1   The rate of heat flow through a rod due to conduction is given by Fourier's Law:

$$\frac{Q}{t} = \frac{CA(\Delta T)}{L}$$

where A is the cross-sectional area of the material,

L is the length of the material,

ΔT is the temperature difference across the length of the material, and

C is a constant.

(a)   Determine the SI base units of C.

SI base units = ... [2]

(b) An experiment is conducted to determine the value of *C*. Using copper rod of diameter 0.80 cm but different length, and two ends of the rod are maintained at pure ice point and steam point, the rate of flow of thermal energy was measured using a heat flux sensor. A graph of how $\frac{Q}{t}$ varies with $\frac{1}{L}$ is plotted, as shown in Fig. 1.1.
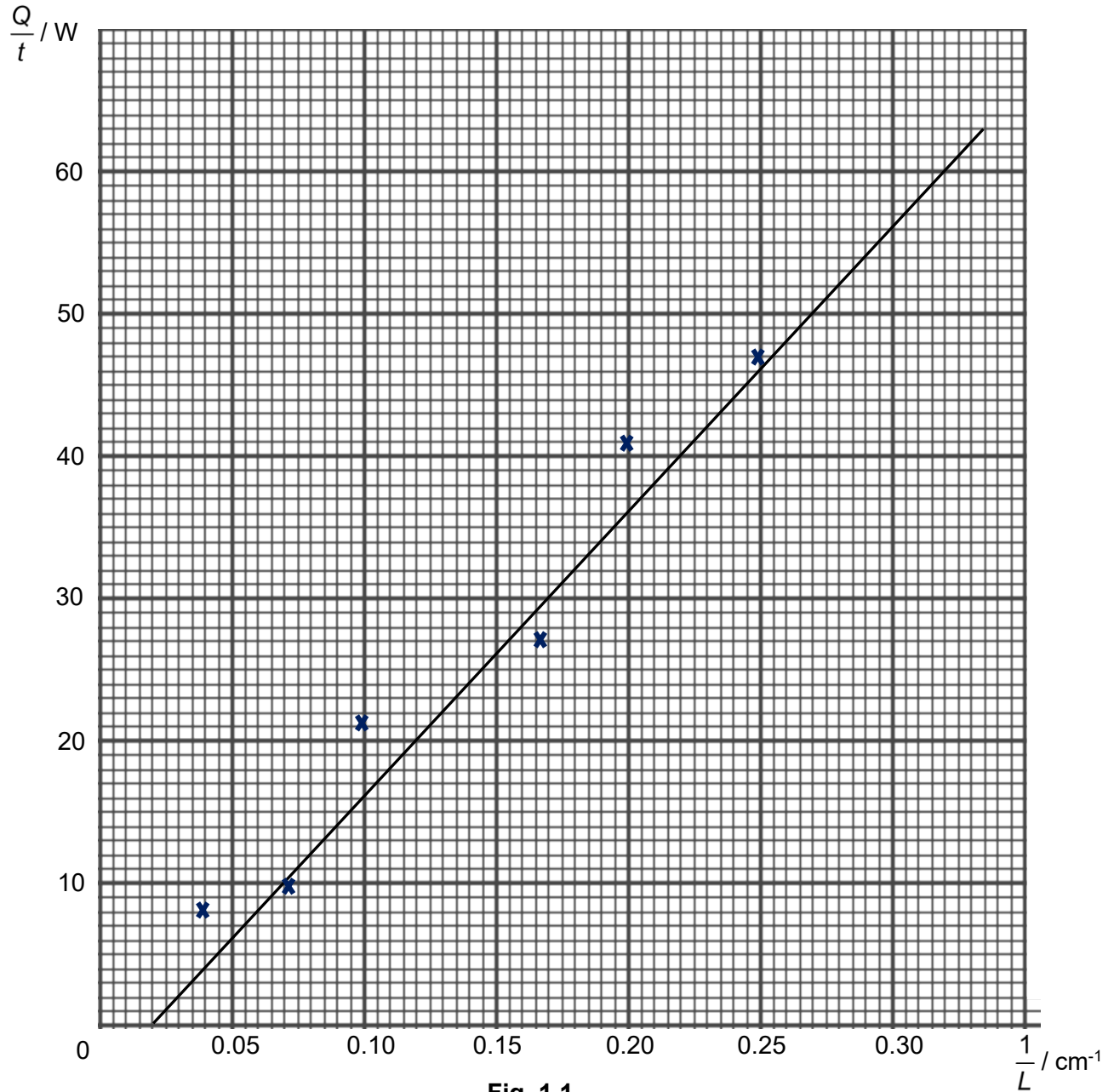

Fig. 1.1

(i) State the feature of the graph that indicates the presence of systematic error in the experiment.

....

....[1]

(ii) Calculate the value of C, in SI units, from Fig. 1.1.

value of C = …….…………. SI base units [3]

(iii) With reference to Fig. 1.1 and **(b)(i)**, state and explain whether the accuracy of C is affected by the presence of systematic error in the experiment.

………………………………………………………………………………………………..

………………………………………………………………………………………………..

………………………………………………………………………………………………..

……………………………………………………………………………………..………..[1]

[Total: 7]