ATOMIC AND NUCLEAR PHYSICS

Radioactivity has mostly negative associations such as nuclear reactor accidents. But radioactivity is also, in fact, completely natural. For example, the air that we breathe contains decay products of radon. These can be detected with a comprehensible experiment.

Different concentrations can also be measured in tap and rain water depending on the region. The human body has adjusted to this environmental radioactivity and copes with it well. This is known as background radiation.

In the Science Lab Set *Atomic and Nuclear Physics*, students investigate this environmental radioactivity.

HIGHLIGHT

LP6.2.3.1C Detecting decay products in the air

Students will investigate the decay products of radon.
For this experiment you will need the set **Science Lab Radioactivity RA (207 152S)**.

Overview of topics and sets

EXPERIMENT TOPICS		REQUIRED SETS	NO. EXPERIMENTS	DETAILS
LP6.2	ENVIRONMENTAL RADIOACTIVITY			
LP6.2.1	INTRODUCTION TO RADIOACTIVITY	Environmental Radioactivity RA  207 152S	42	PAGE 136
LP6.2.2	INVESTIGATING THE INFLUENCE OF SAMPLE PROPERTIES AND THE SIZE OF THE MEASUREMENT WINDOW			
LP6.2.3	ENVIRONMENTAL RADIOACTIVITY			
LP6.2.4	STATISTICS OF RADIOACTIVE DECAY			
LP6.2.5	RADIATION SHIELDING			
LP6.2.6	DISTANCE			
LP6.2.7	INVESTIGATING THE RADIATION IN A MAGNETIC FIELD			
LP6.2.8	HALF-LIFE			

LP6.2.7.1C The influence of a magnet on beta radiation

Students will investigate how a magnetic field can deflect beta radiation.
For this experiment you will need the set **Science Lab Radioactivity RA (207 152S)**.

Further information about our curriculum-compliant topics and student experiments as well as the corresponding sets can be found on the following pages.

ATOMIC AND NUCLEAR PHYSICS - RA

OVERVIEW OF OUR CURRICULUM-COMPLIANT EXPERIMENTS

Sensors		
	LP6.2	**ENVIRONMENTAL RADIOACTIVITY**
	LP6.2.1	Introduction to radioactivity
	LP6.2.1.1	Detecting radioactive radiation in the environment
●	LP6.2.1.1C	Detecting radioactive radiation in the environment (with Mobile-CASSY 2 WiFi) DIGITAL
	LP6.2.1.2	Detecting radioactive radiation in the surrounding air (underground)
●	LP6.2.1.2C	Detecting radioactive radiation in the surrounding air (underground) (with Mobile-CASSY 2 WiFi) DIGITAL
	LP6.2.1.3	Detecting radioactive radiation in a button shaped source
●	LP6.2.1.3C	Detecting radioactive radiation in a button shaped source (with Mobile-CASSY 2 WiFi) DIGITAL
	LP6.2.1.4	Safety rules when working with radioactive materials
●	LP6.2.1.4C	Safety rules when working with radioactive materials (with Mobile-CASSY 2 WiFi) DIGITAL
	LP6.2.1.5	Number of N pulses and R counting rate
●	LP6.2.1.5C	Number of N pulses and R counting rate (with Mobile-CASSY 2 WiFi) DIGITAL
	LP6.2.2	Investigating the influence of sample properties and the size of the measurement window
	LP6.2.2.1	Potassium chloride in different layer thicknesses
●	LP6.2.2.1C	Potassium chloride in different layer thicknesses (with Mobile-CASSY 2 WiFi) DIGITAL
	LP6.2.2.2	Potassium chloride as normal
●	LP6.2.2.2C	Potassium chloride as normal (with Mobile-CASSY 2 WiFi) DIGITAL
	LP6.2.2.3	Counting rate when screening the entrance window
●	LP6.2.2.3C	Counting rate when screening the entrance window (with Mobile-CASSY 2 WiFi) DIGITAL
	LP6.2.3	Environmental radioactivity
	LP6.2.3.1	Detecting decay products in the air
●	LP6.2.3.1C	Detecting decay products in the air (with Mobile-CASSY 2 WiFi) DIGITAL
	LP6.2.3.2	Detecting decay products in fresh tap water
●	LP6.2.3.2C	Detecting decay products in fresh tap water (with Mobile-CASSY 2 WiFi) DIGITAL
	LP6.2.3.3	Detecting decay products in rain water
●	LP6.2.3.3C	Detecting decay products in rain water (with Mobile-CASSY 2 WiFi) DIGITAL
	LP6.2.3.4	Detecting decay products in freshly fallen snow
●	LP6.2.3.4C	Detecting decay products in freshly fallen snow (with Mobile-CASSY 2 WiFi) DIGITAL
	LP6.2.4	Statistics of radioactive decay
	LP6.2.4.1	Investigating the fluctuations when measuring the pulse count
●	LP6.2.4.1C	Investigating the fluctuations when measuring the pulse count (with Mobile-CASSY 2 WiFi) DIGITAL
	LP6.2.4.2	Statistical examination of the radiation of the button shaped source
●	LP6.2.4.2C	Statistical examination of the radiation of the button shaped source DIGITAL
	LP6.2.4.3	Statistical examination of the radiation of the potassium chloride
●	LP6.2.4.3C	Statistical examination of the radiation of the potassium chloride DIGITAL
	LP6.2.5	Radiation shielding
	LP6.2.5.1	Radiation shielding from the button shaped source using different materials
●	LP6.2.5.1C	Radiation shielding from the button shaped source using different materials (with Mobile-CASSY 2 WiFi) DIGITAL
	LP6.2.5.2	Radiation shielding from the button shaped source using different material thicknesses
●	LP6.2.5.2C	Radiation shielding from the button shaped source using different material thicknesses (with Mobile-CASSY 2 WiFi) DIGITAL
	LP6.2.6	Distance
	LP6.2.6.1	Dependence of the counting rate on the distance between button shaped source & counter tube
●	LP6.2.6.1C	Dependence of the counting rate on the distance between button shaped source & counter tube (with Mobile-CASSY 2 WiFi) DIGITAL
	LP6.2.7	Investigating the radiation in a magnetic field
	LP6.2.7.1	The influence of a magnet on beta radiation
●	LP6.2.7.1C	The influence of a magnet on beta radiation (with Mobile-CASSY 2 WiFi) DIGITAL
	LP6.2.7.2	Use of the influence of a magnet on beta radiation
●	LP6.2.7.2C	Use of the influence of a magnet on beta radiation (with Mobile-CASSY 2 WiFi) DIGITAL
	LP6.2.8	Half-life
	LP6.2.8.1	Evaluation of a test series with radon water
●	LP6.2.8.1C	Evaluation of a test series with radon water (with Mobile-CASSY 2 WiFi) DIGITAL

For experiments marked with „C", the measurements are carried out **digitally** with the Mobile-CASSY 2 WiFi.

● GM adapter M

42 EXPERIMENTS

LP6.2.1.3C Detecting radioactive radiation in a button shaped source

OVERVIEW OF EQUIPMENT REQUIRED FOR PERFORMING EXPERIMENTS

LP6.2 ENVIRONMENTAL RADIOACTIVITY

TOPIC SET	DIGITAL MEASURING DEVICE	LITERATURE
Radioactivity RA	Mobile-CASSY 2 WiFi	Science Lab Atomic and nuclear physics digital

+

+

Detailed information on the above listed and **additionally required products** are available on the following pages.

Science Lab Radioactivity RA (Set)

Student experiment set of the student experiment system Science Lab in the field of physics. Set-up material for one working group in pre-formed tray. With the equipment set RA, in combination with the Mobile-CASSY 2 WiFi (524 005W) and the GM adapter M (524 440) or with the counter S (575 471), 42 experiments at school, college and university level for worldwide curriculums can be performed. The students deal with the topic radioactivity and in particular with the environmental radioactivity. While working out the curriculum required topics, they are also trained in communication and assessment skills. The additional possibility of using the Mobile-CASSY 2 WiFi (524 005W) enables the students the access of digital learning.

Scope of delivery:

Count	Name
1	Plate holder on rod
1	Precision metal rail, 25 cm
4	Clamp rider
1	Horseshoe magnet, small
1	Buffer and Plastic Plate
1	Pancake GM counter tube
1	Holder for Pancake GM counter
1	Holder for radiation emitter and magnet

Count	Name
1	Tray, low
25 out of	Round filter fiber glass, 55 mm Ø, Set of 100
1	Petri dish 60 mm
1	Büchner funnel porcelain, for filters with 55 mm Ø
2 out of	Plastic clamps, span 1.2 cm, set of 3
1	Potassium Chloride 50 g
1	Frame and Set of Aluminium slides
207 152S	Science Lab Radioactivity RA (Set)

ADDITIONALLY REQUIRED EQUIPMENT

Additionally required per working group

Count	Cat.-No.	Name	Description
1	524 005W	Mobile-CASSY 2 WiFi	for digital experiments
1	524 440	GM adapter M	
1	559 460	Button-shaped source	
1	575 471	Counter S	alternative for analog measurements
1	LDS00001	Stopwatch, digital	alternative for analog measurements

Additionally required per class

Count	Cat.-No.	Name	Description
1	520 715	LIT: LP6 Science Lab Atomic and nuclear physics, digital	
1	666 767	Hotplate, 1500 W, 180 mm Ø	
1	ADACB501	Compact scale 500 g: 0.1 g	

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OVERVIEW OF ADVANTAGES

- Proof of all relevant phenomena of environmental radioactivity
- Includes a large area (Pancake) GM counter tube with a stable protection net for the measurement of low decay rates
- The additionally required button-shaped source is below the exemption limits in Germany and many other countries
- Devices and detailed instructions were developed in cooperation with Prof. Dr. phil. Henning von Philipsborn (University of Regensburg)
- Acquired skills: Communication and evaluation

STUDENT MEASURING DEVICE

DIGITAL CLASS / EDUCATION

Mobile-CASSY 2 WiFi

The universal student measuring device with WiFi for all measuring tasks in physics, chemistry and biology.

524 005W	Mobile-CASSY 2 WiFi	

You can find detailed information on the Mobile-CASSY 2 WiFi on page 228.

SENSORS

GM adapter M

For measuring radioactive radiation with a Geiger-Mueller counter tube (559 01 or 559 012) with Mobile-CASSY 2 WiFi (524 005W).

524 440	GM adapter M	

You can find detailed information on this and other sensors from page 229.