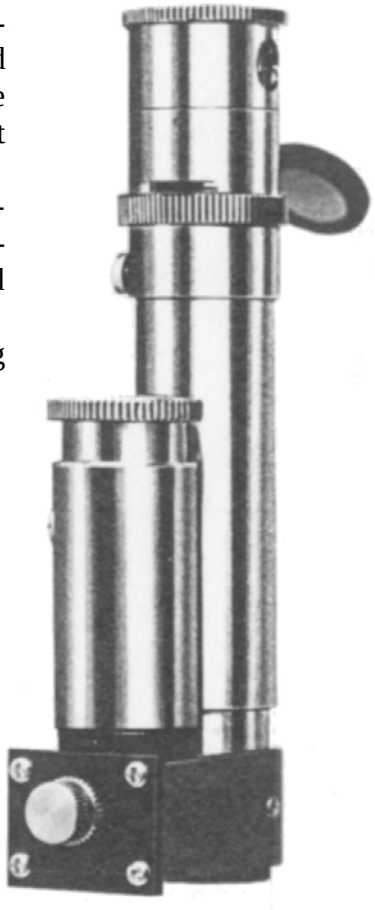
Spectroscope - Cat No. 1148001



Designed for examining the spectra of various liquids and solutions, by daylight or artificial light. There is a single eyepiece and independent focusing tubes for the graticule and diffraction grating, the two images being superimposed by a system of mirrors. The graticule, which carries an index mark at 590 nm can be calibrated to a known light source by adjustment of a knurled screw at one side.
The amount of light admitted to the spectroscope can be regulated by a variable slit adjusted by a knurled ring round the grating tube. Immediately beyond the slit width control there is a swing-out prism, which, when used in conjunction with the side mounted adjustable mirror, enables comparisons to be made between two light sources.
At the distal end of the grating tube, is the sprung specimen tube holder for positioning sample tubes in the light path.

SPECIFICATIONS:

Graticule calibrations 400 to 700 nm
Index 590 nm
Dimensions, overall 115 x 50 x 20 mm length x width x depth
Mass 200 g
Specimen tube 35 x 6 mm length x diameter

Supplied in a fitted case complete with five specimen tubes.

The hand spectroscope is a small instrument used to view and measure spectral lines from various light sources. Light enters through a single adjustable slit, is focused with a lens and then dispersed through a system of glass prisms to produce a spectrum of colours.
Most spectroscopes have two tubes, the longer one being the main viewing telescope, while the shorter one contains a scale which can be moved across the spectrum to calibrate it. The scale is graduated in nanometres, where 1 nm = 10^{-9} m.
Some models come in a case with three miniature test tubes which can be filled with liquids and used to observe absorption spectra.

SAFETY PRECAUTIONS:

- Handle with care - dropping this device could damage the intricate internal prism and lens structure..
- Do not permit students to look directly at the sun through this device, as the Sun's rays will burn the retina of the eye.

SETI1NG UP AND USING THE SPECTROSCOPE:

It is worth checking the following items before an experiment is set up.:
Ensure the spectroscope has not been dropped and damaged by testing to see if a white light spectrum is clearly visible. Follow the first two steps of the setting up procedure.

Extra equipment for the suggested learning experience includes:
- an ordinary light globe (tungsten filament) and desk lamp mounting
- a mercury lamp, mounting and power supply
- a sodium lamp, mounting and power supply
- neon discharge tube and stand
- a hydrogen discharge tube and stand
- a power pack
- an induction coil
- 2 long leads with alligator clips, 2 with banana clips
- nichrome or platinum wire with a glass handle
- chlorides of sodium, calcium, potassium, strontium and barium
- a piece of copper wire
- concentrated hydrochloric acid
- small beakers
- coloured filters

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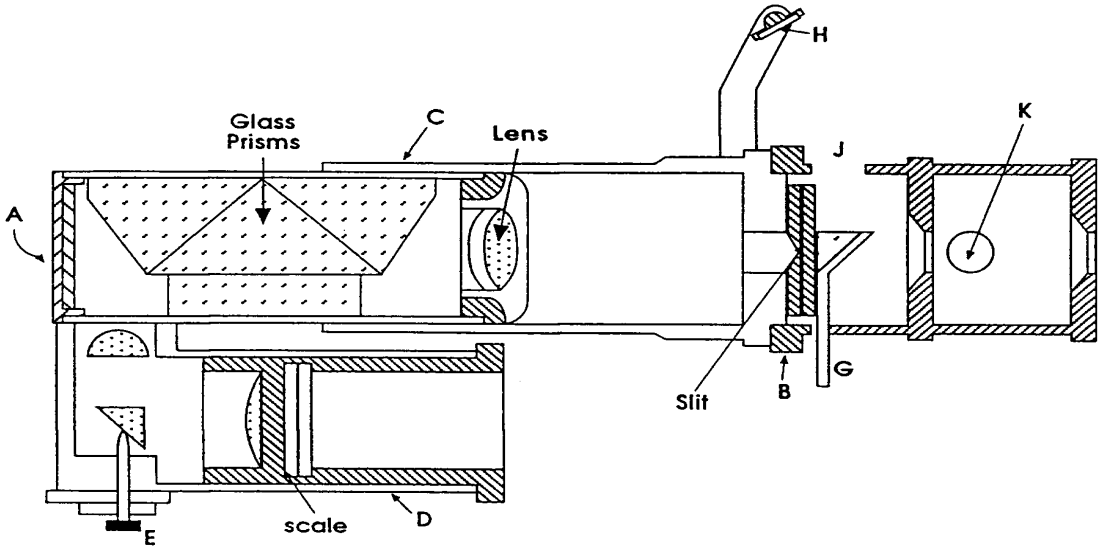
SETI1NG UP THE SPEC-TROSCOPE:

- Hold the spectroscope horizontal so that the long tube is on the right and the short tube is on the left. Lever (G) should be up..
- Look through the eye-piece (A) and observe the solar spectrum by direct-ing the spectroscope at a bright part of the sky (not directly into the Sun). The red should appear on the left and the violet on the right.



- Adjust the slit size by turning the knurled ring (B) until Fraunhofer lines (vertical dark lines) become visible down the spectrum. The slit usually needs to be almost closed for clearest viewing..
- To focus the spectrum, slide the long tube (C) in or out until the Fraunhofer lines are clear. The tube does not generally need to be pulled very far out for focusing.
- To focus the scale, slide tube (0) until the graduations on the scale are clear. If it is difficult to actually see the scale, close the slit for this step.
- To move the scale, turn screw (E) until the marked 589 graduation exactly corresponds to the Fraunhofer 'D' line (the most conspicu-ous dark line in the orange region of the spectrum). The spectroscope is now calibrated and can be used to read off wavelengths from any spectrum being examined.

SUGGESTED LEARNING EXPERIENCES:

1. View a continuous emission spectrum from an ordinary tungsten filament lamp following the same procedure as outlined above.
2. View line emission spectra in a darkened room using the following light sources:
   - the mercury lamp.
   - the sodium lamp.
   - the neon spectrum tube
   - the hydrogen spectrum
   - the characteristic coloured flame of the following metals - sodium, calcium, potassium, strontium and barium. To create this light source, clean a nichrome or platinum wire by dipping it into a solution of concentrated hydrochloric acid and burn off any residue in a Bunsen flame. Dip the clean wire into a small beaker of the chloride salt of one of the metals. Heat in a Bun-sen flame to obtain the characteristic colour.
   - the characteristic green coloured flame produced when a copper wire is heated in a Bunsen flame.

   Estimate the wavelengths for each set of emission lines using the scale in the spectroscope.
   Compare your estimated values of these line spectra with documented values.
3. View line absorption spectra by
   - using the Sun indirectly as a source of light and viewing the Fraunhofer dark lines. Refer to the setting up procedure for de-tails..
   - placing a sodium flame source between the sodium lamp and the spectroscope. The sodium flame will absorb particular fre-quencies of light which appear as dark lines in the spectrum. These bands correspond to those emitted initially by the sodium lamp.
4. View band absorption spectra by placing:
   - coloured filters in front of an ordinary tungsten filament globe. Observe the dark bands where a larger range of frequencies are absorbed by the filter.
   - a solution of potassium permanganate, chlorophyll, or one of the metallic chloride salts previously mentioned into a micro test tube. Insert the tube in hole (K) in front of the slit (see figure) and use an ordinary tungsten filament light globe as a light source. The resulting spectrum can be compared directly with the white light source by moving lever (G) down. This moves a prism across half the slit. The top half of the field of view is now the absorption spectrum being examined, while the bottom half is the continuous emission spectrum from the tungsten filament lamp. The latter is very dull and can be brightened by adjusting the position of mirror (H) so that it reflects light into hole (J).