CLASS X-PRACTICAL WORKSHEET

Experiment No: …7……. **Date: ……..**

Comparative Cleaning Capacity of Soap with Hard and Soft Water

Aim:

To study the comparative cleaning capacity of a sample of soap in soft and hard water.

Materials required:beakers, test tubes**,**Distilled water, Calcium chloride**,**glass rods**,**Pre -prepared soap solution **,**Measuring cylinder **,**Measuring scale etc

Theory:

Although soap is a good cleaning agent, its cleaning capacity is reduced when used in hard water. Hardness of water is due to the presence of sulphates, chlorides or bicarbonate salts of Ca^{2+} or Mg^{2+} ions. Soaps are sodium or potassium salts of long chain fatty acids. When soap is added to hard water, the Ca^{2+} and Mg^{2+} ions present in hard water react with soap. The sodium salts present in soaps are converted to their corresponding calcium and magnesium salts which are precipitated as scum. The insoluble scum sticks on the clothes and so the cleaning capacity of soap is reduced.

$$Ca^{2+} + 2\,RCOONa \rightarrow (RCOO)_2Ca + 2Na^{+}$$

The cleaning action of soap is very effective in soft water because it contains negligible calcium and magnesium ions.

Procedure:

- Take three beakers and label them as A, B and C.
- In beaker A, put 20ml of distilled water using a measuring cylinder.
- In beaker B, put 20 ml of tap water using another measuring cylinder.
- In beaker C, add 20 ml of tap water. To this, add 2 g of calcium chloride and stir with a glass rod till it dissolves.
- Add 10 ml of soap solution to each beaker.
- Stir the contents in the beakers with separate glass rods to ensure that soap has mixed properly.
- In beaker A, the soap solution formed is almost clear, in beaker B, some turbidity is observed and in beaker C scum is formed.

- Take three pieces of white cloth of size 5 cm x 5 cm each.
- Put a drop of oil in the centre of each cloth by means of a dropper and allow it to dry.
- Place one piece of cloth with oil spot in the remaining soap solution in beaker A, another piece of cloth in beaker B and the third piece of cloth in beaker C.
- Leave the three beakers undisturbed for about 10 min.
- Remove the pieces of cloth from the beakers and rub each piece.
- The oil spot on the cloth in soap solution A has almost disappeared
- The oil spot on the soap cloth in soap solution B partially disappeared.

- There is no change in the oil spot on the piece of cloth dipped in soap solution C, and some scum has been deposited on the surface of the cloth piece.

Conclusions:

- The dirty cloth washed in soft water becomes absolutely clean.
- The dirty cloth washed in hard water does not become clean ,instead some amount of scum sticks to it.
- Therefore cleansing capacity of soap solution is more in soft water than in hard water.

Precautions

- Use distilled water for soft water
- Use the same soap sample for all solutions
- Shake each test tube equal number of times

Questions

1) What is scum?

2) What is micelle?

3) Why is the concentration of all soap solutions kept same?

4) What makes the water hard?

Multiple choice type questions

1	A student takes about 5 ml of distilled water in 4 test tubes marked P,Q ,R, S .He dissolves an equal amount of Na_2SO4 in P,K_2SO_4 in Q,$CaSO_4$ in R&$MgSO_4$ in S. After that he adds equal amount of con soap solution in each test tube. On shaking these test tubes well ,he would observed a good amount of lather in the test tubes marked a. P&Q b. Q&R c. R&S d. Q&S
2	Which one of the following combinations is suitable for the preparation of hard water. a. Distilled water & $CaCl_2$ **b.** Distilled water & KCl **c.** Distilled water &NaCl **d.** Distilled water ,NaCl&KCl
3	The soap solution was added to the given water samples A-Distilled water , B-underground water,& C-Distilled water &$CaSO_4$.The water sample that will produce the maximum foam is: a. C only b. A only c. A &B d. B &C
4	Soaps are better than detergents because a. They do not create water pollution b. These are more effective than detergents c. They have more cleaning capacity d. These are highly soluble in water.