7E
Answers

7E Mixtures and separation

7Ea Mixtures

Student Book

1: 7Ea Mixtures and separation (Student Book)

L3 **1** **a** any suitable answer, e.g. solid – glass (in beaker), sodium chloride crystals, steel (in furniture); liquid – water, hydrochloric acid, cola; gas – air, oxygen, carbon dioxide

L4 **b** any suitable description, e.g. solid – holds its own shape; liquid – fixed volume but not a fixed shape, flows to fill bottom of container; gas – no fixed shape or volume, spreads out to fill all space, can be squashed/compressed to a smaller volume

L4 **2** **a** Gravel can be separated from water by sieving.

b Sand can be separated from water by filtering.

L4 **3** **a** A solution is a mixture where a solid has been dissolved in a liquid.

b evaporate the water

L4 **4** **a** You can return to the original constituents by the reverse/opposite process – in this case, evaporation.

b any suitable change, e.g. melting, freezing, condensation

2: 7Ea Writing a method (Student Book)

L4 **1** to explain how to carry out the experiment

L5 **2** It can show more clearly how the apparatus is arranged.

L4 **3** so other scientists can repeat the same or similar experiments; to allow other scientists to check that the reported method works in the way that is claimed

L4–5 **4** any three of: fold (A and B), place (D and E), stir (F), pour (G) (they are all instructions to do something)

L4 **5** any suitable example, such as: 'mixture' or 'suspended' (the name of a piece of apparatus is also appropriate)

L4–5 **6** Steps A and B could be drawn as a diagram, which would be clearer as it would show clearly where the folds should be made.

L4–6 **7** The method should be written using clear language, one action per step, arranged in the correct order and using an imperative verb in each step. Steps should include a logical order for placing the equipment, e.g. place the tripod on the bench, put the gauze on the tripod, fill a beaker with water and then put this on the gauze.

3: 7Ea Mixtures (Student Book)

L4 **1** It contains substances other than water, such as mud, human waste and other solids.

L4 **2** **a** large solids

L5 **b** A sieve has large holes/gaps that let everything through except large solids.

L5 **3** A suspension contains suspended solids; a solution contains dissolved solids.

L5 **4** A suspension, because it contains solids that settle out if left to stand (it is also a solution because there are dissolved solids in the water).

L5 **5** The polystyrene and air are mixed in a way that is not easy to separate again (so it is not a suspension), but the solid is not dissolved (so it is not a solution).

L4 **6** A colloid, because it is a cloudy mixture with no sediment after it has had time to settle.

L5 **7** filtered or left to settle and water removed from the top; because the solids are now large enough to settle from the liquid

L5 **8** flow chart similar to: waste water from homes → sieved to remove large solids → settle and strained, or filtered to remove smaller solids → treated with chemicals to clump finest solids then settled or strained to remove clumps

Activity Pack

7Ea-1 Writing a clear method

L4 **1** A – action; B – sequence; C – apparatus; D – diagram; E – language

L4 **2** **a** unlock, open, put, close, sit

L4 **b** A – Unlock the car. B – Open the car door.

L4 **c** The steps are not in the right order as you can't put the seat belt on before you sit in the seat.

L5 **d** C – Sit in the car seat. D – Put the seat belt on. E – Close the car door. (Steps D and E can be in either position.)

L5 **3** Method should be written with one action per step, each step starting with an imperative verb, and sequenced in the correct order. For example: A – Place the ready-meal container in the microwave. B – Set the correct power for cooking the meal. C – Set the correct cooking time. D – Press the start button. E – Test to make sure the food is hot.

7Ea-2 Types of mixture

L4 **1** suspension – a mixture where the solid settles out of the liquid if left to stand still
colloid – a cloudy mixture where the solid doesn't settle out of the liquid if left to stand still
solution – a mixture in which the solid is dissolved in the liquid

L4 **2** large suspended solids

L4 **3** **a** polystyrene – solid; **b** air – gas

L4 **4** cloudy/opaque

7Ea-3 Ordering a method

L4

Correct order:
Fold the filter paper in half, and then into quarters.
Open out one layer of the filter paper to make a cone.
Place the filter paper cone into the wide end of the funnel.
Put the narrow end of the funnel into the top of the flask.
Carefully pour the sand/water mixture into the filter paper.
Leave the apparatus to stand until all the liquid in the mixture has filtered into the flask.

7Ea-5 Apparatus diagram

L4 **1** (In either order) They show the same pieces of apparatus. The pieces of apparatus are arranged in the same way.

L4 **2** (In either order) The picture looks like the real apparatus but the diagram doesn't. The diagram shows the apparatus as if cut through, but the pictures shows the apparatus as if seen from the side.

L4 **3** Any suitable answer, e.g. you don't have to draw as much; it's much simpler to draw the diagram.

L4 **4** It is easier for everyone to understand what the diagram shows.

L4 **5** A suitable drawing done using a ruler and showing the neck of the flask and bottom of the funnel open.

7Ea-6 The right steps

L5 **1** A – Anything that clearly describes how to fold the paper and open it out to make a cone that fits into the top of the funnel.
B – Anything that clearly states that the narrow end of the funnel is inserted into the neck of the flask.
C – Anything that clearly describes how the water is poured carefully into the filter paper, so that it filters through the filter paper.

L4 **2** Correct apparatus symbols for filter funnel and paper, and conical flask, neatly drawn with sharp pencil and a ruler.

L5 **3** Any suitable explanation, e.g. it is quicker and neater to use symbols; everyone understands what the symbols mean.

7Ea-7 Different mixtures

L4 **1** correct statements: The flour is a solid and the water is a liquid. The flour will settle to the bottom of the container if the mixture is left to stand.

L4 **2** hairspray – liquid; air – gas; gelatine – solid; water – liquid

L5 **3** Styrofoam cup – The air stops heat passing quickly through.
Hairspray – The air spreads the liquid droplets so you don't get too much in one place.
Gel in a disposable nappy – The water is absorbed and locked away.
Hand cream – The water helps it to spread more thinly.

7Ea-8 An emergency water filter

L4 **1** Labelled apparatus diagram of filter paper, filter funnel and container such as a conical flask or beaker.

L5 **2** Clearly written method, with one instruction in each step and in correct order.

L5 **3** The layers of stones, sand and moss will separate out the larger solids as the dirty water filters through them.

L5 **4** The water may also contain harmful microorganisms that would not be trapped in the filter because they are too small. Boiling the water would make it safer to drink. Also, the finest solids will probably not be removed by the filtering.

7Ea-9 Different kinds of colloids

L4 **1** Hairspray: liquid aerosol of liquid in gas. Mayonnaise: emulsion of liquid in liquid. Smoke: solid aerosol of solid in gas. Jelly: gel of liquid in solid. Styrofoam: solid foam of gas in solid. Inks: sol of solid in liquid. Whipped cream: liquid foam of gas in liquid.

L4 **2**

	Gas in …	**Liquid in …**	**Solid in …**
gas	–	liquid aerosol	solid aerosol
liquid	liquid foam	emulsion	sol
solid	solid foam	gel	–

L5 **3** Hand cream – emulsion. Dirty water – sol. Fog – liquid aerosol. Pumice – solid foam.

L5 **4** **a** Suspension, because the liquids separate on standing.
b Emulsion, because it is a colloid of liquids.
c Any suitable answer that shows understanding of the problems caused by trying to group things that may not fit only one group in a classification.

7Eb Solutions

Student Book

1: 7Eb Solutions (Student Book)

L4 **1** The water contains dissolved substances/solutes.

L4–5 **2** any two suitable solutes, e.g. sodium chloride, copper sulfate (other possibilities include any chloride, iodide, bromide, fluoride, calcium carbonate, magnesium), and any one gas, e.g. oxygen (other possibilities include carbon dioxide, ammonia)

L4–5 **3** It may be coloured (e.g. copper sulfate) but still transparent. It may taste or smell different from the solvent that does not contain the solute.

L5 **4** propanone is the solvent, nail varnish is the solute

L5 **5** 20 + 150 = 170 g

L4 **6** **a** sodium chloride

L5 **b** 5 × 32 = 160 g

L6 **c** As the liquid cools, the copper sulfate will start to crystallise out. This is because the solubility of the copper sulfate decreases as the temperature decreases and so less of it can stay dissolved in the solvent.

Activity Pack

7Eb-1 Solution words and definitions

dissolves – when a substance splits up and mixes with a liquid to make a solution
soluble – something that will dissolve in a liquid
transparent – See-through
insoluble – something that will not dissolve in a liquid
solution – a mixture formed when a substance dissolves in a liquid
solute – the substance that has dissolved in a liquid to make a solution
solvent – a liquid in which other substances dissolve
saturated – when a solution contains the most solute that will dissolve in the solvent
solubility – the amount of substance that dissolves in a given amount of liquid

7Eb-2 Solvents and solutions

A matches with **2**, label **a**
B matches with **5**, label **b**
C matches with **7**, label **a**
D matches with **8**, label **b**

7Eb-3 Temperature and solubility 1

Students should find that more salt dissolves if the water is hot.

7Eb-4 Temperature and solubility 2

Students should find that the solubility increases as temperature increases.

7Eb-5 Graphing solubility 1

L5 **2** **a** goes up
L5 **b** chloride
L5 **c** nitrate
L6 **d** 41
L6 **e** 45

7Eb-6 Graphing solubility 2

L5 **2** **a** Solubility increases as temperature rises.
L5 **b** potassium chloride
L5 **c** potassium nitrate
L6 **d** answers from graph – 15 °C, 24 °C, 27 °C, 31 °C, 34 °C, 37 °C

7Eb-7 Solution questions

L5 **1** **a** soluble **b** insoluble, soluble

L4 **2** solution 1: solvent is water, solute is copper sulfate
solution 2: solvent is propanone, solute is nail varnish

L5 **3** The amount of solute that dissolves in a particular amount of solvent.

L5 **4** **a** The amount of sodium nitrate that dissolves in water increases as temperature increases.
L5 **b** no
L5 **c** The solution was saturated.

7Eb-8 Solution questions

L4 **1** The copper chloride dissolves in ethanol.

L4 **2** solution

L4 **3** Copper chloride is the solute, because it is the solid that 'disappears' in the ethanol. Ethanol is the solvent, because it is the liquid in which the copper chloride 'disappears'.

L5 **4** **a** 220 g
L5 **b** The mass of solute is added to the mass of the solvent.

L5 **5** **a** All the copper chloride would dissolve because this mass is lower than the solubility.
L5 **b** Most of the copper chloride will dissolve, but 7 g of the copper chloride would remain undissolved at the bottom of the beaker, because this mass is greater than the solubility at this temperature.
L5 **c** Some of the copper chloride would remain undissolved at the bottom of the beaker because 60 cm^3 can only dissolve 53 × 60/100 = 32 g copper chloride at this temperature.
L5 **d** Possibly all of the copper chloride will dissolve because solubility usually increases with temperature.

7Eb-9 Hot water and oxygen

L5 **2** **a** It goes down/gets less.
L5 **b** It is the opposite – most solids get more soluble as the temperature increases.

L5 **3** **a** fresh water

L5 **b** Fresh water – the graph goes down more steeply (or, the solubility changes by 9.9 mg/dm^3 for fresh water as the temperature goes up from 0 to 60 °C, but only goes down by 7.5 mg/dm^3 for sea water).

L5 **4 a** answer from graph – should be approximately 12.8 mg/dm^3

L5 **b** a half of 12.8 mg/dm^3 is 6.4 mg/dm^3, and this solubility occurs at 40 °C

L5 **5** Less oxygen would be dissolved in the warmer water, so there would be less oxygen for the fish and they may be harmed. (The warmth also encourages the growth of microorganisms that further deplete the oxygen supply, but students are not expected to know this.)

L5 **6** Heating sea water does not have as big an effect on solubility as heating fresh water. Also, the sea has a far greater volume than rivers, so the warm water spreads out and the overall temperature increase is very small apart from very close to the outlet pipe.

7Ec Evaporation

Student Book

1: 7Ec Safety when heating (Student Book)

L4 **1** to heat things

L4 **2** so the burner is lit with a safety flame, which is less hazardous than a blue flame

L5 **3** It is not very hot, like the noisy blue flame, so it is easier to stop the heating before the solution starts spitting; it is not smoky like/it is hotter than the yellow flame.

L5–6 **4 a** hot apparatus that could burn on touch; spitting of liquid during heating

b Do not touch the apparatus until it is cool; if the apparatus must be handled, use heatproof tongs or gloves; switch the Bunsen burner off before all liquid evaporates from the solution.

L6 **5** The plan must identify the hazards of heating solutions and include instructions to minimise risk from these.

2: 7Ec Evaporation (Student Book)

L4 **1 a** the water evaporates

b The salt does not evaporate, so it is left behind when the water evaporates.

L5 **2** Faster in the warm ponds, because the rate of evaporation increases as the temperature increases.

L5 **3** rock salt: water pumped into rock layers → brine pumped to surface → brine heated to evaporate water and leave dry salt

sea salt: salt water from sea taken into shallow ponds → water evaporates from salt water (warmth from Sun speeds up rate of evaporation) → dry sea salt left in ponds and collected for use

L4 **4** At 100 °C all the liquid water is trying to evaporate at the same time, causing many bubbles of water vapour in the liquid. Below boiling point, evaporation happens only at the surface of the liquid.

L5–6 **5** At 80 °C all the ethanol will turn to vapour and leave the liquid. Some of the water will be evaporating at this temperature too, but it will not be boiling because 80 °C is below its boiling point.

L5 **6** evaporating all the liquid from a solution to leave behind the solids that were dissolved in it

L5 **7 a** They were heated gently until most of the water had evaporated. Then they were left to dry from the heat left in the dish.

b The water in the sample on the right contained more dissolved solids than the water in the other sample.

Activity Pack

7Ec-1 Safety when heating

L4 **2 a** Small, but very hot blue flame. **b** Larger, bluer flame. **c** Large, yellow flame.

7Ec-2 Evaporation

L4 **1** Evaporation
L4 **2** Dissolved/Dry Salts/Solids
L4 **3** Sodium Chloride
L4 **4** Brine
L4 **5** Sea Salt
L4 **6** Boiling
L4 **7** Boiling Point
L4 **8** Heat To Dryness

7Ec-6 Making salt

correct order: **B**, **F**, **E**, **G**, **J**, **A**, **C**, **I**, **D**, **H**

7Ec-7 Dissolved salts in water

L4 **2 a** Any one appropriate hazard, for instance hot apparatus or spitting of evaporating solution.

L4 **b** Suitable risk reduction for hazard given, for instance don't touch apparatus until cool/ wear heat-resistant gloves/use tongs or wear eye protection.

L5 **3 a** using a bar chart

L5 **b** same volume of each water was evaporated

L5 **c** Bottled water 2, as it has the highest amount of dissolved solids.

7Ec-8 Gandhi and the Salt Act

L5 **1** Gandhi's salt would have been mixed with sand.

L5 **2** No, sea water has more than one substance dissolved in it. Also there would have been small animals and possibly some pollution in the sea water.

L5–6 **3** Mix the impure mixture with water, so the salt will dissolve in the water.

Filter the mixture. The sand will be trapped in the filter paper, but the dissolved salt will go through the filter paper.
Evaporate the filtrate. The water will evaporate, leaving the salt behind in the evaporating dish.
Students should draw a labelled diagram, using the correct apparatus symbols, illustrating each step in the process.
They should also identify hazards from hot equipment and from spitting liquid in the final stages of evaporation if the solution is still heated. Heat-resistant gloves or tongs should be used for handling anything hot. Eye protection should be worn. The source of heat should be switched off when there is still a little liquid in the evaporation basin, and the rest of the liquid left to evaporate naturally.

7Ec-9 Carry out a risk assessment

L7 The full risk assessment should be laid out neatly and clearly.
It should identify all the hazards including hot equipment, spitting liquid and any chemicals used.
Hazards of a large number of people include risk of bumping into each other, falling into equipment, tripping hazards from bags, etc.
Assessment of risk will vary but should be realistic.
Ways of reducing risk should include safe ways of handling hot equipment or rules not to touch until cool, protection for eyes and clothing, switching off heat while still a little solution left.
Action needed if something goes wrong should include rapid treatment of scalds or burns, suitable advice for dealing with spills.

7Ed Chromatography

Student Book

1: 7Ed Chromatography (Student Book)

L4 **1** a technique that separates substances dissolved in a solvent

L5 **2** Substance A, because it has the higher peak on the graph.

L4–5 **3** Dots of the inks were placed near the base of the paper. The paper was then placed in the beaker. A small amount of solvent was placed in the beaker, so that the level of solvent was below the ink dots on the paper.

L4–5 **4 a** Black ink contains blue, purple and red dye; brown ink contains yellow and red dye; red ink contains red and yellow dye; green ink contains blue and yellow dye; blue ink contains blue and purple dye; orange ink contains yellow and red dye.

b red

L4–5 **5** The solvent carries the substances at different speeds so they are spread out.

L4–5 **6** Evaporation leaves the solid substances still mixed up so it is difficult to identify them.

L4 **7 a** tartrazine, carotene, natural orange

L4 **b** orange squash 3 because the chromatogram shows that it does not contain any tartrazine

L4 **8** any two suitable examples, such as: forensic analysis, testing for banned drugs, water analysis, food analysis

L4–6 **9 a** They separate out the substances in the mixture.

b The water analysis method shows how much of each substance is present, which paper chromatography does not.

c The water needs to be tested to show how much of some substances there are, because there are limits on how much of these substances are safe in drinking water.

Activity Pack

7Ed-1 How does chromatography work?

Chromatography can separate … different coloured dyes in a mixture.
A drop of the mixture … is put onto a piece of special chromatography paper.
The bottom of the paper … is put into a solvent such as water.
The solvent dissolves the dyes and … travels up the paper.
The different dyes in the mixture … are carried at different speeds in the solvent.
The paper is dried … to make a chromatogram.
You can work out the number of different dyes in the mixture … by seeing how many different colours are on the chromatogram.

7Ed-2 A chromatography method

L4 **1** Make the dots as concentrated as possible by applying the substance several times in the same place and letting it dry between times.
L4 **2** Use something that isn't soluble in the solvent, e.g. pencil when using water.
L4 **3** Along a line above the bottom of the paper, so that they all start at the same level and so that they don't dissolve into the solvent at the bottom of the beaker.
L4 **4** Do a test beforehand to make sure the substances dissolve in the solvent.
L4 **5** Spread the dots of the different dyes out across the paper at the same level.
L4 **6** Support it, e.g. by attaching it to a stick that is balanced across the top of the beaker, or roll it into a cylinder and clip it before putting it in the beaker.
L5 **7** Safety instructions will depend on hazards for any substances used, but always use eye protection when using solvents.

7Ed-4 Chromatography

L3 **1** correctly labelled diagram (clockwise from the bottom left): water, pencil line, beaker, paper, spots of ink

L4 **2** **a** A, B and E

b These inks have all got only one spot on the chromatogram.

L4 **3** **a** A and E **b** A and B

L4 **4** **a** F

b It has not moved from its original position.

7Ed-5 Who scraped the gatepost?

L5 **1** Paint does not dissolve in water.

L4 **2** B

L5 **3** F

L5 **4** C and D

L5 **5** D

L5 **6** Test the paint from a Post Office van to see if it matched the sample. (Higher-attaining students may point out that manufacturer D may also make Post Office vans, in which case this would not prove anything.)

L5 **7** See if there was damage to the vehicle, or if any paint from the gatepost was transferred onto it.

7Ed-6 Gas chromatography in water analysis

L5 **1** They separate out the dissolved substances in the solution.

L6 **2** It is easier to identify the separate substances than if they are mixed together.

L6 **3** The gases and liquids are colourless, and they need detecting. Also spectrometry identifies the amount of substance, not just whether it is present or not.

L6 **4** Samples taken after treatment check that the treatment processes are working properly. Samples taken from people's taps check that nothing has leaked into the water as it travels from the treatment plant to the tap.

L7 **5** Because the internal standard is a substance never found in water, the graph produced will always be the same. This allows the machine to be checked between samples.

L7 **6** The known amount of dieldrin gives a peak height that can then be used by comparison to calculate the amount of dieldrin in the sample.

L6 **7** The amount of dieldrin in the sample was within safe limits. The known sample containing 62.5 ng/dm^3 produced a peak with a height of 0.9 on the vertical scale. The sample has a peak that reached 0.3 on the vertical scale, which suggests that level of dieldrin will be around 21 ng/dm^3 (62.5/3 = 20.8). 21 ng/dm^3 is the same as 0.021 μg/dm^3 which is lower than the safe limit of 0.03 μg/dm^3.

7Ee Distillation

Student Book

1: 7Ee Distillation (Student Book)

L3 **1** because it contains only small amounts of dissolved substances

L4 **2** because they do not get much rain

L4 **3** removing salts from water

L5 **4** They use sea water to produce fresh water by desalination.

L5 **5** concentrated salty water or solid salts, because the salts do not evaporate

L5 **6** sea water heated → water evaporates to form water vapour leaving behind dissolved salts → water vapour condenses on a cool surface to form liquid water → liquid water is collected for drinking

L4 **7** **a** Violent boiling could cause the flask to shake and spill boiling liquid.

L5 **b** Adding anti-bumping granules to the liquid prevents violent boiling.

L5 **8** **a** Sea water is dangerous to drink and once any fresh water has been used the people will soon need more.

b Bacteria in the water do not evaporate, so this is a good way to separate them from the water and make the water safe to drink.

L5 **9** **a** similarities – they both use the processes of evaporating the water to separate it from the dissolved substances and condensation to collect pure liquid water; differences – the solar still uses heat from sunlight to warm the water while the still in diagram C uses heat from a burner; the solar still uses air to cool the cooling surface while the still in diagram C uses cold water

L5–6 **b** The still apparatus will be the more efficient as it will heat the water to a higher temperature, increasing the rate of evaporation, and cool the water more rapidly in the condenser, therefore increasing the rate of condensation.

2: 7Ee Safe drinking water (Student Book)

L4 **1** **a** because we have a lot of rain, effective water treatment and we separate drinking water from polluting sources by carrying it in pipes

b Climate change could change the amount of water we receive in rain, causing longer periods of drought or worse flooding. Droughts will reduce the amount of water we store for use. Floods can damage pipes carrying drinking water and sewage, polluting the water supply.

L4 **2** **a** Water passes through the holes in the filter but the undissolved solutes are trapped in the filter.

L5 **b** extremely small particles including disease-causing organisms (filters usually have

bigger holes than this and therefore leave filtered water unsafe until it is treated with chemicals to kill these organisms)

L5–6 **c** Dissolved solids are small enough to pass through most filters. If the concentration of some dissolved solids is too high, it can make the water dangerous to drink.

L4–6 **3** any suitable answer that makes clear that different problems in different places need different solutions, e.g. areas at risk of flooding need emergency water supplies that would not be affected by the flooding, drought areas need safe sources of water that are below ground or processes such as desalination that can make salty water suitable for drinking

Activity Pack

7Ee-1 Distillation apparatus

L4 **1** correctly labelled diagram (clockwise from the bottom left): flask, thermometer, water out, Liebig condenser, beaker, water in, heat

L4 **2 a E** inside the flask **b C** inside the condenser

L4 **3** The dirty water mixture is put into the flask. The mixture is heated.

The water evaporates and forms steam. The dirt does not evaporate.

The steam goes into the condenser.

The cold water flowing around the outside of the condenser cools the steam.

The steam condenses to form pure water.

The water runs into the beaker.

7Ee-2 Building a solar still

Suggested improvements should be well supported by a scientific explanation, for instance:

• Dark objects placed in the hole will heat up faster and increase the air temperature in the hole, so rate of evaporation will be faster.

• Cooling part of the sheet surface, e.g. by shading, will increase the rate at which water vapour condenses on that part of the surface.

• Digging a shallow hole reduces the volume of air inside the still and so reduces the amount of heat energy wasted.

• Placing fresh plant material, or dirty water, into the hole will increase the amount of water that can evaporate.

7Ee-4 A solar still

L4 **1 a** heats **b** evaporates **c** condenses **d** runs down

L4 **2** distillation

L5 **3** It helps the dirty water to stay warmer for longer so more water evaporates.

7Ee-5 How a solar still works

L5 **1** Heat from sunlight heats up the dirty water. Water evaporates to form water vapour, leaving the dirt behind as the dirt doesn't evaporate. Water vapour condenses into liquid water on the underside of the glass cover. The liquid water runs down the cover and into the collection trough.

L4 **2** Distillation is the separation of the solvent/liquid from a solution.

L5 **3** The insulation reduces heat loss from the water to the environment, so the water stays warmer. The warmer the water, the faster the rate of evaporation.

L6 **4** Any suitable answer with a good science explanation, such as:

• Paint the inside of the still black so it absorbs more heat and heats the water faster.

• Shade the lower part of the glass cover so it is cooler, so water vapour condenses faster.

7Ee-6 Distilling scents for perfumes

L6 **1** They evaporate quickly from warm skin carrying their smell, which makes us smell nice.

L5 **2** correctly labelled diagram showing: chopped material in flask, separate heated flask containing water, water evaporates to form steam, steam passes through the chopped material causing the volatile oils in the plant tissues to evaporate, the hot vapour is cooled as it passes through a condenser so that the vapour condenses to liquid, the cooled liquid is collected in a flask with the oil and water forming separate layers

L5 **3 a** Dry distillation uses direct heating to evaporate the oils from the plant material. Steam distillation uses steam to warm the plant material so that the oils evaporate.

L6 **b** Only oils that evaporate below 100 °C can be extracted using steam distillation. Also some oils are changed by high heat, so steam distillation is better for extracting those damaged by heat.

L6 **4** Cooler temperatures can be used when preparing absolutes than in the preparation of essential oils. So chemicals that are spoilt by heat are best extracted using the wax/ethanol method.

L6–7 **5 a** The boiling point of water is 100 °C, which is much higher than that of ethanol at 78 °C. If the temperature is kept at just above the boiling point of ethanol but well below that of water, then all the alcohol in the mixture will evaporate but only some of the water.

L6–7 **b** Water evaporates at any temperature, though it evaporates faster as temperature increases. So there is no temperature at which some water will not evaporate but the ethanol will.