THE SPECTRONIC 20 UV-VISIBLE SPECTROPHOTOMETER

Spectroscopy is one of the most powerful tools used in the laboratory for determining information about or the identity of a substance. There are many types of spectroscopy utilizing almost all of the electromagnetic spectrum. These include gamma rays, X-rays, ultraviolet and visible light, infrared light, microwaves, electron spin resonance, and nuclear magnetic resonance. One of the most useful tools in the general chemistry laboratory is the Spectronic 20 UV-visible spectrophotometer. This instrument is used to measure the absorption or transmission of a solution for both identification and concentration of specific substances.

The instrument used in the Pima College laboratory is the Spectronic 20 Genesys spectrophotometer. (see Figure SP-1) This instrument is a single-beam diffraction grating that works over a wavelength range of 325 to 1100 nm. Generally, the Spectronic 20 employs a tungsten filament light source, the light from which is dispersed through a simple reflection type of diffraction grating to provide a narrow wavelength, passes through a reference or sample solution, in a container called a cuvette (see Figure SP-4), and then to a phototube. The amplified electrical signal from the detector is displayed as either transmittance or absorbance. By reading specific wavelength absorbances, or transmittances, one can determine if a specific substance is present in a sample, and, once calibrated, can determine the concentration of that substance.

To use a Spectronic 20, the spectrophotometer must be plugged in to the appropriate power outlet and turned on using the switch located in the rear of the instrument. For best stability, the instrument should be allowed to warm up for at least 5 minutes.

Once the internal self-check of the instrument is completed, the desired wavelength is set using the up or down *nm arrow* buttons. (See Figure SP-2)

Select Absorbance, Transmittance, or Concentration mode, as required by your experimental procedure, using the button labeled A/T/C. (See Figure SP-2)

Once the samples are prepared, open the light shield, place a cuvette containing the blank or reference sample into the cuvette holder with the clear side facing the front of the Spectronic 20. Close the light shield, push the 0 Abs 100% T button. Allow the instrument to calibrate to a display of 0 Absorbance or 100% Transmittance. Open the light shield, remove the cuvette containing the blank sample and replace it with a cuvette containing a sample to be measured. Close the light shield and record the reading. (Do not touch any of the buttons on the display panel.)

Figure SP-1. The Spectronic 20 Genesys

If additional samples are to be used, open the light shield, remove the cuvette in the cuvette holder and replace it with the cuvette containing your next sample. Record the reading. Continue with any additional samples.

After all the readings are complete. Remove the last cuvette, dispose of solutions in accordance with laboratory procedures, and rinse the cuvettes with distilled or deionized water.

To determine a concentration of the desired species, you will need a calibration curve, previously prepared, which plots Absorbance or Transmittance vs. concentration, or you will need to prepare a calibration curve from your data, if a series of measurements were made for that purpose.

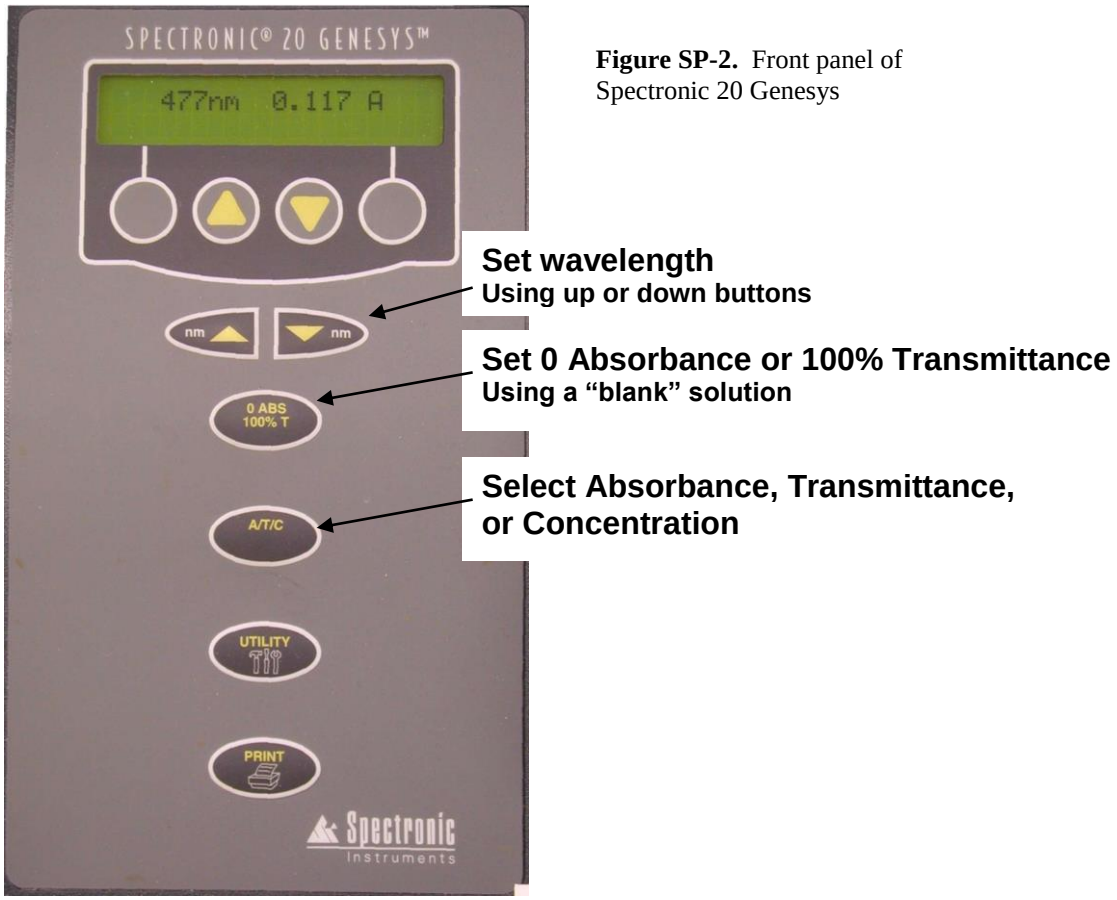

Figure SP-2. Front panel of Spectronic 20 Genesys

Figure SP-3. The Spectronic 20 with the light shield raised showing the cuvette holder.

Figure SP-4. Cuvettes for the Spectronic 20 Genesys