cultures.

For M1, they need to explain, using the science, why all these, and cytological and genetic tests, are useful and what they can tell us.

To achieve D1, students have to suggest diagnostic procedures for different patients with a range of symptoms, and explain why these procedures would be the best ones to use.

Assignment 14.2: Lessons 11 to 14 (approximately 7 hours)

For this Assignment, students are researchers for a local newspaper; their task is to provide journalists with detailed information about drugs used in the local hospital. For P2, they need to group therapeutic drugs into types and describe what they do. For M2, they need to give information on how particular drugs are administered. For D2, they need to describe the actions of the main types of therapeutic drug on the body.

Assignment 14.3: Lessons 15 to 21 (approximately 14 hours)

The scenario is now that of a TV programme *Medicine Tonight*. Students are script writers and need to make preparatory notes for a programme about treatment options when drugs are not the answer. For P3, they need to research the full range of physical therapies, including 'alternative' therapies and preventative therapies, and write up information about what conditions they can be used to treat/prevent. For M3, they need to describe how each of these therapies is used.

To achieve D3, students need to evaluate, using evidence, the effectiveness of one of each type of therapy: one of radiotherapy, laser therapy, physiotherapy or osteopathy; one type of surgery; one complementary or 'alternative' therapy; one replacement therapy; one preventative therapy.

Assignment 14.4: Lessons 22 to 26 (approximately 11 hours)

Students are now nurses in a health clinic and need to explain to patients the risks and side-effects associated with the treatment options. For criterion P4, they need to identify the general risks of each type of treatment, including all the main types of therapeutic drugs and physical therapies. They need to show that they are aware of any possible objection to treatment for personal, cultural or religious reasons.

For M4, they need to be more specific: students must set out the risk of addiction with sedatives, stimulants, antidepressants and analgesics; they need to present evidence for classifying physical treatments as high or low risk; and they need to show through some examples that they understand the reasons that some people may refuse treatments.

For D4, students need to explain fully why some patients may refuse particular treatments on religious grounds, or by personal choice once the risks and benefits have been explained. This may be done in writing or by spoken presentation.

Assignment 14.5: Lessons 27 to 30 (approximately 9 hours)

In this Assignment, students take the role of a hospital administrator who has to respond to a critical article in the local newspaper about his/her Health Trust. The article criticises the availability of treatments and decisions made about the prescription of drugs.

For P5, students need to review and identify the different financial and resourcing / geographical factors that affect the choice and availability of treatment to patients.

For M5 and D5, they need to write a response to the article. In the first part of the response, for M5, they need to describe some of the controversial decisions that must be made by the Health Trust when prescribing treatments. In the second part, for D5, they need to explain why, in general, these difficult decisions have to be made; they also need to respond to specific criticisms in the article; and they need to explain why these decisions are necessarily controversial.

1 Symptoms

Learning outcome

LO1 Be able to investigate the range of scientific procedures used in diagnosing illness

Assessment criterion

P1 Carry out investigations into biological and physical procedures used to diagnose illness

Planning and resources

This lesson will take an hour but may run to two.

You will need the following resources:

- videos of people describing symptoms (see, for example, the first website below)
- Student Book page 294
- Task sheet A14.1 TS1.1

Real-life links

It may be possible to engage a practice nurse or GP to describe the kinds of questions asked of a patient (via your local Primary Care Trust or a local GP surgery). Or you could contact your local Science, Technology, Engineering and Mathematics (STEM) network (or use the STEM directory) to see if there are any science ambassadors.

Setting the scene

Introduce students to the scenario of the Assignment. They are student doctors on a placement at an NHS clinic. They will work alongside a doctor to observe his work with patients and help carry out tests. They will need to show that they understand all the procedures used to diagnose illnesses, starting with asking questions.

Class activity

P1

- You could start by showing a video, such as the one on the website below, of someone describing their symptoms.
- Then use the Student Book page 294 to discuss the case of a girl called Lucy who is complaining to her mother of feeling unwell. Explain that her mum needs to decide whether to take her to the doctor or not, by asking her daughter questions. Ask the students to think about what they feel like when they are ill and tell them that these are 'symptoms'. Symptoms help diagnose (tell us) what is wrong with someone. A good example of a symptom is 'feeling sick'.
- Explain that, for an illness to be diagnosed, we need to try to understand the symptoms, thinking of them as clues. The first step is to take a 'case history'; that is, to ask questions in order to produce a detailed account of the patient's medical history and any facts and symptoms that might be useful in the diagnosis.
- Explore through discussion with the class useful questions to ask someone who is feeling unwell, e.g. 'Do you feel pain?', 'Where does it hurt?'. Discuss which parts of the body common symptoms affect.

Assignment activity

P1

In this lesson students will be working on Task 1 (part 1) of Assignment 14.1.

Students should work in groups of three in one of the following ways.

- Two students role-play an imaginary conversation between a parent and a daughter/son, while the third student listens and takes notes. The 'parent' needs to decide whether to go to the doctor or keep their child at home, based on the child's answers to the questions they ask.

If the 'parent' decides to go to the doctor with the patient, the third student then becomes the 'doctor', who must decide what questions to ask the patient. The combination of the parent's questions and the doctor's questions will then help with a decision about whether the patient should go for further medical tests.

- Alternatively, the students work together in their group to produce a written conversation or a presentation such as a PowerPoint slide show, with questions and suitable responses. They can develop their own characters or use a scenario from the Student Book.

The questions and answers can be recorded directly as a 'case history' on **Task sheet A14.1 TS1.1**, or can inform students' decisions about good questions to include.

Teacher guidance

Students should work in their groups to decide on questions and/or answers but write up their Task sheets individually.

Delivering PLTS and functional skills

PLTS Creative thinkers – putting themselves into the role required for the Assignment task

Team workers – working together in planning, practical and presentation work

Effective participators – inputting ideas at planning and discussion stages

Functional skills ICT – recording evidence using appropriate software to create presentations

Speaking and listening – participating in group discussions, producing coherent questions/responses for the case study

Useful websites

<http://www.youtube.com/watch?v=fw4FQH9SrL8> – an example of a video about symptoms: 'I didn't realise I had swine flu'

http://www.headaches.org/educational_modules/completeguide/completeguide.html – questions to ask about headache symptoms

4 Looking inside the body

Learning outcome

LO1 Be able to investigate the range of scientific procedures used in diagnosing illness

Assessment criteria

P1 Carry out investigations into biological and physical procedures used to diagnose illness

M1 Explain the scientific principles underlying the biological and physical procedures used to diagnose illness

D1 Evaluate the advantages and disadvantages of using biological and physical procedures to diagnose illness

Planning and resources

This lesson will take two hours.

You will need the following resources:

- X-ray pictures
- a skeleton
- Internet access
- Student Book pages 300–301
- Worksheet WS1 Which bone is broken?
- Task sheet A14.1 TS2
- (optional) *Collins BTEC First Applied Science Interactive Book* Interactive presentations 'Brain damage', 'Scanning techniques'

Real-life links

It may be possible to engage a radiologist to speak, or to arrange a visit to an imaging department in a local hospital.

Setting the scene

Present students with the skeleton. Ask them if they know the names of any bones. Ensure they have a basic knowledge of the skeleton before the lesson begins.

Class activity

Explain the principles of an X-ray image. In simple terms:

- X-rays are a type of electromagnetic wave.
- They pass easily through flesh but not through bone.
- When they hit a special white plate it turns dark.
- As the X-rays don't pass through bone, a bright 'shadow' or outline of the bone is made on the plate.
- This is a negative image and can be used to diagnose fractures and breaks.

Locate X-rays on a chart of the electromagnetic spectrum. Discuss their position, frequency and wavelength in relation to other electromagnetic waves (Student Book page 301).

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P1 M1 D1

Worksheet WS1 Which bone is broken? can be used to show what an X-ray picture looks like; students can try to identify the bones that have been broken. (Image 1: broken arm (humerus); Image 2: broken collar bone (clavicle); Image 3: broken shin bone (fibula).)

You could ask students to suggest what an X-ray cannot show, and why. Identify the limitations of X-rays as a diagnostic tool. Encourage students to think about the difference between bone and surrounding soft tissue. Often if a broken bone is not visible on an X-ray image, there is a default diagnosis of soft tissue damage, such as a sprain, rip or tear of the muscles, ligaments or tendons. The X-ray does not show this; nor does it show scar tissue or inflammation.

Discuss with the students other kinds of diagnostic imaging techniques. Use the Student Book page 300 as a stimulus for a research task. You could use the book's scenario of Sara falling off her bike and the students, as student doctors, trailing her through the tests she might have, e.g. an X-ray is inconclusive; a CT scan provides more detail and confirms no bones are broken; an MRI scan reveals bad inflammation around the shoulder joint.

Assignment activity

In this lesson students will be working on Task 1 (part 3), Task 2 and Task 3 of Assignment 14.1.

- For Task 1 (P1), part 3, students should present their research findings of X-ray images, CT scans, MRI scans and endoscopy images, and explain what they show and how they aid diagnoses. They could make a display on paper or produce a slide show using ICT facilities.
- For Task 2 (M1), students need to describe the scientific principles of each of these imaging techniques, using **Task sheet A14.1 TS2**.
- In preparation for Task 3 (D1), students should make some notes evaluating how useful the different imaging techniques are as diagnostic tools.

Teacher guidance

It would be useful to have real X-ray photos available so that students can handle them and see first-hand what they are like. If possible, relate what they are looking at to models/diagrams.

As an optional extra task, students could research what it is like to work in a radiography department, and possibly write an account of a day in the life of a radiographer. This can lead into useful discussion.

Although the specification does not require study of ultrasound imaging, this is worth mentioning.

Delivering PLTS and functional skills

PLTS Independent enquirers – using research skills to obtain the information needed during investigations
Effective participators – adding ideas at discussion stages

Functional skills ICT – using Internet sources to research information
Writing – communicating information, ideas and opinions effectively

Useful websites

Accessible information about each of the imaging techniques:

<http://www.nhs.uk/conditions/x-ray/Pages/Introduction.aspx>

<http://www.nhs.uk/conditions/ct-scan/Pages/Introduction.aspx>

<http://www.nhs.uk/conditions/mri-scan/Pages/Introduction.aspx>




<http://www.nhs.uk/conditions/endoscopy/Pages/Introduction.aspx>

<http://www.nhs.uk/conditions/ultrasound-scan/Pages/Introduction.aspx>

Preparing for
Assignment
14.1

Worksheet 1

Which bone is broken?

<p>1</p> 	<p>Description</p> <p>FOR EVALUATION ONLY</p>
<p>2</p> 	<p>Description</p> <p>FOR EVALUATION ONLY</p>
<p>3</p> 	<p>Description</p> <p>FOR EVALUATION ONLY</p>



P1
(part)

Help Sheet 1.2

Growing microbes

Before you start

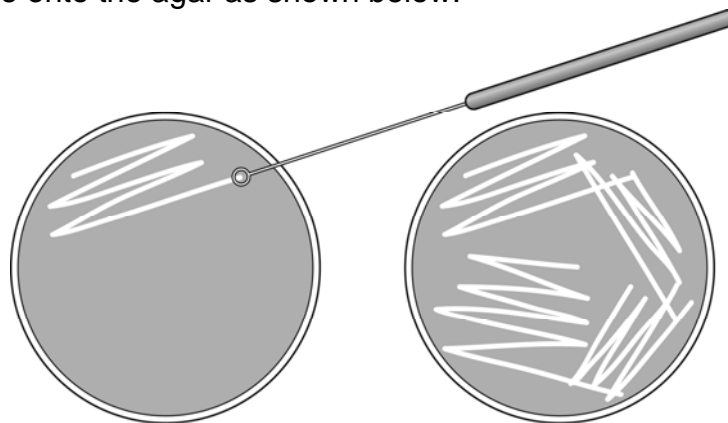
To grow microbes you need to use aseptic techniques. It is important to control the risk to yourselves and others.

The area you work in must be clean and disinfected. Disinfect the area with a disinfectant solution and wash your hands. Cover cuts with waterproof plasters.

You will need: samples of water, agar plates, a wire loop, a Bunsen burner, sticky tape. The agar contains food for the microbes.

What to do

- 1 Label the bottom of the plate with:
 - the name of someone in your group
 - today's date
 - the sample of water used.
- 2 Move the plate and wire loop near to a burning Bunsen burner. Put the end of the wire loop in the flame until it turns red hot. This will sterilise it (kill any existing bacteria).
- 3 Don't let the end of the wire loop touch anything. Wait for it to cool.
- 4 When the wire loop has cooled, dip it into the sample of water that you are testing. Quickly lift the lid of the plate and spread the water sample onto the agar as shown below.



- 5 Put the lid back on the plate and secure it using four short pieces of tape. **Do not seal the plate all around the lid** because this will encourage the growth of potentially harmful bacteria.
- 6 Give your plate to your teacher for incubation and **wash your hands**.

