T-LEVELS | Institute for Apprenticeships & Technical Education

T Level Technical Qualification in Science

Occupational specialism assessment (OSA)

Laboratory Sciences

Assignment 1 – task 1

Assignment brief

V1.0: P001945
Summer 2023
20th-24th March 2023
603/6989/9

NCFE CACHE

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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 the radioactive count rate
- task 3: writing a risk assessment for the SOP

Task 1

Carry out a literature review of the materials in the literature list to determine suitable methods and how to interpret results. Some materials will help you understand the accident at Fukushima Daiichi.

Write a literature review that demonstrates how you have evaluated which literature to select for the task, including justifications for the literature selected.

Select key information that will be needed to write a SOP to determine radioactive contamination in spinach leaves collected from the Fukushima Daiichi prefecture, including:

- information that would help to inform the methods, techniques and equipment used
- how results are determined
- the results expected
- safety considerations

Reference any sources you use in an appropriate way.

(28 marks)
(3 hours)

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

Owner: Head of Assessment Design