3. A spectrometer, sodium lamp/flame and a glass prism are provided to determine the refractive index (n) of glass for light emitted from sodium. Certain adjustments in the spectrometer have to be made before taking measurements.

(*a*) **Two parts** of the spectrometer can be rotated about the vertical axis through the centre of the spectrometer independently of the other parts. List the **two** parts.

(1) .....

(2) .....

(*b*) Telescope of the spectrometer has been adjusted for parallel light by focusing to a distant object. As observed by a student through the telescope, is the image of the object erect or inverted?

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(*c*) In this experiment, the eyepiece, the telescope and the collimator have been adjusted for parallel light by one student. A second student whose near point is different from that of the first student is to continue the experiment. What is the only adjustment the second student has to repeat?

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(*d*) The prism PQR shown in figure (a) is given to level the prism table. Draw on figure (b) how you would place the prism on the prism table. Label P, Q and R. (D, E and F are the three screws available to level the prism table.)

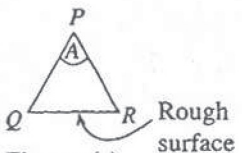

Figure (a)

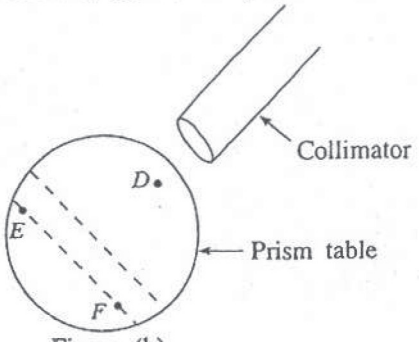

Figure (b)

(*e*) Fig. (c) shows the cross-wires (broken lines) and the image of the slit (solid line) formed by the reflected light from one surface of the prism as seen through the telescope. It indicates two errors associated with the set-up. Identify them.

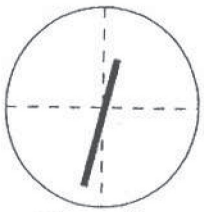

Figure (c)

(1) .....

(2) .....

(*f*) In this experiment, two measurements have to be taken to determine the angle of prism *A*.

(i) Draw on figure (d) the correct location of the prism, and the two positions of the telescope in order to obtain the two measurements.

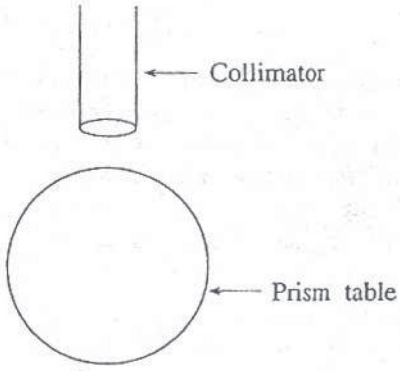

Figure (d)

(ii) Scale readings for the two measurements are 197° 6′ and 72° 52′. The scale did not pass through 360° mark when taking the measurements. Calculate the angle of prism.

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(*g*) One student argues that a source of white light can be used instead of a sodium lamp in taking measurements for the determination of the angle of minimum deviation for the wavelength of sodium light. Is this correct? Give reasons.

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(*h*) If the angle of prism is *A* and the angle of minimum deviation for sodium light is *D*, write down an expression for the refractive index *n*.

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