

UV Radiation – extended package

Guide with lesson plans

Download educational materials described in this guide from:

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UV radiation – extended package

Guide with lesson plans

The “UV radiation – extended package” is designed for students aged 16-19, so for those attending upper secondary schools and technician schools.

It may be used during two various lessons. The first lesson contains theoretical introduction and should be conducted with the use of PowerPoint presentation. The second lesson is more practically oriented and should be conducted with the use of information from the website ogimet.com, which serves as a good source of meteorological information from all over the world.

Additionally, for better understanding of problems presented in this package, teachers may use also materials proposed for the lesson „UV index in practice”, presented as a part of the methodological guide of the basic package.

Title	UV radiation – basic package
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Students' age	16-19 years
Educational stage	upper secondary school
Subject	Biology, Physics, Geography
Overview of package content	
The “UV radiation” package on the extended 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. 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. 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.

Extended package – in comparison to the basic one – puts emphasis on physical phenomena connected with emission of Sun radiation and thermonuclear reactions inside the Sun. Moreover, it presents in detail the influence of UV radiation on human's health. It increases also students' knowledge on factors, which influence UV index value.

Expected educational goals

The student knows:

- What is the source of heat on Earth;
- What is UV radiation;
- What are the positive and negative effects of UV radiation on human life;
- What factors influence UV index value;
- How to protect ourselves from harmful Sun radiation.

The student understands:

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

The student can:

- describe the structure of the Sun and reactions occurring inside it;
- use differences in wave length to describe the spectrum of solar radiation reaching the Earth;
- 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 – extended package;
2. [„UV radiation” – movie based on presentation – extended package;](#)
3. [How sunscreen works – movie;](#)
4. Meteorological databases – worksheet;
5. “UV radiation” – test;
6. “UV radiation” – test – answers ;
7. “UV radiation” – methodological 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 – from thermonuclear reactions to chromosomal mutations

Lesson plan for “UV radiation – extended package”

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

- a multimedia projector, computer, loudspeakers;

Expected educational goals of the lesson:

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

Suggested forms of work:

- offering: a lecture, a talk;
- displaying: a presentation, a movie;
- activating: a discussion, a brainstorm;

Lesson procedure:

1. Start of the lesson, organizational activities, attendance list check.
2. Introduction of the topic. Review of basic information regarding solar radiation. The teacher asks questions and encourages the group to discuss them.
 - What are the sources of radiation?
 - What types of radiation, apart from the visible light, can be found in the natural world? How do they differ from each other?
 - What is the source of ultraviolet radiation?
 - Is UV radiation beneficial or harmful?
 - What is the ozone layer?
3. A brief description of solar radiation. The teacher presents the topic on the basis of the multimedia presentation “UV radiation” (no. 1).
 - The structure of the Sun and thermonuclear fusion;
 - Types of radiation (classification based on wave length);
 - Attenuation of radiation of different wave lengths;
4. The teacher divides the students into groups of four. The students note down ideas for both of the following categories:
 - Dangers involved in excessive exposure to solar radiation;
 - Positive aspects of solar radiation
5. Feedback. Students share their ideas in open class. The teacher puts conclusions on the board and compares them with the information included in the multimedia presentation.

6. Next, on the basis of the multimedia presentation, the teacher discusses:
 - what the UV index is;
 - how to get information about the UV index (manual gauges, weather forecasts, data from meteorological stations);
 - which factors influence the value of the UV index;
 - what skin phototypes are;
 - what role in human life is played by vitamin D.
7. The teacher asks the group what can be done to avoid the negative consequences of UV radiation (brainstorming). Possible answers include: using sunscreen and sunglasses with a UV filter, staying in the shade, using sun umbrellas, covering one's head, etc.
8. The teacher explains the way in which sunscreen works (this may be done on the basis of the presentation). Next, students watch [the video "How sunscreen works"](#) (no. 3).
9. To conclude the lesson, the group may complete a test (no. 5). A possible alternative is to do the quiz in an interactive way with the help of kahoot.it. Follow the link to access the quiz:

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

Lesson 2.

Subject: Databases – how to use them?

Lesson plan for “UV radiation – extended package”

An important objective of the ERIS project is to teach students how to use various databases containing data published by institutions which collect and process them. Most of these databases are available online free of charge. Relatively speaking, the easiest to use are meteorological data, because they refer to familiar parameters, such as air temperature, atmospheric pressure and precipitation totals. Data used in this lesson will come from ogimet.com, which is an excellent source of regularly updated meteorological information.

In accordance with the subject matter of the package, the lesson will focus on data regarding sunshine duration at a selected meteorological station. The students will draw a diagram illustrating a monthly pattern of sunshine duration at the selected station.

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

- a computer with an internet connection;
- “Meteorological databases” 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 – extended package”.

Suggested forms of work:

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

Lesson procedure:

1. Start of the lesson, organizational activities, attendance list check.
2. Introduction of the topic. The teacher asks the group what kinds of data are collected daily by meteorological stations. Next, the teacher informs the group that they will analyse data on sunshine duration at a meteorological station of their choice.
3. The teacher reminds the students that **sunshine duration is the length of time (measured in hours) during which sunlight reaches the Earth’s surface directly from the Sun.**
4. The teacher distributes worksheets. Each student chooses one of the 12 months within the year (e.g. the month in which they were born). During the lesson, they will analyse the data from the month they have selected.
5. The students help the teacher select a meteorological station to focus on (e.g. one closest to where the school is located). The teacher and the group discuss how meteorological data are presented in the database they will be using. Information on how to use the website is included in task instructions on the worksheet.

6. The students complete the table with sunshine duration data for particular days of the month and then use the data to draw a diagram and answer questions.
7. The students compare their diagrams and indicate months with maximum and minimum sunshine duration.
8. The second part of the worksheet makes use of another database, namely the sunrise/sunset calculator of the American National Oceanic and Atmospheric Administration (NOAA), available at:
<http://www.esrl.noaa.gov/gmd/grad/solcalc/sunrise.html>
9. The students use the calculator to determine the local midday for two European cities of their choice.
10. Once the task has been completed, the teacher checks if it is correct and evaluates the work of the students.