

**Marking scheme for Core Worksheet – Chapter 11**

- 1** Accuracy is how close a measured value is to the actual value of a quantity. [1]  
Precision is how close repeat measurements are to each other/the mean value. [1]
- 2**
- |          |          |     |
|----------|----------|-----|
| <b>a</b> | 1.02     | [1] |
| <b>b</b> | 0.00679  | [1] |
| <b>c</b> | 0.00200  | [1] |
| <b>d</b> | 0.0540   | [1] |
| <b>e</b> | 0.00390  | [1] |
| <b>f</b> | 0.000500 | [1] |
| <b>g</b> | 0.499    | [1] |
- 3**
- |          |       |     |
|----------|-------|-----|
| <b>a</b> | 0.50% | [1] |
| <b>b</b> | 0.56% | [1] |
| <b>c</b> | 25%   | [1] |
- 4**
- |          |   |     |
|----------|---|-----|
| <b>a</b> | $\frac{0.15}{100} \times 25.7849203 = 0.04$     | [1] |
|          | $25.78 \pm 0.04$                                | [1] |
| <b>b</b> | $\frac{0.67}{100} \times 0.0178359273 = 0.0005$ | [1] |
|          | $0.0178 \pm 0.0005$                             | [1] |
- 5**
- |          |  |     |
|----------|--|-----|
| <b>a</b> | $105.7 \pm 0.4$                              | [1] |
| <b>b</b> | $0.0137 \pm 0.004$                           | [1] |
| <b>c</b> | $4.17 \pm 0.96\% \times 0.272 \pm 0.74\%$    | [1] |
|          | $1.13424 \pm 1.7\%$                          | [1] |
|          | $1.13 \pm 0.02$                              | [1] |
| <b>d</b> | $\frac{25.78 \pm 0.039\%}{1.685 \pm 0.12\%}$ | [1] |
|          | $15.29970326 \pm 0.16\%$                     | [1] |
|          | $15.30 \pm 0.02$                             | [1] |

- 6 a** temperature change =  $3.7 \pm 0.4$  °C [1]  
percentage uncertainties:  
volume of water, 1%  
temperature change, 10.8%  
mass of LiCl, 5%  
1 mark for all three percentage uncertainties [1]  
energy =  $100 \times 4.18 \times 3.7 = 1546.6 \pm 16.8\%$  [1]  
moles of LiCl =  $\frac{2.0}{42.39} = 0.0472 \pm 5\%$  [1]  
enthalpy given out per mole of LiCl =  $\frac{1546.6 \pm 16.8\%}{0.0472 \pm 5\%} = 32780 \pm 21.8\%$  [1]  
 $\Delta H = -33 \pm 7$  kJ mol<sup>-1</sup> [1]  
**b** percentage error =  $\frac{37.2 - 33}{37.2} \times 100$  [1]  
= 11% [1]  
the percentage uncertainty due to random errors is larger than the percentage error  
and therefore any variation can be explained by random errors [1]  
there is no evidence that there are systematic errors from this data [1]
- 7** (directly) proportional relationship as the graph is a straight line through the origin [1]  
gradient is approximately 0.75 [1]  
units of gradient: s<sup>-1</sup> [1]