InkChemistry

QUESTION WORKBOOK

# Measurement, uncertainty and significant figures in chemistry

Working in the laboratory · Unit C00

AQA MS 1.1, MS 1.3; 8 (practical skills) · OCR A 1.1.3, 1.1.4

15 questions · 47 marks

PRINT EDITION

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## SECTION A · Short, 1 to 2 marks

**A1** MU-Q11

Suggest what effect a thermometer that reads 1.5 °C too high at every temperature has on a measured temperature rise, and why. [2]

**A2** MU-Q15

Give two sources of random error in a titration. [2]

## SECTION B · Standard, 3 to 5 marks

**B1** MU-Q2

Calculate the titre and its percentage uncertainty when a student's initial burette reading is 1.20 cm³ and her final reading is 23.70 cm³, each reading being uncertain by ±0.05 cm³. [4]

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**B2**
MU-Q12

Compare random errors with systematic errors, giving an example of each from a titration. [4]

**B3**
MU-Q14

Describe how a burette reading should be taken and recorded, and identify which of these recorded readings is wrong: 0.00 $cm^3$, 12.35 $cm^3$, 24.7 $cm^3$, 36.05 $cm^3$. [4]

**B4**
MU-Q18

Suggest two causes of a titre that is 0.40 $cm^3$ larger than the three concordant titres in its set, and explain why it is left out of the mean rather than averaged with the others. [4]

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**B5**
MU-Q1

State the uncertainty of a single reading on each of: a 50 $cm^3$ burette marked every 0.10 $cm^3$, a balance whose display reads to 0.01 g, and a thermometer marked every 1 °C. [3]

**B6**
MU-Q3

Calculate the amount, in mol, of sodium hydroxide in 22.40 $cm^3$ of a 0.125 mol $dm^{-3}$ solution, and give the answer in standard form. [3]

**B7**
MU-Q4

Calculate the percentage uncertainty in the mass of solid transferred when a weighing bottle and solid weigh 14.73 g and the bottle weighs 12.28 g after the solid has been tipped out. The balance display reads to 0.01 g. [3]

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**B8** MU-Q6 Calculate the percentage uncertainty in a temperature rise when the starting temperature is 21.0 °C and the highest temperature is 27.5 °C, both read on a thermometer with an uncertainty of ±0.5 °C per reading. [3]

**B9** MU-Q7 Explain why repeating a titration several times does not remove a systematic error, using the example of a burette rinsed with water instead of the acid it holds. [3]

**B10** MU-Q8 Explain why a titration designed to give a titre of about 25 $cm^3$ gives a more reliable result than one giving a titre of about 10 $cm^3$. [3]

**B11** MU-Q9 Explain how many significant figures a concentration should be given to when a calculator shows 0.0827519 mol $dm^{-3}$ from a mass of 1.06 g, a titre of 24.15 $cm^3$ and a 25.0 $cm^3$ pipette, and give the answer. [3]

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**B12**
MU-Q10

Suggest two changes that would reduce the percentage uncertainty in the mass of a 0.12 g piece of magnesium ribbon weighed by difference on a balance whose display reads to 0.01 g, and show how large that uncertainty is at present. [3]

**B13**
MU-Q19

Show that, in a titration using a 25.0 $cm^3$ pipette with an uncertainty of ±0.06 $cm^3$ and a burette read to ±0.05 $cm^3$, a titre of 20.00 $cm^3$ carries a larger percentage uncertainty than the pipette volume does. [3]

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