This paper included many items which were accessible across the whole ability range allowing all candidates to demonstrate their knowledge, whilst still giving the most able candidates an opportunity to demonstrate their knowledge. The questions gave candidates a good opportunity to demonstrate their knowledge of practical activities, though some of the answers suggested a wide range of extent of practical experience across the cohort.

Question 1

In part (a) the flame colours were very well known with most candidates scoring both marks. Some candidates clearly misunderstood the question and gave answers which did not include flame colours. In parts (b), (c) and (d) candidates clearly knew what they should see in these tests, however they also added extra information which was sometimes incorrect, losing the credit they had gained. The most common example in part (b) was the formation of a white precipitate as well as carbon dioxide with the potassium carbonate. In part (c) the idea that there would be no observable reaction with sodium hydroxide and potassium sulfate seemed to put candidates off, and very few seemed willing to write this, with many guessing that sulfur dioxide would be formed.

In 1(d) candidates offered a range of possible observations and gases that might be formed in these reactions. Whilst this was often productive with sodium bromide, where there were three gases which could be formed, with sodium chloride the formation of more than one gas would lead to no marks being scored as only one, HCl, was a valid answer. Observations were generally recorded to match the stated gases, and these were often correct, but the same comments regarding the number of acceptable answers applies here as well.

Question 2

Question 2 allowed candidates to score very well, with (b) proving the most challenging. Correct final structures were often produced, but there were also many primary and secondary alcohols. Some candidates drew the structure of **G** instead of **J**.

Question 3

There were many correct responses in 3(a), with (i) in particular scoring very well for candidates. Part (ii) also scored well, though sometimes candidates gave -1463 instead of +1463 (although the positive sign was not required here). Whilst the numerical value in (iii) was usually correct the sign and the number of significant figures required meant that some marks were lost. Reading the question carefully was clearly very important here.

3(b) proved much more challenging, particularly (i). Some candidates answered by stating that one reaction was exothermic whilst the other was endothermic, which was true, but did not answer the question which was specifically asking about the way the temperature change differed. Part (ii) was rather better known with answers related to heat loss, complete reactions, density and specific heat capacity of the solutions all being seen quite commonly.

In part 3(c)(i) candidates scored relatively low, failing to balance the equations, particularly with the number of moles of water and carbon dioxide. The wrong state symbol for sodium chloride, given as a solid, also resulted in marks not being scored. In (ii) there were many correct answers, but also many which did not multiply ΔH_1 by 2, giving just

$\Delta H_{reaction} = \Delta H_1 - \Delta H_2$

Many candidates were able to score in (iii) either because their answer matched the mark scheme or because of error carried forward from the value for ΔH_1 or from the equation.

Question 4

The colours for the use of phenolphthalein as an indicator were well known, though sometimes they were used the wrong way around. The mean value for the titration was well answered, though sometimes there was confusion as to what the table was showing with the final burette readings sometimes used instead of the total titres. The meniscus in (b) (ii) was drawn correctly quite often, and the position of the reading also commonly correct, but quite a few candidates scored only one, by using a straight line at the correct volume or a nicely shaped meniscus at 22.35 cm^3.

The calculations in 4(c) were well answered, though some candidates were confused by (ii), though they were able to score in (iii) using error carried forward. The description of the use of the burette proved a little more difficult with some candidates not clearly able to explain what they meant. There were some diagrams, which helped to clarify this and was a useful way to confirm the award of marks. The use of 'the lower meniscus' implying more than one, rather than the 'the bottom of the meniscus' lead to some marks not being awarded.

Question 5

Many candidates were able to score on the calculations in this question. In part (i) most knew the unit, but some had numerical values which were not correct so did not score that mark. Part (ii) proved more difficult with care needed in rounding to ensure a mistake was not made. This was also true in part (iii), though a number of candidates were able to score here with errors carried forward from (ii).

This question allowed candidates to get some credit, though very few got all 3 marks in (i), usually not recognising that water was required for step 2 and that either sodium hydrogen carbonate or sodium carbonate were required for step 1, with sodium or potassium hydroxide being common wrong answers. Step 3 was much better known with a range of correct drying agents being seen. Redistillation in part (ii) scored rather well.

Summary

It was clear that many candidates had a very broad experience of practical work in their courses, with many scoring extremely high marks, however it was also clear that there is a considerable range of practical experience. Candidates are advised not only to gain as much practical experience as possible but also to try to understand why particular techniques are used and steps taken to gain the best results. Reading the question carefully is also important, particularly when questions refer to the need for particular numbers of significant figures, signs with answers and units.