Commentary on candidate evidence

The candidate evidence has achieved the following marks for this section of the course assessment component.

Candidate	Section	Mark available	Mark awarded	Comments
A	4a	4	3	The candidate has carried out density calculations and interpreted infrared (IR) spectra. The final calculated density values are correct however there is an error in the average value for replicate 2. This should be 801·2. The sample calculation presented does not lead to the value shown with the units that are recorded. IR spectra have been interpreted by assigning the major peaks. The size of the spectra makes checking the wavenumbers difficult, full size spectra should have been given. The top IR spectrum is missing an x-axis and scale, however the peaks can still be identified and the peaks have been assigned correctly. All other units have been given and are correct, including in the assignment of IR peaks.
	4b	1	0	The density values have been given to four significant figures and the experimental measurements (raw data masses) had six significant figures. This is outwith the accepted range (one fewer and two more). The significant figures for the average melting point values are acceptable.

Candidate	Section	Mark available	Mark awarded	Comments
B	4a	4	2	The candidate has carried out one type of chemical relationship calculation on four samples with duplicates. This includes raw titration data with average calculations. The candidate has also provided a bar graph. There are some errors in calculations: ♦ Sample Type 1 (replicate) – the candidate has given a correctly rounded average titre of 12·2 but has used the correct unrounded average of 12·15 in the calculation. The quoted average value does not give the final calculated value given. This error has also been made for Type 3 (first titration) where an average titre has been quoted as 11·9 but the correct value of 11·85 was used in the calculation. ♦ There is an incorrectly calculated titre value for Type 4 (first titration) (40·8 – 29·2 =11·6 and not 11·8 as stated). This would give a final value of 65·01 mg per tablet, not 65·57 mg as stated by the candidate. The average titre quoted is rounded but the unrounded average was used in the calculation. The bar graph has no axes labels or units (the units are given as part of the graph title). The size and scale of the graph is not appropriate for the measurement of mg to 2 decimal places. There are no minor gridlines and so checking the accuracy of plotting is not possible.
	4b	1	1	The experimental measurements (titre values) are given to three significant figures and all the iron masses have been quoted to four significant figures. This is within the acceptable range (one fewer and up to two more).

Candidate	Section	Mark available	Mark awarded	Comments
C	4a	4	1	The candidate has calculated R_f values for a wide range of individual spots within chromatograms of 'controls' and samples with duplications.
				Photographs of chromatograms of three 'control' samples and 2 unknown samples with duplications have been given. These photographs are very small and the labelling is unclear for most of the samples.
				There is no solvent front marked on the chromatograms to allow checking for accurate measurement of distances. The spot labelling, as well as the sample labelling, is also difficult to see clearly and labels have been placed on top of the spots obscuring the spot.
				There is inappropriate averaging of R_f values. For example – spot 1 is taken to be the lowest spot appearing for sample B and the R_f value for this spot in replicate 1 (0·43) and replicate 2 (0·09) have been averaged on the assumption that these two spots are for the same component. Similarly for spot 3, 4, 6 and 7.
				The labelling of the chromatograms is not clear and nor is the table, and so the interpretation given cannot be followed in terms of which components are present in samples X and Y. The analysis of the spot R_f values in comparison to each other is reasonable with the result given that, for example, spots 1, 4 and 6 are likely to be the same component.
	4b	1	1	The lowest number of significant figures recorded for experimental measurements is one and the final average R_f values are quoted to two significant figures, and so this is within the acceptable range (one fewer and up to two more).

Candidate	Section	Mark available	Mark awarded	Comments
D	4a	4	3	The candidate has carried out titration calculations and average calculations on a total of 8 samples. A bar graph has also been given. The calculations have been carried out correctly with one instance of incorrect rounding for the control trial 2 (page 13). The value is 0·04548, which should have been rounded to 0·0455 not 0·0454. The duplicate experiment results have been averaged together giving only one final result for each milk type. This would have been better to leave as two separate values to allow a comparison of the duplicate experiments to be made. Although a chemical calculation has been carried out with only one minor error, there is only one type of calculation and this, on its own, is not sufficiently complex for Advanced Higher level. This would be considered a large quantity of data analysis. The candidate could have converted mol l^{-1} values to mg l^{-1} and this would have added to the complexity, and also allowing a comparison with literature values to be made. The bar chart has no minor gridlines meaning the accuracy of plotting the calculated values (4 decimal places) cannot be checked.
	4b	1	1	The final values have been given to three significant figures and as the titre values have been recorded to a minimum of two significant figures, the final values are within the acceptable range (one fewer and up to two more).

Candidate	Section	Mark available	Mark awarded	Comments
E	4a	4	1	There is only one type of calculation using a correct chemical relationship (% extraction). The calculation has only been carried out on two samples. There are no graphs or spectra included.
	4b	1	1	The fewest number of significant figures in the experimental measurements is four (mass of piperine) and the final values are quoted to three significant figures, and so this is within the acceptable range of three to six in this case.
F	4a	4	4	The candidate has successfully carried out calculations for the back titration of aspirin and has calculated the correct final value with units. The candidate has also calculated the percentage of aspirin in a tablet, although to allow a comparison with literature, this would have been better calculated as a mass of aspirin in one tablet, as this would allow comparison with the quantity recorded on the box.
	4b	1	1	Final percentage by mass values are quoted to three significant figures and the experimental measurements (titre volume) has been quoted to two significant figures, and so this is within the acceptable range (one fewer and up to two more).