# Identifying ions: supporting resources

This resource supports the practical video Identifying ions, available here: <rsc.li/3dhnn5B>

## Using the follow-up worksheet

A practical skills worksheet has been included as part of the additional resources. The first section provides structured questions at a support level for learners, the second section provides more challenging applied questions. Select the questions most appropriate to the stage your learners are at. This worksheet could be used to follow up the practical activity, for example as homework or a revision exercise.

## **Follow-up worksheet**

1. A student carried out some flame tests.

Complete the flame test results table. The first row has been done for you.

|  |  |  |
| --- | --- | --- |
| **Metal ion** | **Symbol** | **Observation: flame colour** |
| Potassium | K+ | Lilac |
| Sodium |  |  |
|  | Li+ | Crimson |
| Calcium |  |  |
|  | Cu2+ | Green |
| Unknown solution X |  | Yellow |

1. Describe how you would test for positive ions using the sodium hydroxide chemical test.
2. Complete the sodium hydroxide test results table.

|  |  |  |
| --- | --- | --- |
| **Positive ion** | **Symbol** | **Observation when added to sodium hydroxide solution** |
| Iron(ii) | Fe2+ |  |
|  |  | Brown precipitate |
| Copper(ii) |  | Blue precipitate |

1. Complete the equations, using the example to help. Iron(ii) + hydroxide → iron(ii) hydroxide

Fe2+(aq) + 2OH-(aq) → Fe(OH)2(s)

1. Iron(iii) + hydroxide →

Fe3+(aq) + OH-(aq) → Fe(OH)3( )

1. Copper(ii) + hydroxide → (ii) hydroxide Cu2+(aq) + OH-(aq) → Cu(OH)2( )
2. A student carried out some tests to identify the ions present in an unknown solution. After adding a few drops of dilute nitric acid and silver nitrate to the sample, a cream coloured precipitate appeared.

The student concluded that a ion was present in the solution.

**Challenge**

1. A student was asked to identify an unknown sample. She carried out some tests and here are the results.
2. Complete the table.

|  |  |  |
| --- | --- | --- |
| **Test** | **Result** | **Conclusion** |
| Add 2 drops of sodium hydroxide to 2 drops of solution | A white precipitate is formed |  |
| Add excess sodium hydroxide to the drop | No change to the white precipitate |  |
| Flame test | An orange-red flame is observed |  |
| Add a few drops of hydrochloric acid to sample | No changes observed |  |
| Add a few drops of hydrochloric acid then a few drops of barium chloride to sample | No change observed |  |
| Add a few drops of nitric acid then a few drops of silver nitrate to sample | A white precipitate is formed |  |

1. The unknown sample is
2. Complete the ionic equations for the positive results.

( ) + OH-(aq) → ( )

Ag+(aq) + ( ) → ( )

1. A sample of an unknown ionic solution has been collected for analysis. The sample is colourless. Describe a series of qualitative tests that could be used to identify the unknown ions in the sample. In your plan you must include instructions for carrying out the tests and the expected results.

*This question has a structure strip to support your written answer. Find more resources to support you here rsc.li/3a7LS37.*

## **Follow-up worksheet: answers**

1. A student carried out some flame tests.

Complete the flame test results table. The first row has been done for you.

|  |  |  |
| --- | --- | --- |
| **Metal ion** | **Symbol** | **Observation: flame colour** |
| Potassium | K+ | Lilac |
| Sodium | **Na+** | **Yellow** |
| **Lithium** | Li+ | Crimson |
| Calcium | **Ca2+** | **Orange-red** |
| **Copper** | Cu2+ | Green |
| Unknown solution X  **Sodium** | **Na+** | Yellow |

1. Describe how you would test for positive ions using the sodium hydroxide chemical test.

##### Add 2 drops of sodium hydroxide to 2 drops of an unknown solution and observe.

1. Complete the sodium hydroxide test results table.

|  |  |  |
| --- | --- | --- |
| **Positive ion** | **Symbol** | **Observation when added to sodium hydroxide solution** |
| Iron(ii) | Fe2+ | **Green precipitate** |
| **Iron(iii)** | **Fe3+** | Brown precipitate |
| Copper(ii) | **Cu2+** | Blue precipitate |

1. Complete the equations, using the example to help. Iron(ii) + hydroxide → iron(ii) hydroxide

Fe2+(aq) + 2OH-(aq) → Fe(OH)2(s)

1. Iron(iii) + hydroxide → **iron(iii) hydroxide**

Fe3+(aq) + **3**OH-(aq) → Fe(OH)3(**s**)

1. Copper(ii) + hydroxide → **copper**(ii) hydroxide Cu2+(aq) + **2**OH-(aq) → Cu(OH)2(**s**)
2. A student carried out some tests to identify the ions present in an unknown solution. After adding a few drops of dilute nitric acid and silver nitrate to the sample, a cream coloured precipitate appeared.

The student concluded that a **Chloride (or Cl-)** ion was present in the solution.

**Challenge**

1. A student was asked to identify an unknown sample. She carried out some tests and here are the results.
2. Complete the table.

|  |  |  |
| --- | --- | --- |
| **Test** | **Result** | **Conclusion** |
| Add 2 drops of sodium hydroxide to 2 drops of solution | A white precipitate is formed | **Al3+, Ca2+ or Mg2+ ions could be present** |
| Add excess sodium hydroxide to the drop | No change to the white precipitate | **Ca2+ or Mg2+ ions could be present** |
| Flame test | An orange-red flame is observed | **Ca2+ ion is present** |
| Add a few drops of hydrochloric acid to sample | No changes observed | **The carbonate or CO32- ion is**  **not present** |
| Add a few drops of hydrochloric acid then a few drops of barium chloride to sample | No change observed | **The sulfate or SO42- ion is not**  **present** |
| Add a few drops of nitric acid then a few drops of silver nitrate to sample | A white precipitate is formed | **The chloride or Cl- ion is present** |

1. The unknown sample is

##### Calcium chloride (or CaCl2)

1. Complete the ionic equations for the positive results.

**Ca2+(aq)** + **2**OH-(aq) → **Ca(OH)2(s)**

Ag+(aq) + **Cl-(aq)** → **AgCl(s)**

1. A sample of an unknown ionic solution has been collected for analysis. The sample is colourless. Describe a series of qualitative tests that could be used to identify the unknown ions in the sample. In your plan you must include instructions for carrying out the tests and the expected results.

This question has a structure strip see ‘suggested answer content’ (rsc.li/3a7LS37).