Supporting Technical Education Teaching:

**Curriculum Resources**

Teaching Guide

Topic: Good scientific and clinical practice

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| --- | --- |
| **Route** | Health & Science |
| **Qualification** | T level Technical Qualification in Health (Level 3) (Delivered by NCFE) [www.ncfe.org.uk/qualification-search/qualification-detail/t-level-technical-qualification-in-health-level-3-delivered-by-ncfe-1644](http://www.ncfe.org.uk/qualification-search/qualification-detail/t-level-technical-qualification-in-health-level-3-delivered-by-ncfe-1644)  |
| **Topic** | Good scientific and clinical practice |
| **Specification coverage** | **A7: Good scientific and clinical practice**A7.1, A7.2, A7.3, A7.4, A7.5, A7.6, A7.7, A7.8, A7.9, A7.10 |

This resource is part of a series of materials to support technical education teaching. The approach to developing the materials draws from research led by Professor Kevin Orr that sets out a model for understanding of technical education pedagogy.

The curriculum development begins with the knowledge that students are working to learn and apply. Teachers draw from their subject and industry expertise, and their knowledge of their students, to make decisions about the core concepts the curriculum will focus on; how they will sequence these concepts; and the activities that are selected to support students’ learning. The decisions behind the resources suggested in this topic are the result of choices made by the curriculum development team, which will be reviewed and improved by teachers’ decision-making and ongoing reflection in their own circumstances.

The materials also seek to support teachers in bringing classroom and industry closer together, by providing assets that draw from authentic industry materials, and using opportunities to capture current workplace practices that can be shared with students.



HEALTH AND SAFETY

This topic has been safety checked but not trialled by CLEAPSS.

It is assumed that activities outlined in this Teaching Guide will be undertaken in suitable facilities or work areas and that good practices, appropriate use policies and procedures will be observed. Teachers should consult their employers’ risk assessments before use and consider whether any modification is necessary for the particular circumstances of their own class/institution.

For practical activities, the Technical Education Networks programme has tried to ensure that experiments are healthy and safe to use in colleges and schools, and that any recognised hazards have been indicated together with appropriate control measures (safety precautions). It is assumed that experiments and activities will be undertaken in suitable laboratories or work areas and that good laboratory practices will be observed. To access the CLEAPSS materials in this suite, institutions will need to be a member of CLEAPSS. Further details are available at [www.cleapss.org.uk](http://www.cleapss.org.uk) If necessary, CLEAPSS members can obtain further advice by contacting the Helpline by email at science@cleapss.org.uk or on 01895 251496.

Acknowledgments

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Introduction

This document for teachers outlines the topic area covered, and the approach to using the suite of resources and assets for each lesson.

# Topic purpose

This topic introduces the key principles of good scientific and clinical practice, including standard operation procedures (SOPs) and the importance of following these correctly. It then covers the necessity of calibrating equipment and being appropriately trained to use equipment correctly and concludes by looking at some of the potential consequences of not storing and using products correctly, such as cross-contamination.

This topic could be taught at the beginning of the course as it introduces practical work students may undertake in their industry placements. It also evolves understanding of the importance of a SOP, which will be revisited by students throughout the course and may be discussed in industry placements.

There are five lessons, and each is assumed to be 1.5 hours. You may want to adapt the suggested sequencing of concepts and activities as appropriate for your students and circumstances. The lessons are broken down to provide teacher flexibility on the depth covered in the activities; lessons can also be split over multiple shorter lessons if required.

There are also opportunities to build several essential skills that are developed during the course and general competencies for maths, English and digital.

The content in the lessons can be reinforced throughout the course to support students’ learning. For example, when discussing a forthcoming industry placement, one objective could be for students to look for a particular SOP in the workplace (this could be one they have used in a lesson or on a similar theme) and discuss the importance of following this SOP with their supervisor. This learning can then be noted in their logbook. For example: [www.support.tlevels.gov.uk/hc/en-gb/articles/360015345420-Industry-placement-logbook-for-students](https://support.tlevels.gov.uk/hc/en-gb/articles/360015345420-Industry-placement-logbook-for-students)

# Industry importance

It is essential to work safely in the workplace within the healthcare and science sectors. It is therefore necessary to have a clear understanding of the benefits of SOPs, how to follow one, and the potential consequences of an organisation not having SOPs in place, or not following them correctly.

When carrying out any practical procedure or investigation, it is essential that SOPs are followed to make sure the employee and other stakeholders are kept safe, and the procedures achieve accurate results. Examples include:

* formulating medicinal drugs (e.g. Pharmacist)
* using a piece of equipment such as electron microscope (e.g. Medical Research Scientist)
* completing maintenance tasks to devices or machinery, such as calibrating a balance (Science Technician)
* storing or transporting chemical substances which may be toxic, corrosive or damaging to the environment (e.g. Engineer)
* growing a sample of bacteria (e.g. Microbiologist).

“Safety is paramount to every aspect of healthcare; in everything we do. We must be accountable as individuals and ensure we are adhering to processes and procedures to ensure safety of ourselves, colleagues, and patients, and have the courage to speak up when something isn’t right.”

**Phoebe Roberts, Delivery Manager, Solent NHS Trust**

# Industry links

* CLEAPSS provides guidance on using equipment and chemicals safely: [www.science.cleapss.org.uk](http://www.science.cleapss.org.uk)
* The Health and Safety Executive provides risk assessments and guidance documents on the control of substances hazardous to health (COSHH): [www.hse.gov.uk/coshh](http://www.hse.gov.uk/coshh)
* NHS England has SOP requirements for risk assessments such as coronavirus. Each Trust will have their own SOPs: [www.england.nhs.uk/coronavirus/primary-care/general-practice/standard-operating-procedures](http://www.england.nhs.uk/coronavirus/primary-care/general-practice/standard-operating-procedures)
* NHS England has technical guidance on the national standards for cleanliness for all organisations to adhere to: [www.england.nhs.uk/estates/national-standards-of-healthcare-cleanliness-2021/](http://www.england.nhs.uk/estates/national-standards-of-healthcare-cleanliness-2021/)
* The National School of Healthcare Science is part of NHS England. This Academy for Healthcare Science document sets out the principles and values on which good practice is founded: <https://nshcs.hee.nhs.uk/publications/academy-for-healthcare-science-good-scientific-practice/>

# Prior learning

Students may be familiar with the following Science concepts at Key Stage 4 and may have been introduced to risk assessments. However, most students are unlikely to have seen a SOP unless they have been shown these on a work experience placement or within part-time working roles.

Students may have carried out a range of practical work in Key Stage 3 and Key Stage 4 Science, as well as in Key Stage 3 Design and Technology. Some students may have experience of a more technical nature from their Key Stage 4 curriculum, such as from a Level 2 engineering qualification. Students should be familiar with the need to work with care and precision to achieve specified goals, but students’ experiences of practical work will be varied depending on their prior experiences.

# Accessibility

The teaching materials have been designed to provide teachers with a flexible framework, including different approaches to activities, suggested consolidation activities to further embed knowledge, and adaptable study questions to assess learning. As with all resources, teachers will wish to consider the specific needs of their students when using the materials, including Special Educational Needs and Disabilities (SEND).

Learning outcomes and specification coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Lesson** | **Learning outcomes** | **Specification coverage** | **Skills and General competencies** | **Links to other content in the specification** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **1** | Students will be able to:* Describe what a standard operating procedure (SOP) is and why their use is essential.
* State the key principles of good practice in scientific and clinical settings.
* Discuss potential consequences of not following good practice in scientific and clinical settings.
 | **A7.1** The principles of good practice in scientific and clinical settings:• using standard operating procedures (SOPs) • effectively managing calibration and maintenance of equipment and work areas • effectively managing stock • appropriately storing products, materials and equipment**A7.2** What a SOP is: • a set of sequential steps or instructions designed to standardise the approach to a process or action**A7.3** Why it is important for everyone to follow SOPs: • maintaining health and safety • enabling consistency of approach • meeting any legal or organisational requirements • upholding professional standards • demonstrating compliance for audit purposes | Skills**CS3.2** Undertake collaborative work demonstrating an ability to follow standard operating procedure specific to the environment they are working inGeneral competenciesEnglish:**GEC4** Summarise information/ideas**GEC6** Take part in/lead discussions | **A1.1** The purpose of organisational policies and procedures in the Health and Science sector**A1.2** The importance of adhering to quality standards, quality management and audit processes within the Health and Science sector**A1.4** The purpose of following professional codes of conduct |
| **2** | Students will be able to:* Follow a SOP to take the temperature of a service user.
* Perform a search to locate a specific SOP for a given activity.
* Identify missing statutory requirements on a SOP.
 | **A7.2** What a SOP is: • a set of sequential steps or instructions designed to standardise the approach to a process or action **A7.3** Why it is important for everyone to follow SOPs: • maintaining health and safety • enabling consistency of approach • meeting any legal or organisational requirements • upholding professional standards • demonstrating compliance for audit purposes **A7.4** How to access SOPs for a given activity: • carrying out detailed index searches (for example via intranet/manual) • completing detailed staff induction and ongoing training • ensuring the SOP is the most up-to-date version • ensuring all relevant documentation has been completed and signed | Skills**CS3.2** Undertake collaborative work demonstrating an ability to follow standard operating procedure specific to the environment they are working in.General competenciesEnglish:**GEC5** Synthesise information**GEC6** Take part in/lead discussionsMaths:**GMC1** Measuring with precision**GMC6** Understanding data and riskDigital:**GDC1** Use digital technology and media effectively | **B1.29** The normal expected ranges for physiological measurements and the factors which may affect these measurements. |
| **3** | Students will be able to:* Explain why it is important to calibrate and test equipment, so it is fit for use.
* Describe the potential impacts of not maintaining cleaning and servicing equipment.
* Outline how to escalate concerns over faulty or unsuitable equipment.
 | **A7.6** The potential impacts of not maintaining, cleaning and servicing equipment: • risks to health and safety: increased risk of injury, spread of infection • invalid results: contamination or cross-contamination (for example environmental, samples, reagents) • reduced function of equipment: decreased lifespan of equipment, increased cost and timescales (for example equipment needing repair or being out of service) **A7.7** Why it is important to calibrate and test equipment to ensure it is fit for use: • ensuring accuracy of measurements • prolonging the life of equipment • meeting legal requirements**A7.8** How to escalate concerns if equipment is not correctly calibrated/unsuitable for intended use: • taking the equipment out of action • labelling the equipment as being out of use, if appropriate • reporting concerns to the relevant person, in line with organisational policies and procedures • recording concerns according to organisational procedures | Skills**CS3.2:** Undertake collaborative work**CS4.1:** Undertake reflective practice and record reflections and experiences**CS6.1:** Present findings in a range of formats: using digital formats (video)General competenciesEnglish:**GEC5** Synthesise information**GEC6** Take part in/lead discussionsMaths:**GMC1** Measuring with precision**GMC2** Estimating, calculating and error spotting | **A1.1** The purpose of organisational policies and procedures in the Health and Science sector**A1.2** The importance of adhering to quality standards, quality management and audit processes within the Health and Science sector |
| **4** | Students will be able to:* Describe the difference between contamination and cross-contamination.
* Explain the importance of regular cleaning of work areas and equipment.
* Analyse some potential consequences of incorrectly storing, cleaning and maintaining products, materials and equipment, and work areas.
 | **A7.5** The potential impacts of not regularly cleaning and preparing work areas for use: • risks to health and safety spread of infection o production of toxic/dangerous by-products • invalid results: contamination or cross-contamination (for example environmental, samples, reagents, DNA) • inefficient working practices: leads to increased costs and timescales • damage to equipment: leads to increased costs and timescales **A7.6** The potential impacts of not maintaining, cleaning and servicing equipment: • risks to health and safety: increased risk of injury, spread of infection • invalid results: contamination or cross-contamination (for example environmental, samples, reagents) • reduced function of equipment: decreased lifespan of equipment, increased cost and timescales (for example equipment needing repair or being out of service) **A7.10** The potential consequences of incorrectly storing products, materials and equipment: • cross-contamination • breakdown of limited stability products • products exceeding expiry dates • loss of samples or degradation of reagents not stored at the correct temperature (-20°C, -4°C, 4°C or room temperature) • risks to health and safety (for example spread of infection, release of dangerous chemicals or heavy items not stored at correct height) • stock is difficult to locate • financial loss | Skills**CS6.1** Present their project findings in a range of formats**CS6.3** Apply considerations for adapting presentation style when presenting to a range of stakeholdersGeneral competenciesEnglish:**GEC1** Convey technical information to different audiences**GEC2** Present information and ideas**GEC3** Create texts for different purposes and audiencesDigital:**GDC1** Use digital technology and media effectively | **A10.1** The techniques for infection control and why they’re important in stopping the spread of infection.**A10.2** The importance of good handwashing techniques and personal hygiene and how to practice this in relation to infection control. |
| **5** | Students will be able to:* Discuss reasons why it is important to order and manage stock effectively.
* Explain some potential impacts of not storing materials and chemicals properly.
 | **A7.9** Why it is important to order and manage stock: • ensuring sufficient supply of required consumables and materials • ensuring that materials are used before their expiry date • reducing the costs of excess stock • improving efficiency • improving productivity • ensure safety of stock (bottles aren’t damaged/degraded) **A7.10** The potential consequences of incorrectly storing products, materials and equipment: • cross-contamination • breakdown of limited stability products • products exceeding expiry dates • loss of samples or degradation of reagents not stored at the correct temperature (-20°C, -4°C, 4°C or room temperature) • risks to health and safety (for example spread of infection, release of dangerous chemicals or heavy items not stored at correct height) • stock is difficult to locate • financial loss | Skills**CS6.1** Present their project findings in a range of formats**CS6.3** Apply considerations for adapting presentation style when presenting to a range of stakeholdersGeneral competenciesEnglish:**GEC2** Present information and ideas**GEC4** Summarise information/ideas**GEC6** Take part in/lead discussionsMaths:**GMC2** Estimating, calculating and error spotting**GMC8** Communicating using mathematics**GMC10** Optimising work processesDigital:**GDC3** Communicate and collaborate**GDC4** Process and analyse numerical data |  |

Lesson guidance

# Lesson 1: What is a standard operating procedure (SOP)? (A7.1, A7.2, A7.3)

This lesson introduces students to some of the key principles of good practice in scientific and clinical settings, the purpose of a SOP and what the consequences might be of not following appropriately. Then a range of different SOPs in healthcare are covered including the principles of good practice in clinical settings.

## Preparation

|  |  |
| --- | --- |
| **Resources provided** | * L1 Slide deck
* Activity 2 – L1 Principles Worksheet
* Follow-up/consolidation – L1 Consolidation Worksheet
 |
| **Equipment needed** | * Follow-up/consolidation – Examples of healthcare SOPS
 |
| **Safety factors** | None |
| **CLEAPSS references** | None |
| **Prior learning** | * Students are unlikely to have covered a SOP (unless via a prior work experience placement or in part-time jobs). However, students may be more familiar with following appropriate procedures from Key Stage 4 and may have been introduced to risk assessments.
* Students may have been introduced to a range of organisational policies and procedures in the Health and Science sectors in A1 Working within the health and science sectors, if delivered before this topic (<https://www.technicaleducationnetworks.org.uk/health-science/working-in-the-health-and-science-sectors/>).
 |
| **Common misconceptions** | * Standard operating procedures (SOPs) are not mandatory.
* Standard operating procedures (SOPs) only exist for machinery or when using equipment.
* The sole purpose of SOPs is to mitigate risk.
 |
| **Accessibility** | * Seek to ensure wide representation for any visiting speakers and case studies used.
* You may wish to group students in groups of different abilities to support each other when working on group tasks.
 |

## Activity guide

|  |  |
| --- | --- |
| **Introduction**SUGGESTED TIME: 15 minutesRESOURCES: * L1 Slide deck – slides 2–4
 | * The slide deck summarises what will be covered in the lesson. You may wish to use this with students.
* Start the lesson by introducing the lesson objectives using the slide deck.
* Share the example of a SOP for measuring blood pressure with the students, by either linking from the slide deck or printing copies for groups to share.
* Ask students to read the SOP and, in groups, discuss their initial ideas about what a SOP is, and why they think these are used:[www.clinicalguidelines.scot.nhs.uk/nhsggc-guidelines/nhsggc-guidelines/kidney-diseases/sop-manual-doppler-blood-pressure/](file:///Users/samanthajackman/Desktop/Desktop%20-%20iMac/Gatsby%20TEN%20T%20Level%20Health%20and%20Science/Topic%203/09%20Final%20proofs%20for%20Director%20review_Health/www.clinicalguidelines.scot.nhs.uk/nhsggc-guidelines/nhsggc-guidelines/kidney-diseases/sop-manual-doppler-blood-pressure)
* After listening to their ideas, use the slide deck to explain what a SOP is and why it is important for everyone to follow SOPs.
* Explain that SOPs are used to standardise the approach to a process or action. This is especially important when many disciplines are working together such as multi-disciplinary working in the NHS. The blood pressure example highlights the purpose of a SOP for enabling consistency of approach.
 |
| **Activity 1: Purpose of SOPs**SUGGESTED TIME: 20–25 minutesRESOURCES: * L1 Slide deck – slides 5–9
 | * This activity introduces students in more detail to the purposes of a SOP.
* Share some more examples of real SOPs with students, by either sharing the slide deck with students so they can click on the links or print some copies of the SOPs. There are ten examples on the slide deck to choose from, so you may wish to split the class into groups to look at different examples and share their findings. If useful, you could provide physical copies of relevant SOPs used in your institution for practicals not yet undertaken.
* Ask each group to identify what the image shows, then read the SOP by clicking on the image.
* When introducing the SOPs it is worth remembering that the general concept and significance of a SOP is very important for students to understand as well as specific examples.
* When looking at the SOPS students should think about:
	+ What is the purpose of the SOP?
	+ Why it is important for everyone to follow the SOP?
	+ Which of the key features, discussed previously, can they find in the SOPs?
	+ Do SOPs contain any other type of information not previously discussed?
* You may choose to look at all the images or select specific ones for your students. Possible points of discussion for the SOPs in the slide deck:
	+ Image 1 – Using an autoclave. Purpose of SOP: Enable consistency of approach/maintain health and safety.
		- Autoclaves are important in infection control because they sterilise medical equipment using heat and pressure to kill harmful microorganisms. Incorrect use could cause personal injury, or the contents not being sterilised, which could expose healthcare workers to contaminated blood and other bodily fluids
	+ Image 2 – Blood storage facility. Purpose of SOP: Meet any legal or organisational requirements/Demonstrate compliance for audit purposes.
		- Not following a SOP could lead to incorrect labelling, storage at the wrong temperature or blood being kept that is past its expiration date. All of these could be fatal for patients.
	+ Image 3 – Using a portable hoist. Purpose of SOP: Maintain health and safety.
		- Incorrect use could lead to injury to the patient, the operator or both.
	+ Image 4 – Manual handling training. Purpose of SOP: Maintain health and safety.
		- Manual handling training teaches how to lift heavy objects correctly. The wrong technique could cause injury to themselves or others.
	+ Image 5 – Biohazard disposal. Purpose of SOP: Demonstrate compliance for audit purposes.
		- A biohazard is a biological substance that can cause harm to humans and the environment. Correct disposal is needed to mitigate this threat.
		- Students should search online for an example of a SOP for tissue sample disposal to demonstrate compliance for audit purposes. They should compare their SOP to what they have learned so far about SOPs. Review the SOPs that students find online and talk through the content of them.
	+ Image 6 – Chemotherapy drugs. Purpose of SOP: Meet any legal or organisation requirements/maintain health and safety.
		- Chemotherapy drugs are very powerful and can be very harmful to health if taken by someone other than a cancer patient.
	+ Image 7 – Making a bottle of formula for a baby. Purpose of SOP: Enable consistency of approach/maintain health and safety.
		- Incorrectly made baby formula may contain microbes or be contaminated and cause health issues to babies.
	+ Image 8 – Making and cleaning hospital beds. Purpose of SOP: Uphold industry standards.
		- Hospital beds need to be cleaned to prevent the transmission of disease.
	+ Image 9 – Wearing uniforms. Purpose of SOP: Uphold industry standards.
		- Following a SOP for uniform wearing is important for good practice and industry standards. Wearing and washing uniforms correctly is important legally for health and safety and employment equality, see section 4.1.
	+ Image 10 – Using an oximeter. Purpose of SOP: Enable consistency of approach.
		- The equipment is an oximeter which is used to measure blood oxygen levels to check they are at a safe level. Not following a SOP could lead to the equipment not being used correctly and giving an inaccurate result, which could put the patient in danger.
 |
| **Activity 2: Principles of good practice**Suggested time: 20 minutesResources: * L1 Slide deck – slides 10–17
* L1 Activity 2 Principles Worksheet
 | * This activity introduces students to the principles of good practice in scientific and clinical settings.
* Use the visual prompts on the slide deck (slides 10–15) to introduce the principles of good practice in scientific and clinical settings. On each slide, the students should try to come up with the principle being introduced and use this to produce a list of key features of good practice. Click on the question mark icon to reveal the principle being shown.
* Use slide 16 to summarise the five key principles of good practice.
* You may also wish to introduce ‘reporting concerns or ideas for improvement’ as another feature of good practice, such as ways to do things faster or cheaper. Although this is not specifically stated in the specification, it is vital that students/employees are engaged in the improvement process. They may be the first to identify problems and potential improvements, and this reporting should be encouraged as good practice. Fundamentally, everyone in an organisation should be seen as having an important role to play.
* Show students the case studies on slide 17 (case study 1 ‘A day in the life of an NHS nurse’ and case study 2 ‘A day in the life of an ambulance crew’). As the students watch each video, they should identify principles of good practice such as checking the fridges as an example of storing materials and chemicals appropriately and wiping over equipment with disinfectant wipes as an example of maintaining work areas. Students can use the Principles Worksheet tables to add the specific examples identified, allocating them to the correct key principle column.
* Students may also wish to search for similar videos in careers they are interested in or discuss experiences they have had in their industry placement.
 |
| **Activity 3: What could go wrong?**Suggested time: 15–20 minutesResources: * L1 Slide deck – slides 18–27
 | * This activity is designed to support students to think about the potential consequences of not following the principles of good practice in scientific and clinical settings.
* Use the slide deck (slides 18–25) to introduce a number of different scenarios where good practice has not been followed. For each scenario, students could consider what could go wrong and how they could rectify the situation/prevent it having occurred.
* Slides 26–27 provide some real-life examples of what happened when good practice was not followed in two industry settings.
* Suggested points for discussion:
	+ Scenario 1 – Lost keys: Report to a manager immediately to ensure that the contents of the medicine cabinet are not stolen or taken and used inappropriately. This scenario is about appropriately storing products, materials and equipment. It could also point to the need for a SOP on the storage of radioactive materials (such as radioactive tracers used in the detection and treatment of cancer).
	+ Scenario 2 – Lunch in the medicine refrigerator: This is not acceptable. There is the possibility of contamination from medicine spillages and subsequent problems due to this. There is also the danger of cross-contamination of the medicines from the packed lunch. This scenario is about appropriately storing products, materials and equipment.
	+ Scenario 3 – The medicine refrigerator was switched off: Do not switch it on straight away. You should report it immediately. The temperature of the fridge should be taken to see whether there may be damage to temperature-sensitive drugs. This scenario is about appropriately storing products, materials and equipment and about potential consequences of incorrect storage. In particular, it addresses the breakdown of limited stability products and the loss of samples or degradation of reagents not stored at the correct temperature.
	+ Scenario 4 – Missing drugs: This should be reported immediately to a senior colleague before it was checked. No accusations should be made, simply reporting factually what was seen.
	+ Scenario 5 – Altered prescription: This should not, under any circumstances, be given to the patient. Pass this to a senior colleague for investigation. The wrong drugs could be lethal.
	+ Scenario 6 – Use of the autoclave: You must follow the SOP irrespective of what you are asked to do. The SOP is a legal document, and you will be liable for the consequences if you do not follow it. You must seek advice from a senior colleague as what to do.
	+ Scenario 7 – An unidentifiable spillage: The spillage should be treated as a potentially hazardous chemical. A SOP must be followed to safely clear up the spill.
* This could lead onto a discussion about how much personal responsibility a student has whilst on an industry placement, for example, to report incidents such as these to their supervisor (and how this is likely to increase as they progress through the course and into their careers). Discussion of whistleblowing policies could be included, and links made to other relevant organisational policies and industry codes of conduct. This role-modelling could support students to develop into good practitioners for the future.
* Discuss why people may not follow good practice in the workplace even when they have been trained how to. The discussion should focus on human factors, such as the workplace may be busy, noisy, or cramped; people are trying to juggle many things like work projects and/or homelife; there may be time pressures, fatigue or a lack of resources.
 |
| **Plenary**Suggested time: 10 minutesResources: * L1 Slide deck – slides 28–33
 | * In pairs, give students two minutes to tell their partner what a SOP is, and why they are so important in a range of settings.
* Can their partner add any further detail to their description or is there anything they missed?
* Alternatively, you can use the multiple-choice questions on the slides to consolidate the learning from the lesson.
* Revisit the learning objectives to close the lesson on slide 33.
* Discuss the consolidation activity below (where appropriate).
 |
| **Follow-up/ consolidation**Suggested time: 30–45 minutesResources: * Examples of healthcare SOPs
* Consolidation Worksheet
 | * In healthcare, SOPs can be very large documents as many do not cover practical applications but share information on how a service is run and standardised.
* You may wish to provide students with one of these documents, which they could then critique elements of (What is done well? What could be improved?).
* Alternatively, students could write a SOP for using a piece of standard laboratory equipment for which they are confident in using, such as a practical procedure they have recently carried out. They can use the template on the worksheet.
 |

#

# Lesson 2: Using a SOP (A7.2, A7.3, A7.4)

This lesson provides further opportunities for students to become familiar with working with SOPS within the Health and Science industries. They begin by following a SOP to accurately take the temperature of a service user (patient) before carrying out their own searches for specific SOPs. They also analyse a SOP that is missing key information.

## Preparation

|  |  |
| --- | --- |
| Resources provided | * L2 Slide deck
* Activity 1 – L2 Activity 1 Worksheet
* Activity 2 – L2 Activity 1 Worksheet
* Plenary – L2 Plenary Worksheet
* Follow up/consolidation – L2 Consolidation Worksheet
 |
| Equipment needed | Each student will need:* Tympanic thermometer and probe cover
* Surgical gloves
* Surgical mask
* Isopropyl (rubbing) alcohol/soap
* Eye protection
* Apron
 |
| Safety factors | Teachers are required to carry out their own risk assessments for these activities including but not limited to:* A new disposable probe cover must be placed on the thermometer between each use.
 |
| CLEAPSS references | None |
| Prior learning | * The key principles of good practice in scientific and clinical settings (Lesson 1).
* What is a SOP and why are they important? (Lesson 1).
 |
| Common misconceptions | * SOPs are not mandatory.
* SOPs only exist for machinery or when using equipment.
* The sole purpose of SOPs is to mitigate risk.
 |
| Accessibility | * Seek to ensure wide representation for any visiting speakers and case studies used.
* You may wish to use pair work to help students of different abilities to support one another.
* You may wish to use different thermometers depending on your students' needs, for example one that provides an audio reading.
 |

## Activity guide

|  |  |
| --- | --- |
| **Introduction**SUGGESTED TIME: 5 minutesRESOURCES: * L2 Slide deck – slides 2–4
 | * The slide deck summarises what will be covered in the lesson. You may wish to use this with students.
* Start by introducing the lesson objectives using the slide deck.
* This lesson starter checks that students can recall the principles of good practice in scientific and clinical settings.
* Ask students to list the five key principles of good practice in scientific and clinical settings (covered in Lesson 1).
 |
| **Activity 1: Following a SOP**Suggested time: 20–25 minutesResources: * L2 Slide deck – slide 5
* L2 Activity 1 Worksheet
* Tympanic thermometer
* Disposable probe covers
* Surgical gloves
* Surgical masks
* Paper towel
* Eye protection
* Apron
* Isopropyl (rubbing) alcohol
* NHS handwashing procedure (A1 Working within the health and science sectors - Lesson 2, Audits, ethical practices and professional codes of conduct)
 | * This activity is designed to test students’ ability to follow a SOP and illustrate why it is essential that everyone follows a SOP.
* Students follow a SOP on the worksheet (without any further guidance) to take the temperature of a service user (patient). Before carrying out the task, you may wish to introduce the different types of thermometers used in healthcare, their purpose and how the range of temperatures considered normal vary depending on the piece of equipment used.
* Students will also need access to the NHS handwashing procedure which can be found on the Infection Prevention Control website here: [www.infectionpreventioncontrol.co.uk/resources/hand-hygiene-compliance-monthly-audit-tool-for-care-homes/](http://www.infectionpreventioncontrol.co.uk/resources/hand-hygiene-compliance-monthly-audit-tool-for-care-homes/%20)
* Following the activity, discuss with students: Why is it important to follow a chronological process? What could they improve if they performed the procedure again? Why is it essential that everyone follows a SOP?
* A chronological process means all steps are followed in the same order regardless of the operative completing the procedure, meaning any results from the SOP are comparative with others. It is essential to have standard operating procedures to produce accurate and reliable results, improve productivity, ensure safety, and reduce risk.
* Discuss with students that, should the recorded temperature be outside the normal range, they must report this to the appropriate supervisor and follow the appropriate protocol. This may be, but not limited to, their tutor if in college, or mentor when on an industry placement.
* If using a tympanic thermometer students may now be aware of the steps they should follow to gain an accurate result and to prevent themselves and the service user from potential harm. Use the SOP to introduce the importance of training on procedures and pieces of equipment (and regular ‘refresher’ training).
 |
| **Activity 2: Writing a SOP for a physiological measurement**Suggested time: 20–25 minutesResources: * L2 Slide deck – slide 6
* L2 Activity 2 Worksheet: SOP template
 | * This activity is designed to enable students to be familiar with how to perform a range of physiological measurements.
* Divide the class into small groups.
* Ask each group to research and then write a SOP for collecting another physiological measurement. For example, blood pressure, heart rate, respiratory rate or oxygen saturation levels. If time is restricted, students should focus on completing the procedure section of the template provided.
* Following the activity, students could review and critique other groups’ SOPs and any key feedback implemented.
* Students may choose to share their SOPs and add these to revision notes.
 |
| **Activity 3: Finding and comparing SOPs**Suggested time: 10–15 minutesResources: * L2 Slide deck – slides 7–9
 | * This activity is designed to enable students to perform a search to locate a specific SOP for a task that needs to be performed. It also provides students with a further opportunity to see the diverse range of SOPs that exist within industry.
* Discuss with students where SOPs are located in your institution and the different places they may be found in a workplace. For example, hard copies given to an employee; located in a central store; printed off and kept in relevant locations such as, the kitchen or next to a piece of machinery or on an intranet.
* Students carry out an online search to find specific SOPs for a range of given scenarios presented on the slide and decide what key points should be in the SOP. You may wish to add more of your own examples or ask students if they have encountered different SOPs on their industry placement.
* Examples of suitable SOPs to search for:
	+ Scenario 1 – Preparing a meal in a school kitchen: A SOP that outlines procedures to keep catering staff safe when working in a kitchen.
	+ Scenario 2 – Moving someone with limited mobility: A SOP that outlines how to use a hoist to move a patient.
	+ Scenario 3 – New strain of COVID: A SOP that outlines the correct procedure to use a COVID-19 lateral flow test.
* Depending on the time available and the size of the group, you may wish to split the class into small groups to look at one scenario each. Groups can then feed back to each other with their findings.
* Use the slide deck to go through how to access SOPs.
* Once they’ve looked up the SOP, students consider:
	+ How many of the key points had you already suggested?
	+ Identify which points in the SOP are critical? (i.e. could have disastrous outcomes if incorrectly administered). Did you include these in your approach?
* Students can then share their findings in small groups – did all the SOPs look the same? Did they contain the same essential features?
 |
| **Plenary**Suggested time: 10 minutesResources: * L2 Slide deck – slides 10–14
* L2 Plenary Worksheet
 | * Use slide 9 to recap what is required in a good SOP.
* Ask students to imagine they are working in healthcare and are asked to take the temperature of a patient. Ask pairs to discuss what they would do in order to access the SOP of this procedure. Listen to their answers – they may suggest using an intranet/online training manual.
* Provide students with the worksheet, which is a SOP on taking body temperature.
* Students read through the document and highlight any mistakes:
	+ The SOP has not been reviewed or authorised.
	+ The users have not dated when they read the policy.
	+ The scope and the purpose have been muddled up and placed in the wrong boxes.
	+ The time to wait after eating is missing in the procedure.
	+ Final step in the procedure is missing, where the healthcare professional should remove their PPE.
* Discuss the mistakes and any potential problems that could arise.
* Revisit the learning objectives to close the lesson on slide 14.
* Discuss the consolidation activity below (where appropriate).
 |
| **Follow-up/ consolidation**Suggested time: 30–45 minutesResources: * L2 Consolidation Worksheet
 | * While on placement, students could collect examples of SOPs they have used. When returning to their provider, students could then compare the different SOPs they have met including their purpose and format.
* Students search for two SOPs online for the same piece of equipment or procedure, and then compare them using the activity sheet provided. The activity describes looking for a SOP for how to use a light microscope. A suitable example is here: <https://learn.lboro.ac.uk/pluginfile.php/1128655/mod_folder/content/0/SOP022%20-%20Use%20and%20Maintenance%20of%20the%20Olympus%20CKX41%20Inverted%20Microscopev1%20%282%29.pdf>
* This task could be amended for any piece of laboratory equipment or procedure.
 |

#

# Lesson 3: Use of equipment (A7.6, A7.7, A7.8)

This lesson introduces students to the importance of calibrating equipment and knowing how to test equipment correctly to ensure it is fit for purpose. The students are also presented with ways in which they should escalate any concerns over faulty or unsuitable equipment whilst on placement (and in their future career).

## Preparation

|  |  |
| --- | --- |
| Resources provided | * L3 Slide deck
* Activity 3 – L3 Activity 3 Worksheet
 |
| Equipment needed | * Various pieces of faulty equipment, for example, an overstretched spring in a Newton meter, balance that does not tare to zero, faulty temperature sensor, a stopwatch with dead batteries.
* Bathroom scales or mass balance

For the classroom carousel:* Balance
* 4 x 50cm3 beakers
* Beaker containing salt (unknown mass)
* Measuring cylinder
* Water
* Thermometer
* Bunsen burner
* Gauze
* Tripod
* Mat
* Safety glasses
* Pipette/syringe
 |
| Safety factors | * Teachers are required to carry out their own risk assessments for these activities.
 |
| CLEAPSS references | * CLEAPSS resource handbook – Section 9 General equipment: [https://science.cleapss.org.uk/Resource-Info/Handbook-Section-9-General-Equipment-A-L.aspx](https://emea01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fscience.cleapss.org.uk%2FResource-Info%2FHandbook-Section-9-General-Equipment-A-L.aspx&data=05%7C02%7C%7Cab514f6922d04573c5eb08dc3f527450%7C84df9e7fe9f640afb435aaaaaaaaaaaa%7C1%7C0%7C638454870639201227%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C0%7C%7C%7C&sdata=gPhGXQRuik1a%2BGAl2YFrvowNdJze6oh9r%2FuGVmhKFcA%3D&reserved=0)
 |
| Prior learning | * The purpose of a SOP (Lesson 1).
* The purpose of organisational policies and procedures in the Health and Science sectors ([A1 Working within the health and science sectors](https://www.technicaleducationnetworks.org.uk/health-science/working-in-the-health-and-science-sectors) - Lesson 1 Organisational policies and procedures).
* The importance of adhering to quality standards, quality management and audit processes within the Health and Science sectors ([A1 Working within the health and science sectors](https://www.technicaleducationnetworks.org.uk/health-science/working-in-the-health-and-science-sectors) - Lesson 1 Organisational policies and procedures).
 |
| Common misconceptions | * Confusion over the terms accuracy and precision.
* Students sometimes think that measurement error means a mistake rather than the difference between the measurement and the true value.
 |
| Accessibility | * Seek to ensure wide representation for any visiting speakers and case studies used.
 |

## Activity guide

|  |  |
| --- | --- |
| **Introduction**SUGGESTED TIME: 5–10 minutesRESOURCES: * L3 Slide deck – slides 2–4
 | * The slide deck summarises what will be covered in the lesson. You may wish to use this with students.
* Start the lesson by introducing the lesson objectives using the slide deck.
* This activity is designed to introduce students to a wide range of measurements that are taken by people in healthcare occupations.
* Use the image of a patient on a ward to introduce the importance of measurement in healthcare. Ask the students what measurements do people working in healthcare take? Why are they important?
 |
| **Activity 1: Why is it important to regularly test equipment?**Suggested time: 15–20 minutesResources: * L3 Slide deck – slides 5–6
* Various pieces of faulty equipment
 | * This activity is designed to introduce students to the importance of calibrating and testing equipment to ensure it is fit for use. It partially covers the potential impacts of not maintaining, cleaning and servicing equipment (which will be looked at further in Lesson 4 in this teaching sequence).
* Provide students with some equipment, some which is faulty, for example, an overstretched spring in a Newton meter, mass balance that does not tare to zero, faulty temperature sensor or a stopwatch that has dead batteries. If possible, provide some equipment with visible calibration labels and a servicing record. Ask students to use their equipment to make measurements, which should be identical, and then compare their results – whose group is correct? How do they know?
* As an additional task, you could reveal the true measurements and ask students to calculate the percentage difference between their measurement using the faulty equipment and the accurate measurement.
* When discussing the results, talk about the importance of making sure that any equipment used is not faulty to ensure accuracy of measurements, how regular testing can help to ensure equipment is fit for use, and that this is often needed to meet legal requirements. If you can provide equipment with calibration labels and a service record, point this out and note that the calibration dates should be checked. Slides 8–9 look at this in more detail.
* Introduce the concept of calibration, and that each piece of equipment has a regular calibration cycle which should be followed to ensure a piece of measuring apparatus reads correctly and to extend its life. This will be standard procedure in the workplace. (Examples you could use to illustrate the differences in lengths of calibration cycles: the calibration cycle of a Newton meter varies by manufacturer but, generally, they recommend about once a year. Most manufacturers recommend educational balances are recalibrated once a month, but for more accurate measurements, they should be recalibrated each time they are used.)
 |
| **Activity 2: Calibrating equipment**Suggested time: 20–25 minutesResources: * L3 Slide deck – slides 7–9
* Bathroom scales or mass balances (uncalibrated)
* Set of calibrated scales
* Calibration masses
 | * This activity is designed to introduce students to the way a piece of equipment is calibrated to ensure it remains fit for purpose.
* To introduce how to calibrate equipment, demonstrate calibrating a set of weighing scales or mass balance, as this is a familiar context for students. Many balances can be calibrated using the following approach or similar (check with the manufacturer for the specific approach for your balances):
	+ Place the scale on a flat surface and turn on.
	+ Press the ‘calibrate’ button and wait for the display to read zero. This indicates that the scale has been reset to its default settings and is ready for calibration.
	+ Next, use a mass and place it on top of the scale platform.
	+ Then press ‘calibrate’ again, adjusting the scale reading up or down until the display shows the correct mass reading of your item.
* Students then calibrate their own balance and use these to take the mass of a number of objects (of varying sizes) three times. The students then check their measurements with a set of pre-calibrated scales.
* Discuss the questions on slide 7 with the students. Discuss why it is important to calibrate and test equipment to ensure it is fit for use, and how to escalate concerns if they come across equipment which is not fit for purpose while on placement, and later in their careers. Links can be drawn here with the use of organisational policies which they met in A1 Working within the health and science sectors.
* You may wish to replace activity 2 by turning activity 1 into a class practical by asking students to check and re-calibrate mass balances, using a range of masses.
 |
| **Activity 3: Identifying mistakes**Suggested time: 20 minutesResources: * L3 Slide deck – slides 10–11
* Cards cut from L3 Activity 3 Worksheet
* Balance
* 4 x 50cm3 beakers
* Salt
* Measuring cylinder
* Water
* Thermometer
* Bunsen burner
* Gauze
* Tripod
* Mat
* Safety glasses
* Pipette/syringe
 | * This activity is designed to introduce the importance of identifying and reporting errors/mistakes, and the potential consequences of not doing so. It links to their previous work on the principles of good practice.
* Students complete a carousel activity set up prior to the lesson, using the scenario cards on L3 Activity 3 Worksheet. Print and cut the scenarios and divide between carousel stations.
	+ Scenario 1 – Using a balance to measure the mass of salt.
	+ Scenario 2 – Using a measuring cylinder to measure a volume of water.
	+ Scenario 3 – Using a thermometer to measure the temperature of a liquid whilst heating. (Before the students do the activity, set up the equipment and heat a beaker containing water. The water should be hot when students come to carry out the activity.)
	+ Scenario 4 – Using a beaker to measure a 12 cm3 volume of liquid.
* Each scenario is set with a card that describes the equipment by a student, and how the equipment was used (cut from the worksheet). Students spot what has been done wrong, and then use the supplied equipment to carry out the measurement correctly.
* Discuss with the students what mistakes they spotted, how they corrected them and why using the correct technique when making measurements is important.
* Discuss the correct procedures with the students (slide 11):
	+ Scenario 1 – Place the empty beaker on the balance, press tare, then remeasure the mass of the beaker with the salt added.
	+ Scenario 2 – Place the measuring cylinder on a table whilst filling the cylinder and reading the volume. To determine the correct volume of liquid, line up the eye to the level of where the liquid sits on the scale before taking the reading. (This avoids parallax error.)
	+ Scenario 3 – The thermometer should be held in the liquid away from the beaker sides when measuring the temperature. The liquid should be stirred before a measurement is taken.
	+ Scenario 4 – Use a pipette/syringe to accurately measure out the volume of liquid and transfer to the beaker. Beakers may not be suitable for accurate volume measurements due to their larger graduations.
 |
| **Activity 4: Escalating concerns**Suggested time: 10 minutesResources: * L3 Slide deck – slides 12–13
 | * Ask students to read through the scenario on the slide about a potentially faulty drug storage fridge. With their partners, they should discuss what the trainee nurse should do next, before discussing the appropriate steps as a class.
* Students should realise that they are not responsible for determining if the equipment is faulty but it is their responsibility to report a fault they know about (testing an electrical appliance is faulty is the responsibility of an electrical technician as an example), and should not switch off the equipment. The drugs should also not be moved before discussing with a line manager because if the equipment is faulty, the drugs may need to be appropriately discarded as they may have degraded. Therefore, the drugs may not benefit a patient and could cause harm. Marking the equipment as faulty and not in use and completing a proforma report form is important, so that another staff member does not dispense the drugs.
* It is also important to note that concerns should be escalated to a more senior member of staff if they come across equipment which is not fit for purpose while on placement, and later in their careers.
* Use slide 13 to recap the key points in the discussion.
 |
| **Plenary**Suggested time: 5 minutesResources: * L3 Slide deck – slide 14-15
 | * Ask students to provide verbal responses or write down three reasons why it is important to calibrate and test equipment (ensuring accuracy of measurements, prolonging the life of equipment, meeting legal requirements).
* Revisit the learning objectives to close the lesson on slide 15.
* Discuss the consolidation activity below (where appropriate).
 |
| **Follow-up/ consolidation**Suggested time: 30–45 minutesResources: * L3 Slide deck – slide 16
 | * Students may wish to make a video(s) of either correct, or subtly incorrect, procedures to show to the rest of the group in a later session for them to critique.
* Students could also be asked to look at online animations to help develop practical skills they lack confidence in, e.g. How to make a solution. Some examples can be found here: [www.labxchange.org/library](http://www.labxchange.org/library)
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# Lesson 4: Maintaining clean work areas, machinery and resources (A7.5, A7.6, A7.10)

This lesson introduces students to some potential consequences of incorrectly storing, cleaning and maintaining products, materials, equipment and workspaces. Using contamination as a focus, students look at how this may occur and control measures which can be taken to prevent this occurring.

## Preparation

|  |  |
| --- | --- |
| Resources provided | * L4 Slide deck
* Activity 2 – L4 Activity 2 Worksheet
* Activity 3 – L4 Activity 3 Worksheet
 |
| Equipment needed | * Boiling tubes – one per student. Place boiling tubes part-filled with milk and water into a rack. Add strong starch solution to one of the tubes to make it ‘infected’. Check it can be detected with iodine when further diluted.
* Iodine in a dropper bottle
* Eye protection
* Measuring cylinder
* Beaker (to mix milk solutions)
* Stirring rods

OR* Fluorescent tracking gel and UV light
 |
| Safety factors | * Teachers are required to carry out their own risk assessments for these activities.
 |
| CLEAPSS references | * Iodine – see CLEAPSS Student Safety Sheet 56: [www.science.cleapss.org.uk/resource/sss056-iodine.pdf](https://science.cleapss.org.uk/resource/sss056-iodine.pdf)
 |
| Prior learning | * The purpose of a SOP (Lesson 1 in this teaching sequence).
* The purpose of organisational policies and procedures in the Health and Science sectors ([A1 Working within the health and science sectors](https://www.technicaleducationnetworks.org.uk/health-science/working-in-the-health-and-science-sectors) - Lesson 1 Organisational policies and procedures).
* The importance of adhering to quality standards, quality management and audit processes within the Health and Science sectors ([A1 Working within the health and science sectors](https://www.technicaleducationnetworks.org.uk/health-science/working-in-the-health-and-science-sectors) - Lesson 1 Organisational policies and procedures).
 |
| Common misconceptions | * Contamination is only when a food or medical product contains a microorganism.
* Cross-contamination and contamination are the same thing.
 |
| Accessibility | * Seek to ensure wide representation for any visiting speakers and case studies used.
* Choice of practical depending on equipment available. Students can visualise the spreading of contamination using a fluorescent dye or complete the practical using milk and starch solution.
 |

## Activity guide

|  |  |
| --- | --- |
| **Introduction**SUGGESTED TIME: 5–10 minutesRESOURCES: * L4 Slide deck – slides 2–4
 | * The slide deck summarises what will be covered in the lesson. You may wish to use this with students.
* Start the lesson by introducing the lesson objectives using the slide deck.
* This introduction is designed to remind students about the importance of regularly cleaning surfaces and equipment and preparing the work area for use.
* Show students the images on the slide. Ask them to list as many reasons as they can why surfaces and equipment need to be regularly cleaned and prepared for use. These include:
	+ Cleaning surfaces in a healthcare setting – to avoid the spread of infection.
	+ Cleaning laboratory glassware – to avoid issues with contamination/cross-contamination, which will prevent invalid results and the possible production of dangerous by-products.
	+ Cleaning medical equipment (endoscope) – to avoid the spread of infection, to increase the function/lifespan of the equipment, to avoid damage to the equipment.
	+ Preparation of work area – to increase efficiency and avoid increased costs and timescales if preparation is not complete.
 |
| **Activity 1: The importance of correct storage**Suggested time: 10 minutesResources: * L4 Slide deck – slides 5–6
 | * This activity is designed to introduce students to the importance of storing chemicals, materials and products carefully (this will be revisited in Lesson 5 in this teaching sequence).
* Ask students to identify the potential issue with the way materials are being stored in each scenario on the slide. Discussion points could include:
	+ Scenario 1 – Stock is being stored too high so it’s difficult to locate and may cause a health and safety risk of falling on a person when trying to reach it. It may also cause a financial loss if the item can’t be found and has to be reordered.
	+ Scenario 2 – Stock looks very old so could be past its expiry date. It may no longer work in the desired manner and could even pose a safety risk, for example by releasing a dangerous gas, especially if stored in a bag suggesting bottle may be leaking. This could also lead to cross-contamination/the breakdown of limited stability products.
* Ask students if there are any other potential issues that they can think of. Slide 6 summarises some of the key issues of incorrect storage. Explain that in today’s lesson, the students are going to study contamination.
 |
| **Activity 2: Contamination and cross-contamination**Suggested time: 30–40 minutesResources: * L4 Slide deck – slides 7–11
* L4 Activity 2 Worksheet
* Boiling tubes of milk and water - one per student (one will be ‘infected’ with starch
* Iodine in a dropper bottle
* Eye protection
* Measuring cylinder
* Beaker (to mix milk solutions)
* Stirring rods

OR* Fluorescent tracking gel and UV light
 | * Introduce students to the difference between contamination and cross-contamination using the definitions and examples on the slide deck. Discuss the potential consequences of this, such as risks to health, spread of infection, and invalid results from a practical procedure.
* Students complete an activity to demonstrate how cross-contamination can occur, by either completing the ‘contaminated milk’ practical (on the worksheet) or through using a hand rub containing a fluorescent tracking gel that can be seen under a UV lamp/handwashing light box. Explain to the students that this is a simulation, so any references to ‘infection’ are fictional.
* In preparation for the contaminated milk practical, ensure appropriate PPE is administered. Prepare boiling tubes part-filled with milk and water. Add starch solution to one of the tubes to make it ‘infected’.
* During the activity, students make ‘contact’ with each other by sharing and then redistributing their solutions; therefore, the ‘infection’ spreads as contacts are made. This simulates a number of people shaking hands, and hence potentially transferring a pathogen. The details of how to do this are provided on the accompanying worksheet. You may wish to blow a whistle to tell students when to move on to meet a new contact.
* After students have made five contacts, test which of them have been ‘infected’ by adding iodine to the boiling tubes; these will turn blue-black in the presence of starch.
* You may wish to use the following questions to lead a discussion:
	+ How might you find out who was originally infected? This can be related to COVID outbreaks.
	+ How might a workplace respond to a reported infection outbreak, or the presence of a contaminant in one of its products? You may wish to talk about the Genomic Surveillance Unit at Sanger that sequences the genome of pathogens so they can identify mutations that affect transmission, disease severity and susceptibility to treatment: [www.sanger.ac.uk/collaboration/genomic-surveillance-unit/](http://www.sanger.ac.uk/collaboration/genomic-surveillance-unit/)
	+ Why is handwashing and clean nails so important in a health setting?
	+ Would it be possible for a workplace to introduce a control measure to prevent the spread of an infection or contaminant, using the simulated approach above?
* Links can be drawn between this activity and the handwashing audit they carried out in A1 Working within the health and science sectors, linking together industry conduct and the importance of adhering to quality standards, quality management and audit processes within the Health and Science sectors.
 |
| **Activity 3: The importance of regular cleaning, preparation and maintenance of equipment**Suggested time: 40 minutesResources: * L4 Slide deck – slides 12–13
* L4 Activity 3 Worksheet
 | * This activity is designed to show students the importance of regular cleaning in a workplace of their choice.
* In small groups, students complete a research activity using the worksheet; they look into specific work areas where regular cleaning and maintenance of work areas and equipment is important to prevent contamination, as well as ensuring accurate results are gathered and machinery and equipment life is maximised.
* Students may also wish to choose a specific piece of machinery/equipment and research how it is maintained to use as an example in their report.
* Then students could present their findings as a written report for the management of a company working in that field, which they can use as a training resource for employees within the relevant workplace.
* Students share three key findings from their research with a person from another group, who has researched another workplace.
 |
| **Plenary**Suggested time: 10 minutesResources: * L4 Slide deck – slides 14–16
 | * Students complete the exam-style question on the slide deck about the incorrect storage of a blood sample.
* They then mark their answer using the mark scheme provided.
* Revisit the learning objectives to close the lesson on slide 16.
* Discuss the consolidation activity below (where appropriate).
 |
| **Follow-up/ consolidation**Suggested time: 30–45 minutesResources: * L3 Slide deck – slide 17
 | * Students could produce a checklist to be placed inside a fridge in a care home to ensure its contents are stored correctly, minimising the risk of cross-contamination. The fridge stores food products which are checked for the safety of being eaten up until their ‘use-by’ date.
* To help with this task students could use the following website: [www.foodstandards.gov.scot/consumers/food-safety/at-home/washing-and-preparing-food-1](http://www.foodstandards.gov.scot/consumers/food-safety/at-home/washing-and-preparing-food-1)
 |

# Lesson 5: Ordering and storing stock correctly (A7.9, A7.10)

This lesson introduces students to the importance of managing and storing stock correctly. The lesson begins by looking at the reasons why stock levels need to be carefully managed, as well as carrying out an activity to decide when different types of stock need to be reordered. Students then carry out an activity where they identify the potential consequences of not storing products, equipment and materials correctly.

## Preparation

|  |  |
| --- | --- |
| Resources provided | * L5 Slide deck
* Activity 1 – L5 Activity 1 Worksheet
* Activity 2 – L5 Activity 2 Worksheet
* Plenary – L5 Plenary Worksheet 1, L5 Plenary Worksheet 2
 |
| Equipment needed | None |
| Safety factors | Teachers are required to carry out their own risk assessments for these activities. |
| CLEAPSS references | None |
| Prior learning | * The purpose of a SOP (Lesson 1).
* The purpose of organisational policies and procedures in the Health and Science sectors ([A1 Working within the health and science sectors](https://www.technicaleducationnetworks.org.uk/health-science/working-in-the-health-and-science-sectors) - Lesson 1 Organisational policies and procedures).
* The importance of adhering to quality standards, quality management and audit processes within the Health and Science sectors ([A1 Working within the health and science sectors](https://www.technicaleducationnetworks.org.uk/health-science/working-in-the-health-and-science-sectors) - Lesson 1 Organisational policies and procedures).
 |
| Common misconceptions | * Chemicals and medicines can be stored indefinitely.
* Chemicals do not have a ‘use-by’ date as they are not a food product.
 |
| Accessibility | * Seek to ensure wide representation for any visiting speakers and case studies used.
* Activity 1: 'Managing stock levels' requires some mathematical problem-solving skills. If individual students require additional support to complete this activity, you may wish to pair students up to work on this task collaboratively.
 |

## Activity guide

|  |  |
| --- | --- |
| **Introduction**SUGGESTED TIME: 5 minutesRESOURCES: * L5 Slide deck – slides 2–3
 | * The slide deck summarises what will be covered in the lesson. You may wish to use this with students.
* Start the lesson by introducing the lesson objectives using the slide deck.
* Give students two minutes to list as many reasons as possible for why it is important to order and manage stock effectively. Students could then verbally share their thoughts and add examples they have not included from their peers on their lists.
* Where students have experience of working, for example in a retail environment, encourage the sharing of their experiences of issues they may have encountered when stock was not managed effectively.
 |
| **Activity 1: Managing stock** Suggested time: 20–25 minutesResources: * L5 Slide deck – slides 4–5
* L5 Activity 1 Worksheet 1
* L5 Activity 1 Worksheet 2
 | * This activity introduces students to the reasons why it is important to order and manage stock.
* Using ideas generated in the introduction as a starting point and the examples in the slide deck, hold a discussion about why it is important to order and manage stock, resulting in students producing a list of key reasons. Introduce key terms of *consumables* – items that are often used once and then disposed of (some are used more than once) – and *materials,* used in the creation of a product such as ingredients and/or components.
* To support students further in understanding this concept (and to introduce an initial understanding of the potential complexity of ensuring materials, chemicals, stock, etc., are ordered and arrive on time), students complete Worksheet 1, a maths activity, where they are asked to perform a series of calculations to identify some of the challenges around managing chemical stock levels.
* Students then self-assess using Worksheet 2.
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| **Activity 2:** **Storing products, materials and equipment**Suggested time: 45 minutesResources: * L5 Slide deck – slides 6–8
* L5 Activity 2 Worksheet
 | * This activity introduces students to some of the potential impacts of not storing products, materials and equipment correctly.
* In pairs, ask students to identify the potential consequences of not storing products, equipment and materials correctly. Share these ideas in a class discussion ensuring the discussion covers cross-contamination, breakdown of limited stability products, products exceeding their expiry date (including financial loss), loss of samples or degradation of reagents not stored at the correct temperature, risks to health and safety, and stock being difficult to find.
* Divide the class into groups and allocate each group one of the potential six consequences of not storing products, equipment and materials correctly. Ask each group to identify a scenario when this may happen, who may be affected, and what the potential consequences are for the organisation involved. They should also identify the steps the organisation should take to prevent this occurring again.
* Groups then share their scenarios with the rest of the class and summarise their discussions in the summary table provided on the worksheet.
* At this point, it may be useful to discuss with students that although a material/chemical/medicine might be correctly stored at one point, this does not guarantee that it was stored correctly throughout its life. Having steps in a SOP for quality control and validation are critical to ensure chemical stocks are useful and safe to use.
 |
| **Plenary**Suggested time: 20 minutesResources: * L5 Slide deck – slide 9-10
* L5 Plenary Worksheet 1
* L5 Plenary Worksheet 2
 | * Students complete the worksheet, which is an exam-style question on managing stock.
* Then they swap their answer with a partner and mark their response using the mark scheme provided on Worksheet 2.
* Finally, they go back through their marked response and add in detail where appropriate to fill any gaps in learning.
* Revisit the learning objectives to close the lesson on slide 10.
* Discuss the consolidation activity below (where appropriate).
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| **Follow-up/ consolidation**Suggested time: 30–45 minutesResources: * L5 Slide deck – slide 11
 | * The Pfizer COVID vaccine has a different lifespan, depending on whether a vial has been opened or is unopened, and the temperature at which it has been stored. Ask students to produce a timeline for the storage of a sample of vaccines with an expiration date a maximum of six months from manufacture. They should mark the changes in the way the vaccine can be stored along the line. The conditions for storage can be found here: [www.cdc.gov/vaccines/covid-19/info-by-product/pfizer/downloads/storage-handling-label.pdf](http://www.cdc.gov/vaccines/covid-19/info-by-product/pfizer/downloads/storage-handling-label.pdf)
* Or, as an alternative, ask students to choose a temperature-sensitive drug: chloramphenicol, amoxicillin, leukeran, insulin or botox, and create a SOP for its storage based on their own literature search. This links together their study of SOPS and chemical storage.
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| Location | Link (with permission if required) | Owner | Date last accessed |
| Teacher Guide page 2 | [www.ncfe.org.uk/qualification-search/qualification-detail/t-level-technical-qualification-in-health-level-3-delivered-by-ncfe-1644](http://www.ncfe.org.uk/qualification-search/qualification-detail/t-level-technical-qualification-in-health-level-3-delivered-by-ncfe-1644) | NCFE International | June 2024 |
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| Teacher Guide page 6 | [www.hse.gov.uk/coshh](http://www.hse.gov.uk/coshh) | HSE / GOV UK | June 2024 |
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| Teacher Guide page 6 | [www.england.nhs.uk/estates/national-standards-of-healthcare-cleanliness-2021/](http://www.england.nhs.uk/estates/national-standards-of-healthcare-cleanliness-2021/) | NHS | June 2024 |
| Teacher Guide page 6 | <https://nshcs.hee.nhs.uk/publications/academy-for-healthcare-science-good-scientific-practice/> | NHS | June 2024 |
| Teacher Guide page 12, 22, 27, 31 | <https://www.technicaleducationnetworks.org.uk/health-science/working-in-the-health-and-science-sectors/> | Technical Education Networks | June 2024 |
| Teacher Guide page 13Lesson 1 Slide 3 | [www.clinicalguidelines.scot.nhs.uk/nhsggc-guidelines/nhsggc-guidelines/kidney-diseases/sop-manual-doppler-blood-pressure/](http://www.clinicalguidelines.scot.nhs.uk/nhsggc-guidelines/nhsggc-guidelines/kidney-diseases/sop-manual-doppler-blood-pressure/)  | NHS | June 2024 |
| Teacher Guide page 19Lesson 2 Slide 5 | [www.infectionpreventioncontrol.co.uk/resources/hand-hygiene-compliance-monthly-audit-tool-for-care-homes/](http://www.infectionpreventioncontrol.co.uk/resources/hand-hygiene-compliance-monthly-audit-tool-for-care-homes/) | Infection Prevention Control | June 2024 |
| Teacher Guide page 21 | <https://learn.lboro.ac.uk/pluginfile.php/1128655/mod_folder/content/0/SOP022%20-%20Use%20and%20Maintenance%20of%20the%20Olympus%20CKX41%20Inverted%20Microscopev1%20%282%29.pdf> (with permission) | Loughborough University | June 2024 |
| Teacher Guide page 22 | [https://science.cleapss.org.uk/Resource-Info/Handbook-Section-9-General-Equipment-A-L.aspx](https://emea01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fscience.cleapss.org.uk%2FResource-Info%2FHandbook-Section-9-General-Equipment-A-L.aspx&data=05%7C02%7C%7Cab514f6922d04573c5eb08dc3f527450%7C84df9e7fe9f640afb435aaaaaaaaaaaa%7C1%7C0%7C638454870639201227%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C0%7C%7C%7C&sdata=gPhGXQRuik1a%2BGAl2YFrvowNdJze6oh9r%2FuGVmhKFcA%3D&reserved=0) | CLEAPSS | June 2024 |
| Teacher Guide page 26Lesson 3 Slide 16 | [www.labxchange.org/library](http://www.labxchange.org/library) | Labxchange | June 2024 |
| Teacher Guide page 27 | [www.science.cleapss.org.uk/resource/sss056-iodine.pdf](http://www.science.cleapss.org.uk/resource/sss056-iodine.pdf) | CLEAPSS | June 2024 |
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| Lesson 1 Slide 3 | <https://www.clinicalguidelines.scot.nhs.uk/nhsggc-guidelines/nhsggc-guidelines/kidney-diseases/sop-manual-doppler-blood-pressure/>  | NHS | June 2024 |
| Lesson 1 Slide 5 | <https://www.pharmaguideline.com/2008/04/sop-for-autoclave.html>  | Pharmaceutical Guidelines | June 2024 |
| Lesson 1 Slide 5 | <https://www.plymouthhospitals.nhs.uk/blood-bank>  | NHS | June 2024 |
| Lesson 1 Slide 6 | <https://www.widgetlibrary.knowledge.scot.nhs.uk/media/WidgetFiles/1010876/D0.05%20Lifts%20procedures.pdf>  | NHS | June 2024 |
| Lesson 1 Slide 6 | <https://www.dpt.nhs.uk/download/Nan5r7PK0Q>  | NHS | June 2024 |
| Lesson 1 Slide 7 | [<https://www.sheffield.ac.uk/media/6291/download?attachment>](https://www.sheffield.ac.uk/media/6291/download?attachment) | University of Sheffield | June 2024 |
| Lesson 1 Slide 7 | <https://www.england.nhs.uk/mids-east/wp-content/uploads/sites/7/2018/04/spillage-of-cytotoxic-and-anti-cancer-drugs.pdf>  | NHS | June 2024 |
| Lesson 1 Slide 8 | <https://www.unicef.org.uk/babyfriendly/baby-friendly-resources/bottle-feeding-resources/guide-to-bottle-feeding/>(with permission) | UNICEF | June 2024 |
| Lesson 1 Slide 8 | [www.nursesclass.com/2021/04/bed-making.html](http://www.nursesclass.com/2021/04/bed-making.html)  | Nurses Class | June 2024 |
| Lesson 1 Slide 9 | <https://www.england.nhs.uk/coronavirus/documents/uniforms-and-workwear-guidance-for-nhs-employers/>  | NHS | June 2024 |
| Lesson 1 Slide 9 | <https://www.bristol.ac.uk/media-library/sites/expsych/documents/targ/SOP%2001%20Use%20of%20oximeter%20and%20extraction%20of%20data.pdf>  | University of Bristol | June 2024 |
| Lesson 1 Slide 17 | [www.youtube.com/watch?v=CfVmGIojfX4](http://www.youtube.com/watch?v=CfVmGIojfX4)  | YouTube / Claire Carmichael | June 2024 |
| Lesson 1 Slide 17 | [www.youtube.com/watch?v=Zn2wyzOMqe0](http://www.youtube.com/watch?v=Zn2wyzOMqe0)  | YouTube / NHS | June 2024 |
| Lesson 1 Slide 26 | [www.wikipedia.org/wiki/Sheri\_Sangji\_case](http://www.wikipedia.org/wiki/Sheri_Sangji_case) | Wikepedia.org | June 2024 |
| Lesson 1 Slide 27 | <https://archive.cdc.gov/#/details?url=https://www.cdc.gov/media/releases/2014/p0711-lab-safety.html> | CDC | June 2024 |
| Lesson 2 Activity 1 worksheet | <https://www.gov.uk/government/publications/ppe-guide-for-non-aerosol-generating-procedures/guide-to-donning-putting-on-and-doffing-removing-ppe-non-agp-in-adult-social-care-settings-text-only-version> | GOV UK | June 2024 |
| Lesson 4 Activity 3 worksheet | [www.infectionpreventioncontrol.co.uk/wp-content/uploads/2023/06/CH-21-Safe-management-of-care-equipment-April-2023-Version-3.00.pdf](http://www.infectionpreventioncontrol.co.uk/wp-content/uploads/2023/06/CH-21-Safe-management-of-care-equipment-April-2023-Version-3.00.pdf)[www.infectionpreventioncontrol.co.uk/wp-content/uploads/2019/06/CH-24-Safe-management-of-the-care-environment-April-2023-Version-3.00-1.pdf](http://www.infectionpreventioncontrol.co.uk/wp-content/uploads/2019/06/CH-24-Safe-management-of-the-care-environment-April-2023-Version-3.00-1.pdf) | Infection Prevention Control | June 2024 |
| Lesson 4 Activity 3 worksheet | [www.gov.uk/government/publications/infection-prevention-and-control-in-adult-social-care-settings/infection-prevention-and-control-resource-for-adult-social-care](http://www.gov.uk/government/publications/infection-prevention-and-control-in-adult-social-care-settings/infection-prevention-and-control-resource-for-adult-social-care) | GOV UK | June 2024 |
| Lesson 4 Activity 3 worksheet | [www.england.nhs.uk/wp-content/uploads/2021/04/B0271-national-standards-of-healthcare-cleanliness-2021.pdf](http://www.england.nhs.uk/wp-content/uploads/2021/04/B0271-national-standards-of-healthcare-cleanliness-2021.pdf) | NHS | June 2024 |
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