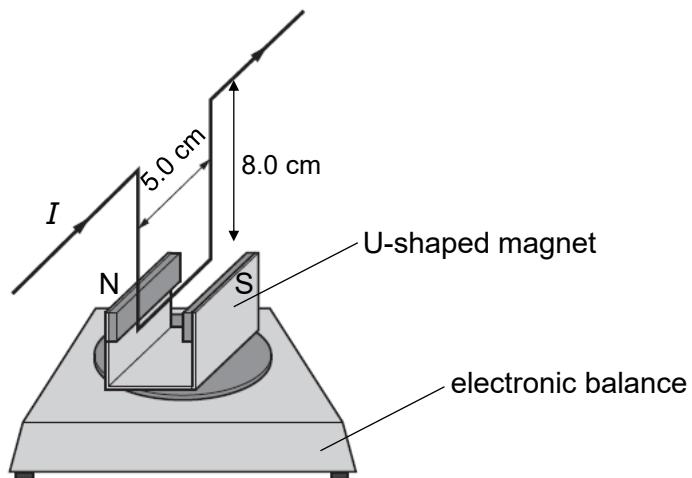
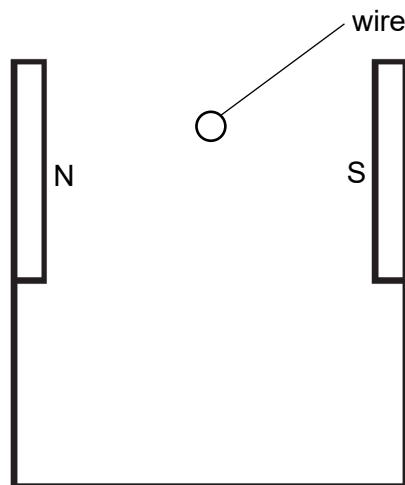


- 5 Fig. 5.1 shows the arrangement of the apparatus used in the measurement of the magnetic flux density between the poles of a U-shaped magnet. The magnet rests on top of an electronic balance. A stiff rectangular frame measuring 8.0 cm by 5.0 cm carries a current  $I$  between the magnetic poles. The bottom edge of the frame is lowered into the region between the poles of the U-shaped magnet and is entirely within the uniform magnetic field.



**Fig. 5.1**

Fig. 5.2 shows the apparatus when viewed from the front. The poles of the U-shaped magnet have been indicated.



**Fig. 5.2**

- (a) (i) Draw, on Fig. 5.2, a vertical force acting on the wire when current passes through it. Label the force  $F$ . [1]
- (ii) When current passes through the wire, the balance reading changes.

Explain why there is a change in reading, and whether the change is an increase or decrease.

[2]

- (b) The current  $I$  is varied and the change in the balance reading is recorded as shown in Fig. 5.3.

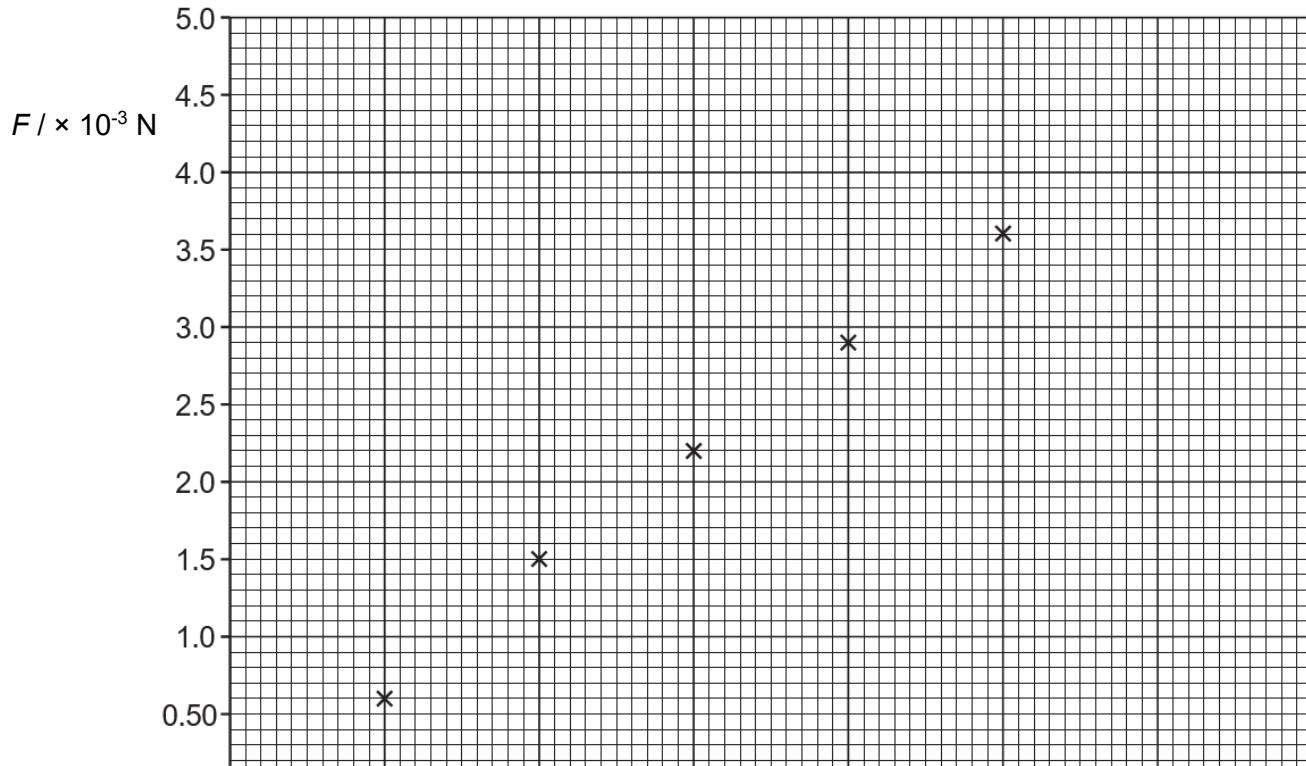
$I / A$	Change in balance reading / g			Mean change / g	$F / \times 10^{-3} N$
	Trial 1	Trial 2	Trial 3		
0.5	0.08	0.05	0.06	0.06	0.6
1.0	0.14	0.16	0.16	0.15	1.5
1.5	0.22	0.20	0.23	0.22	2.2
2.0	0.31	0.29	0.31	0.30	2.9
2.5	0.38	0.39		0.37	3.6
3.0	0.44	0.48	0.48		

Fig. 5.3

- (i) Complete the table in Fig. 5.3. [1]

- (ii) On Fig. 5.4, plot the missing data point from the table in Fig. 5.3 and draw a line of best fit.

[1]



**Fig. 5.4**

- (iii) Use your graph to determine the value of the magnetic flux density  $B$ , in mT, between the U-shaped magnet.

$$B = \dots \text{ mT} [2]$$

- (iv) The value of the magnetic flux density in (b)(iii) is slightly inaccurate for a reason which has nothing to do with human error or meter inaccuracies.

Suggest one reason that might be the cause of this inaccuracy.

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.....

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[1]

[Total: 8]