Science ASSIST Information Sheet

Radioactive isotopes and minerals
Requirements and disposal

Introduction

This information sheet is an updated review of the answers to the following questions, and replaces the previously published Q&As:

- Are we still able/allowed to buy radioisotopes?
- What are the requirements to keep radioactive sources?
- Some of the old radioactive materials we have in a lead box are leaking and I have been told not to open/touch it. Where or who do we contact for disposal of these old radioactive materials?
- Our school recently found a cardboard box of radioactive minerals which have been stored at the back of the cupboard. Do these minerals need to be stored in a metal container or glass jar like our radioactive samples or is the original box still okay? Will these samples also produce Radon gas? One of the minerals from what I can see is Uraninite.

Regulation of radioactive materials

ARPANSA is the Australian Government's primary authority on radiation protection and nuclear safety. Each state/territory is responsible for regulating the licencing and compliance in line with its own laws and the first place to seek information is the radiation regulator which is usually within the health department in your state/territory. For details of your state/territory regulator see State & territory regulators[1] on the ARPANSA website.

All known sources of radioactive materials for use in school science should be stored in a manner that protects staff, students and visitors from harmful effects.

For school specific guidance on best practice see the ARPANSA Safety Guide for the Use of Radiation in Schools (2015).[2] Science ASSIST recommends that schools be familiar with this document and have a printed copy of this resource available for reference.

Radioactive Sources

Radioactive sources suitable for use in schools come as sealed sources, available for purchase from several science suppliers. Sources commonly used in schools are alpha-emitting Americium-241 (Am-241) or Polonium-210 (Po-210), beta-emitting Strontium (Sr-90) and gamma-emitting Cobalt (Co-60). The potential for harm from these sources is very low.

The purchase of any radioactive materials should take into consideration their safe use, storage and disposal. Science ASSIST has developed guidance for use in schools with a Standard Operating Procedure (SOP): Handling sealed radioactive sources.[3]

Radioactive Minerals

Unsealed sources of radiation such as in rocks, minerals and ores, present more hazards than sealed radioactive sources. There is a much higher risk to human health due to possible exposure through the skin, ingestion or inhalation. If you have uranium ores, be aware that uranium compounds emit alpha particles, which are much higher risk if they enter the body via swallowing or inhaling, therefore the **generation of dust must be avoided**.[4] Uraninite, which is a uranium oxide mineral, is not suitable for use in the classroom,[5] so you will need to seek professional help with its disposal.

It is not uncommon for schools to receive donations that contain radioactive rocks, so we recommend that all schools check their geological samples using a Geiger counter to see if they unknowingly have any radioactive rocks, minerals or ores. When the rock collection is being examined, we strongly recommend that you include samples in the geography or geology department and check for any samples of asbestos.[6]

The ARPANSA safety guide states that radioactive rocks may be used in schools and that "Such rocks are best kept in a box with a clear lid so that their radioactive properties may be demonstrated without the need to handle them." You should seek advice from your school jurisdiction or governing body to see if radioactive rocks are permitted and you should also seek advice from your state regulator, regarding any state requirements or restrictions concerning the level of radiation emitted and for guidance for suitable disposal.

Considering the hierarchy of controls for risk management, we recommend disposing of radioactive rocks, minerals and ores, and substituting with activities, such as those noted below in additional information.

If your school is permitted to and decides to keep radioactive rocks, this should only be done in consultation with your school's radiation supervisor and following strict control measures, as described in the ARPANSA safety guide.

Disposal of Radioactive Materials

Disposal of radioactive materials is quite challenging as it depends upon the radioactivity level and whether it is above the exempt levels. Schools do not generally have the equipment to measure these levels. School Geiger counters tend to measure activity relative to background radiation and do not accurately measure the actual activity levels.

State/territory regulators will be able to give you directions on suitable disposal for your region. You may need to engage the services of a private contractor who has the necessary transport and storage licencing requirements to dispose of your radioactive materials. Your radiation regulator should be able to recommend a suitable contractor who is compliant with these requirements.

Production of Radon Gas from Radioactive Sources and Minerals

Radon gas is a naturally occurring radioactive gas, which is present in the air. It comes from the natural decay of Radium and Thorium, which is present in small amounts in rocks, minerals and soil. It has no smell, colour or taste and is chemically inert. The gas can build up in poorly ventilated buildings and if inhaled, is linked to the development of lung cancer.[7] A simple measure to bring radon levels down is to increase the ventilation.[7]

Additional information

CLEAPSS has some information that they have made freely available. Note these documents refer to UK and not Australian legislation.[4, 7]

Some online education resources that relate to radiation that may be useful are:

- Australian Nuclear Science and Technology Organisation https://www.ansto.gov.au/education/teachers/teacher-professional-development-courses
- Farlabs: Freely Accessible Remote Laboratories https://www.farlabs.edu.au/nuclear/

References

[1] Commonwealth of Australia. (2022, September). *'State & territory regulators'.* Retrieved from ARPANSA. https://www.arpansa.gov.au/regulation-and-licensing/regulation/state-territory-regulators

[2] Commonwealth of Australia. (2015). '*Radiation Protection Series No. 18, Safety Guide for the Use of Radiation in Schools'*. Retrieved from ARPANSA. https://www.arpansa.gov.au/regulation-and-licensing/regulatory-publications/radiation-protection-series/guides-and-recommendations/rps18

[3] Science ASSIST. (2015, March). '*SOP Handling Sealed Radioactive Sources'*. Retrieved from Science ASSIST: https://assist.asta.edu.au/resource/2490/sop-handling-sealed-radioactive-sources

[4] CLEAPSS website. (2019). *'L093-Managing Ionising Radiations and Radioactive Substances in Schools and Colleges'.* Retrieved from CLEAPSS. https://science.cleapss.org.uk/Resource-Info/L093-Managing-Ionising-Radiations-and-Radioactive-Substances-in-Schools-and-Colleges.aspx

[5] Geology.com website. (2022, September). '*Uraninite'.* Retrieved from Geoscience news and information. https://geology.com/minerals/uraninite.shtml

[6] Science ASSIST. (2015, November). *'AIS Asbestos Minerals in Schools'.* Retrieved from https://assist.asta.edu.au/resource/3354/ais-asbestos-minerals-schools

[7] Commonwealth of Australia. (2022, September). *'Radon exposure and health'.* Retrieved from ARPANSA. https://www.arpansa.gov.au/understanding-radiation/radiation-sources/more-radiation-sources/radon

[8] CLEAPSS website. (2022). *'Student Safety sheets SSS011 – Radioactive Materials'.* Retrieved from CLEAPSS. https://science.cleapss.org.uk/Resource-Info/SSS011-Radioactive-materials.aspx