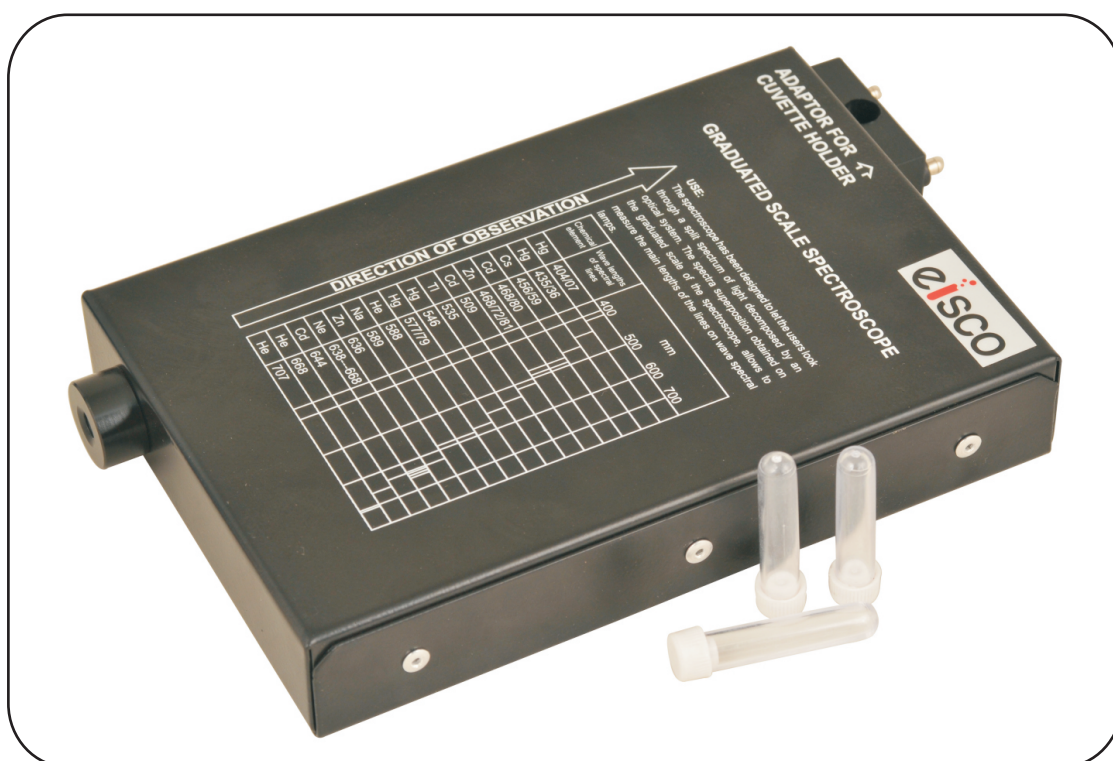




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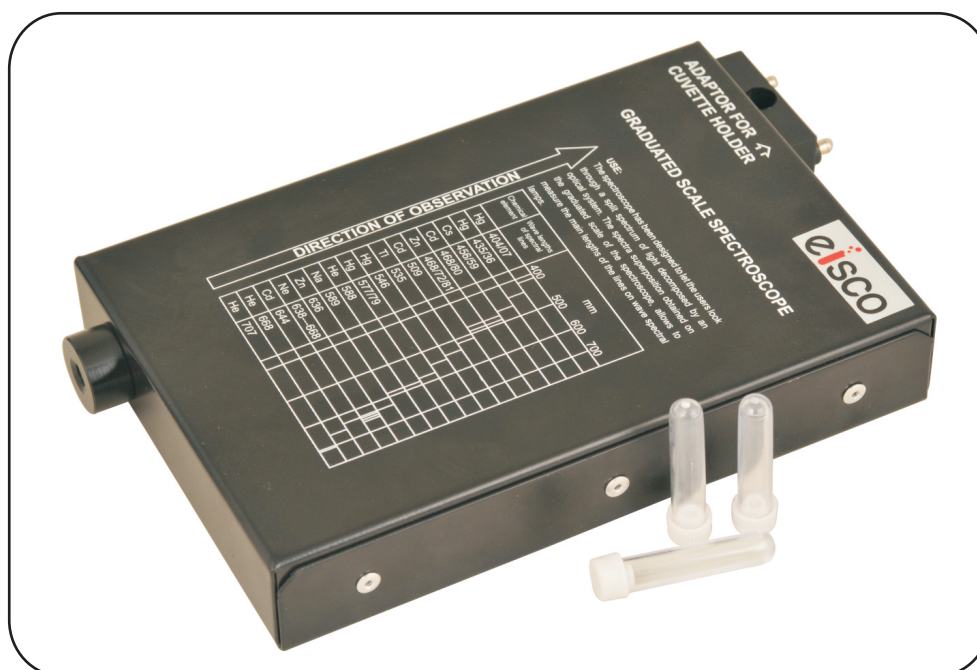
DIRECT VISION SPECTROSCOPE IN METAL CASE

CAT NO. PH0595



Instruction Manual

Direct Vision Spectroscope



INTRODUCTION:

This spectroscope has been designed to let the user look through a slit spectrum of light decomposed by an optical system. The spectra superposition obtained on the graduated scale of the spectroscope, allows the observer to measure the displacement of the spectral lines.

Included Components

Name of Part	Quantity
Graduated scale spectroscope in metal body	1
Cuvette holder	1
Cuvette for aqueous solution	3

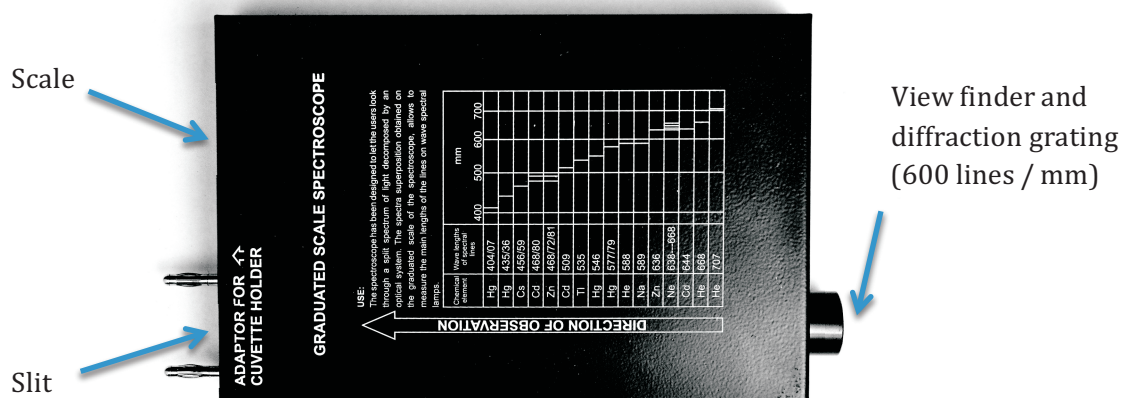
Required Components (not included)

Name of Part	Quantity
Fluorescent light bulb (for light source)	1

Recommended Components (not included)

Name of Part	Quantity
Spectrum Tube Power Supply (with safety door) PH 1199B (110V)	1
Spectrum Tubes Assorted (O, Ne, He, N, Ar, CO2, H, I, S, Xe, Kr) PH 1196B 1 -11	1

DIAGRAM LABELING ALL PARTS:



GENERAL BACKGROUND:

A spectroscope helps scientists (and you) to study and observe a spectrum of light. In this case it helps you to observe visible light. Visible light is just part of the electromagnetic spectrum. What makes this band of light unique is that humans can detect these frequencies with their eyes. There are other animals like bees for example that are able to see different frequencies of light. Scientists also use spectroscopes to study ultraviolet and infrared spectrums to of faraway stars and galaxies. They can use these spectrums to determine the elements burning in distant stars.

When white light travels from one medium to another such as from air to glass, the light slows down and bends. The frequency of the light determines how much the light bends. Therefore shining white light through a prism will sort the light by its frequency. The higher the frequency of light the more it bends. This is called dispersion of light. Many spectroscopes use a prism to separate white light into its spectrum. However this spectroscope uses a diffraction grating.

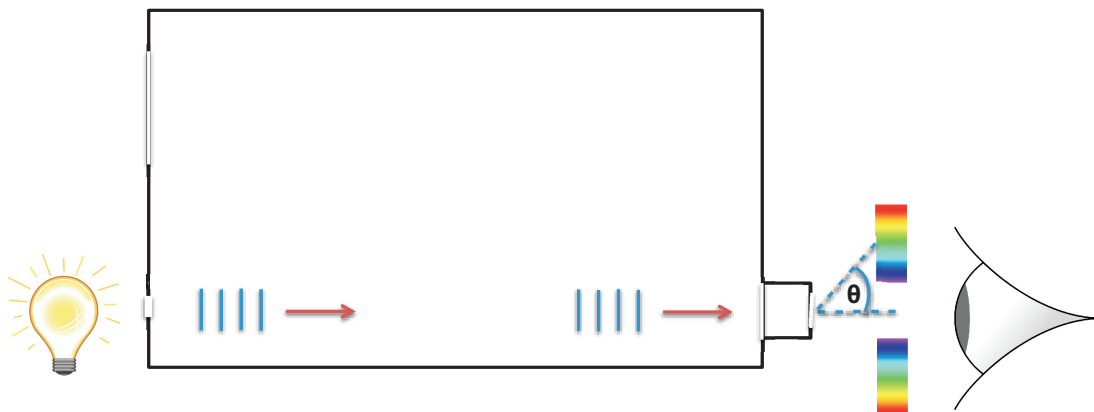
Similarly, when white light travels through a double slit, an interference pattern emerges that is dependent on the wavelength of light. A diffraction grating will also reveal a spectrum. In this case the diffraction grating has a series of parallel slits 600 lines/mm.

Using the formula $\sin \theta = m \lambda / d$,

where θ is the angle between the center bright fringe and the fringe you are looking at and m is an integer ordering each maximum bright point, and λ is the wavelength of light, we can calculate where a monochromatic wavelength of light would be positioned on the end of the spectroscope. The value for d is determined by the diffraction grating. If there are 600 lines/mm, then there are 1.66×10^{-6} m between the slits.

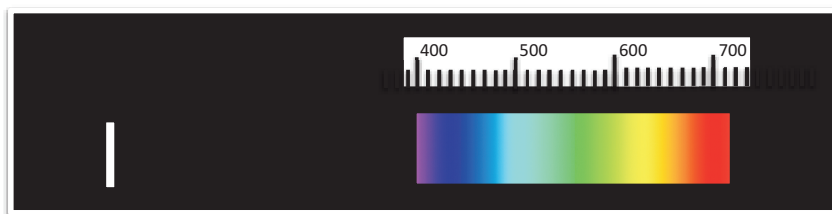
A line with a wavelength of 400nm would be located at:

$$\theta = \sin^{-1}[(1)(400 \times 10^{-9} \text{m}) / 1.66 \times 10^{-6} \text{m}] = 13.75^\circ.$$



OPERATING INSTRUCTIONS:

Find a florescent light source and block all other light coming into the room by pulling curtains or shades down. Point the slit end of the spectroscope at the light source and observe this through the view finder. You should see what looks like a rainbow inside the spectroscope. There may be two or three different rainbows. Look to the right hand side inside the spectroscope and notice the scale. While looking at the scale, tilt the slit end of the spectroscope slowly upwards and downwards until a bright green and violet line appear just underneath the scale which is superimposed in your field of vision. This is the appropriate view position for this spectroscope. The scale is marked 400-700 to denote the visible spectrum. The measure is in nanometers (nm). Therefore a bright line appearing at 400 would correspond to a wavelength of 400 nanometers.



When observing the scale, the bright purple line should coincide with 436 nm and the green line should coincide with 546 nm. If your scale is shifted to the right or left by 10 nanometers or so, you must adjust all your readings accordingly while using this spectroscope.