# Polymers

Are all plastics the same?

# SAILS inquiry and assessment unit overview

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| **Name** | Polymers |
| **Key content/concepts** | * Determining density of plastic materials by comparing with water density * Thermal stability and thermal conductivity of plastic materials * Combustion of plastic materials * Electrical conductivity of plastic materials |
| **Level** | * Upper second level |
| **Inquiry skills assessed** | * Planning investigations * Developing hypotheses * Forming coherent arguments * Working collaboratively |
| **Assessment of scientific reasoning and scientific literacy** | * Scientific reasoning (collecting and recording data, problem-solving, argumentation, forming conclusions) * Scientific literacy (understanding properties of plastics and how they are utilised in everyday life) |
| **Assessment methods** | * Classroom dialogue * Teacher observation * Peer-assessment * Self-assessment * Worksheets * Student devised materials (final summary) |

Table 1: Questionnaire for the self-assessment of working collaboratively

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Very good** | **Good** | **I have to get better** |
| **1. How did I help during group work?** |  |  |  |
| **2. How did the other members of the group help me?** |  |  |  |
| **3. Did I make group work harder?** |  |  |  |
| **4. How did I manage to fulfil the goal of the lesson?** |  |  |  |
| **5. How did other members of the group manage to fulfil the goal of the lesson?** |  |  |  |

Table 2: Questionnaire for the self-assessment of working collaboratively (group work)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Assessment criteria** | **1** | **2** | **3** | **4** | **5** |
| **Communicative skills, planning investigations** | 1. We discussed procedures for solving the given tasks together |  |  |  |  |  |
| 2. I suggested procedures and the others agreed |  |  |  |  |  |
| 3. The others suggested procedures and I agreed |  |  |  |  |  |
| **Formulation of conclusions** | 4. We formulated conclusions together |  |  |  |  |  |
| 5. I explained to the others how to formulate conclusions |  |  |  |  |  |
| 6. Other classmates explained to me how to formulate conclusions |  |  |  |  |  |
| **Creation of answers to questions** | 7. We formulated answers together |  |  |  |  |  |
| 8. I answered questions and justified them |  |  |  |  |  |

Table 3: Rubric for the assessment of forming coherent arguments in part 1 of Activity D

|  |  |  |
| --- | --- | --- |
| **1 point** | **2 points** | **3 points** |
| The student guesses the answers, he cannot justify why plastics, wood and cotton wool are non-conductive. | The student answers that plastics, wood and cotton wool are non-conductive on the basis of experiences, observations and knowledge from everyday life (wooden electric poles, plastics in electronics, insulators, plastic carpet in chemical laboratories etc.)  The student describes the phenomenon and the realised experiment (the connection of substances into the electrical circuit). However, the student cannot scientifically justify it. | The student understands the essence of conductivity of substances and understands the essence of metallic bonding.  The student scientifically justifies why metals conduct the electric current – the reason is free motion of electrons – and why plastics do not conduct the electric current – the reason is non-existence of free electrons. |

Table 4: Rubric for the assessment of planning investigations in Activity A

|  |  |  |
| --- | --- | --- |
| **1 point** | **2 points** | **3 points** |
| The student understands the task, but does not know what the density is. S/he does not independently plan the experiment. | The student knows what density is and suggests a procedure to determine density of plastics in comparison to water, but s/he does not scientifically justify the suggested procedure. | The student defines density, suggests a procedure to determine density of plastics in comparison to water and scientifically justifies the suggested procedure. |

Table 5: Rubric for the assessment of the skill of developing hypotheses in Activity B

|  |  |  |
| --- | --- | --- |
| **1 point** | **2 points** | **3 points** |
| The student assumes that plastics do not burn and does not consider other contexts. | The student assumes that some plastics burn and lists some specific examples. With the teacher´s help, the student is able to carry out the experiment and verify the hypothesis. | The student assumes that plastics burn, lists specific examples and suggests an experiment without the help of the teacher, in which s/he takes a small sample of plastic and with tongs s/he inserts the plastic into flame of the burner and therefore verifies the hypothesis. |