1. What is the difference between slit and monochromator?

A slit is a mechanical opening in a black painted metallic sheet, with a circular or triangular hole through which incident rays pass which lead to a monochromator. The slit permits passage of only a small fraction of incident radiation, which is selected for further processing such as wavelength selection and detection etc.

Usually the output of the radiation is in the image of the slit. When the slit is wide relative to the wavelength, diffraction is difficult to observe. But when the wavelength and slit opening are of the same order of magnitude, diffraction is observed easily. Here the slit behaves as if it is a source of radiation. The output in this case occurs in a series of 180^0 arcs.

The plot of the frequency of the radiation as a function of peak transmittance is in the form of a Gaussian curve with maximum intensity being the midpoint of the frequency range.

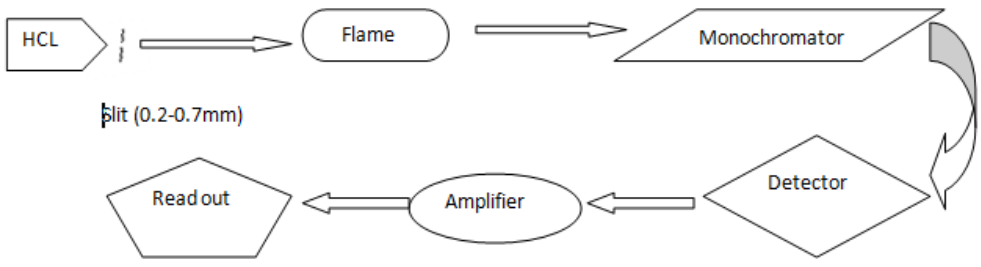
In contrast, monochromator may be defined as a device to select different wavelength of the original source radiation. Usually monochromators used in a UV-Visible/Fluorescence/AAS refer to the combination of slits, lenses, mirrors, windows, prisms and gratings.

The output of monochromator is also a narrow band of continuous radiation. The band width is an inverse measure of the quality of the monochromator device. The band widths obtained from filters, prisms, gratings etc., become progressively narrower in each case.

2. Where is the monochromator being placed between source and sample or sample and detector in UV visible spectrophotometer?

In a UV- Visible spectrophotometer, the monochromator is placed between the source of light and the sample. The light source gives white light which is dispersed by the monochromator and only light of the selected wavelength falls on the sample, gets absorbed by the sample and the decreased intensity of the emerging light is measured.

\3. In the schematic diagram of AAS where is the slit being placed?



In AAS, the source of light is monochromatic and there is no need for entrance slit. However a slit of 0.2 or 0.7 nm is employed before the flame only to control the intensity of the incident radiation. . The light passes through the sample in the flame and then enters the monochromator. From the exit slit of the monochromator it falls on to the detector and the signal is amplified and readout.

4. How do you select the wavelength for AAS/AES?

For AAS, the characteristic resonance absorption wavelength of the analyte is selected. This information can be obtained from the literature on atomic spectra of the elements. The instrument manufacturer usually provides these data. The wavelength selected is independent of the matrix (other elements and compounds present).

For atomic emission spectrometer, most elements have several prominent lines that can be used for identification and determination purposes. Wavelength data recorded up to three decimal places with corresponding intensity information for prominent lines of more than 70 elements can be found in literature and available databases. From the two or three wavelengths available for the given analyte, that wavelength which has least interference from other matrix elements in the sample is selected.

5. What is preamplifier? What is lock- in amplifier?

Preamplifier, as the name suggests, is an electronic device to amplify very weak signal. The output from it becomes the input for another amplifier.

A signal is modulated by superimposing a known frequency on it and the amplifier is set to detect only those signals on which the selected frequency is superimposed. Such an amplifier is known as lock-in-amplifier. Noise not modulated by the selected frequency will not be amplified. Therefore it will be filtered off.