

## Unit 3 - activity

- 4 A class of students carried out experiments to determine the value of  $x$  in the formula of hydrated sodium carbonate,  $\text{Na}_2\text{CO}_3 \cdot x\text{H}_2\text{O}$ .

Hydrated sodium carbonate was heated until no more water of crystallisation remained. Anhydrous sodium carbonate,  $\text{Na}_2\text{CO}_3$ , was formed.



The students were given the following instructions:

- weigh a sample of the hydrated sodium carbonate in a pre-weighed crucible
- heat the crucible containing the sample to remove the water of crystallisation
- allow the crucible to cool and then reweigh the crucible.

(d) The Data Book value for  $x$  is 10.

One student obtained a value for  $x$  of 8.63 and another student obtained a value for  $x$  of 10.79.

Explain the practical errors that could have led to each of these values.

(4)

| Question number | Answer   | Additional guidance   | Mark |
|-----------------|--|---|------|
| 4(d)            | <p>An explanation that makes reference to:</p> <ul style="list-style-type: none"><li>• 8.63 is too low because not enough water has been removed</li><li>• because it's not been heated long/strongly enough</li><li>• 10.79 is too high because apparently too much water has been removed/some extra material has been lost</li><li>• because solid has been lost from the crucible.</li></ul> | <p>(1) Accept hydrated sodium carbonate has lost water in storage</p> <p>(1)</p> <p>(1) Ignore reference to impurities in the sodium carbonate</p> <p>(1) Do not award measurement errors</p> | 4    |