

Crystallisation Chemistry Questions with Solutions

Q1. Which of the following facilitates crystallisation?

- (a) Adiabatic evaporation and cooling
- (b) Solution is concentrated by evaporation
- (c) Hot concentrated solution is cooled for crystals to form
- (d) All of the above

Answer: (d) Adiabatic evaporation, cooling and cooling of hot concentrated solution to form crystals facilitates crystallisation.

Q2. What is the name of the substance containing water of crystallisation?

- (a) Anion
- (b) Hydrate
- (c) Buffer
- (d) None of the above

Answer: (b) Hydrate contains water of crystallisation.

Q3. Which of the following is not an essential criterion for crystal formation?

- (a) Moisture content
- (b) Caking characteristics of the crystal
- (c) Shape
- (d) None of the above

Answer: (d) Moisture content, caking characteristics of the crystal and shape are the essential criterion for crystal formation.

Q4. Which of the following salts does not contain water of crystallisation?

- (a) Blue vitriol
- (b) Washing soda
- (c) Baking soda
- (d) All of the above

Answer: (c) Washing soda does not contain water of crystallisation.

Q5. Which of the following parameter affects the rate of crystallisation?

- (a) Purity of solution
- (b) Agitator speed
- (c) Population density
- (d) All of the above

Answer: (d) Purity of solution, agitator speed and population density affect the rate of crystallisation.

Q6. Which of the following tells the significance of crystallisation in food processing?

- (a) Physical stability of the food
- (b) Consistency of food emulsions
- (c) A good feel of food inside the mouth
- (d) All of the above

Answer: (d) Physical stability of the food, consistency of food emulsions and a good feel of food inside the mouth tells about the significance of crystallisation in food processing.

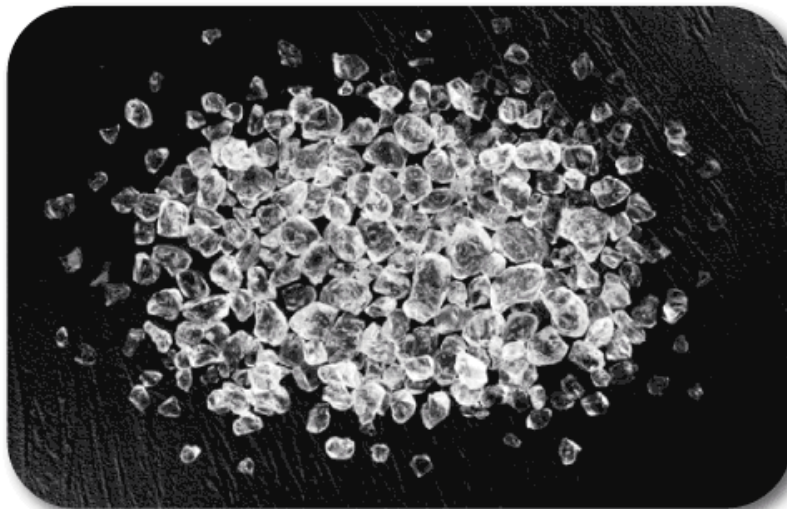
Q7. What is crystallisation? Why is it important?

Answer: Crystallisation is a purification technique under which an atom or molecule arranges itself in a well-defined three-dimensional lattice and minimises the system's overall energy. It is essential because it enables us to prepare substances of the highest purity.

Q8. What is the water of crystallisation?

Answer: Water of crystallisation is the substantial number of water molecules present in a loose combination with a formula unit of the compound.

CRYSTALLIZATION



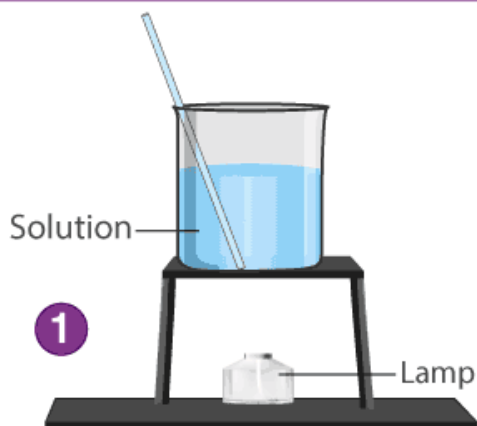
Q9. What are the different steps involved in crystallisation?

Answer: Crystallisation is a purification technique under which an atom or molecule arranges itself in a well-defined three-dimensional lattice and minimises the system's overall energy. Various steps are involved in the process of crystallisation. They are

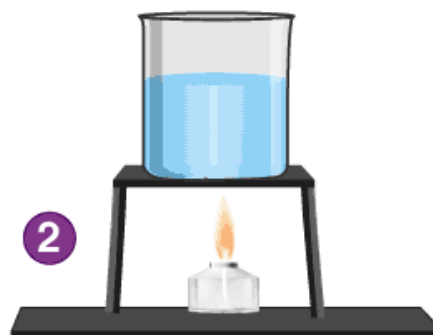
1. Preparation of the solution

2. Filtration of the solution
3. The concentration of the solution (by heating)
4. Slow cooling of the solution (to form crystals, i.e. crystallisation)
5. Separation and drying of the crystals

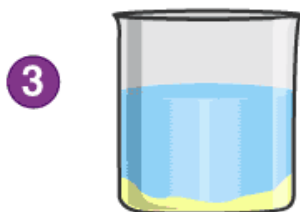
CRYSTALLIZATION PROCESS



1
The impure solid is dissolved in a solvent



2
The solution is heated to evaporate most of the solvent



3
The hot solution is allowed to cool. the solid appears as pure crystals



4
The cold solution is poured off to obtain the crystals. The crystals may be dried by pressing them between sheets of filter paper

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Q10. What happens when the following crystals are heated individually?

- (a) Benzoic acid
- (b) Potash alum
- (c) Blue vitriol

Answer: (a) When the crystals of benzoic acid are heated, they will undergo sublimation.

(b) When the crystals of potash alum are heated, they turn into a fluffy white mass.

(c) When the crystals of blue vitriol are heated, they will change into a white powder due to the loss of water of crystallisation.

Q11. What are the applications of crystallisation?

Answer: Crystallisation is an essential purification technique under which an atom or molecule arranges itself in a well-defined three-dimensional lattice and minimises the system's overall energy. It plays a vital role in

1. Separation of salt from seawater
2. Separation of alum crystal from an impure alum sample
3. Synthesis and isolation of co-crystals, controlled release pulmonary drug delivery, pure active pharmaceutical ingredients (API), and separating chiral isomers.

Q12. What are the benefits of crystallisation?

Answer: Crystallisation is an essential purification technique under which an atom or molecule arranges itself in a well-defined three-dimensional lattice and minimises the system's overall energy. It has a lot of advantages. A few of them are enlisted below.

1. It enables us to obtain a high purity compound in a single step.
2. The energy requirement and the operating temperature of crystallisation are fairly low.
3. The parched products obtained from crystallisation can be directly packaged and stored.

Q13. Match the following.

Column I	Column II
Alloying	Exothermic change
Crystallisation	Periodic change
Soap powder + Water	Mixing of molten solids
Seasonal changes	Pure solid

Answer:

Column I	Column II
Alloying	Mixing of molten solids
Crystallisation	Pure solid
Soap powder + Water	Exothermic change
Seasonal changes	Periodic change

Q14. What are the two types of crystallisation?

Answer: Crystallisation is an essential purification technique under which an atom or molecule arranges itself in a well-defined three-dimensional lattice and minimises the system's overall energy. We can classify crystallisation into two classes, namely.

1. Evaporative crystallisation
2. Cooling crystallisation

Q15. Differentiate between evaporation and crystallisation.

Answer:

S. No.	Evaporation	Crystallisation
1.	Evaporation converts a liquid into its gaseous phase at a specific high temperature.	Crystallisation is the formation of crystals and may occur as either natural or artificial processes.
2.	Evaporation is the formation of vapour from a liquid.	Crystallisation is the formation of solid crystals from a liquid.
3.	It can remove a more volatile substance from a liquid mixture.	It can remove a solid substance from a liquid.
4.	It is less efficient because some solid decomposes on heating.	It is used in separating pure solid from liquid with high efficiency.

Practise Questions on Crystallisation

Q1. Why is the solution not heated to dryness to get crystals?

Answer: The solution is not heated to dryness to get crystals because heating the solution to dryness will not remove soluble impurities of the solution, and crystals of inferior quality will be obtained.

Q2. Why is the hot saturated solution not cooled suddenly?

Answer: The hot saturated solution is not cooled suddenly because slow cooling grows the crystals of the solution. This will help improve the separation of the crystals, or else a massy substance of no proper geometry will be formed.

Q3. What are three factors that affect the rate of crystallisation?

Answer: Crystallisation is a purification technique under which an atom or molecule arranges itself in a well-defined three-dimensional lattice and minimises the system's overall energy. The three factors that affect the rate of crystallisation are mentioned below.

1. The nature of the crystallising substance.
2. The concentration of the crystallising substance.
3. The temperature of the surroundings.
4. Agitation.
5. Impurities present in the solution.

Q4. How does temperature affect the rate of crystallisation?

Answer: Crystallisation is a purification technique under which an atom or molecule arranges itself in a well-defined three-dimensional lattice and minimises the system's overall energy. Temperature can affect the rate of crystallisation to a great extent. The higher the temperature, the warmer the crystal solution will be, and the faster its molecules will move. This movement permits them to evaporate quickly, leaving behind particles to form crystals.

Q5. Distinguish between precipitation and crystallisation.

Answer:

S. No.	Precipitation	Crystallisation
1.	In precipitation, an amorphous solid is formed.	In crystallisation, crystals are formed.
2.	Precipitation process takes less time than the crystallisation process.	The crystallisation process takes more time than the precipitation process.
3.	Precipitation is easier than crystallisation.	Crystallisation is harder than precipitation.