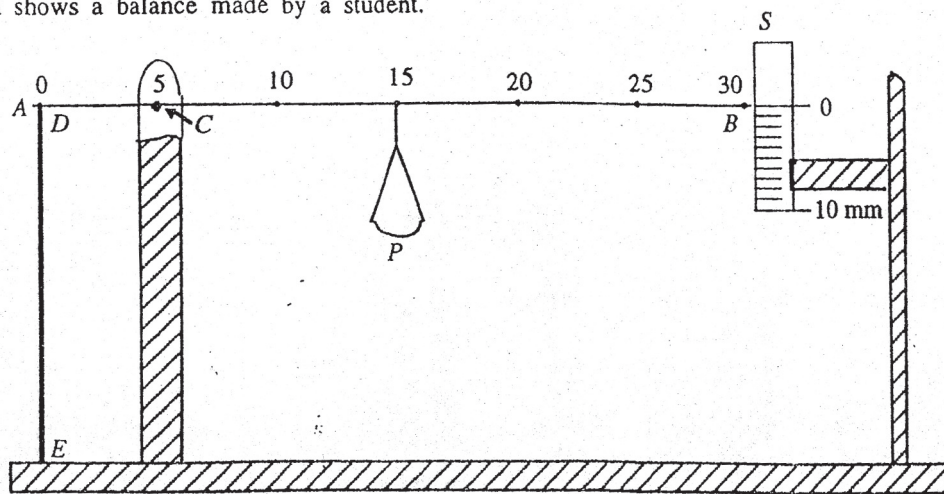


1996 A/L Structured Essay Question No (01)

Diagram shows a balance made by a student.



- ACB* — a 30 cm long thin beam having centre of gravity at the pivoted point *C*.
- DE* — a light rubber thread of circular cross section; *E* is fixed and *D* is connected to the end *A* of the beam.
- S* — a mm scale.
- P* — a light pan which can be slid along *CB*.

The pointer at the end of the beam indicates zero on the scale *S* when the rubber thread is ~~unstretched~~.

(a) When the pan *P* with a 10 gram weight on it is at the 15 cm mark, the reading on the scale *S* is 5 mm divisions. Assuming that the deflection of the beam is small and rubber obeys Hook's Law for small extensions, find

(i) the extension of the rubber thread (in mm).

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.....

(ii) the force on the rubber thread (in N).

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(b) If the range of the scale *S* is 0 - 10 mm and the pan *P* can be moved between the 10 cm and the 25 cm marks only, find the maximum weight that can be measured using this balance.

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(c) This arrangement can be used to obtain stress - strain relationship for rubber.

(i) To calculate stress and strain in the rubber thread using values obtained in the part (a), what additional **measurements** do you need to make ?

For stress : ..... (X - say)

For strain : ..... (Y - say)

(ii) What are the most appropriate instruments that can be used to take these measurements ?

X : ..... (state only one instrument)

Y : ..... (state only one instrument)

(iii) Write down the corresponding stress and strain for the case (a) using X and Y.

Stress : .....

Strain : .....

(d) If an identical second rubber thread is fixed along with the first one, what should be the position of the pan *P* in order to obtain the same reading of 5 mm divisions on *S* for the 10 g weight

.....  
at ..... cm mark