

Cambridge **TECHNICALS LEVEL 3**

Cambridge  
**TECHNICALS**  
**2016**

# APPLIED SCIENCE

## Unit 6

### Control of hazards in the laboratory

A/507/7047

Guided learning hours: 60

Version 3 - September 2016 - black line indicates updated content

## LEVEL 3

### UNIT 6: Control of hazards in the laboratory

**A/507/7047**

**Guided learning hours:** 60

**Essential resources required for this unit:** Access to a functioning laboratory

**This unit is internally assessed and externally moderated by OCR.**

#### UNIT AIM

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Running a research lab is a challenge. In all the hustle of loading the autosampler, pipetting, pouring, and mixing for research experiments, worker health and safety can be overlooked, inadvertently pushed aside or forgotten—sometimes with dire consequences. Understanding the legal requirements and recognizing hazards will help you to identify and minimize many of the common safety and health hazards associated with running a research laboratory.

This unit presents an overview of the most common hazards encountered in typical research labs and will help you maintain a safe work environment. It also links to many other units within the qualification and you can apply skills in the context of the practicals you will carry out elsewhere.

## TEACHING CONTENT

The teaching content in every unit states what has to be taught to ensure that learners are able to access the highest grades.

Anything which follows an i.e. details what must be taught as part of that area of content. Anything which follows an e.g. is illustrative, it should be noted that where e.g. is used, learners must know and be able to apply relevant examples in their work, although these do not need to be the same ones specified in the unit content.

For internally assessed units you need to ensure that any assignments you create, or any modifications you make to an assignment, do not expect the learner to do more than they have been taught, but must enable them to access the full range of grades as described in the grading criteria.

Learning outcomes	Teaching content
The Learner will:	Learners must be taught:
1. Understand the types of hazard that may be encountered in a laboratory	<p>1.1 The types of hazardous agents that may be encountered in the Laboratory and the risks they pose i.e.:</p> <ul style="list-style-type: none"> <li>• biological agents</li> <li>• compounds listed as carcinogens, mutagens or teratogens</li> <li>• chemical hazards e.g. cleaning agents, disinfectants, drugs, anaesthetic gases, solvents and compressed gases</li> <li>• physical hazards e.g. slips and falls from working in wet locations, ergonomic hazards of lifting, pushing, pulling and repetitive tasks, electrical, acoustic and thermal</li> </ul> <p>1.2 The principles of disease causing organisms i.e.:</p> <ul style="list-style-type: none"> <li>• structure of a virus as nucleic acid, capsid and viral enzymes</li> <li>• presence of antigens</li> <li>• lytic and lysogenic cycles as related to diseases</li> <li>• structure of a bacterial cell and how bacteria reproduce to include cell wall variation               <ul style="list-style-type: none"> <li>○ gram positive</li> <li>○ gram negative</li> </ul> </li> <li>• plasmids</li> <li>• endotoxins in cell wall (e.g. Salmonella)</li> <li>• the presence of pili for adhesion (e.g. E. coli)</li> <li>• capsules to block phagocytosis (e.g. Meningococcus)</li> <li>• link between toxin production and symptoms</li> <li>• binary fission and how quickly a bacterial population can build up given the right conditions</li> <li>• conditions affecting bacterial population growth through binary fission               <ul style="list-style-type: none"> <li>○ humidity</li> <li>○ temperature</li> <li>○ nutrient source</li> <li>○ pH balance</li> <li>○ aerobic/anaerobic</li> </ul> </li> </ul> <p>1.3 How some viruses (bacteriophage) can infect bacterial cells</p>

Learning outcomes	Teaching content
The Learner will:	Learners must be taught:
<p>2 Be able to use health and safety procedures to minimise the risk presented by hazards in a laboratory</p>	<p>2.1 Safe working practices in the laboratory when working with bio hazardous substances i.e:</p> <ul style="list-style-type: none"> <li>• Hazards in the laboratory (disease risk and hazards)</li> <li>• Risk assessment</li> <li>• biohazard symbol</li> <li>• COSHH regulations</li> <li>• RIDDOR Regulations</li> <li>• safety of instrumentation including electrical equipment</li> <li>• Use of standard operating procedures</li> </ul>
<p>3 Be able to design a safe functioning laboratory to manage the risk presented by hazards</p>	<p>3.1 Design of the area of work i.e.:</p> <p>Initial planning</p> <ul style="list-style-type: none"> <li>• utilisation of space, technician workspace position in relation to other rooms</li> <li>• security, access and containment</li> <li>• services and utilities</li> <li>• Storage space for             <ul style="list-style-type: none"> <li>○ toxic and flammable substances</li> <li>○ radioactive substances</li> <li>○ biological materials</li> <li>○ laboratory equipment</li> </ul> </li> <li>• furniture</li> <li>• air management and fume control</li> <li>• waste disposal</li> <li>• changing facilities</li> </ul> <p>Resources</p> <ul style="list-style-type: none"> <li>• computer hardware/software</li> <li>• laboratory equipment</li> <li>• testing equipment</li> <li>• Personal Protective Equipment (PPE)</li> </ul> <p>Procedures</p> <ul style="list-style-type: none"> <li>• Working under supervision</li> <li>• Hazard recognition</li> <li>• Safety awareness</li> <li>• Risk assessments</li> <li>• Incident procedures</li> <li>• Accident procedures</li> <li>• Fire precautions</li> <li>• Storage and security</li> <li>• Use of fume cupboards and fume control</li> <li>• Disinfection</li> <li>• Disposal of waste</li> <li>• Personal Protective Equipment (PPE)</li> </ul>

Learning outcomes	Teaching content
The Learner will:	Learners must be taught:
	<p>Legislation</p> <ul style="list-style-type: none"> <li>• Health and Safety at Work</li> <li>• Codes of Practice</li> <li>• Control of toxic and flammable substances</li> <li>• Microbiological hazards</li> </ul> <p>Design specifications</p> <ul style="list-style-type: none"> <li>• siting of laboratory</li> <li>• structures and fittings</li> <li>• ergonomics and aesthetics</li> <li>• health and safety</li> <li>• space efficiency e.g. storage, movement of personnel</li> <li>• environmental conditions e.g. light and temperature</li> </ul>

## GRADING CRITERIA

LO	Pass	Merit	Distinction
	The assessment criteria are the Pass requirements for this unit.	To achieve a Merit the evidence must show that, in addition to the Pass criteria, the candidate is able to:	To achieve a Distinction the evidence must show that, in addition to the pass and merit criteria, the candidate is able to:
1. Understand the types of hazard that may be encountered in a laboratory	*P1: Describe the types of hazard agents that are found in a laboratory situation	M1: Explain how disease causing organisms reproduce and are transmitted	
2 Be able to use health and safety procedures to minimise the risk presented by hazards in a laboratory	*P2: Carry out risk assessments for a laboratory procedure	M2: Describe how health and safety legislation influences procedures and practices	D1: Evaluate the effectiveness of current legislation in safe working practices in the control of diseases
	*P3: Explain the procedures and practices required to effectively prevent diseases from spreading in a laboratory		D2: Evaluate the potential impact of poor procedures and practices on individuals and the environment
3 Be able to design a safe functioning laboratory to manage the risk presented by hazards	*P4: Produce a design specification to control risks posed by hazards in a laboratory	M3: Explain how the design of a laboratory can control the spread of disease in a laboratory	D3: Analyse how procedures and legislation affects the control of diseases in a laboratory

## ASSESSMENT GUIDANCE

Learners will require significant support from the tutor through their work. Learners will work mainly from supplied materials but must provide evidence of an initial appreciation of the basis of an investigation/analysis together with the appropriate procedures relevant to the identified working environment. A variety of strategies should be used and be appropriate to the topic and task to provide opportunity to explore the concept of controlling diseases. Written work/assignment will be the normal method of reporting however, scientific work can also be recorded orally or through electronic media where appropriate. Whatever medium is chosen, learners must communicate the conduct of the work, the results achieved and the extent to which their learning outcomes were met. The work must be documented sufficiently well to enable the assessment and grading to be verified. Where reporting is totally oral, evidence must include their preparation notes and assessor commentary.

It is intended that a generic approach be used in the delivery of learning outcomes 1, 2 and 3 offering an insight into different environmental situations. Reference to specific diseases and their controls should be provided. Examples of safe laboratory practice must be used and, where appropriate transferred to other units within the qualification.

Feedback to learners: you can discuss work-in-progress towards summative assessment with learners to make sure it's being done in a planned and timely manner. It also provides an opportunity for you to check the authenticity of the work. You must intervene if you feel there's a health and safety risk.

Learners should use their own words when producing evidence of their knowledge and understanding. When learners use their own words it reduces the possibility of learners' work being identified as plagiarised. If a learner does use someone else's words and ideas in their work, they must acknowledge it, and this is done through referencing. Just quoting and referencing someone else's work will not show that the learner knows or understands it. It has to be clear in the work how the learner is using the material they have referenced to inform their thoughts, ideas or conclusions.

For more information about internal assessment, including feedback, authentication and plagiarism, see the centre handbook. Information about how to reference is in the OCR Guide to Referencing available on our website: <http://www.ocr.org.uk/i-want-to/skills-guides/>.

## SYNOPTIC LEARNING AND ASSESSMENT

It will be possible for learners to make connections between other units over and above the unit containing the key tasks for synoptic assessment. Please see Section 6 of the Qualification Handbook for more details. We have indicated in the unit where these links are with an asterisk.

Name of other unit and related LO	This unit:
<b>Unit 1 Science fundamentals</b>  LO1 Understand the chemical structures of elements and compounds	LO1 Understand the types of hazard that may be encountered in a laboratory (P1)
<b>Unit 2 Laboratory techniques</b>  LO1 Understand the importance of health and safety and quality systems to industry	LO1 Understand the types of hazard that may be encountered in a laboratory (P1)  LO2 Be able to use health and safety procedures to minimise the risk presented by hazards in a laboratory (P2, P3)  LO3 Be able to design a safe functioning laboratory to manage the risk presented by hazards (P4)
<b>Unit 4 Human physiology</b>  LO3. Be able to assess how the cardiovascular system functions in the body  LO4. Be able to assess how the respiratory system functions in the body	LO1 Understand the types of hazard that may be encountered in a laboratory (P1)  LO2 Be able to use health and safety procedures to minimise the risk presented by hazards in a laboratory (P2, P3)
<b>Unit 8 Cell biology</b>  LO2 Be able to use cytological techniques	LO1 Understand the types of hazard that may be encountered in a laboratory (P1)  LO2 Be able to use health and safety procedures to minimise the risk presented by hazards in a laboratory (P2, P3)

Name of other unit and related LO	This unit:
<b>Unit 10 Testing consumer products</b> LO2 Understand how product testing determines the development of consumer products LO3 Be able to use quantitative titration techniques on consumer products LO4 Be able to use extraction and separation techniques on consumer products	LO1 Understand the types of hazard that may be encountered in a laboratory (P1) LO2 Be able to use health and safety procedures to minimise the risk presented by hazards in a laboratory (P2, P3)
<b>Unit 11 Drug development</b> LO2 Understand the range of techniques used in drug production and screening LO3 Be able to carry out a basic extraction, synthesis, isolation and purification of a simple drug or pharmaceutical	LO1 Understand the types of hazard that may be encountered in a laboratory (P1) LO2 Be able to use health and safety procedures to minimise the risk presented by hazards in a laboratory (P2, P3)
<b>Unit 13 Environmental surveying</b> LO3 Be able to use field and laboratory techniques to conduct environmental investigations	LO1 Understand the types of hazard that may be encountered in a laboratory (P1) LO2 Be able to use health and safety procedures to minimise the risk presented by hazards in a laboratory (P2, P3)
<b>Unit 17 Food technology</b> LO2 Understand the importance of food safety in food manufacture LO4 Be able to test product samples	LO1 Understand the types of hazard that may be encountered in a laboratory (P1) LO2 Be able to use health and safety procedures to minimise the risk presented by hazards in a laboratory (P2, P3)
<b>Unit 19 Crop production and soil science</b> LO3 Be able to monitor the growth of a crop plant species LO4 Be able to carry out soil testing	LO1 Understand the types of hazard that may be encountered in a laboratory (P1) LO2 Be able to use health and safety procedures to minimise the risk presented by hazards in a laboratory (P2, P3)

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