2.2 Bonding and Structure: 10-minute Pack

AQA 7405 · Calculator allowed · about 10 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 This question is about uncertainty in temperature measurements made using a melting point apparatus.

(a) A student determines the melting point of a solid organic compound using a melting point apparatus with a thermometer marked in divisions of 1.0°C. State the uncertainty in a single temperature reading from this thermometer, given that the uncertainty in an analogue scale reading is taken as half the smallest scale division. **(1)**

(b) The student records the sample beginning to melt at 182.0°C. Calculate the percentage uncertainty in this single reading. **(2)**

(c) The sample finishes melting at 184.0°C. Calculate the melting range (the difference between the two readings) and its absolute uncertainty. **(3)**

(d) Calculate the percentage uncertainty in the melting range, and comment on what this shows about using this apparatus to determine a small melting range precisely. **(2)**

(Total for Question 1 is 8 marks)

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Mark scheme · 2.2 Bonding and Structure: 10-minute Pack

Question 1

(a) ± 0.5°C **B1**

(a) Answer: ± 0.5°C

(b) correct substitution: (0.5/182.0) x 100 **M1**

(b) 0.27% (accept 0.27-0.28%), cao **A1**

(b) Answer: 0.27%

(c) melting range = 184.0 - 182.0 = 2.0°C **M1**

(c) absolute uncertainties are added when two readings are subtracted: total uncertainty = 0.5 + 0.5 = ± 1.0°C **M1**

(c) melting range = (2.0 ± 1.0) °C **A1**

(c) Answer: (2.0 ± 1.0) °C

(d) correct substitution: (1.0/2.0) x 100 = 50% **M1**

(d) even though each individual reading has a small percentage uncertainty (about 0.3%), the percentage uncertainty in a small difference between two similar readings is very large (50%), so this apparatus is unsuitable/unreliable for precisely determining a narrow melting range, oe **B1**

(d) Answer: 50%; the apparatus gives a very large percentage uncertainty for a small temperature difference.

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