T Level Technical Qualification in Science

Occupational specialism assessment (OSA)

Laboratory Sciences

Assignment 1 – task 3

Assignment brief

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Contents

Scenario

In 2011 an ocean floor earthquake, measuring a magnitude of 9.0, triggered a tsunami that struck the eastern shore of Japan. Much of the infrastructure for power was interrupted because of the earthquake.

Fukushima Daiichi nuclear power station is situated in the Fukushima Prefecture (district), which is north of Tokyo on the east coast of Japan. The earthquake and tsunami caused the power supply to the cooling systems to fail. A meltdown followed and radioactive material was released.

This was rated a level 7 incident, which is as high as that of the 1984 Chernobyl disaster.

The Japanese government created exclusion zones around the Fukushima Daiichi nuclear power station and evacuated citizens.

Following the incident, the Japanese government declared a ban on the shipment and sale of spinach leaves from the area. To this day, many Japanese consumers prefer not to purchase produce from this area.

Produce is regularly tested to determine radioactive isotope content. Samples are sent to private testing facilities to ensure scientific rigour and reproducibility. These samples are tested independently and current data is either confirmed or challenged.

Your laboratory has received numerous samples of spinach from the Fukushima Daiichi area. It is the responsibility of the laboratory to:

- test the samples
- determine the radioactive levels
- identify the isotopes present
- contest or confirm whether the data supports use of these products within the human food chain

You will need to complete the following tasks:

- task 1: writing a literature review (that includes a literature search)
- task 2: writing the standard operating procedure (SOP) for measuring radioactive count rate
- task 3: writing a risk assessment for the SOP

Task 3

Before the contaminated materials arrive, you should make a risk assessment that details the risks, hazards and personal protective equipment (PPE) required when receiving, testing, and storing the radioactive samples. This is part of your ongoing training in the laboratory.

Produce a risk assessment for the procedure described in your SOP (task 2).

Use the template provided.

The material for testing is potentially contaminated with radioactive materials that are beta emitters.

(16 marks)
(1 hour)

Risk assessment guidance

Complete the risk assessment template, including the following:

- identify and list any hazards that you feel apply to your activity
- identify the people that could be harmed by this hazard
- using the risk matrix provided, identify the risk level that this hazard presents
- think about the control measures that you can put in place to reduce the risk of the individual hazards
- using the risk matrix provided, identify the new risk level now that control measures are in place to manage the hazard and reduce the risk of injury – please note that the severity level will not always alter, only the likelihood
- continue on a separate sheet if necessary
- sign and review the document

Risk matrix

Likelihood	Risk matrix – evaluation of risks							Action level
	Almost certain	**5**	**5**	**10**	**15**	**20**	**25**	**20 to 25 STOP**
	Highly likely	**4**	**4**	**8**	**12**	**16**	**20**	
	Likely	**3**	**3**	**6**	**9**	**12**	**15**	**12 to 16 URGENT**
	Unlikely	**2**	**2**	**4**	**6**	**8**	**10**	**8 to 10 ACTION**
	Extremely improbable	**1**	**1**	**2**	**3**	**4**	**5**	**4 to 6 MONITOR**
		X	**1**	**2**	**3**	**4**	**5**	**1 to 3 NO ACTION**
			Minimal	Minor injury	7 day + injury	Serious or major injury	Severe	
				Consequence				

Risk assessment form

Person carrying out risk assessment:	
Persons responsible on site:	
Venue:	
Work activity:	
Date of assessment:	

THOSE AT RISK	KEY
Own staff	OWN
Venue staff	VEN
Organisers	ORG
Visitors	VIS
Public	PUB
Contractors	CON
All persons onsite	AOS

Please read the guidelines prior to completing your risk assessment.

Section 1

Hazard	Who might be harmed? (see 'those at risk', above)	Likelihood	Severity	Total risk level	Control measures (add any other control measures you will use)	Likelihood	Severity	Res. risk level

Hazard	Who might be harmed? (see 'those at risk', above)	Likelihood	Severity	Total risk level	Control measures (add any other control measures you will use)	Likelihood	Severity	Res. risk level

By signing the declaration below, you have agreed that you will put the appropriate control measures in place to ensure that hazards are reduced and that the risks applicable to your stand are controlled.

Signed	
Print name	
Review date	

Literature list

An article by Greenpeace on the on-going situation.

www.greenpeace.org/international/story/46720/since-fukushima-disaster-decade/

An article on levels of Cs 134 Cs 137.

www.seafish.org/trade-and-regulation/contaminants/radionuclides/

An article on the disaster area.

www.worldnomads.com/travel-safety/eastern-asia/japan/how-dangerous-is-the-radiation-in-japan

An explanation of units of measurement of radiation/ non scientific.

www.mysteryofascension.com/becquerels-grays-and-sieverts/

A radiation dosage chart.

www.informationisbeautiful.net/visualizations/radiation-dosage-chart/

Experiments with Geiger counters. Politecnico di Torino.

www.core.ac.uk/download/pdf/76522239.pdf

World Nuclear Association: Fukushima Daiichi Accident.

www.world-nuclear.org/information-library/safety-and-security/safety-of-plants/fukushima-daiichi-accident.aspx

National Geographic: Fukushima's Tragic Legacy.

www.nationalgeographic.com/environment/article/fukushima-tragic-legacy-radioactive-soil

IAEA: Fukushima Daiichi Status Update.

www.iaea.org/newscenter/focus/fukushima/status-update

World Nuclear News: Monitoring Fukushima.

www.world-nuclear-news.org/Articles/Monitoring-Fukushima-radiation-on-land-and-sea

An APR article documenting the radioactivity levels in food grown near Fukushima Daiichi.

www.npr.org/2011/03/21/134714332/japanese-document-radioactivity-in-food?t=1633425251090

Soil Science and Plant Nutrition: Changes in concentration of radioactive isotopes.

www.tandfonline.com/doi/full/10.1080/00380768.2014.989541

The Geiger counter.

www.spark.iop.org/geiger-muller-tube

Document information

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