

# Teaching Ideas: Separation of Substances

**Duration:** 90 minutes

**Grade:** VI

## 1. Objective

The objective of this lesson is to enable students to develop an understanding of the various separation techniques that are used to separate the components in a mixture.

## 2. Learning Outcomes

After the completion of this lesson, the students will be able to do the following:

- Understand the need for separation of substances.
- Apply different methods to separate the components of a mixture.

## 3. Pre-requisites

Before studying this lesson, the students should know about the different properties of matter, such as solubility, weight, size, etc.

## 4. Elements of a Good Science Classroom

A good science classroom should have the following elements: science skills, classroom culture, and a connection to the life around the students. This year, we will be focusing on the following specific elements:

1. Science skills:  
the students should understand, at their level, the following elements of the scientific method: generation of a hypothesis, experimentation, observation, analysis, and inference.
2. Classroom conducive for learning science:  
Self-motivation, self-awareness, working in a team, and social/civic awareness and consciousness. The students should be allowed to interact with each other and learn from each other to improve their communication skills through peer-learning.
3. Connection with life around:  
The students should be able to learn and apply scientific concepts in simple real-life situations.
4. Removal of gaps in learning:  
The gaps in numeracy, literacy, and conceptual understanding of science should be addressed.

In the context of this module, the following elements of a good science classroom can be demonstrated:

<b>Classroom Element</b>	<b>Specific Type</b>	<b>Context</b>	<b>Teacher's Actions</b>	<b>Students' Actions</b>
Classroom engagement	Students' participation	Giving opportunities to students (individuals/groups) to share their findings and discuss them with the whole class.	Through this activity, the teacher should engage the students and provide them an opportunity to express their understanding about pure substances and mixtures.	The students should present their ideas to the whole class.
Conceptual understanding	Activity and assessment	Multiple-choice questions and activities (application level) to check the understanding of the students.		The students must deduce the ways in which substances are separated from a given mixture.
Science skills	Observation	Observing the components in a mixture.	The teacher should guide the students to observe the different components that are present in a given mixture.	The students should be able to identify the different substances present in the given mixture.
Science skills	Inference	Predicting the basis of separation in each of the cases (in terms of size, weight, colour, solubility, and magnetic attraction).	The teacher should guide the students to identify the properties of the substances in the mixture that can be used to separate it from the mixture.	The students should identify the properties and use suitable separation techniques to separate different substances from the mixture.

				the given mixture.
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## 5. Materials required

The materials mentioned below will be required to perform the experiment. It has been assumed that the strength of the class is 30.

S. No	Method of Separation	Materials Required
1	Hand picking	Stones of different colour and different sizes
2	Threshing	Harvested rice paddy or sesame
3	Churning	Curd and churner
4	Winnowing	Rice with husk
5	Sedimentation/Decantation	Calcium hydroxide solution or chalk powder in water
6	Magnetic separation	Iron fillings mixed with sand/salt/grains, magnet
7	Sieving	Rice and flour mixed with sand or small gravels (low cost), sieve
8	Sedimentation/Decantation	Polluted water with various contaminants, such as sticks, thermocol, sand, stone gravels, paper clips, nails, food colour, plastics, etc.

Some important materials that are to be kept include strainers, mesh screens, coffee filter, filter paper, glass rod, funnel, cotton, spoons, beakers, magnets

## 6. Note to the Teacher

The concept of separation needs to be dealt as a continuation of the discussion pertaining to pure substances and mixtures.

In Activity 1, the students should observe the different mixtures. They should deduce the ways in which the substances of the mixture can be separated, and they should note down the results in the worksheet that will be provided to them. In Activity 2, the students should observe the

different components present in a mixture and apply different methods to separate the components of the mixture.

The teacher should encourage students to predict the outcomes of the activities before the students do it. The students may make predictions based on their observations and daily-life experiences. The students can be encouraged to answer orally.

## 7. Activity 1

### 7.1 Procedure:

1. Divide the students into groups of 4. Distribute the worksheets and the samples of the mixtures to each group. Provide the sample mixtures one at a time.
2. Ask the students to discuss within their groups and first identify the component that would be the easiest to separate and the method of separation that would be most suitable for separating it. The students should also discuss about the equipment that they would require for the separation. The students should also note down the property that makes possible the separation through their chosen technique in the worksheet.
3. Allow the groups to attempt the separation technique based on their group's decision. Once all the groups are done, discuss what was the best method available and what was the property that made separation through the technique possible.
4. Repeat this process for the other samples as well.

### 7.2. Observables

Solubility, weight, colour, and size of the substances present in the mixture are the observables for this experiment.

### 7. 3. Worksheet

You are given different mixtures in your respective groups.

1. Identify the components in each of the given mixtures.
2. Discuss in your group the possible ways to separate the components of the mixture.
3. Predict the basis of separation in each of the cases.
4. Consolidate your findings in Table 1 given below.

### 7.4. Table 1

Mixture	Components of the mixture	Method of separation	Basis of separation

A bag of vegetables	Onion, tomato, brinjal, potato, leaves, etc.	Hand picking	Difference in size, shape, and colour.
Stones of different sizes and colours			
Harvested rice paddy.			
Rice with husk			
Curd and churner			
Rice with stones of different colours (white/ grey/brown/black )			
Calcium hydroxide solution or Chalk powder in water.			
Iron filings with sand/salt/grains			
Sand with small gravels			
Rice with flour			

### **7.5. Activity 3**

After the recent floods, all the sources of water in the town has become polluted with various contaminants. You are given a sample of water from a nearby source. The samples are filled with mud, stones, thermocol, plastics, etc. Find out ways to obtain the cleanest sample of water that you can using the materials provided. Discuss in your groups and create a plan for doing the same. Carry out the plan and record the results.

## 7.6. Assessment

### Worksheet

1. Why do we separate substances?
  - a. To know the price of the substances.
  - b. To take out the useful substances from a mixture.
  - c. To prevent them from spoiling.
2. Can all substances be separated using the same method? Give reasons.

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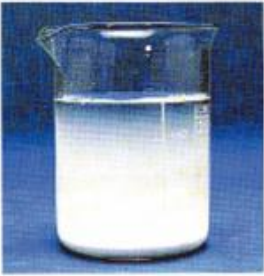



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3. Why can't we separate rice and flour using the hand-picking method?
  - a. They are very expensive.
  - b. They are too large in number.
  - c. They are too large in size.
4. The method of separation to be adopted depends on the \_\_\_\_\_ of the components.
  - a. Color
  - b. Shape
  - c. Size
  - d. All of the above

5. Match the following:

Handpicking	Used to separate magnetic materials from non-magnetic materials.
Winnowing	Adopted to separate lighter solids from heavier ones.
Magnetic separation	Process of pouring out the clear liquid without disturbing the sediment.
Sedimentation	For smaller quantities containing particles of different sizes.
Decantation	Process of separating insoluble solid particles (residue) from a liquid (filtrate) by using a filter paper.
Filtration	Settling down of suspended, insoluble, and heavy solid particles.

6. Match the following:

	Mixture of chalk and water	Magnetic separation
	Mixture of sand and water	Decantation
	Mixture of iron filings, salt and sand	Filtration
	Husk and paddy	Hand picking
	Rice and stone	Winnowing