**03.2 Lesson plan**

**Age group/grade:** from 16 y. o.

**Lesson title:** Spectra

**Subject:** Physics

**Key concepts:** radiation spectrum, line spectrum, band and continuous spectrum, absorption spectrum, spectral analysis.

**Objectives:**

* To repeat the concept of light, the law of refraction and the phenomenon of dispersion;
* To learn about the types of spectrum;
* To learn about the structure and differences between the spectroscope and spectrograph.

**Skills developed:** discussion, observation, analytical thinking, collaboration.

**Materials/Equipment needed:**

VR experience (<https://eloquent-ramanujan-887aa5.netlify.app/laser-2.html>), VR headset,computer, projector, handouts.

**Lesson Plan**

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| **Stages** | **Description of activity** | **Time** |
| **Preparation before the lesson** | If this is a first VR experience for students, a teacher goes through the safety rules. | 5 min. |
| **Introduction** | A frontal survey to remind on the key concepts   1. The law of light refraction; 2. The concept of light, the speed of light; 3. What is meant by dispersion of light? Examples.   During this lesson we will learn about the basic parts of a spectroscope and a spectrograph, as well as about spectral analysis. | 5 min. |
| **Initial Immersive Experience** | Students individually explore the VR experience and make notes if they go along the following terms: spectral analysis, spectroscope, spectrograph, spectrum, continuous, band, line, absorption spectrum: <https://eloquent-ramanujan-887aa5.netlify.app/laser-2.html> | 10 min. |
| **Guided Immersive Experience** | Brainstorming after the VR experience | 3 min. |
| **Follow up** | With the help of a teacher, students systematize the structure of the spectrograph and spectroscope and write down the principles of operation of these devices.  Then the term of spectral analysis (analysis of the chemical composition of a substance according to its spectrum);  Types of spectrum:  Continuous emission spectrum – produced by solid bodies, liquids and gases of high density.  Students and teacher discuss the continuous spectrum (picture below):    Line spectrum – produced by low-density atomic gases.  Students and teacher discuss the line spectrum (picture below):  Band spectrum – produced by molecular gases.  Students and teacher discuss the band spectrum (picture below):    Absorption spectrum – produced by hot gases.  Students and teacher discuss the absorption spectrum (picture below): | 15 min. |
| **Formative Assessment** | Students together with teacher find out what types of spectra they have already seen in nature, in the environment.  Topics for discussion:  What spectrum is produced by natural objects the Sun, a candle, a campfire, an electric spark.  Is it possible to identify what elements make up a substance having only a continuous spectrum? | 7 min. |