5 A small circular conducting wire loop of diameter 3.0 cm is placed inside a larger flat circular loop of diameter 20.0 cm. Current is supplied to the larger loop via a battery and a variable resistor.

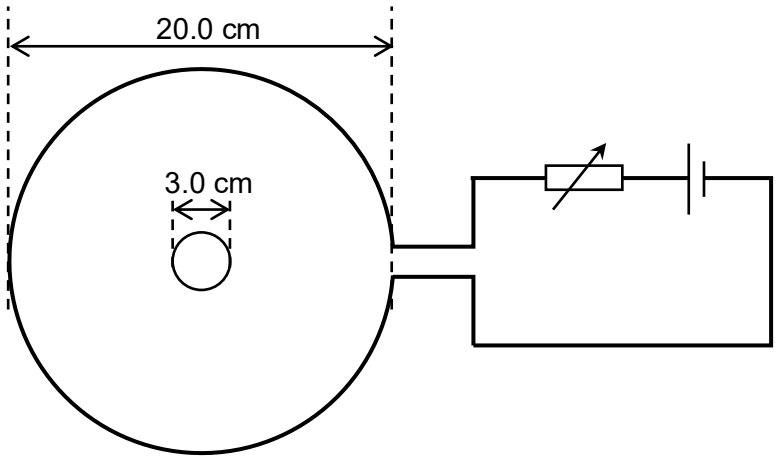

Fig. 5.1

(a) Explain why a current is momentarily detected in the small loop when the resistance of the variable resistor is increased.

.....

.....

.....

..... [2]

(b) Explain whether the induced current in the small loop flows in a clockwise or anti-clockwise direction as the resistance of the variable resistor is increased.

.....

.....

.....

.....

[2]

(c) Calculate the magnetic flux density at the centre of the large loop when the current is 2.0 A.

magnetic flux density = ... T [1]

(d) **(i)** The current in the large loop is reduced from 2.0 A to 1.0 A in a time of 0.25 s at a constant rate. Given that the resistance of the small loop is 1.5 Ω, calculate the average current induced in the small loop.

average current = ……... A

[3]

(ii) State the assumption you made to simplify the calculation in **(d)(i)**.

……

…… [1]

(e) The smaller wire loop is now replaced with a loop of the same dimensions made from an electrical insulator.

Explain why there is no current flowing in this insulating loop when the experiment is repeated.

……

……

……

[2]

[Total: 11]