1. **Purity and Formulations**

1. A student carried out an experiment in which they measured the temperature of two substances whilst they were heated. During the experiment both substances melted.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time in seconds | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| Temperature of substance A OC | 30 | 35 | 39 | 40 | 40 | 40 | 40 | 44 | 49 | 54 | 59 |
| Temperature of substance B OC | 30 | 35 | 37 | 39 | 40 | 42 | 44 | 46 | 49 | 54 | 59 |

What can be concluded about each chemical from the results the student obtained? Explain your answer. (4)

2. Why would a scientist not describe “pure milk” as pure? (2)

3. There are a number of alloys of steel. They all contain slightly different components e.g. carbon steel is 99% iron and 1% carbon, whereas stainless steel is 88% iron and 12% chromium.

What is the scientific name given to these types of mixtures and why are they made? (3)

1. **Chromatography**

1. A student carries out chromatography on two chemicals X and Y. Explain how chromatography might split up the chemicals in the two substances. (3)

2. The student found that a spot had risen up 0.7cm from chemical X, whereas the solvent had risen 2cm, chemical Y had not moved.

Calculate the Rf value for chemical X. Describe what the student would have seen if X was a pure chemical and what might happen to chemical Y if a different solvent was used in the chromatography. (6)

1. **Identification of Common Gases**

1. A student has two test tubes of gas. He believes that one contains hydrogen and one contains oxygen. Describe how he could test for each gas and the positive result he would see for each gas. (4)

2. A student adds hydrochloric acid to a white solid in a test tube. She believes the solid is a carbonate. Describe in detail how she could test the gas given off to prove her prediction. You may draw a diagram to help you in your answer. (4)

1. **Identification of Ions By Chemical Means (Chemistry only)**

 1. A student has three different samples of chemicals, they know that one contains lithium, one contains potassium and one contains calcium. Describe the test she could do to determine which chemical contains which metal. (6)

2. The student has another sample that they know contains copper, however when they carry out the flame test they get a yellow colour rather than the expected green. Explain why this happens. (2)

3. In a further experiment two solutions contain aluminium and magnesium ions. They are tested with sodium hydroxide solution. Describe the similarities and differences in the results they would get. (3)

4. A chemist believed that a sample of water contained iodide and sulfate ions. When it was tested with silver nitrate a cream precipitate was produced; when tested with barium chloride a white precipitate was produced. What ions were present in the water? Write balanced symbol equations for the positive results, include state symbols. (6)

1. **Identifications of Ions by Spectroscopic Means (Chemistry only)**

1. Give three advantages of using instrumental methods compared to chemical methods to identify ions. (3)

2. Describe how you would carry out flame emission spectroscopy and what you would use it to test for. (4)