| Question | Answer | Extra information | Marks | AO /  Spec ref. |
| --- | --- | --- | --- | --- |
| **01.1** | so it does not smudge/run/dissolve |  | 1 | AO3  C8.1.3 |
| **01.2** | The spots would dissolve/would not rise up the paper. |  | 1 | AO3  C8.1.3 |
| **01.3** | Any **three** from:   * X contains six/6 colourings * Y contains five/5 colourings * both X and Y contain the same   five/5 colourings   * both contain A **and** C * neither contains B **or** D. | If neither of first two bullet points given, allow **1** mark for X contains more colours than Y or converse. | 3 | AO3  C8.1.3 |
| **01.4** | 4.6 divided by 0.30  = 15.3 cm | Award **2** marks for 15 cm or 15.33 cm;  evidence of rearranged *R*f equation **1** mark. | 1  1 | AO2  C8.1.3  MS1a, 2a, 3b |
| **02** | **Level 3 (5–6 marks):** Description of methods used to identify both positive **and** negative ions, with relevant results. | | 6 | AO1×4  AO2×2  C8.3.1  C8.3.3  C8.3.4 |
| **Level 2 (3–4 marks):** Description of workable methods used, with results to identify positive **or** negative ions. | |
| **Level 1 (1–2 marks):** Any description of a method used and/or a result given. | |
| **Level 0 (0 marks):** No relevant content. | |
| **Indicative content:**   * **Test:** Add (platinum/nichrome) wire (for the flame test). * **Result:** The sodium compounds result in a yellow/orange/gold flame or the potassium compound results in a lilac/purple/mauve flame. * Accept any method of introducing the solution into the flame, e.g. a splint soaked in the solution or sprayed from a bottle. * The student could state that potassium carbonate gives a different colour to the three sodium compounds, as long as it is clear that the flame test colour comes from Na+ or K+. * **Test:** Add dilute nitric acid to all four solutions.   Allow any acid.   * **Result:** Sodium carbonate and potassium carbonate will effervesce/ give off gas **or** sodium chloride and sodium iodide will not effervesce. * **Test:** Add dilute nitric acid followed by silver nitrate. * **Result:** Sodium chloride and sodium iodide produce a precipitate **or** sodium chloride produces a white precipitate and sodium iodide produces a yellow precipitate.   Accept sodium carbonate and potassium carbonate do not produce a precipitate.  This indicative content is not exhaustive, other creditworthy responses should be awarded marks as appropriate. | |  |
| **03.1** | chloride |  | 1 | AO1  C8.3.4 |
| **03.2** | Solid silver chloride is formed;  which does not dissolve/is insoluble (in water). | accept AgCl(s) | 1  1 | AO3  C8.3.4 |
| **03.3** | Add hydrochloric acid;  bubble gas produced through limewater that goes cloudy / misty / milky. |  | 1  1 | AO1  C8.3.3 |
| **04.1** | Ca2+ |  | 1 | AO1 |
| **04.2** | Colours mix/one colour masks others. |  | 1 | AO3 |
| **04.3** | Not enough to test/chemicals lost/ used up. | Allow flame test not sensitive enough. | 1 | AO3  C8.3.1 |
| **04.4** | flame emission spectroscopy |  | 1 | AO1  C8.3.7 |
| **04.5** | Any **two** from:   * more sensitive * can detect more than one ion at once * can determine ion concentrations. | Allow converse for flame test. | 2 | AO3  C8.3.6 |
| **04.6** | green |  | 1 | AO2  C8.3.1 |
| **04.7** | formulation |  | 1 | AO1 |
| **04.8** | rocket may not work/perform badly/ explode/produce unpredictable results | Allow any sensible answer | 1 | AO2  C8.1.2 |
| **05** | A: lithium **and** carbonate  B: iron(III) **and** bromide  C: iron(II) **and** sulfate | Allow Li+ / CO32–  Allow Fe3+ / Br–  Allow Fe2+ / SO42– | 1  1  1 | AO2  C8.3.1  C8.3.2  C8.3.3  C8.3.4  C8.3.5 |