

2011 A/L Structured Essay Question No (01)

Figure 1 shows a spherometer used in a laboratory. Number of divisions in the circular scale is 50. Linear progress made by the circular scale on the vertical scale in **two** complete rotations is 1 mm.

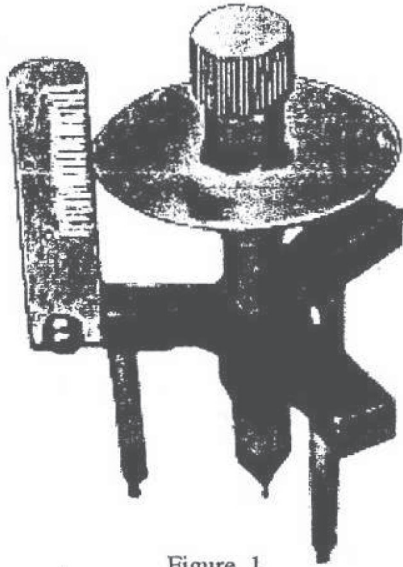


Figure 1

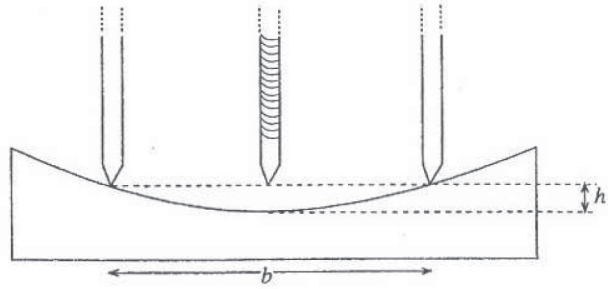


Figure 2

Spherometer is used to determine the radius of curvature of the curved surface of a plano-concave lens. In such a determination, spherometer is placed on the curved surface of the lens as shown in figure 2. After obtaining the measurements  $h$  and  $b$  which are shown in the figure, the radius of curvature ( $R$ ) can be determined by the following formula.

$$R = \frac{b^2}{6h} + \frac{h}{2}$$

(a) What is the least count of this spherometer?

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(b) Before placing the spherometer on the curved surface, it has to be adjusted by placing it on a flat glass plate. How do you experimentally make sure that the tip of the screw just touches the glass plate?

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(c) Then the spherometer is placed on the curved surface of the lens.

(i) What adjustment would you make before taking the next measurement in order to determine  $h$ ?

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(ii) What is the reading that you would take from the spherometer after the above mentioned adjustment?

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(d) After extensive use, the reading taken from the vertical scale may not be so accurate in some spherometers. What is the reason for this?

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(e) In order to determine  $R$  you need to measure the mean distance between the spherometer legs.

(i) What measuring instrument would you use to determine  $b$ ?

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(ii) What experimental steps would you follow in order to determine  $b$ ?

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(f) Give another use of a spherometer except the measurement of radius of curvature.

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(g) Suggest a method to further decrease the least count of the spherometer given above.

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