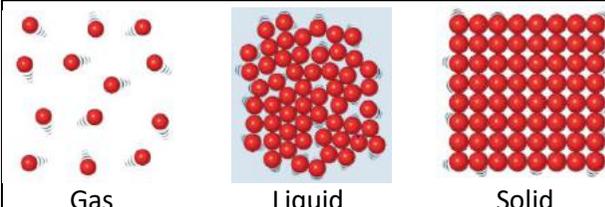
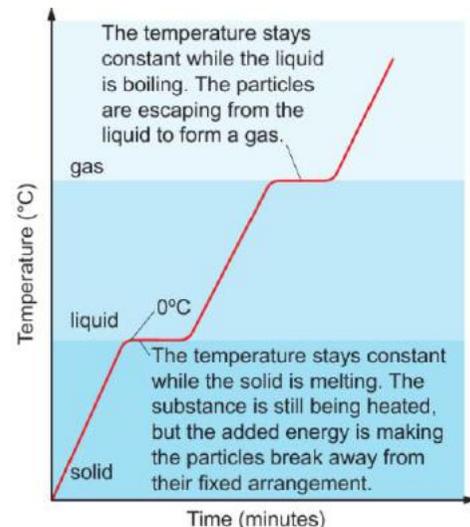


| Section A: Key Vocabulary |   |
|---------------------------|---|
| Keyword                   | Definition  |
| Atom                      | The smallest independent particle. Everything is made from atoms.                     |
| Boiling Point             | Temperature at which a substance changes from liquid to gas.                          |
| Chlorination              | Process of adding chlorine to a substance, often to water.                            |
| Chromatogram              | Piece of paper showing the results of chromatography.                                 |
| Compound                  | A substance made from two or more different elements bonded together.                 |
| Condensation              | When a gas turns in to a liquid.  |
| Crystallisation           | Separating the solute from a solution by evaporating the solvent.                     |
| Desalination              | Producing pure water from seawater.   |
| Distillation              | Separating a liquid from a mixture by evaporating the liquid then condensing it.      |
| Element                   | A substance made from only one type of atom.  |
| Evaporate                 | When a liquid turns into a gas.   |
| Filtrate                  | Solution that has passed through a filter.  |
| Filtration                | Using a filter to separate insoluble substances from a liquid.                        |
| Fractional Distillation   | Separating mixture of liquids of different boiling points into individual components. |
| Insoluble                 | Substance that cannot be dissolved in a certain liquid.                               |

| Section B: Methods and Procedures  |
|--|
| <b>Separating Mixtures</b>   |
| <p><b>1. Filtration</b><br/>The filter paper contains many tiny holes. The water molecules are small enough to pass through the holes into the beaker below, the solid particles are too big and get trapped in the filter paper.</p> <p><b>2. Distillation</b><br/>The solution is heated until it is hot enough for the solvent to boil. The solvent is then passed through a cool condenser where it turns back to liquid. The solute does not get hot enough to evaporate and stays where it is.</p> <p><b>3. Crystallisation</b><br/>Solution is heated so that the solvent evaporates away. The solid substance is then collected.</p> |
| <b>How to do Paper Chromatography</b>  |
| <p><b>Method:</b></p> <ol style="list-style-type: none"> <li>1. Draw pencil line on paper 1cm from the bottom.</li> <li>2. Place sample spot on line</li> <li>3. Place paper in solvent, with solvent <b>below</b> the pencil line.</li> <li>4. Allow the solvent to soak up the paper.</li> <li>5. Stop when the solvent is near the top of the paper mark how far it gets.</li> <li>6. Calculate R<sub>f</sub> Values.</li> </ol>  |

| Section C: Diagrams   |
|---|
| <b>States of Matter</b>   |
|  <p style="text-align: center;">Gas                      Liquid                      Solid</p>   |
| <b>Temperature/Time Graph</b>   |
|  <p>The temperature stays constant while the liquid is boiling. The particles are escaping from the liquid to form a gas.</p> <p>gas</p> <p>liquid</p> <p>0°C</p> <p>The temperature stays constant while the solid is melting. The substance is still being heated, but the added energy is making the particles break away from their fixed arrangement.</p> <p>solid</p> <p style="text-align: center;">Temperature (°C)</p> <p style="text-align: center;">Time (minutes)</p> |
| <b>Filtration and Crystallisation</b>   |
|  <p style="text-align: center;">Filtration                      Crystallisation</p>  |

## Year 9 Autumn Term – C1-2 States of Matter/Methods of Separating and Purifying Substances

|                      |   |
|----------------------|---|
| Melting Point        | Temperature at which substance changes from solid state to the liquid state when heated.                              |
| Mixture              | A substance made of two or more substances mixed but not bonded together.   |
| Mobile Phase         | The solvent in chromatography.  |
| Molecule             | A particle made from two or more atoms bonded together.   |
| Paper Chromatography | Separating out mixtures of liquids to show what is in them by letting them travel up a piece of chromatography paper. |
| Particle             | Tiny pieces that all matter is made from.   |
| Potable Water        | Water that is safe to drink.  |
| Precipitate          | An insoluble substance that is formed when two soluble substances react together in solution.                         |
| Residue              | Solid that gets left behind in filter paper.  |
| Sedimentation        | Process in which rock grains and insoluble substances sink to the bottom of a liquid.                                 |
| Soluble              | Substance that can be dissolved in a certain liquid.  |
| Solute               | Solid that has been dissolved.  |
| Solution             | Mixture of a solute dissolved in a solvent.   |
| Solvent              | Liquid that has dissolved a substance.  |
| Stationary Phase     | The substance the solvent moves through in chromatography.  |

### Calculating R<sub>f</sub> Values

R<sub>f</sub> values enables you to identify a substance because for a given solvent and stationary phases, it is unique to each substance.

$$R_f = \frac{\text{distance moved by the spot}}{\text{distance moved by the solvent}}$$

#### For example –

In a chromatogram, a pink spot have moved 4cm and the solvent has moved 10cm along the paper. Calculate the R<sub>f</sub> value of this pink compound:

$$R_f = \frac{4}{10} = 0.4$$

A compound never rises as fast as the solvent, so R<sub>f</sub> values are always less than 1. If you calculate an R<sub>f</sub> value bigger than 1, you've made a mistake.

### Water Treatment in the UK

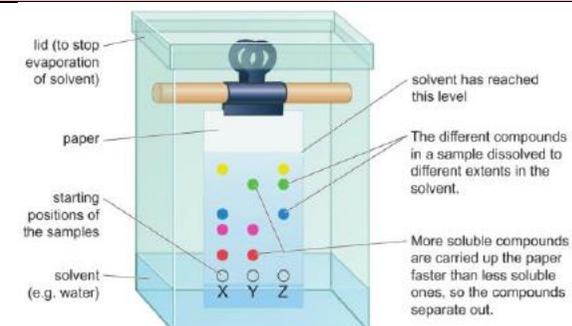
The raw material for producing drinking water comes from rivers and lakes. Fresh water from these sources contains:

- Objects such as leaves and twigs.
- Small insoluble particles such as grit and fertilisers.
- Soluble substances, including salts, pesticides and fertilisers.
- Bacteria and other microorganisms that may be harmful to health.

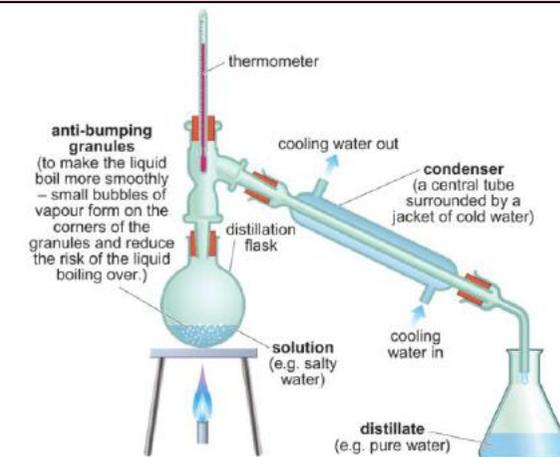
To deal with these impurities there are 3 main stages:

**sedimentation, filtration and chlorination.**

### Paper Chromatography



### Distillation



### Purifying Water

