**O3.2\_Lesson plan\_Physics\_Plasma**

**Age group/class:** 5th grade

**Lesson title:** Plasma; the 4th aggregation state of matter

**School Discipline:** Physics

**Key concepts:** Plasma, aggregation state

**Aims:** - Identification of the plasma as a state of aggregation,

* Identification of the plasma characteristics in relation to the other aggregation states
* Mathematical modelling - Models that describe the state of aggregation
* Uses of plasma:
  + In the lab - Plating with the help of plasma – VR experience
  + Outdoors – Stars – VR experience
  + Indoors – Luminescent discharge tubes with Ne – VR experience

**Skills developed**: Analysis, collaboration, communication

**Materials/Equipment needed**: Video projector, computer, VR glasses

**Lesson plan:**

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| **Stages** | **Description of activity** | **Time** |
| **Preparation before the lesson** | Familiarise students with VR if you use it for the first time.  Go through safety rules with students before using VR.  Each time before going to VR, remind students about the possible negative effects some of them can get and set the expectations.  Give students the option to opt out of VR. |  |
| **Introduction** | The teacher asks students questions to highlight some observations made by students in their daily lives:  The sun in which state of aggregation can you place it? Why does a neon tube emit light? Which state of aggregation can you fit the welding arc in? What is aurora borealis? | 5 min |
| **Initial Immersive Experience** | We watch aurora borealis in VR in pairs (<https://eloquent-ramanujan-887aa5.netlify.app/plasma.html>). The students write their finds. | 10 min |
| **Guided Immersive Experience** | The teacher follows each observation and explains why the lights appear as a cause and thus explains the composition of the plasma. The discussion will then be extrapolated to the mathematical model of the plasma. Plasma applications are identified by the teacher through discussions with students and then he directs the discussion toward plasma use in the laboratory.  The use of plasma in the process of depositing a thin layer is watched in VR. | 15 min |
| **Follow up** | The teacher extrapolates the discussion to the Sun by explaining the mechanism of nuclear fusion. | 10 min |
| **Formative Assessment** | The teacher asks the students to watch how neon light emits and to explain the phenomena in the tube. | 10 min |