Essential Pre-Uni Physics E1.4

A Level

Quantity being measured	Absolute uncertainty	Heading of column in results table (with units)	Number of decimal places for measured values
A time where you are **manually** operating a stopwatch that reads to the nearest hundredth of a second.	(a)	(b)	(c)

Part A Absolute uncertainty

a) What is the absolute uncertainty in the time?

- $\pm 0.1\,\mathrm{s}$
- $\pm 1\,\mathrm{s}$
- $\pm 0.1\,\mathrm{ms}$

Part B Column heading

b) What is the heading of the column in the results table?

- Time / s
- Weight / kg
- Length / m

Part C Decimal places

c) What is the number of decimal places for the measured values?

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Physics. You work it out.

Essential Pre-Uni Physics E1.5

A Level

P P P

You measure the time taken for a pendulum to complete 20 full swings, using an electronic timer accurate to the nearest $0.1\,\text{s}$. You then divide your answer by 20 to get the time for just 1 swing. What is the absolute uncertainty on your value for just 1 swing?

Gameboard:

STEM SMART Physics 39 - Uncertainties

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Essential Pre-Uni Physics E1.9

A Level

P P P

If you measured a resistance using an ohmmeter and obtained the following results, what would you do next? Give a value for the absolute uncertainty and the average that you would use for this set of results: $10.5\,\Omega$, $10.3\,\Omega$, $10.9\,\Omega$, $14.7\,\Omega$, $10.6\,\Omega$.

- Repeat the anomalous $14.7\,\Omega$ reading. Absolute uncertainty $= 0.3\,\Omega$. Average reading $= 10.6\,\Omega$
- Repeat the whole experiment. Absolute uncertainty $= 0.2\,\Omega$. Average reading $= 10.5\,\Omega$
- Repeat the whole experiment. Absolute uncertainty $= 0.3\,\Omega$. Average reading $= 10.6\,\Omega$

Gameboard:

STEM SMART Physics 39 - Uncertainties

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Essential Pre-Uni Physics E2.1

A Level

Your answer will be marked incorrect for an inappropriate number of significant figures (e.g. giving an uncertainty to 3 significant figures, or giving a measurement to 2 decimal places if the uncertainty is $\pm\ 0.1$ would be inappropriate).
Please make sure that the unit of absolute uncertainty is clear - so $20.34\,\mathrm{mA} \pm 20\,\mu\mathrm{A}$ or $(20.34 \pm 0.02)\,\mathrm{mA}$ are both appropriate, but $20.34\,\mathrm{mA} \pm 20$ would not be clear. Note that 'nearest millimetre' implies an absolute uncertainty of $\pm\ 0.5\,\mathrm{mm}$ not $\pm\ 1\,\mathrm{mm}$.

Calculate the relative uncertainty, in percent, of:

Part A Length

a) A length of $50.4\,\mathrm{cm}$ measured using a metre rule to $\pm 0.5\,\mathrm{mm}$.

Part B Current

b) A current of $240\,\mathrm{mA}$ measured to the nearest milliamp.

Part C Time

c) A time of $0.62\,\mathrm{s}$ measured using a stopwatch to the nearest $0.01\,\mathrm{s}$.

Part D Angle

d) An angle of 43° measured to the nearest degree with a protractor.

Part E Time

e) A time of $4\,\text{minutes}\ 32\,\text{seconds}$ measured to the nearest second.

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Physics. You work it out.

Essential Pre-Uni Physics E2.6

A Level

Your answer will be marked incorrect for an inappropriate number of significant figures (e.g. giving an uncertainty to 3 significant figures, or giving a measurement to 2 decimal places if the uncertainty is $\pm\ 0.1$ would be inappropriate).
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An experiment is conducted to find the acceleration of a dropped object (which should be $9.81\,\text{m}\,\text{s}^{-2}$). The measurement obtained is $9.62\,\text{m}\,\text{s}^{-2} \pm 1.5\,\%$. Is the experiment accurate?

- Yes
- No

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Essential Pre-Uni Physics E3.1

A Level

P P P

You will be penalized for an inappropriate number of significant figures (e.g. giving an uncertainty to 3 significant figures, or giving a measurement to 2 decimal places if the uncertainty is $\pm\ 0.1$).
Please make sure that the unit of absolute uncertainties is clear - so $20.34\,\text{mA} \pm 20\,\mu\text{A}$ or $(20.34 \pm 0.02)\,\text{mA}$ are both appropriate, but $20.34\,\text{mA} \pm 20$ would not be clear. Note that 'nearest millimetre' implies an absolute uncertainty of $\pm\ 0.5\,\text{mm}$ not $\pm\ 1\,\text{mm}$.

Calculate the relative uncertainty, in percent, of a resistance which is worked out from a voltage known to $3\,\%$ and a current known to $7\,\%$. (Equation: $R = \dfrac{V}{I}$)

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Essential Pre-Uni Physics E3.3

A Level

You will be penalized for an inappropriate number of significant figures (e.g. giving an uncertainty to 3 significant figures, or giving a measurement to 2 decimal places if the uncertainty is $\pm\ 0.1$).
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Calculate the relative uncertainty, in percent, of the density of a cuboid block of iron whose lengths are known to $2\,\%$ and whose mass is known to $0.1\,\%$. (Equation: $\text{density} = \dfrac{\text{mass}}{\text{volume}}$)

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Essential Pre-Uni Physics E3.4

A Level

P P P

You will be penalized for an inappropriate number of significant figures (e.g. giving an uncertainty to 3 significant figures, or giving a measurement to 2 decimal places if the uncertainty is $\pm\ 0.1$).
Please make sure that the unit of absolute uncertainties is clear - so $20.34\,\text{mA} \pm 20\,\mu\text{A}$ or $(20.34 \pm 0.02)\,\text{mA}$ are both appropriate, but $20.34\,\text{mA} \pm 20$ would not be clear. Note that 'nearest millimetre' implies an absolute uncertainty of $\pm\ 0.5\,\text{mm}$ not $\pm\ 1\,\text{mm}$.

Calculate the relative uncertainty, in percent, of the time taken for a marble to fall by a distance known to $4\,\%$.
(Equation: $\text{distance} = \frac{1}{2}gt^2$)

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Essential Pre-Uni Physics E3.5

A Level

P P P

You will be penalized for an inappropriate number of significant figures (e.g. giving an uncertainty to 3 significant figures, or giving a measurement to 2 decimal places if the uncertainty is $\pm\,0.1$).
Please make sure that the unit of absolute uncertainties is clear - so $20.34\,\text{mA} \pm 20\,\mu\text{A}$ or $(20.34 \pm 0.02)\,\text{mA}$ are both appropriate, but $20.34\,\text{mA} \pm 20$ would not be clear. Note that 'nearest millimetre' implies an absolute uncertainty of $\pm\,0.5\,\text{mm}$ not $\pm\,1\,\text{mm}$.

Calculate the relative uncertainty, in percent, of the resistivity of a constantan wire if the resistance is known to $8\,\%$, the diameter to $2\,\%$ and the length to $5\,\%$. (Equation: $\text{resistivity} = \dfrac{RA}{L}$, where A is the cross sectional area.)

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Physics. You work it out.

Essential Pre-Uni Physics E4.6

A Level

You obtain the following results for the time period of a pendulum: $(561, 563, 569, 562, 565)\,\text{ns}$. None of these results are anomalous. You are then told that the accepted value is $560.5\,\text{ns}$. Does this lie within your error bars?

- Yes
- No

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