Frequently Asked Questions:

1. **Why is dehydration necessary for fruits and vegetables?**

Ans: Dehydration of fruits and vegetables offers some advantages. They are

1. Reduction in bulk for storage, transportation and packaging.
2. Convenience in use
3. Better storage stability because of the reduction in water activity thereby preventing microbial growth.
4. Dried and dehydrated foods are concentrated foods as calorific value is too high.
5. Can be used in the event of wars, famine, exploration, space travel and outbreak of diseases and floods etc.

2. **What is dehydration?**

Ans: The removal of water from food products before marketing may be referred to as dehydration,

3. **How is solar drying of fruits done?**

Ans: In Solar drying fruits are spread on a slotted wooden trays 90cm× 60cm with sides about 5cm high and with flat bottom are convenient for handling the fruits. The trays are exposed to direct sunlight for about 5 days and then turned over to expose the bottom layer to the sun for another 5 days. The trays are then stocked in the shed to complete drying. It usually takes about 20-25days for satisfactory drying.

The dried fruits are placed in air tight wooden boxes or rooms for about a month to undergo sweating or equilibration of moisture. The over dried fruits absorb moisture from the fruits of higher moisture content, and the surface of the fruits becomes moist through the diffusion of moisture from the interior of the fruit to the surface. During the treatment a fumigant such as methyl bromide may be used at 1 pound per 1000 cubic feet to destroy

any insect that may have harbored during sun drying step. The boxes after 24hrs.of the treatment are continued to be dried as before.

4. Mention the advantages of Solar drying.

Ans: Advantages of solar drying

i) Low investment
ii) Labor cost saving
iii) Low delivery cost
iv) Product free from insect and mold contamination
v) Longer shelf life and better organoleptic quality

5. Explain the process of Radiation type of solar drying.

Ans : In Radiation type the product to be dried is spread thinly in the trays and exposed to direct radiation from the sun. There are no controls beyond the adjustment of the orientation of cabinet and the drying of the product is non-uniform. This type of drier is found to be suitable for drying only small batches of material.

A polyethylene tent drier developed by **Doe etal** operates by absorbing solar radiation through the clear polyethylene onto the back surface of the dryer, thus increasing the temperature of the air inside the drier. Moisture removed from the food during drying is generally carried out of the drier with the exhaust air or condenses inside of the polyethylene sheeting

6. Name the different types of Dehydration methods.

Ans: The different types of Dehydration methods are

a. Cabinet, tray and pan driers
b. Tunnel driers
c. Continuous conveyor drying
d. Fluidized Bed drying

e. Vacuum shelf drier
f. Freeze drying
g. Spray drying
h. Microwave drying
i. Osmotic dehydration

7. Differentiate between Cabinet and Tunnel Driers

Cabinet Drier: The cabinet dryers are air-convection batch tray drier, intended for relatively small scale operation. Air flow may be across or through the trays with or without recirculation.

Tunnel driers: A tunnel drier is basically a group of truck and tray dryers. These are most commonly used for dehydration of fruits and vegetables. They consist of tunnels 10-20 meter long into which trucks containing the trays of the food are placed. Hot air is blown across the trays. Production is scheduled so that when the truck of the finished product is removed from one end of the tunnel, a truck of the fresh product is put to the other end.

Air movement may be in the same direction as the movement of the product. This is referred to as parallel flow. This has the advantage that the hottest air contacts the wettest product. Therefore, hotter air can be used.

The air movement may be in the opposite direction of the material flow. This is referred to as counter-current flow. In this case the hot dry air contacts the driest product first so that very dry end product can be obtained.

In some cases, the two types of tunnels are combined into one unit. The product is first placed in the parallel tunnel to take advantage of high initial rate of drying. It can then be placed in a counter current tunnel to get very dry end product.

8. **Explain how grains, peas and other particulates are dried in Fuidized bed drying method.**

Ans: In this drier, the heated air is blown up through the food particles with just enough force to suspend the particles in a gentle boiling motion and to convey it towards the outlet. Semidry particles such as potato granules enter the left and gradually migrate to the right where they are discharged dry. Heated air is introduced through the porous plate that support the bed of granules . The moist air is exhausted at the top. This is a continuous operation and used mainly to dry grains, peas and other particulates.

9. **Describe the process of Freeze Drying**

Ans: In this method, the material is first frozen on the trays in the lower chamber of the freeze drier and the frozen material is dried in the upper chamber under high vacuum. The material dries directly by sublimation of ice without passing through the intermediate liquid stage. The main advantages of this drying method are related to high quality of final product compared with other drying methods.

The advantages are

(1) High retention of flavor and aroma
(2) High retention of nutritional value
(3) minimal shrinkage
(4) Minimal changes in shape, colour and value
(5) Practically no damage in structure and texture
(6) Porous final structure
(7) Easily rehydratable

10. **Briefly note the Microwave drying type of dehydration**

Ans: Microwave heating increases the temperature of the interior, wetter part of the solid. In addition moisture transport to the evaporation surface is also enhanced by an internal pressure gradient.

Microwave heating has three main advantages.

1. A penetrating quality that leads to the uniform drying (conventional drying may cause damage to the surface of the product.
2. selective adsorption by liquid water which leads to uniform moisture profile within the particle.
3 ease of control due to the rapid response of such heating.

11. How is osmotic dehydration is done?

Ans: In Osmotic dehydration, Hot air drying notably reduces the quality of the processed foodstuff (changes in colour, shape, loss of aroma and nutrients etc.). Osmotic dehydration is an alternative technology to reduce the water content , as well as to improve the quality of the final product. Osmotic dehydration involves the immersion of cut fruits or vegetables in a concentrated solution of sugar in case of fruits and in salt for vegetables. A flux of water out of the food and other solute into the food stuffs develops due to the difference in osmotic pressure, thereby nearly 50 % reduction in the weight of the product can be achieved

12. What are the pretreatments for dehydration?

Ans: Pretreatments are very much necessary for dehydration of foods. It is for better sanitation, storage, stability and retention of nutritive values.
They are :

a. Washing,
b. Peeling
c. Trimming
d. Topping and tailing
e. Slicing
f. Blanching
g. Sulphination

13.How is Blanching helpful in dehydration process?

Ans: Blanching is very much needed as pretreatment of foods. It has many extraordinary features to enhance the nutrition values.

(a) To inactive the enzymes (peroxides and catalase) responsible for discoloration and change in flavor and aroma

(b) To remove intracellular air from the tissues (which makes the product limp and easy to pack

(c) To remove microbial load, to cook partially which causes softer texture

(d) To fix the green color (chlorophyll)

(e) To achieve better retention of ascorbic acid and carotene.

(f) To remove harsh flavor as in turnip, spinach, okra and snap beans and

(g) To reduce drying time.

14.Briefly explain the process of Apple dehydration

Ans: Apples are never sun-dried but dehydrated either by means of tunnel driers or in kiln depending upon the type of the product desired. Vacuum drier are used for preparing dehydrated apples of 3% moisture content. It undergoes various steps of pretreatments.

First the Storage of fruits: Apples are stored for several months at 35 to 38^{o}F, length of the storage depending upon the variety and waxing treatment prior to storage.

Washing: Washing is carried out to remove grits and dirt. Since the apples are subsequently peeled, it is not necessary to give acid wash to remove spray residue unless the waste is used for feed or other purposes. If the peel is to be dried for pectin manufacture or for feed purposes, and the fruit has been sprayed, it will be necessary to acid treat before peeling. This may be

carried out by immersing the apples for about 3 min in a 0.5 to 1.0 percent solution of hydrochloric acid at 70^0F.

Peeling and coring: This is done by machine, peeling and coring being accomplished in one operation. Peeling should be thorough because subsequent grading of the dried product will be governed to some extent by the presence of peel. Peeling, trimming, coring loss will amount to from 25 to 40%.

Slicing or dicing: The peeled, trimmed fruit may be sliced into rings, ½ inch thick, diced ¼ inch cubes, quartered or sliced.

Sulphitation: The fruits are then sulphited

Drying and Packaging is done to give the end product

15. Give the formulae for Drying ratio, and Rehydration ratio

Ans :

$$\textbf{Drying ratio: } \frac{\text{Wt. of the prepared product entering the drier}}{\text{Wt. of the dry product leaving the drier}}$$

$$\textbf{Rehydration ratio: } \frac{\text{Wt. of the dry product taken for rehydration}}{\text{Drained wt. of the rehydrated product}}$$