**O3.2\_Framework of the lesson plan**

**Age group/class:** 13-14 years

**Lesson title: Combination reaction**

**School Discipline:** CHEMISTRY

**Key concepts:** combination reaction, reactants, reaction products law of mass action

**Aims:** Strengthen knowledge of chemical reactions, the law of mass action, the application of notions learned in everyday life and the formation of skills for writing combination reactions.

1. Exploring some phenomena and properties of the substances encountered in daily activity

1.1. Identification of products of combination reactions

1.2. Description of the mechanism of combination reactions encountered in known contexts using chemistry-specific terminology

1.3. Use of chemistry-specific symbols to represent elements, simple or compound substances and transformations of substances

2. Interpretation of data and information obtained in an investigative approach

2.2. Use of laboratory equipment and VR technologies to study combination reactions

2.3. Investigation of processes and phenomena in the virtual laboratory in order to identify the mechanisms of combination reactions

3. Problem solving in concrete situations, using algorithms and tools specific to chemistry

3.1. Identify the information and data needed to solve a problem in various contexts

3.2. Solving qualitative and quantitative problems based on the concepts studied

**Skills developed:**

**As a result of this lesson, students will develop their ability:**

- to deduce the uses of the studied combination reactions

- the ability to analyze and interpret the information / data obtained through investigative activity

- to draw conclusions and generalize in order to write correctly any combination reaction

- to apply the rules / laws in order to solve problems

- to present the results of an experiment using the VR technique

- to assess the advantages and disadvantages of using certain substances

**Materials/Equipment needed:** worksheets,; video projector, interactive whiteboards, VR application for chemical reaction modeling, Periodic Table, reagents, laboratory utensils

**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. | 1 min |
| **Introduction** | The teacher specifies the title of the lesson.  The teacher presents the purpose of the lesson and the objectives pursued.  Through the teacher-student dialogue, the notions related to chemical reactions and the law of mass action studied in the previous lesson are recalled.  Introduce the notion of combination reaction and explain to students the mechanism of this reaction. | 6 min |
| **Initial Immersive Experience** | The teacher presents a combination reaction model.  Students model on the worksheet the proposed reactions, equalize them respecting the law of mass action and then check them with the help of VR if they are correctly written and matched.  In experimental VR the reactions will be performed at the respective atomic and molecular level.  If the reaction is not modelled correctly, no reaction products appear in experimental VR. | 10 min |
| **Guided Immersive Experience** | After discussing all the reactions in the worksheet and making the corrections where appropriate, the students perform the VR experiments again this time in the correct matched form. | 14 min |
| **Follow up** | Furthermore, in order to fix the newly learned notions, the students are divided into two teams and using VR they obtain some compounds of practical importance. | 10 min |
| **Formative Assessment** | Using the information received, the bibliographic material and the internet will make a material related to the use of the products obtained in the combination reactions in everyday life. | 10 min |