Name Date

Worksheet 1.1: Elements, compounds, mixtures and kinetic molecular theory

**1** Classify each of the following substances as an element, a compound or a mixture:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Element** | **Compound** | **Mixture** |
| Coffee |  |  |  |
| Tungsten |  |  |  |
| Steam |  |  |  |
| Crude oil |  |  |  |
| Sulfur trioxide |  |  |  |
| Bromine |  |  |  |
| Air |  |  |  |
| Zinc chloride |  |  |  |
| Pure ethanol |  |  |  |
| Phosphoric acid |  |  |  |

**2** Insert the missing state symbols for each of the following processes:

1. sodium metal reacting with water to produce a solution of sodium hydroxide and hydrogen gas

Na( ) + 2H2O( ) → 2NaOH( ) + H2( )

1. sublimation of iodine at room temperature

I2( ) → I2( )

1. the dissolving of copper(II) sulfate crystals in water to form a blue solution

CuSO4·5H2O( ) + H2O( ) → CuSO4( )

1. forming silver chloride precipitates by mixing a solution of silver nitrate and a solution of sodium chloride; the other product, sodium nitrate, is soluble in water

AgNO3( ) +NaCl( ) → AgCl( ) + NaNO3( )

**3** Describe the process of preparing a pot of filtered coffee. Your answers should include the   
following keywords: soluble, insoluble, filter paper, residue, filtrate, solvation, solute, solvent, solution, dissolve.

A glass cup filled with liquid

Description automatically generated

**4** Explain, using kinetic molecular theory, the physical process that is happening in this picture.   
Your answers should comment on the change in the energy, the arrangement and the movement   
of the particles.

A funnel with smoke coming out of it

Description automatically generated

dry ice

**5** *Extension question*: Methyl propanoate is an ester which can be made by refluxing a mixture of methanol and propanoic acid. A few drops of concentrated sulfuric acid are added as a catalyst.   
After refluxing, the following procedure is carried out to purify the ester:

**Step 1**: Add the reaction mixture to a solution of sodium carbonate. Stir until no more gas   
is produced.

**Step 2**: Transfer the mixture into a separatory funnel. Shake the mixture and release the pressure by removing the stopper of the funnel. Remove the lower aqueous layer carefully.

**Step 3**: Add anhydrous calcium chloride to the remaining liquid in the funnel.

**Step 4**: The mixture is filtered.

**Step 5**: Distil the liquid by fractional distillation and the distillate with the boiling point of 79–81°C   
is collected.

Explain steps 1–5and how they help to purify the ester.