Chapter E

Uncertainties

E1 Absolute Uncertainties

$^{14}/_{17}$

For the following measured quantities give (A) the absolute uncertainty (including units), (B) the heading you would put in the results table and (C) the number of decimal places you would give in the results table.

Fill in the gaps in the table.

	Quantity being measured	A	B	C
E1.1	Voltage using a multimeter reading in volts to 3 dp	(a)	(b)	(c)
E1.2	Current, using a multimeter, reading in amps to 3 dp but the last digit fluctuates a lot. The second to last digit stays fairly steady.	(a)	(b)	(c)
E1.3	A length measured using a metre rule that has mm marks.	(a)	(b)	(c)
E1.4	A time, where you are manually operating a stopwatch that reads to the nearest hundredth of a second.	(a)	(b)	(c)

E1.5 You measure the time taken for a pendulum to complete 20 full swings, using an electronic timer accurate to the nearest 0.1 s. You then divide your answer by 20 to get the time for just one swing. What is the absolute uncertainty on your value for just one swing?

Now work out the absolute uncertainties in your readings if you obtained the following data after conducting repeats:

E1.6 For a current, where your ammeter can read to the nearest 0.01 A, you obtain the results: 2.35 A, 2.39 A, 2.39 A, 2.38 A.

E1.7 Using a micrometer that reads the diameter of a wire to the nearest 0.01 mm, you obtain the results: 3.46 mm, 3.55 mm, 3.42 mm. What is the absolute uncertainty in the radius of the wire measured?

E1.8 If you measured the length of a piece of string and got readings of 6.74 m, 6.79 m, 6.75 m, what would be the absolute uncertainty in the total length of two identical pieces of string placed end to end [assume that the join between them is exact - i.e. no extra uncertainty due to this].

E1.9 If you measured a resistance using an ohmmeter and obtained the following results, give a value for the absolute uncertainty and the average that you would use. $10.5\ \Omega$, $10.3\ \Omega$, $10.9\ \Omega$, $14.7\ \Omega$, $10.6\ \Omega$.