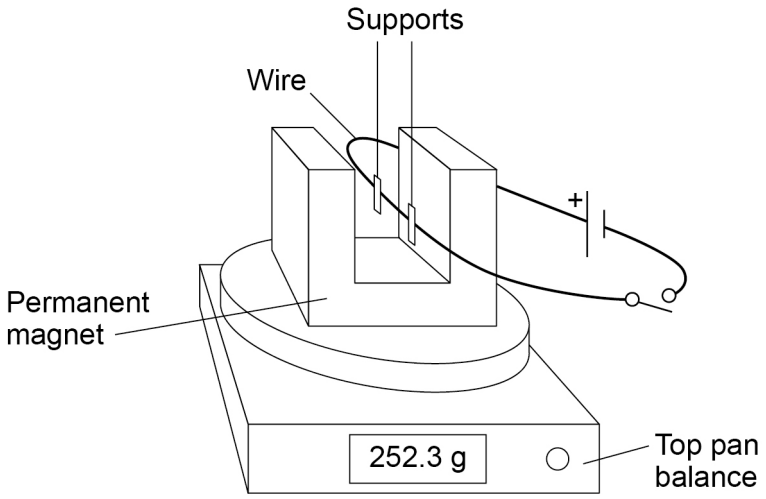
Do not write outside the box

0 7 A student clamped a wire between the poles of a permanent magnet.

The student investigated how the force on the wire varied with the current in the wire.

Figure 13 shows the equipment used.

Figure 13



The top pan balance was used to determine the force on the wire.

0 7 . 1 When the switch was closed the reading on the top pan balance increased.

Explain why the increased reading showed that there was an upward force on the wire.

[2 marks]

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0 7 . 2 **Table 3** shows the readings on the top pan balance with the switch open and with the switch closed.

Table 3

Switch	Mass in grams
Open	252.3
Closed	254.8

Explain how the values in **Table 3** can be used to determine the size of the force on the wire.

[2 marks]

Question 7 continues on the next page

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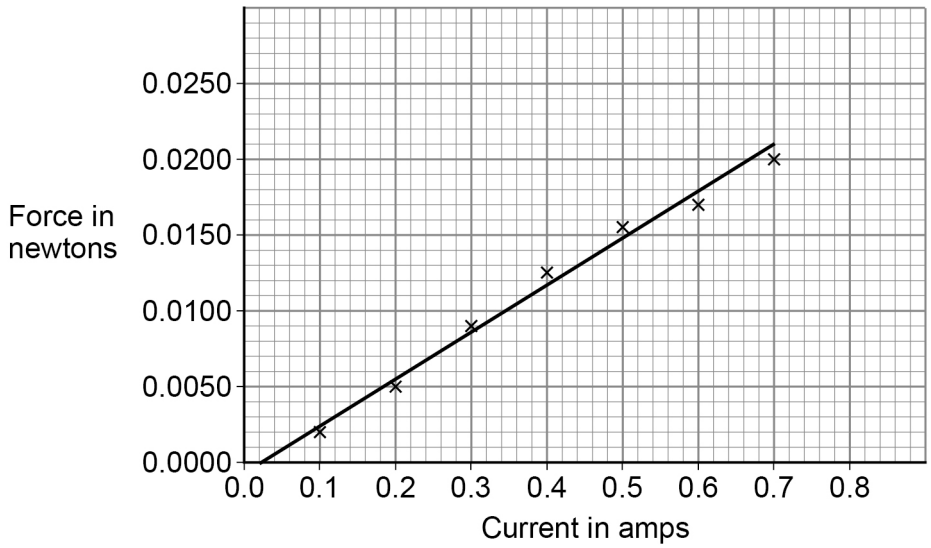
0 7 . 3 The student varied the current in the wire and calculated the force acting on the wire.

Figure 14 shows the results.

Figure 14



The length of the wire in the magnetic field was 0.125 m

Determine the magnetic flux density.

[4 marks]

Magnetic flux density = _____ T

8

END OF QUESTIONS

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	the downward force on the balance increased	allow when there is a current in the wire there is a magnetic field around the wire (which causes a magnetic force)	1	AO3 6.7.2.2 6.5.4.2.3
	therefore the wire must experience an equal and opposite force (which is upwards)		1	
07.2	calculate the difference between the two mass readings	allow 254.8 – 252.3 = 2.5	1	AO1 6.7.2.2
	convert to kg **and** multiply by gravitational field strength	allow (2.5 / 1000) × 9.8 = 0.02375 (N)	1	
07.3	gradient $= \frac{(0.0210 - 0.0)}{(0.70 - 0.02)}$		1	AO3
	gradient = 0.031	allow answer correctly given to any number of significant figures	1	AO3
	0.031 = B × 0.125	allow correct substitution using correctly calculated value given to any number of significant figures	1	AO2
	B = 0.25 T	allow answer correctly given to any number of significant figures	1	AO2
		any rounding must be correct for subsequent marks to be awarded.		6.7.2.2
		max **2** marks if a pair of readings from the graph are used instead of gradient calculation		
Total			**8**	