

Health Effects of Hazardous Substances

TEACHING GUIDE

TEACHING GUIDE – DAY 1

BASIC PRINCIPLES OF TOXICOLOGY

- STUDENT LEARNING OUTCOMES:

1. Able to provide definitions of commonly used toxicological terms.
2. Understand that exposure to more than one hazardous substance at the same may alter the extent of the health effect.
3. Able to identify the main limitations of toxicity testing data.

TYPES OF HEALTH EFFECTS

- STUDENT LEARNING OUTCOMES:

4. Aware of the main types of health effects that may occur from exposure to hazardous substances

BASIC HUMAN BIOLOGY AND TARGET ORGANS

- STUDENT LEARNING OUTCOMES:

5. Able to describe the main features of the principle target organs affected by exposure to hazardous substances at work
6. Able to describe the main health effects that can occur at the target organs and give examples of substances that can cause these effects

Time	Topic	Contents	Learning Processes	Learning Resources	Assessment & Learning Outcomes
0-30 minutes	Course Opening	Welcome	Welcome participants to course		
		Emergency Procedures	Indicate the Site Emergency Procedures to participants	PowerPoint	Understanding of Emergency Procedures
		Introductions	Introduce the lecturers and ask participants to introduce themselves and indicate their background in occupational hygiene	PowerPoint	
30-60 minutes	Course Overview	Course Aims	Indicate the course aims	PowerPoint	
		Overall Learning Outcomes	Indicate the overall course learning outcomes	PowerPoint	
		Topics to be Covered	Discuss the topics to be covered in the course	PowerPoint	
		Format of course	Explain overall format of course	PowerPoint	
	Course Overview (Cont'd)	Today's Learning Outcomes	Indicate the learning outcomes for Day 1		

Time	Topic	Contents	Learning Processes	Learning Resources	Assessment & Learning Outcomes
		Assignment of Groups	Assign individuals to a work group. Ensure persons with some experience are distributed evenly amongst groups		
60-120 minutes	Introduction to Toxicology	Introduction and basic toxicological terms	Discussion of information with other examples being added by students where possible	PowerPoint	Learning Outcome 1
		Types of combined effects	Discuss types of combined effects	PowerPoint	Learning Outcome 2
		Limitations of toxicity testing	Seek students ideas on limitations before showing slide	PowerPoint	Learning Outcome 3
		Nitroglycerin case study		PowerPoint and description of process	
120-150 minutes	Coffee Break				

Time	Topic	Contents	Learning Processes	Learning Resources	Assessment & Learning Outcomes
150-180 minutes	Types of Health Effects	Definitions	Describe main types of health effects with extra examples added by tutor and students	PowerPoint	Learning Outcome 4
180-240 minutes	Types of Health Effects	Group work	Students split into work groups to generate lists of hazardous substances and types of health effects. Groups to report back to whole class		Reinforce Learning Outcome 4
240-300 minutes	Lunch Break				
300-360 minutes	Basic human biology and target organs	Respiratory system and skin	Describe the structure of the target organs. Illustrate health effects with examples of substances that cause the effects	PowerPoint	Learning Outcome 5 and 6
360-390 minutes	Polyurethane manufacture case study		Students split into work groups to discuss work procedures and processes. Groups to report back to whole class on controls in place and exposure routes	PowerPoint and description of process	

Time	Topic	Contents	Learning Processes	Learning Resources	Assessment & Learning Outcomes
390-420 minutes	Coffee Break				
420-480 minutes	Basic human biology and target organs	Nervous system, circulatory system, liver, kidney and reproductive system	Describe the structure of the target organs. Illustrate health effects with examples of substances that cause the effects	PowerPoint	Learning Outcome 5 and 6
480-510 minutes	Learning Outcomes	Review of today's Learning Outcomes	Review and discuss		Agreement that learning outcomes for today have been achieved

TEACHING GUIDE – DAY 2

REVIEW OF OVERNIGHT QUESTIONS

- STUDENT LEARNING OUTCOMES:

1. Receive guidance in understanding the reasons for any incorrect answers to the overnight questions from Day 1.

BASIC TOXICOKINETICS

- STUDENT LEARNING OUTCOMES:

2. Able to describe the main routes by which hazardous substances can enter the body.
3. Understand the factors which influence the absorption, distribution, storage and elimination of hazardous substances.

DOSE RESPONSE AND TOXICITY TESTING

- STUDENT LEARNING OUTCOMES:

4. Can provide definitions of commonly used toxicity testing terms.
5. Describe the main features of dose response curves.
6. Be familiar with a range of toxicity testing techniques and their applications.

EPIDEMIOLOGY

- STUDENT LEARNING OUTCOMES:

7. Aware of the main types of epidemiological studies and their applications and limitations.
8. Can undertake basic interpretation of the results of epidemiological studies.

Time	Topic	Contents	Learning Processes	Learning Resources	Assessment & Learning Outcomes
0-30 minutes	Learning Outcomes	Learning outcomes for today	Indicate the learning outcomes for Day 2		
	Overnight Questions	Student Guidance	Discuss answers to questions and provide guidance where required	Answer sheet	Satisfactory understanding and successful completion of questions Learning Outcome 1
30-90 minutes	Basic toxicokinetics	Toxicokinetics	Describe the four stages of toxicokinetics. Highlight the possibility that metabolism may increase or decrease the potential hazard of a substance	PowerPoint	Learning Outcome 2 and 3
90-120 minutes		Half-life	Describe the concept of half-life. Discuss the implications of different half lives and shift patterns by reference to examples from the students experience where possible	PowerPoint	Reinforce Learning Outcome 3
120–150 minutes	Coffee Break				
150-180 minutes	Dose response and toxicity testing	Dose response curves	Describe dose response curves and their main features.	PowerPoint	Learning Outcomes 4 and 5

Time	Topic	Contents	Learning Processes	Learning Resources	Assessment & Learning Outcomes
180-240 minutes		Dose response syndicate work	Using the materials provided, students break into groups and complete the required tasks	Dose response data and graphs	Reinforce learning outcomes 4 and 5
240-30 minutes	Lunch Break				
300-330 minutes	Dose response and toxicity testing	Toxicity testing	Describe the main types of toxicity testing techniques and their applications	PowerPoint	Learning outcome 6
330-390 minutes	Epidemiology	Epidemiological terms, Bradford Hill criteria and types of studies.	Explain epidemiological terms including causation and association. Introduce Bradford Hill criteria and how they are applied. Discuss types of study and their application, using examples where possible from student's experience.	PowerPoint	Learning outcome 7
390-420 minutes	Coffee Break				
420-510 minutes	Epidemiology	Case study	Using the materials provided, students break into groups and complete the required tasks	PowerPoint and additional information sheets	Learning Outcome 8

Time	Topic	Contents	Learning Processes	Learning Resources	Assessment & Learning Outcomes
	Learning Outcomes	Review of Learning Outcomes	Discuss what topics have been covered today		Agreement that learning outcomes have been achieved

TEACHING GUIDE – DAY 3

REVIEW OF OVERNIGHT QUESTIONS

- STUDENT LEARNING OUTCOMES:

1. Receive guidance in understanding the reasons for any incorrect answers to the overnight questions from Day 2.

REGULATORY CONSIDERATIONS

- STUDENT LEARNING OUTCOMES:

2. Describe the main sources of information on hazardous substances and processes.
3. Understand the importance of critically evaluating information sources when deciding on risks and control strategies.

OVERVIEW OF HEALTH EFFECTS

- STUDENT LEARNING OUTCOMES:

4. Be aware of the likely health effects of a range of commonly encountered hazardous substances and typical sources of exposure.

Time	Topic	Contents	Learning Processes	Learning Resources	Assessment & Learning Outcomes
0-30 minutes	Learning Outcomes	Learning outcomes for today	Indicate the learning outcomes for Day 3		
	Overnight Questions	Student Guidance	Discuss answers to questions and provide guidance where required	Answer sheet	Satisfactory understanding and successful completion of questions Learning Outcome 1
30-60 minutes	Regulatory considerations	Introduction	Discuss risk and safety phrases and use of data sheets	PowerPoint	
60-120 minutes		Group work – data sheets	Using the materials provided, students break into groups and complete the required tasks	PowerPoint and data sheets	Learning Outcome 2
120-150 minutes	Coffee Break				
150-180 minutes	Regulatory considerations	Discussion on data sheets and description of other data sources	Groups to report back on what they would ideally be provided with on data sheets	Results of group work and PowerPoint	Learning Outcome 2
180-210 minutes		Laser printer case study	Discuss issues raised in case study by whole group discussion and participation	PowerPoint and additional information sheets	Learning outcome 3

Time	Topic	Contents	Learning Processes	Learning Resources	Assessment & Learning Outcomes
210-240 minutes		SAICM and REACH	Describe SAICM and REACH and discuss how these approaches may improve quality of information on data sheets and risk assessments	PowerPoint	
240-300 minutes	Lunch Break				
300-390 minutes	Overview of health effects	Gases, organic solvents and liquids, metals, crystalline silica	Describe the likely health effects of the hazardous substances and typical sources of exposure. Where possible involve the students by using examples from their experience.	PowerPoint	
390-420 minutes	Coffee break				
420-450 minutes	Overview of health effects continued	Other dusts and particulate materials, mineral fibres	Describe the likely health effects of the hazardous substances and typical sources of exposure. Where possible involve the students by using examples from their experience.	PowerPoint	Learning outcome 4

Time	Topic	Contents	Learning Processes	Learning Resources	Assessment & Learning Outcomes
450-510 minutes		Case study – Paint manufacture	Describe paint manufacturing processes shown and allow students to watch video clips several times. Students break into groups and complete the required tasks	PowerPoint and video, data sheets previously examined in groups	Reinforce learning outcome 4
	Learning Outcomes	Review of Learning Outcomes	Discuss what topics have been covered today		Agreement that learning outcomes have been achieved

TEACHING GUIDE – DAY 4

REVISION OF OVERNIGHT QUESTIONS

- STUDENT LEARNING OUTCOMES:

1. Receive guidance in understanding the reasons for any incorrect answers to the overnight questions from Day 3.

COMMON INDUSTRIAL PROCESSES

- STUDENT LEARNING OUTCOMES:

2. Be aware of the main hazardous substances that are likely to be encountered in a range of common industrial processes. Understand how exposures are likely to occur and what controls would typically be in place.

SPECIFIC INDUSTRY PROFILES

- STUDENT LEARNING OUTCOMES:

3. Be aware of the main hazardous substances that are likely to be encountered in a range of specific industries. Understand how exposures are likely to occur and what controls would typically be in place.

Time	Topic	Contents	Learning Processes	Learning Resources	Assessment & Learning Outcomes
0-30 minutes	Learning Outcomes	Learning outcomes for today	Indicate the learning outcomes for Day 4		
	Overnight Questions	Student Guidance	Discuss answers to questions and provide guidance where required	Answer sheet	Satisfactory understanding and successful completion of questions Learning Outcome 1
30-120 minutes	Common Industrial Processes	All processes in section	Describe the common industrial processes and identify the main hazardous substances that are likely to be encountered. Illustrate with examples how exposures are likely to occur and what controls would typically be in place.	PowerPoint	Learning outcome 2
120-150 minutes	Coffee break				
150-240 minutes		Group work – health effects	Describe building demolition scenario and explain the task of identifying likely hazardous substances likely to be encountered during the proposed works. Students break into groups and complete the required tasks	PowerPoint	Reinforce learning outcome 2

Time	Topic	Contents	Learning Processes	Learning Resources	Assessment & Learning Outcomes
240-300 minutes	Lunch Break				
300-390 minutes	Specific industry profiles	All industries in section	Describe the specific industrial processes and identify the main hazardous substances that are likely to be encountered. Illustrate with examples how exposures are likely to occur and what controls would typically be in place.	PowerPoint	Learning outcome 3
390-420 minutes	Coffee break				
420-480 minutes	Specific industry profiles	Case study – Pharmaceutical production and packing	Describe pharmaceutical production and packing process and allow students to watch video clips several times. Students break into groups and complete the required tasks	PowerPoint and video	Reinforce learning outcome 4
480-510 minutes	Learning Outcomes	Review of Learning Outcomes	Discuss what topics have been covered today		Agreement that learning outcomes have been achieved

TEACHING GUIDE – DAY 5

REVISION OF OVERNIGHT QUESTIONS

- STUDENT LEARNING OUTCOMES:

1. Receive guidance in understanding the reasons for any incorrect answers to the overnight questions from Day 4.

FACILITATED DISCUSSION ON EXPOSURE LIMIT SETTING

- STUDENT LEARNING OUTCOMES:

2. Be aware of the issues that need to be considered when deciding on an exposure limit

EXAMINATION

Time	Topic	Contents	Learning Processes	Learning Resources	Assessment & Learning Outcomes
0-30 minutes	Learning Outcomes	Today's learning outcomes	Review		
	Overnight Questions	Student Guidance	Discuss answers to questions and provide guidance where required	Answer sheet	Satisfactory understanding and successful completion of questions Learning Outcome 1
30–120 minutes	Setting an exposure limit for a hazardous substance	Areas to be identified and discussed to include: Type of health effect, selection of critical health endpoint(s), routes of exposure, toxicity testing, epidemiology, research articles, chemical analogy, threshold / non-threshold, uncertainty factors, sampling methodology, acceptable risk	Facilitated group discussion to explore in a qualitative manner the issues that need to be taken into account when setting an occupational exposure limit		Apply and reinforce learning outcomes from the course
120-150 minutes	Coffee Break				
150-210 minutes	Final review	Any questions or issues?	Discussion		
210-270 minutes	Lunch Break				
270-370 minutes	Final exam				