

UV Radiation – basic package

Guide with lesson plans

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UV radiation – basic package

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The “UV radiation – basic package” is designed for 13-15 year-old students.

Title	UV radiation – basic package
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Students’ age	13-15
Educational stage	Lower secondary school/ upper classes of primary school
Subject	Biology, Physics, Geography
Overview of package content	
<p>The “UV radiation” package on the basic level covers issues related to the influence of ultraviolet radiation on humans. The topics are presented in an interdisciplinary way, combining elements of biology, physics and geography. The students will learn, among others, what is the Sun’s ultraviolet radiation, and how it differs from the visible light, and from the infrared radiation.</p> <p>The package also shows the positive and negative effects of ultraviolet radiation on humans, and tips on safe use of sunbathing. For this purpose, the following terms were clarified: UV index, skin phototype, SPF (Sun Protective Factor). Students have the opportunity to gain practical skills in determining the value of the UV index (based on data published on open access websites, weather forecasts and own measurements), as well as defining their own skin phototypes, and calculating safe sun exposure time.</p> <p>What needs to be emphasized is the very important role of the package in providing students with practical skills which are necessary during summer vacation, enabling safe outdoor activities in the sun. By presenting a video showing how a face - protected by sunscreen - looks in a UV camera, students will realize that sunscreens have a real influence on protecting the skin from excessive sunlight.</p>	

Expected educational goals

The student knows:

- What is the source of heat on Earth;
- What is UV radiation.

The student understands:

- risks related to the influence of UV radiation on human health and life;

The student can:

- find open-access databases with meteorological and ozone information, and UV index;
- indicate the source of UV radiation;
- list the types of UV radiation;
- define the positive and negative effects of UV radiation on human life;
- describe ways to reduce the negative impact of UV radiation on human health and life;
- explain what the UV index is;
- list the methods of performing UV index measurements.

Content of the package

1. „UV radiation” – presentation – basic package;
2. [„UV radiation” – movie based on presentation](#);
3. [How sunscreen works – movie](#);
4. “UV radiation” – worksheet;
5. “UV index in practice” – worksheet;
6. “UV radiation” – test;
7. „UV radiation” – test – answers;
8. „UV radiation” - Guide with lesson plans.

Additional materials

- Database with meteorological data – ogimet.com;
- Data from Weatherlink automatic stations
<http://www.weatherlink.com/map.php>
- Ozone content data over Belsk Duży – <http://ozon.igf.edu.pl/>
- UV index data – <http://www.temis.nl/uvradiation/UVindex.html>
- <http://uvb.igf.edu.pl/>
- Link to the online test:
<https://play.kahoot.it/#/?quizId=5b871c60-3068-4a8c-93a1-c5edddca6a7d>

Lesson 1

Subject: UV radiation – is it always an enemy?

Lesson plan for “UV radiation – basic package”

In order to conduct the lesson, it will be necessary to provide:

- a multimedia projector, computer, loudspeakers;
- “UV radiation” worksheet (No. 4) printed out for each student.

Expected educational goals of the lesson:

The goals of the lesson are compatible with the goals of the educational package “UV radiation – basic package”.

Suggested forms of work:

- offering: a lecture, a talk;
- displaying: a presentation, a movie;
- activating: a discussion, a brainstorm;
- practical: exercises based on worksheets.

Lesson procedure:

1. Start of the lesson, organisational activities, attendance list check.
2. Introduction to the topic, summary of basic information about solar radiation. The teacher asks questions, and encourages the students to participate in the discussion.
 - What is the source of UV radiation (UVA, UVB, UVC)?
 - Is the UV radiation beneficial or harmful?
 - What is the ozone layer?
 - What are the dangers associated with the ozone layer?
 - What is the UV index?
 - What are the causes and effects of sunburn?
 - What is the SPF?
3. Brief description of solar radiation – teacher's lecture based on the multimedia presentation "UV radiation" (No. 1)
 - Classification by wavelength;
 - Scheme of absorption of different wavelength radiation;
4. Students work in pairs. Each pair on one sheet of paper describes:
 - The risk of excessive exposure to sunlight;
 - The positive aspects of solar radiation.
5. Presentation of results – students present their thoughts in the class forum. The teacher writes down the conclusions on the blackboard, and compares them to the information from the multimedia presentation.
6. In the following part of the lesson, basing on the multimedia presentation, the teacher discusses:

- What is the UV index?
 - What are the sources of information about UV index (hand-held meters, weather forecasts, data from meteorological stations);
 - What factors influence the value of the UV index;
 - What is a skin phototype;
 - What is the role of vitamin D in human life.
7. Teacher asks the students what to do to protect oneself from the negative effects of UV rays (a brainstorming session). Examples of answers: use sunscreen, use sunglasses only with UV filter, stay in the shade, use a sun umbrella, protect your head with headgear, etc.
 8. The teacher discusses how sunscreens work (e.g. basing on the presentation). Then he displays [the movie "How sunscreen works"](#) (No. 3).
 9. Students – on their own – perform tasks 1-3 from the "UV radiation" worksheet.
 10. Summary of the lesson. The teacher verifies the correctness of performance of the tasks in the worksheet, and explains possible doubts.

Lesson 2

Subject: UV index in practice

Lesson plan for “UV radiation – basic package”

The lesson “UV index in practice” is intended as a continuation of the lesson “UV radiation – is it always an enemy?”. It has a practical character. The students, basing on individually acquired data, will make graphs of changes in UV index values within 24 hours in three selected locations. On this basis, students will be able to deduce how the intensity of UV radiation varies depending on the time of day and location of the observation point.

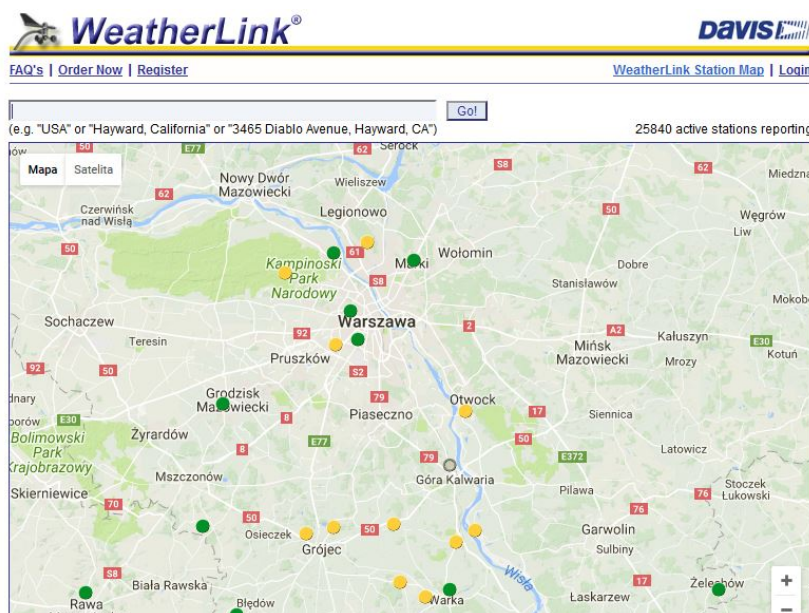
In order to conduct the lesson, it will be necessary to provide:

- A database created by the students before the lesson;
- Computers with internet access and pre-installed spreadsheet;
- “UV index in practice” worksheet (No. 5) printed out for each student;
- A wall map - a physical map of Poland.

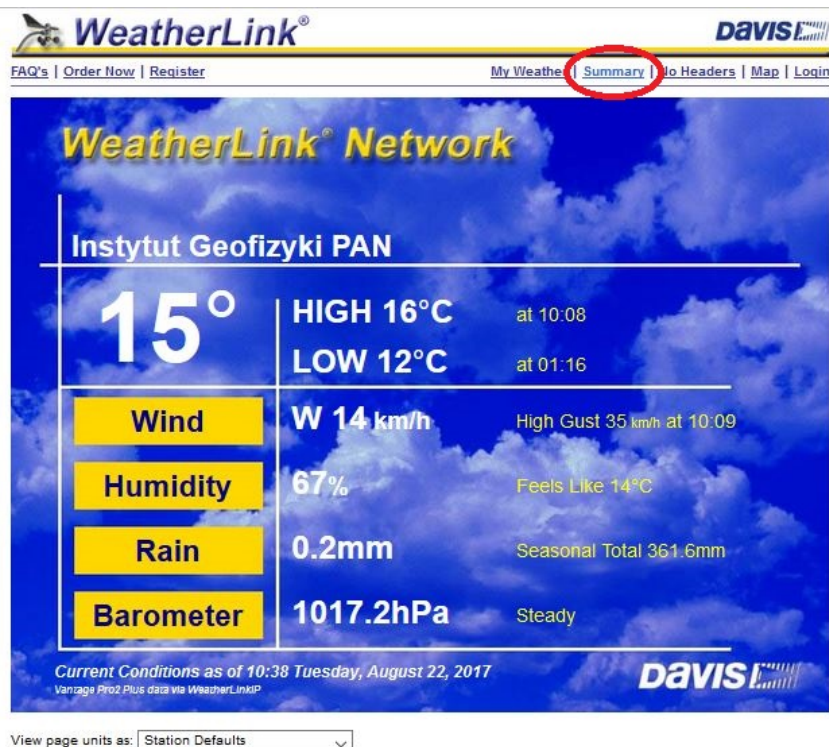
Approximately 1 week before the planned lesson, the teacher hands out the worksheets to the students. The students should do a part of the task 1. marked "Before the lesson". The task is to read the value of the UV index on the selected day, from three different stations (from north, centre and south of Poland). Students should collect data read every hour (between 9am and 5pm).

How to read the data?

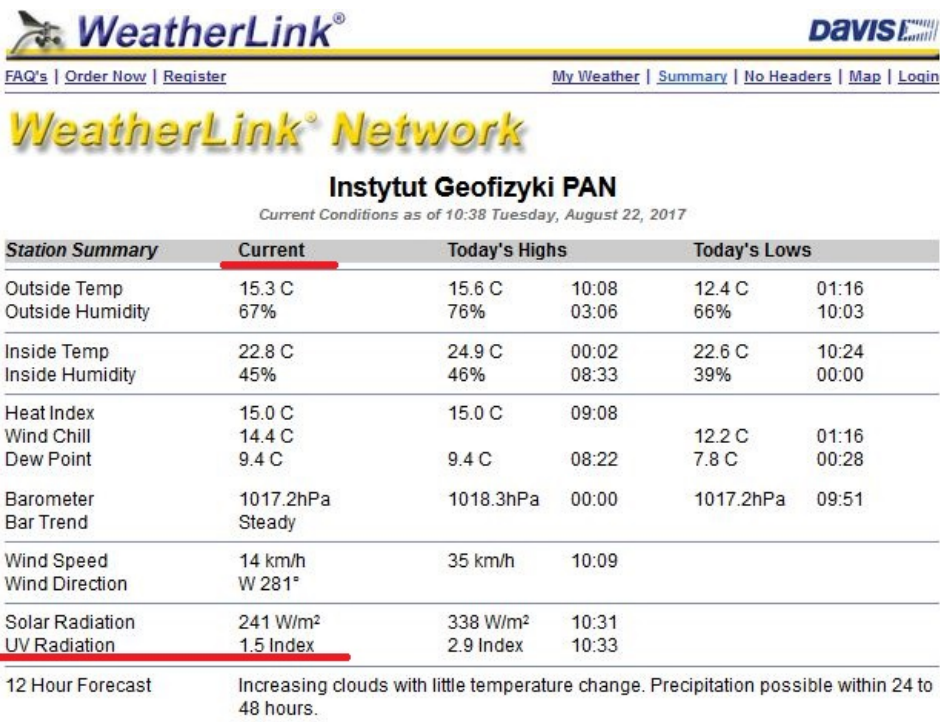
After entering the website <http://www.weatherlink.com/map.php>, which contains a meteorological database, one of the stations should be chosen. Names of suggested stations are given in the worksheet. Choosing other stations is possible, however keep in mind that not all of them perform UV measurements.



After selecting a station, a general view with current meteorological information will be seen. Please enter the "Summary" tab.



The value of the current UV index is read from the indicated column below:



WeatherLink® **DAVIS!**

FAQ's | Order Now | Register | My Weather | **Summary** | No Headers | Map | Login

WeatherLink® Network

Instytut Geofizyki PAN

Current Conditions as of 10:38 Tuesday, August 22, 2017

Station Summary	Current	Today's Highs	Today's Lows
Outside Temp	15.3 C	15.6 C 10:08	12.4 C 01:16
Outside Humidity	67%	76% 03:06	66% 10:03
Inside Temp	22.8 C	24.9 C 00:02	22.6 C 10:24
Inside Humidity	45%	46% 08:33	39% 00:00
Heat Index	15.0 C	15.0 C 09:08	
Wind Chill	14.4 C		12.2 C 01:16
Dew Point	9.4 C	9.4 C 08:22	7.8 C 00:28
Barometer	1017.2hPa	1018.3hPa 00:00	1017.2hPa 09:51
Bar Trend	Steady		
Wind Speed	14 km/h	35 km/h 10:09	
Wind Direction	W 281°		
Solar Radiation	241 W/m²	338 W/m² 10:31	
UV Radiation	1.5 Index	2.9 Index 10:33	
12 Hour Forecast	Increasing clouds with little temperature change. Precipitation possible within 24 to 48 hours.		

Expected educational goals of the lesson:

The goals of the lesson are compatible with the goals of the educational package "UV radiation – basic package".

Suggested forms of work:

- offering: a lecture, a talk;
- displaying: a presentation;
- activating: a discussion, a brainstorm;
- practical: work with a spreadsheet.

Lesson procedure:

1. Start of the lesson, organisational activities, attendance list check.
2. Introduction to the topic, summary of basic information about UV radiation.
3. The teacher checks if all the students have completed the first part of the worksheet. The task of the students was to collect data on the UV index.
4. Students indicate – on the physical map of Poland – the location of the stations chosen by them.
5. Students prepare data for the graph in a spreadsheet, and then generate a line graph for three selected stations. The teacher clarifies possible doubts and gives advice to the students. After completing the charts, the students share their comments and complete the worksheet (task 1).
6. Students begin work on task 2 in the worksheet. If necessary, the teacher may remind the students of some basic information on different skin phototypes, and how sunscreen works. For this purpose, one can use selected slides from the presentation "UV Radiation - basic package" (No. 1).
7. The above task will be carried out on the basis of aggregate data from the Geophysical Observatory of the Institute of Geophysics, Polish Academy of Sciences, in Belsk Duży. In the first place, the students search for the location of the observatory on the physical map of Poland.
8. The teacher assigns a selected measurement year (data is collected since 2001) to the students. Students read the maximum value of the index in the database and complete the table in task 2. Then, based on the graph, they read the safe sun exposure time for a person with a skin phototype II.
9. Using sunscreen (SPF-15) prolongs the safe sun exposure time by 15 times. For example, if we read from the graph that – for a person with phototype II – a safe sun exposure time is 18 minutes, then after applying sunscreen (SPF-15) it would be $18 \times 15 = 270$ minutes. It should be reminded to students, that such long protection is possible only if we stick to certain rules of application of the sunscreen discussed in the previous lesson.
10. As a summary of the lesson, the students solve a verification test (No. 6). It may have a traditional form of a test, but it's recommended to use quiz questions on the kahoot.it platform. Link to the test:

<https://play.kahoot.it/#/?quizId=5b871c60-3068-4a8c-93a1-c5edddca6a7d>