

Exercise :3 C

What is the composition of water ? In what volume its elements combine ?

Solution:

The composition of water is two atoms of hydrogen with one atom of oxygen (H₂O). They combine in the ratio of 2:1.

1. What is the use of solubility of oxygen and carbon dioxide in water ?

Solution:

Oxygen dissolved in water is used by aquatic animals for respiration and survive. CO₂ dissolved in water is used by aquatic plants to prepare their food by photosynthesis.

2. Hot saturated solution of sodium nitrate forms crystals, as it cools. Why?

Solution:

A hot saturated solution of sodium nitrate forms crystals, as it cools because of its solubility decrease with decrease in temperature.

3. What are hydrous substances? Explain with examples.

Solution:

Substances which contain water with salts as known as hydrous substances. In hydrous substances waters helps the crystal structure. Ex: Sodium carbonate decahydrate: Na₂CO₃.10H₂O, Copper sulphate pentahydrate: CuSO₄.5H₂O

5• Name the three methods by which hydrous substances can be made anhydrous.

Solution:

- By heating
- By evaporation
- By exposing to dry air

6. What is the importance of dissolved impurities in water ?

Solution:

Importance of dissolved impurities in water are as follows

- Dissolved minerals and salts are essential for the growth of plants
- Dissolved salts add taste to water
- Dissolved salts and minerals in water provide essential minerals required for our body.

7. State two ways, by which a saturated solution can be changed to unsaturated solution.

Solution:

- a) A saturated solution can be changed to an unsaturated solution by heating.
- b) A saturated solution can be changed to an unsaturated solution by adding more solvent.

8. What do you understand by

- (a) Soft water
- (b) Hard water
- (c) Temporary Hard water
- (d) Permanent hard water.

Solution:

- a) Water is said to be soft water if it readily gives foam with soap.
- b) Water is said to be hard water if it does not readily give foam with soap.
- c) Water that contains only hydrogen carbonates of Calcium and Magnesium is called temporary hard water.
- d) Water that contains sulphates and chlorides of Magnesium and Calcium is known as Permanent hard water.

9. What are the causes for

- (a) Temporary hardness
- (b) Permanent hardness

Solution:

- a) The presence of hydrogen carbonates of calcium and magnesium makes water temporarily hard.
- b) The presence of sulphates and chlorides of magnesium and calcium makes water permanently hard.

10. What are the advantages of (i) soft water (ii) Hard water

Solution:

- a) Advantages of soft water
 - i) With soft water soaps and cleansing agents are consumed less, which will save you money.
 - ii) Soft water does not leave deposits of minerals on pipes which will make plumbing works easy.
 - iii) Clothes washed using soft water lasts long and remain bright

b) Advantages of hard water

- i) Presence of salts and ions in hard water makes it tasty
- ii) Calcium and Magnesium ions present in hard water are essential for the growth of our bones.
- iii) hard water checks poisoning of water by lead pipes.

11. What are stalagmites and stalactites' How are they formed?

Solution:

In some limestone caves we sometimes see conical pillar-like objects hanging from the roof of the caves and some rising from the floors. These conical pillars which grow upward from the floor of the caves are known as stalagmites, and the structures which grow downwards from the roof are called stalactites.

These structures are formed by water dropping from the cracks in the rocks containing calcium hydrogen carbonate. Calcium hydrogen carbonate converts to calcium carbonate when pressure is released. Over some time, calcium carbonate deposits to form stalagmites and stalactites.

12. Name the substances which give water (i) temporary hardness (ii) permanent hardness.

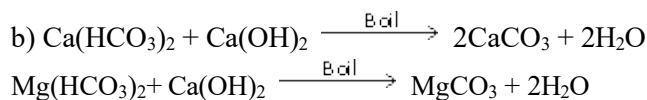
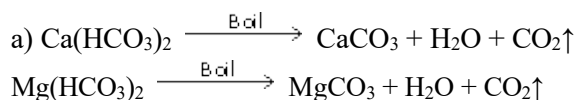
Solution:

- i) **Hydrogen carbonates of calcium and magnesium** turn water temporarily hard.
- ii) **Sulphates and chlorides of magnesium and calcium** make water permanently hard.

13. Give equations to show what happens when temporary hard water is

(a) boiled (b) treated with slaked lime

Solution:



14. State the disadvantages of using hard water.

Solution:

Hard water is unfity for washing as it is difficult to form lather with soap.

Scum may form in a reaction with soap, wasting the soap.

Furring of tea kettles will takes place due to the formation of Carbonates of calcium and magnesium.

Hard blocks hot water pipes. This is due to the formation of layers of Carbonates of calcium and magnesium.

15. What is a soap, what for is it used?

Solution:

Soap is chemically a sodium salt of stearic acid (an organic acid with the formula $C_{17}H_{35}COOH$) and has the formula $C_{17}H_{35}COONa$. Soap is used for domestic washing purposes.

16? What is the advantage of a detergent over soap ?

Solution:

Detergent readily forms lather with hard water and it is more soluble in water.

17? Why does the hardness of water render it unfit for use (i) boiler (ii) for washing purposes?

Solution:

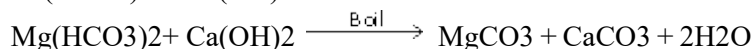
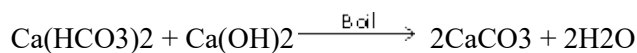
i) The dissolved substance present in the hard water fail to get converted into steam and gets deposited on the inner walls of the tube. Over time this narrows the tubes which stop the water flow, and less steam is produced. When bore of the tube becomes very narrower boiler itself bursts due to the pressure of the steam. Hence, hard water is not used in boilers.

ii) If hard water is used, calcium and magnesium ions of the water combine with the negative ions of the soap to form a slimy precipitate of insoluble calcium and magnesium usually called soap curd (scum). Formation of soap curd will go on as long as calcium and magnesium ions are present. Till then, no soap lather will be formed and cleaning of clothes or body will not be possible. Moreover, these precipitates are difficult to wash from fabrics and sometimes form rusty spots if iron salts are present in water.

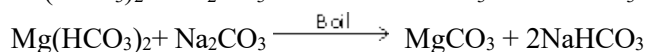
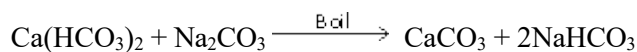
18. Explain with equation. what is noticed when permanent hard water is treated with (a) slaked lime (b) washing soda

Solution:

a) Slaked lime is first mixed with water and then fed into another tank containing hard water. Then mix this solution thoroughly by using revolving paddles. This process will make calcium carbonate to settle down, and the leftover solid is removed by filtration.



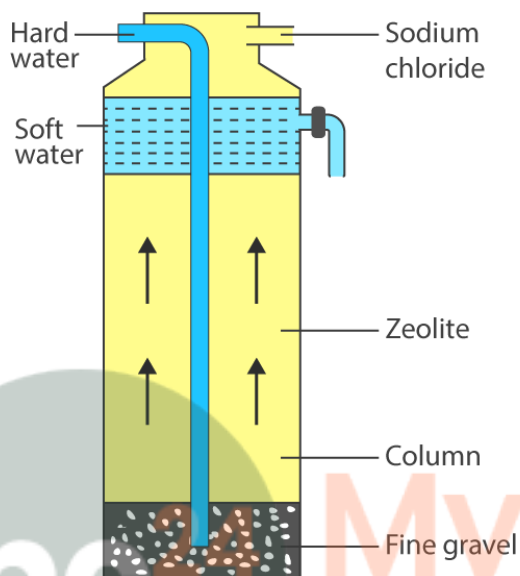
b) Washing soda is added to hard water, which results in settling down of insoluble carbonates which can be removed by filtration.



19. What is permutit method, how can it be used for softening hard water ?

Solution:

Permutit is an artificial zeolite. Chemically, it is hydrated sodium aluminium orthosilicate with the formula $\text{Na}_2\text{Al}_2\text{Si}_2\text{O}_8 \cdot \text{XH}_2\text{O}$. For the sake of convenience, let us give it the formula Na_2P .



A tall cylinder is loosely filled with lumps of permutit. Ions are exchanged when hard water containing calcium and magnesium ions percolates through these lumps. Sodium permutit is slowly changed into calcium and magnesium permutit, and the water becomes soft with the removal of calcium and magnesium ions.

When no longer active, permutit is regenerated by running a concentrated solution of brine over it and removing calcium chloride formed by repeated washing.

