

Types of Colloids: Preparation of Oil-based and Water-based colloids and distinguishing them under a microscope.

Grade IX

Estimated number of students: 24

Time: 90 minutes

Learning Outcomes:

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

- Observe the optical property of a colloidal solution.
- Explain the differences between dispersed phase and dispersion medium.
- Differentiate between oil-based and water-based colloidal solutions.
- Appreciate the role of colloids in cosmetics, foods, and pharmaceuticals.

Prerequisite knowledge:

Before commencing with this module, the students should have prior knowledge of the following:

- Differences between Pure substances and Mixtures.
- Differences between heterogeneous and homogeneous mixtures.

Materials needed:

- Calcium Chloride - 55 g
- Sodium Carbonate (washing soda) - 53 g
- Peppermint essence
- Funnel
- Filter paper
- Beakers of 10–100 ml
- Eggs (whole)- 2
- Vinegar - 2 tablespoons, Lemon juice – 1 tablespoon
- Salt - $\frac{1}{2}$ teaspoon (or as per taste)
- Pepper - $\frac{1}{2}$ teaspoon
- Vegetable oil - 2 cups
- Slides and coverslips – 4 of each
- 400x microscope
- Milk and mayonnaise
- Tissue paper

Activity 1: Observing the differences between oil-based colloids and water-based colloids under a microscope.

Teacher's note: The slides for this experiment can be made before the class commences. For the students of grade 9, the preparation of microscopic analysis slide may be a bit overwhelming.

Preparation of slides for milk (water-based colloid):

- Prepare 2 ml of 70% ethanol solution. Put 32 mg powder of the stain 'Sudan Black' into it. Mix it well.
- Take 1 ml of milk and dilute it with 3 ml of water in a test tube and put 5 drops of prepared Sudan Black solution into it. Stir the mixture well and put a drop of this milk on a slide. Close it with a coverslip and remove any excess liquid with the help of a tissue paper.
- Focus this slide under a 10 x 10 microscope and then move to 40 x 10. Focus the fat droplets (visible as tiny spheres suspended in the milk) with a 10x objective lens. Then, use higher powers of 20x and 40x objective lenses to study the droplets more closely.

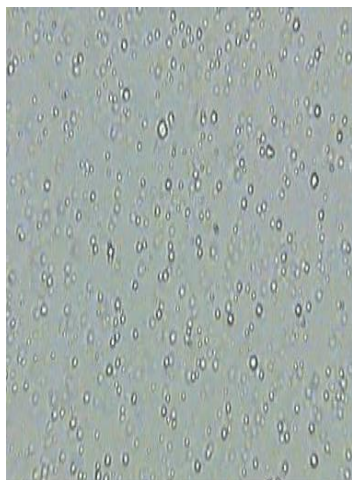
Preparation of slides for mayonnaise (oil-based colloid):

- Take $\frac{1}{4}$ th spoon of mayonnaise in a test tube.
- Put 1 ml of Sudan Black solution in the test tube. Mix it well and take a small drop on a clean slide.
- Close it with a coverslip and clean the excess liquid with the help of a tissue paper.

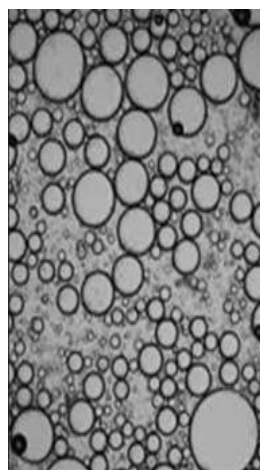
Classroom experiment:

1. Discuss about the different colloids that are familiar to the students, e.g., milk, mayonnaise, toothpaste, curd, etc.
2. Conduct a discussion on dispersed phase and dispersion medium.
3. Ask the students to predict what might be visible when a colloidal solution is observed under the microscope.
4. Allow the students to observe the prepared sides of milk and mayonnaise under the microscope and ask them to draw what they observe.

In the case of milk, the fat globules will be very small, since it is water based (i.e., containing more water than oil). In the case of mayonnaise, the fat globules will be large, since it is oil based (i.e., containing more oil than water).



Picture 1:
Expected view of milk
under a microscope.



Picture 2:
Expected view of
mayonnaise under
a microscope.

SC5106

1. Divide the students into groups of four for this activity. Each group should make a solution of 11 g of Calcium Chloride using the least amount of water possible so as to make a paste in a beaker.
2. Dissolve 10.5 g of washing soda in the least amount of water possible so as to make a paste in another beaker.
3. Mix the two solutions together and stir it well. A fine white precipitate of Calcium Carbonate will be obtained.
4. Filter the mixture, wash it with water, and allow the precipitate to dry.
5. To the dry powder, add two or three drops of flavoring peppermint and mix well.
6. Add water drop-by-drop and stir the mixture till a paste is obtained. Store in a closed container.

The toothpaste will be ready to use after the completion of the previous steps!

Activity 3: Whole-egg mayonnaise recipe.

Procedure:

1. Measure out 2 eggs, 2 teaspoons of vinegar, a pinch of salt, and a pinch of pepper into the big glass bowl. Blend all of these with an egg blender at a slow speed until a uniform mixture is obtained.
2. Increase the speed of blending and add vegetable oil in a slow, continuous drizzle through the feeder tube until the mayonnaise thickens. The amount of oil this will require depends on the size of the eggs.
3. Taste the mayonnaise; adjust the seasoning and add lemon juice or vinegar to taste. Briefly blend again to incorporate any other additions.
4. If you feel that the mayonnaise is too thick, simply add hot water, one teaspoon at a time, while continuing to blend the mixture until the mayonnaise acquires the desired consistency.

Instructions for storing Homemade Mayonnaise: Immediately store the homemade whole-egg mayonnaise in a jar or a plastic container and place it in the refrigerator. Discard any unused homemade mayonnaise after 10 days.

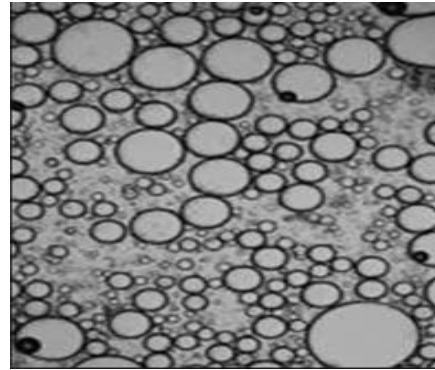
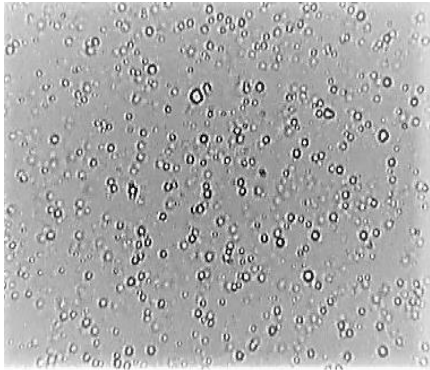
Post-class Assessment:

Marks 10

Time: 15 minutes

I. Identify the pictures of the two colloidal solutions when viewed under a microscope and answer the following: (4)

Write whether **A** and **B** are oil-based or water-based and give an example of each colloid.



A. _____

B. _____

E.g.: _____

E.g.: _____

II. State whether the following statements are true or false and correct the statements if they are false: (4)

1. Oil-based colloids have more water than oil.
2. Toothpaste is not a colloid.
3. Colloids cannot be separated by using a filter paper.
4. Water-based colloids have more water than oil.

III. The scattering of light in a colloid system is known as _____ (1)

- a. Brownian Motion
- b. Tyndall Effect
- c. Coagulation
- d. Electrophoresis

IV. Which of following is a colloid? (1)

- | | |
|------------|---------------|
| a) Milk | b) Pure water |
| c) Vinegar | d) Salt-water |