Year 12 Physics Current Balance

Practical test part 2

10 Marks

The aim of this experiment is to calculate a theoretical value for µ0

The following data was collected from a current balance experiment.

Mass of wire = 1.45 x 10-5 kg

Length of loop (see saw balance) lloop = 3.00 x 10-2 m

Number of coils on the solenoid = 730

Length of solenoid lsoleniod = 0.150 m

1. Complete the table to calculate Bsol using the relationships F= mg and F=Iloop lloop Bsol

(2 marks)

Working space

IlB = mg

B = mg/Ilooplloop

= (1.45 x10-5 x 9.8)/1.2 x 0.03)

= 3.9 x 10-3 T

|  |  |  |
| --- | --- | --- |
| Isolenoid (A) | Iloop (A) | Bsolenoid (T) |
| 0.65 | 1.2 | 3.9 x 10-3 |
| 0.42 | 1.8 | 2.6 x 10-3 |
| 0.30 | 2.6 | 1.8 x 10-3 |
| 0.24 | 3.2 | 1.5 x 10-3 |
| 0.20 | 4.0 | 1.2 x 10-3 |

1. Use this data to draw a graph of Bsolenoid vs Isolenoid (4 marks)

1 data points, 1 LOBF, 1 Labels, 1 Correct I used

1. Calculate the gradient of this graph (2 mark)

m = (4.0 x 10-3 – 0)/(0.66 – 0)

= 6.1 x 10-3 TA-1  must show how they calculated gradient

-1 for no units

-1 for more than 2 SF

1. The relationship between the current in a solenoid and the field in the solenoid is

Bsolenoid = µ0 N Isolenoid Usethis relationship to find a value for µ0  lsolenoid (2 marks)

Bsolenoid = µ0 N Isolenoid

lsolenoid

µ0 = B/I x l/n where B/I = gradient

= 6.1 x 10-3 x (0.15/730) \*must use the gradient -1

= 1.2 x 10-6 NA-2  (units not required)