

Question 19**(10 marks)**

A group of students wanted to calculate the strength of the Earth's magnetic field in Perth. They set up a DC circuit with a section of the wire placed 50.0 mm above a compass.

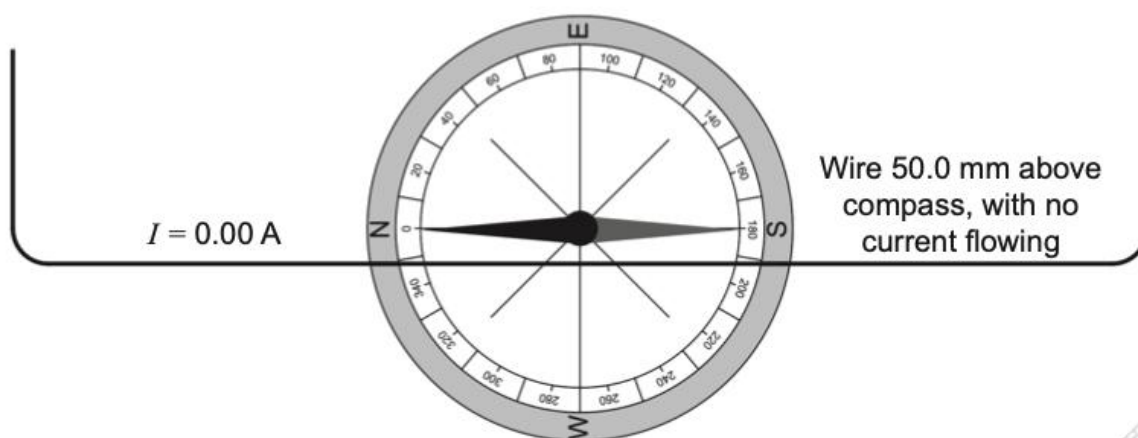


Figure 1

With no current running through the circuit, the compass lined up with the Earth's magnetic field as shown in Figure 1.

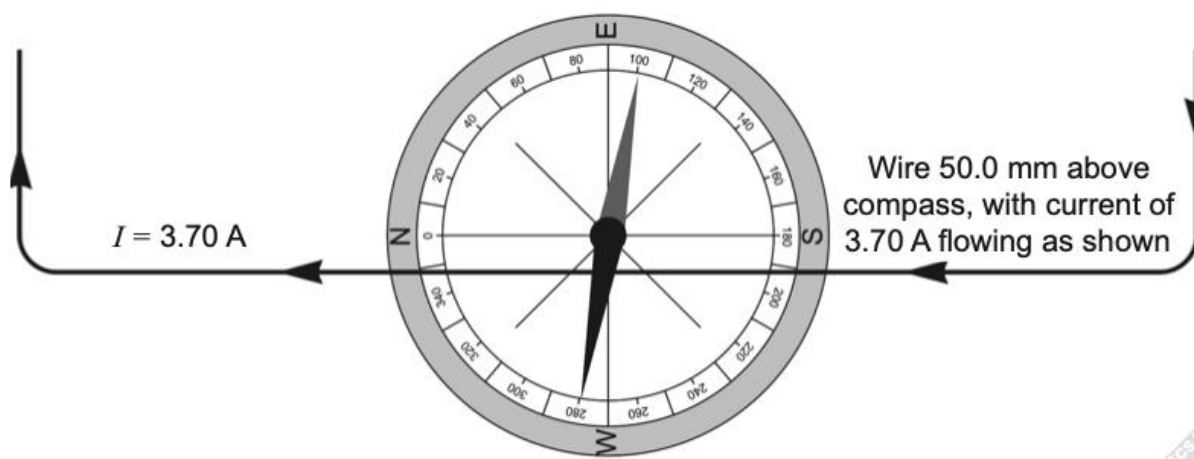


Figure 2

When they closed the switch, they saw the compass needle deflect at an angle of 80.0° to the wire as shown in Figure 2. The needle now pointed in the direction of the net magnetic field. The reading on the ammeter at this time was 3.70 A.

- (a) Calculate the strength of the wire's magnetic field felt by the compass in the position described in Figure 2. (3 marks)

Answer _____ T

- (b) Calculate the strength of the horizontal component of the Earth's magnetic field. (4 marks)

Answer _____ T

- (c) The Earth's magnetic field is at an angle of 66.0° to its surface in Perth. This is called the 'angle of dip'. Use this information to calculate the overall strength of the Earth's magnetic field in Perth. (3 marks)

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Answer _____ T