



Classroom Activity:

Everyday items

Teacher's Checklist

- **Target audience:** GCSE Science\ Physics students
- **Activity format:** Interactive whole-class activity to form part of a lesson or revision session
- **Nominal duration:** 30 minutes
- **Learning Objectives:**
 - Everything contains radiation
 - Radiation can be useful and not always harmful
- **Equipment & Space Required**
 - Lo-salt
 - Smoke detectors
 - Brazil nuts
 - Uranium glass
 - Watch
 - Radium dial watch (x1)
 - High activity rock (Cornwall rock – 1 high activity would be sufficient)
 - Rocks (regular x 3)

Time	Teacher Action	Learner Actions
0 min	Ask students if they are being exposed to radiation right now?	
5 mins	Yes. Radiation is all around us. Tell students that they are being exposed to radiation from space (Cosmic), from the ground (terrestrial), from the building materials used to build this classroom, even radiation from within our own bodies.	
15 mins	Show students everyday items. Ask the students to put the items in order of most radioactive to least radioactive. Allow 10 minutes in teams then reveal the correct order: Brazil nuts Lo-salt Vaseline glass Watch Smoke detector Rock	Students to order items in groups





Time	Teacher Action	Learner Actions
20 mins	<p>Explain that you can't tell how radioactive something is just by looking at it so you have to use radiation detectors to demonstrate the different levels of activity in these objects.</p> <p>You'll be able to hear the detector making a clicking sound. Each click corresponds to a disintegration event being detected. The more clicks you hear, the more active the object.</p> <p>Using a Mini 900/44B, monitor the counts expected will be around the following numbers: Brazil nuts (10) Lo-salt (14) Uranium glass (20) Watch (60) Smoke detector (450) Cornwall rocks (5000)</p> <p>Talk about each item as you monitor it.</p> <p>Brazil nuts: Radium is a radioactive element that occurs naturally in the soil all over earth. The roots of the brazil nut trees grow exclusively into the ground and can extract the radium from the soil and this is transferred into the brazil nuts.</p> <p>Lo-salt: Lo-salt is a health alternative to normal salt and is made up of potassium chloride rather than sodium chloride. All of the potassium in the world is made up of 3 isotopes, K-39, K-40 and K-41. 1% of all potassium contains K-40 which is radioactive. Therefore anything that contains potassium will be very slightly radioactive.</p> <p>Vaseline glass: Vaseline glass is a term for glass that contains levels of uranium that give it its characteristic green colour. Uranium is naturally radioactive.</p>	

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Time	Teacher Action	Learner Actions
30 mins	<p>Watches: The watches in front of you aren't actually radioactive but this one is. Show students a radium dial watch. Radioactive materials have been used extensively in the manufacture of watches so that they could be read in the dark. Originally radium paint was used up to the 1960s, but this was banned because of health problems associated with the watch manufacturers.</p> <p>Smoke detector: Smoke detectors use a radioactive element called Am-241 which emit charged alpha particles. The alpha radiation ionises the air particles inside the smoke detector. This allows a small electric current to flow. If there is a fire, smoke particles going into the detector are hit by alpha radiation. This reduces the ionisation of the air particles causing the current to drop. The drop in current is detected by the smoke detector, setting off the alarm.</p> <p>Rock: Explain again that the rocks in front of them (from just outside) are not particularly radioactive but that some areas of the world have higher naturally occurring radioactivity in the soil and rocks. In Cornwall there are areas of the soil and rock that contain more natural radioactivity than the average for the UK. In some places the amount of uranium or thorium (and their decay products) is high enough to be detectable using radiation instruments.</p>	

The Science:

- Radioactivity describes the processes of radioactive decay.
- Radioactive decay occurs when an unstable 'parent' atom of a particular element (or "radioactive isotope"; e.g. Carbon-14) emits energy or charged particles from the nucleus, allowing it to reach a more stable state known as the 'daughter' atom, which may even be a different element.
- (An isotope is an atom of the same element that has a different number of neutrons.)
- It is these invisible charged particles or energy that form "radiation".
- People are often concerned about radiation because in large doses it can cause diseases such as cancer or even be fatal. This concern is often made worse because humans cannot see or feel radiation.
- It is a common misconception that radioactivity is artificial.
- All things are made up of atoms, some of which may be atoms of an element which has a radioactive isotope.
- Therefore, we can expect that a proportion of these atoms of a particular element will be radioactive.
- Hence, it is possible that everything is slightly radioactive...even food!