INTRODUCTION:
Single crystal X-ray crystallography is one of the most popular analytical methods. Many scientists discovered structures of valuable molecules like DNA, cholesterol and vitamin B12 etc by using this technique. The determination of a crystal structure consists of several steps: crystal growth, unit cell determination, data collection, data reduction, space group determination and structure solution, following these steps the crystallographer obtain atomic coordinates for some or all non-hydrogen atoms. These steps from unit cell determination to structure solution collectively called refinement [1-7].

In this paper we are describing different techniques to grow single crystals and importance of the single crystal X-ray crystallography.

IMPORTANCE OF SINGLE CRYSTAL X-RAY CRYSTALLOGRAPHY (SCXRC)

Many researchers involves in the synthesis of compounds and determination of structure is a key goal, for the determination of structure they use many spectroscopic techniques like IR (Infrared spectra), NMR (Nuclear magnetic resonance) and Mass spectroscopy etc but these techniques do not provide the sharp information about the structure of the compound. Therefore to know the systematic structure we use SCXRC. Crystal structure provides: (i) Confirm Structure (ii) Exact connectivity (iii) Bond distances and angles (iv) Complete identification of the compound (v) Intermolecular and interactions (vi) Comparison of SCXRD and PXRD can confirm that crystal is representative of bulk, etc. 

Till to date 29 Nobel prizes have been given in the field of X-ray crystallography and related field [8].

METHOD TO OBTAIN SINGLE CRYSTALS [9, 10]

Single crystal produced by the transport of crystal constituent in solid, liquid or vapour phase. Crystal growth can be divided into three categories:

I. Solid Growth – Solid to solid phase transformation

II. Liquid Growth – Liquid to solid phase transformation

III. Vapour Growth – Vapour to solid phase transformation

Although there are many techniques to grow the single crystals but scientists mainly use the following three strategies.

(i) Vapour diffusion
(ii) Layering
(iii) Slow evaporation

Before using any of the above methods to grow single crystals we need to have pure solid samples. Therefore solid materials must be recrystallize properly (Table 1) and other important things are glassware should be clean, consider proper location and volume needed to grow the crystals. Then try to grow fine single crystals.

(i) VAPOUR DIFFUSION:

This method is most popular among synthesis community and crystallographers. To grow the crystal by this method we need milligram amounts of compound and solvents. For diffusion, we need to be aware of vapor pressures of solvents. Have available a chart of physical properties of solvents (Table 1 and 2).

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ABSTRACT

In the synthesis (organic, inorganic, organometallic, biochemical) crystal structure of the compound is the milestone. Any crystal structure shows - exact connectivity, bond distances, angles, complete identification of the compound, intermolecular interactions and intramolecular interactions. Information gained is rarely incorrect. It provides positive identification and answers of basic questions regarding bonding. To know the crystal structure we have to grow single crystals by using different strategies and have the idea how single crystals grow from solid, liquid and gas phase.

KEYWORDS: Crystal growth, single crystal, data collection, structure refinement

METHODS OF GROWING SINGLE CRYSTALS
The bottom solvent must be of higher density (Table 2) and compound can be soluble in one of the solvent and partially or insoluble in other solvent and these two solvent must be fully miscible with each other. When these solvent, one containing compound, carefully layered with each other and placed in cool place then they starts to mix together and compound starts to precipitate slowly. This slow precipitation grow the crystals on the walls of layering tube.

SLOW EVAPORATION
Generally most of the compounds crystalize out by this method and this is the easiest method among all methods. First step is filter to remove any particles and allow the material to crystalize out as the solvent evaporates. Keep the solution clean and covered to avoid dust particles (Figure 3). Place the setup in cool place without any disturbance for longer time, sometimes it takes more than a month.

RESULT AND DISCUSSION
By following above methods one can grow fine crystals which can be diffracted and crystal data can be collected using single crystal X-ray diffractometers.

The crystal data can be solve by using different freely available software like WingX, Olex2, and SHELXTL etc. After solving the data carefully one can store crystal and crystal data can be collected using single crystal X-ray diffractometers. By following above methods one can grow fine crystals which can be diffracted.

CONCLUSIONS
In this paper we have explained how to grow fine crystals by using most popular methods. We have described importance of single crystals we also provided very useful table containing physical parameters for recrystallization and single crystal growing.

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