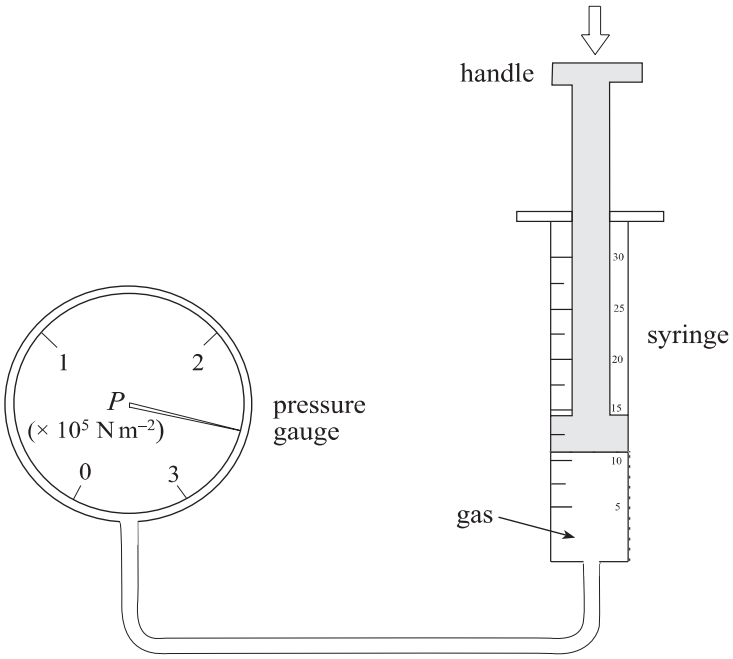
8. A student undertakes an experiment to investigate the relationship between pressure P and total volume V of a gas. The student changes the volume of the gas trapped in the syringe by exerting a force on the handle, as shown in the diagram below. The volume of gas is determined by using the scale marked on the syringe. The pressure is measured in units of $N\ m^{-2}$, using the pressure gauge.

After changing the volume of gas trapped in the syringe, the student records the pressure at a constant temperature.



(a) Complete the following table by calculating the values for $1/V$.

V (m^3)	$1/V$	P ($N\ m^{-2}$)
1.0×10^{-5}		2.57×10^5
1.5×10^{-5}		1.90×10^5
2.0×10^{-5}		1.55×10^5
2.5×10^{-5}		1.34×10^5
3.0×10^{-5}		1.20×10^5

(2 marks)

(b) (i) State the independent variable in this experiment.

_____ (1 mark)

(ii) State the reason for your answer to part (b)(i).

_____ (1 mark)

(c) On page 17, plot a graph of P on the vertical axis against $1/V$ on the horizontal axis, and draw a line of best fit.

(6 marks)

(d) (i) The relationship between P and V can be represented by $P = \frac{bT}{V}$, where b is a constant and T is the constant temperature.

Explain why your graph suggests that there is a systematic error in the data.

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_____

_____

_____ (3 marks)

(ii) Calculate the gradient of your line of best fit. Include the units of the gradient.

_____

_____

_____

_____ (3 marks)

(iii) Using information from your graph, write the equation of your line of best fit in terms of P and $1/V$.

_____

_____

_____

_____ (2 marks)

(iv) The constant temperature T is measured in units of kelvin (symbol K). The value of b is known to be 6.71×10^{-3} J K^{-1}.

Using the gradient you calculated in part (d)(ii), determine the value of the temperature of the gas.

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_____

_____ (2 marks)