Statistics I

Averages and simple data analysis

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Answers to additional problems

32.1 The first point of 17.0 cm^3 looks suspiciously small. We insert data into eqn. (32.7),

$$Q_{(\text{exp})} = \frac{|(17.0-18.3)\,\text{cm}^3|}{(20.0-17.0)\,\text{cm}^3} = +\frac{1.3}{3.0} = 0.433$$

The result is positive because we take the modulus on the top line. There are nine measurements. The value of Q is too small to allow us to reject this datum with greater than 90% confidence. We therefore include this point in subsequent calculations.

32.2 Using eqn. (32.3), the standard deviation is 0.861 cm^3.

32.3 Using eqn. (32.1), the mean is 18.8 cm^3

32.4 There are 9 (reliable) data points within the set so the median titre is the same as the fifth reading, 18.9 cm^3

32.5 The mode titre is 19.3 cm^3 because we obtained this value three times.

32.6 The value that appears suspicious is the last one, –232.7 kJ mol^{-1}. It differs greatly from the others. Inserting values for the last point into eqn. (32.7),

$$Q_{(\text{exp})} = \frac{\left|\left(232.7-230.9\right)\,\text{kJ mol}^{-1}\right|}{\left(232.7-230.0\right)\,\text{kJ mol}^{-1}} = +\frac{1.8}{2.7} = 0.667$$

There are 10 data. We can ignore this point with $>$ 99% certainty. We will not include it in the statistical analysis below.

32.7 Using eqn. (32.1), the mean is –230.5 kJ mol^{-1} for the nine reliable data.

32.8 Using eqn. (32.3), standard deviation $s = 0.30$ kJ mol^{-1} for the nine reliable data.

32.9 The median energy is the same as the fifth reading because there are 9 (reliable) data points within the set. The median is –230.6 kJ mol^{-1}.

32.10 We obtain this result three times which is more frequent than others. The mode energy is –230.6 kJ mol^{-1}.