Medium Term Plan
Making new materials

P levels
Performance attainment targets (P scales) and performance descriptors are used for pupils aged 5 to 16 with special educational needs (SEN) who are working below the standard of the national curriculum tests and assessments. PSTT recognises that the national curriculum levels used in this document are no longer current. We have had so many requests to return these materials to the website that they remain in the documents as a guide for those who have used them in the past. The written statements may be useful to others as an indication of children's development. For further information about P levels see: https://www.gov.uk/government/publications/p-scales-attainment-targets-for-pupils-with-sen

Disclaimer
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Primary Science Teaching Trust recommends that a full risk assessment is carried out before undertaking in the classroom any of the practical investigations contained in the plans.

Safety Note
PSTT advises teachers to refer to either CLEAPSS website or SSERC website for up to date health and safety information when planning practical activities for children.

Teacher's Notes: Making new materials

Big Questions

- Are buildings the same all over the world?
- Do we use the same materials as the Tudors did?
- How can everyone have clean drinking water?
- Does everything dissolve?
- Is there a universal solvent?

Learning Objectives

Pupils will have opportunities:

- To explore a range of materials, their properties and their uses
- To explore a range of reversible and irreversible changes
- To experience materials being separated

Answers

- Buildings are made from different materials across the world, usually depending on what is available and cost effective.
- We use some of the same materials as the Tudors did: wooden fences, silk, satin and woollen clothing. However,modern synthetic materials are now available for us to use: plastic, nylon, polythene.
- Boiling water for at least one minute is sufficient to kill pathogenic bacteria, viruses and protozoa (WHO, 2015). If water is cloudy, let it settle and filter it through a clean cloth.
- Not everything will dissolve. Some materials will dissolve in water and others will not. Nail varnish is insoluble in water but will dissolve in a chemical called propanone or acetone.
- Water is called the "universal solvent" because it dissolves more substances than any other liquid.

Quick review activities

- Treasure hunt to find different materials
- Explore sensory books
- Use camera or digital microscopes to take images of different materials. Discuss where they are being used.
- Look inside e.g a mobile phone, computer or car to see what materials are used
- Make a collection of drinking vessels e.g cups, mugs, glasses, paper and polystyrene cups etc. Discuss the materials used and why
- Look at things used to wash up (clothes and scourers, brushes and sponges) Why are they used?
- Examine what bird's nests are made from.
- Put a marshmallow in the microwave for 45 seconds ref Planet Science
- http://www.planet-science.com/categories/under-11s/our-world/2011/12/giant-marshmallows!.aspx
- Look at everyday mixtures e.g. Bombay mix, frozen mixed vegetable, nuts and raisins, mixed bean salad, bath bombs.

Vocabulary relevant to this topic

- Material - what something is made of
- Tough – resists cracking: opposite to brittle
- Strong - resistant to tearing
- Elastic - returns to original shape when force is removed
- Plastic (property) - retains new shape when force is removed
- Plastic (material) - type of synthetic material made from hydrocarbons
- Flexible – easily bends: opposite of rigid/stiff
- Electrical conductor – material that allows electricity to flow through it
- Thermal conductor - material that allows heat to pass through it
- Solution – mixture of solid and liquid even if you can't see the solid
- Solute - the stuff that dissolves
- Solvent - usually liquid that does the dissolving
- Dissolve – solid mixes with liquid to make solution
- Evaporate – heat liquid until it turns into gas
- Mixture – two or more substances that can be separated
- Soluble - something that dissolves
- Insoluble – something that doesn't dissolve
- Filter – use porous material to separate solid and liquid
- Reversible/ physical change – one that can be undone
- Irreversible/chemical change – one that cannot be undone
- Burning – a special type of chemical change particularly for fuels
- Rough , smooth , hard, soft, prickly, fluffy, matt, shiny , bendy,

Background information about this topic

- A property of a material is just a characteristic. There are many ways to group materials, e.g. colour or texture, but there are also standard groupings such as metal and plastic. The standard groupings are based on properties and origins of materials which are not always easy for pupils to see especially if it is a material like plastic that has a wide range of properties. The choice of a material for a particular job is often a compromise of a number of factors, e.g. silver is a better electrical conductor than copper but it would be too expensive to use in electrical wires. Sometimes pupils confuse properties:
- Tough and hard – a diamond is very hard but if hit with a hammer it will shatter because it is brittle (not tough).
- Tough and strong –polythene doesn't break when dropped so it is tough but is not strong as it is easy to tear apart.
- Aesthetic and economic considerations can also influence the choice of material, e.g. wood, steel and plastic are all strong enough to make tables but the one chosen may depend on the appearance, comfort or cost, or all of these. Sometimes the properties of materials may be combined to produce a material which has properties of neither of them. Copper is a soft metal and zinc is rather brittle but together they make brass which is hard and tough.
- A mixture contains more than one substance: those substances are not chemically joined which means they are easy to separate based on their properties, e.g. size, magnetic, solubility.
- Mixtures can be:
    - gas in solid (pumice stone)
    - solid in solid (muesli)
    - solid in gas (smoke)
    - gas in gas (air)
    - liquid in gas (clouds, mist, aerosol)
    - gas in liquid (fizzy drinks)
    - liquid in liquid (emulsion – milk)
    - insoluble solid in liquid (suspension – muddy water)
    - soluble solid in liquid (solution – salt water).

- A substance may dissolve in one liquid but not in another e.g. nail varnish dissolves in acetone and not water. A solution is usually transparent, even if coloured. So for example, instant coffee does not really dissolve as small solid particles remain in suspension and the liquid is murky. When a solid is added to water the water molecules surround the solid at the edges. If the attraction between the water and solid particles is greater than that between the solid particles then it will dissolve. This process is affected by things like temperature and amount of solid and there is always a limit as to how much solid can dissolve in water. A saturated solution is one where that limit has been reached.
  Materials change and are sometimes valued for how they change or how they resist change. When materials come into contact they can either:
    - Mix but remain as discrete substances
    - Change from liquid to gas
    - Change from solid to liquid
    - Go hard
    - Go soft
    - Burn or burst into flame
- Reversible (physical) changes do not produce a new substance or change the amount of substance – it may look different e.g. melted and solid butter- but it is still the same substance chemically. For example if you freeze 100 cm^3 of water and then thaw it you will still have 100cm^3 of water. These changes are usually changes of state e.g. solid to liquid or gas to liquid and mainly caused by the particles changing their spacing.
- Irreversible (chemical) changes do produce new substances and again no 'matter' is lost or destroyed although some may become gas and float away. This sort of change is usually permanent and very difficult to reverse. Burning, rusting and chemical reactions are all examples of this - the particles are recombined into different substances. Clues that a chemical reaction has taken place might be:
    - Colour change (this can happen with physical change too)
    - Production of gas
    - Production of light or heat /change of temperature)

Making new materials P1-3

Objective 1: To explore a range of materials, their properties and their uses

Descriptions of intended outcomes at different levels of attainment

- Tolerates deliberate touching with a range of different materials (P1i)
- Shows random fleeting response to experiences with different materials (P1ii)
- Begins to respond to the material e.g. turns head when material touches body (P2i)
- Shows consistent or differentiated response to the material (P2ii)
- Explores materials in increasingly complex ways (P3i)
- Actively explores materials for more extended periods (P3ii)

Making new materials P1-3

Objective 1: To explore a range of materials, their properties and their uses

Possible Activities:	Resources:
Provide a range of natural and man-made materials to explore with their senses. Include liquids and gases. Food materials could be particularly motivating. To allow some students to access materials an umbrella can be used to suspend objects.	Range of natural and man-made materials, Umbrella

Optional activities you might like to try include:	Resources:
Visit a farm or zoo, in order to experience different materials.	Access to a farm or zoo
Explore the range of materials in an outdoor environment.	

Points to Note:

Some pupils are sensitive and allergic to certain materials, animals and plants.

Making new materials P1-3

Objective 1: To explore a range of materials, their properties and their uses

Possible Activities:	Resources:
Use a feely bag containing objects with a variety of textures e.g. fluffy, shiny, bendy, prickly, rough, smooth, heavy, light,	Feely bags, objects such as cotton wool balls, straws, heavy and light metal items, clay,

Optional activities you might like to try include:	Resources:
Use wet and dry feely bags which contain the same objects	Wet feely bag made from black plastic bag and water or wet nappy crystals; dry feely bags; plastic animals, fabric, various spoons, etc
Compare the appearance of different materials in different coloured lights including ultraviolet.	

Making new materials P1-3

Objective 1: To explore a range of materials, their properties and their uses

Possible Activities:	Resources:
Make feely boxes containing different materials e.g. shoe boxes with a hole in the side	Feely boxes; corn starch packaging, breakfast cereal, polystyrene beads, ice, warm water in small bottle, straw,

Optional activities you might like to try include:	Resources:
Provide pop up tents containing different materials to explore	Pop-up tents; materials like plastic balls, straw, shredded paper, shells
Provide 'Tuff spots' or similar at different heights containing materials to explore	

Points to Note:

Some pupils are sensitive and allergic to certain materials, animals and plants.

Making new materials P1-3

Objective 1: To explore a range of materials, their properties and their uses

Possible Activities:	Resources:
Play 'Pass the parcel' type game with a box containing different textures for the group to explore. When the music stops pupil can take an object out. Match to symbols or practise e.g. Makaton signing for properties.	Sealable plastic box, plastic objects, metal objects, fabrics, rocks, wood, sandpapers, symbol cards

Optional activities you might like to try include:	Resources:
Play parachute games using items made from different light materials (e.g. Popcorn is a parachute game which involves objects being placed on the parachute and students bounce them up and down)	Parachute plastic bottles, willow balls, corn-starch packaging etc.
Vary the pass the parcel game by including little plastic boxes in the main box. The boxes can contain gooey and wet objects Match to symbols or practise e.g. Makaton signing for properties.	

Points to Note:

Some pupils think that material just means fabric and that everyday materials are single substances, e.g.brick, glass.

Some pupils think thicker or larger or heavier materials are strongest.

Some pupils are sensitive and allergic to certain materials, animals and plants.

Making new materials P1-3

Objective 1: To explore a range of materials, their properties and their uses

Possible Activities:	Resources:
Provide discs/ squares made from different materials to play matching games. (these are commercially available, or you could make your own)	Discs or squares of flooring materials, wall coverings, wooden blocks with things like rice, sugar, cereals glued on or TTS have a product called 'Texture Blocks'

Optional activities you might like to try include:	Resources:
Play matching games blindfolded or in the dark. Ask a pupil to select an object from a feely bag and indicate a property it has. Another pupil selects object with same property from the other bag. Make a sensory book for a younger child.	Wet and dry feely bags containing the same objects e.g. pinecones, sandpapers, string, Lego, paperclips etc, blindfolds.
Match pieces of fabric to different clothes	

Points to Note:

Some pupils are sensitive and allergic to certain materials, animals and plants.

Making new materials P1-3

Objective 1: To explore a range of materials, their properties and their uses

Possible Activities:	Resources:
Plan together how to test different kitchen towels to see which is the best 'mopper -upper' or the strongest when wet. Record results e.g. by putting the number of weights on the different pieces of kitchen roll.	Range of kitchen towels, simple volume measures, 10g masses or blocks to put on wet towel

Optional activities you might like to try include:	Resources:
Plan together how to find the most hard wearing fabric by rubbing with sandpaper or emery boards	Different examples of fabric, san paper on blocks or emery boards
Plan together to find the best material to wrap biscuits in to stop them going soft	

Points to Note:

Some pupils think that material just means fabric and that everyday materials are single substances e.g. brick, glass.

Some pupils have difficulty in distinguishing the material from the object made from the material. It is helpful to have pieces of the material which has not been made into an object.

Some pupils think thicker or larger or heavier materials are strongest.

Some pupils are sensitive and allergic to certain materials, animals and plants.

Making new materials P1-3

Objective 1: To explore a range of materials, their properties and their uses

Possible Activities:	Resources:
Find out if the type of roofing material makes a difference to how much water runs off	Samples of slate, roofing felt, concrete roof tiles, wood, glass, plastic, straw, turf, water, containers to collect run-off water, beakers to pour water from. RV1: Materials to make a collage, glue, paper, scissors RV2: Cameras, prompt cards to help them decide what the material is.

Optional activities you might like to try include:	Resources:
Make collages with different themes e.g. things made from same material such as wood or metal or with similar properties e.g. rough things	Samples of slate, roofing felt, concrete roof tiles, wood, glass, plastic, straw, turf, water, containers to collect run-off water, beakers to pour water from. RV1: Materials to make a collage, glue, paper, scissors RV2: Cameras, prompt cards to help them decide what the material is.
Walk round school or visit a park to see how materials are used. Pupils could take photos as records. Small groups could be given a specific material to look for.	

Making new materials P1-3

Objective 1: To explore a range of materials, their properties and their uses

Points to Note:

Some pupils think that material just means fabric and that everyday materials are single substances e.g. brick, glass.

Some pupils have difficulty in distinguishing the material from the object made from the material. It is helpful to have pieces of the material which has not been made into an object.

Some pupils think thicker or larger or heavier materials are strongest.

Some pupils are sensitive and allergic to certain materials, animals and plants.

Risk assessment needed for visit to DIY store or building site.

Making new materials P1-3

Objective 1: To explore a range of materials, their properties and their uses

Possible Activities:	Resources:
Try shrinking crisp packets. (details of how to do this can be found on the Internet). Use to make a display or key rings. Investigate the best material to package eggs or send a meringue in the post Or If bricks absorb water – stand different ones in water and measure how high the water rises after set amount of time	Clingfilm, bubble wrap, card, hard boiled eggs or meringues, different sorts of bricks, tray to hold water.

Optional activities you might like to try include:	Resources:
Find out which is the stickiest tape by taping the same length to a bag and adding masses until the bag becomes un stuck. Or pressing the same length on to the same surface, roll over with a rolling pin and then seeing which is easiest or hardest to remove. And/ or investigate making the strongest glue see recipes. Amounts could be varied to find out any differences	Sellotape white and brown; masking tape; parcel tape; micropore tape, insulation tape, gaffer tape, duck tape, rolling pin, masses, plastic bag or other light container. Flour, water, salt, cornflour, white vinegar, salt , bowls, stirrers, pan, access to cooker
Investigate which materials can be used for carrying electricity – provide a variety of metals and non-metals. Or which is the the most see-through material.	

Making new materials P1-3

Objective 1: To explore a range of materials, their properties and their uses

Points to Note:

Some pupils think that material just means fabric and that everyday materials are single substances e.g. brick, glass

Some pupils have difficulty in distinguishing the material from the object made from the material. It is helpful to have pieces of the material which has not been made into an object

Some pupils think thicker or larger or heavier materials are strongest

Some pupils are sensitive and allergic to certain materials, animals and plants.
Be aware that some plastic packaging can be brittle and sharp.

If adding masses to plastic bags do this low to the ground with a mat underneath to cushion anything that falls

Making new materials P1-3

Objective 1: To explore a range of materials, their properties and their uses

Possible Activities:	Resources:
Which is the strongest carrier bag? Support the bag using retort stand or other secure structure. Load tins into the bag until it fails.	Selection of carrier bags (pre-test these to find ones which will actually fail with a large load)

Optional activities you might like to try include:	Resources:
Find out which material makes the best clothes peg. Discuss what 'best' means	Plastic, wooden and metal clothes pegs of different sizes and types e.g. clip, dollypegs. Washing line, clothes to hang on line,
Which material makes the bounciest ball? Use balls of approximately the same size. Make a height chart type measure divided into 10 cm sections on which they can mark height of bounce.	

Points to Note:

Load the carrier bag with tins
Seat children so that they are more than 2m from the bag. A foam crash mat must be provided to absorb the impact of the falling tins.

Objective 2: To explore a range of reversible and irreversible changes

Descriptions of intended outcomes at different levels of attainment

- Encounters squashing, twisting and stretching materials (P1i)
- Shows emerging awareness of activities related to materials (P1ii)
- Changes body language in a more sustained way (P2i)
- Cooperates with shared exploration (P2ii)
- Remembers some learned response for longer e.g. intentionally revisits an experience like squashing a cushion (P3i)
- Responds to options and choices with actions/ gestures e.g. touching one material rather than another (P3ii)

Making new materials P1-3

Objective 2: To explore a range of reversible and irreversible changes

Possible Activities:	Resources:
Explore squashy materials using different parts of the body.	Squashy materials such as sponges, balloons, squeegee mops, foam balls, jelly, plasticine, bread dough, pillows clay

Optional activities you might like to try include:	Resources:
Explore twisting a material with parts of their body	Materials to twist. e.g scarves, ropes, playdough, long thin sweets, pipe cleaners, bubble wrap, hair
Explore stretching a material with parts of their body.	

Points to Note:

Some students dislike balloons. Others may be tactile defensive and dislike touching.

Making new materials P1-3

Objective 2: To explore a range of reversible and irreversible changes

Possible Activities:	Resources:
Explore squashy materials with a whole body experience	Squashy materials to lie on e.g. PE mats, duvets, air beds, camping mats, bouncy castle RV1: Opportunities for whole body twisting experiences e.g. hammock, swing, slings RV2: Opportunities for whole body stretching experiences e.g Lycra games, giant elastic bands, lying on a trampoline

Optional activities you might like to try include:	Resources:
Explore twisting materials with a whole body experience	Squashy materials to lie on e.g. PE mats, duvets, air beds, camping mats, bouncy castle RV1: Opportunities for whole body twisting experiences e.g. hammock, swing, slings RV2: Opportunities for whole body stretching experiences e.g Lycra games, giant elastic bands, lying on a trampoline
Explore stretching materials with a whole body experience	

Making new materials P1-3

Objective 2: To explore a range of reversible and irreversible changes

Possible Activities:	Resources:
Experience some simple physical changes in materials e.g. holding an ice cube or piece of chocolate as it melts: stirring crystals into water: making milk shake	Ice cubes, chocolate; brown sugar crystals, bath crystals, milk shake mix, milk, spoons, water, containers

Optional activities you might like to try include:	Resources:
Experience some simple chemical changes e.g. vinegar+ bicarb: water+ indigestion tablet in film canister; cook some foods to show changes	Water, vinegar, bicarbonate, indigestion tablets; film canisters; eggs, pasta, cake mix
Experience some more unusual changes e.g. mix Mentos and Coke elephant toothpaste There are several websites demonstrating how to do both of these. Make snow using instant snow powder.	

Making new materials P1-3

Objective 2: To explore a range of reversible and irreversible changes

Possible Activities:	Resources:
Investigate materials to find out if they bend or break.	Twigs, card, pipe cleaners, aluminium foil, straws, candles, stones RV1: Sliced potato, crisps, pasta (raw and cooked), carrots , meringues, biscuits, celery, breadsticks RV2: plastic bags, tights, paper, elastic, blu-tac, modelling clay, cooked pasta,

Optional activities you might like to try include:	Resources:
Investigate foods to find out if they bend or break – include some food in raw and cooked state as well	Twigs, card, pipe cleaners, aluminium foil, straws, candles, stones RV1: Sliced potato, crisps, pasta (raw and cooked), carrots , meringues, biscuits, celery, breadsticks RV2: plastic bags, tights, paper, elastic, blu-tac, modelling clay, cooked pasta,
Investigate materials to find out if they stretch or snap	

Points to Note:

Eye protection might be needed if something might splinter

Making new materials P1-3

Objective 2: To explore a range of reversible and irreversible changes

Possible Activities:	Resources:
Explore some chemical changes e.g. effect of heat–make popcorn, bread, toast. Looking at the differences before and after. Explore some physical changes with cold e.g. put common liquids in the freezer and see what happens.	Popcorn and method for cooking or toaster and bread, camera Liquids to freeze e.g fruit juice, olive oil, shampoo, milk, pop, water, syrup, Access to freezer

Optional activities you might like to try include:	Resources:
Explore some physical changes using heat e.g. substance in a small container on a hot water bottle. Compare frozen and thawed foods Making puffy writing http://www.planet-science.com/categories/under-11s/chemistry-chaos/2012/04/puffy-paint-pictures!.aspx) Freeze objects in different shaped containers e.g. plastic glove, ice cube or lolly moulds Try different ways to get object out e.g. using a hairdryer, putting in sun, putting by radiator, putting in hot water	Hot water bottles Small containers e.g. foil cupcake cases, ice cubes, chocolate, margarine, butter, lard, grated wax off candle, ice cream. Frozen and thawed foods to observe e.g. peas, bread, ice-pop, ice cream, lettuce, cucumber, eggs, cream

Points to Note:

Take care when cooking popcorn – eye protection could be considered depending on the method used.
Take care with toaster.

Making new materials P1-3

Objective 2: To explore a range of reversible and irreversible changes

Possible Activities:	Resources:
Investigate the colour change in toast by toasting bread on different toaster settings. Try different types and thicknesses of bread. Show results of the toast investigation-photograph of results which shows the development of colour with time	Various types and thicknesses of bread, toasters RV1: margarine/butter, caster sugar, plain flour, baking powder, eggs, wooden spoons, bowls, milk, teaspoons RV2: different types of cream, different sizes of marbles, plastic containers, salt

Optional activities you might like to try include:	Resources:
Make simple sponge cakes with and without baking powder-draw or photograph the results. Do not use SR flour as this already has baking powder added.	Various types and thicknesses of bread, toasters RV1: margarine/butter, caster sugar, plain flour, baking powder, eggs, wooden spoons, bowls, milk, teaspoons RV2: different types of cream, different sizes of marbles, plastic containers, salt
Making butter by shaking cream in a plastic container with a marble added. Find how long it takes to form when using different types of cream and/ or different sized marbles and whether adding salt at the start makes any difference	

Points to Note:

Recipe for sponge cakes:
125g margarine or butter, 125g caster sugar, 125 g plain flour, 2 eggs, 1 teaspoon baking powder, 1-2 teaspoons of milk
Heat the oven to 180°C/fan 160°C/gas 4. Beat the butter and sugar together until fluffy, beat in the eggs followed by the flour and baking powder. Add enough milk to the mixture so that it falls off a spoon easily then divide the mixture between two lined, 20cm sandwich tins. Bake for 35-40 minutes or until a skewer comes out cleanly. Cool on a wire rack.

Making new materials P1-3

Objective 2: To explore a range of reversible and irreversible changes

Possible Activities:	Resources:
Mix different dried foods with water and then compare to the fresh food. Talk about whether it is easy to get back what they started with. Try re-drying some of the foods or making dried apple, herbs,	Dried milk, instant potato, dried pulses, packet soup, dried noodles, packet cake mix or batter, hot water, bowls, fresh milk, tinned soup, fresh noodles, tinned pulses, fresh cake mix or batter, apples, corer, knives, board, string

Optional activities you might like to try include:	Resources:
Involve pupils in making salt dough. Talk about if they can get back the ingredients that started with. Pupils can make models/ cut out different shapes which are baked. Discuss changes after they have been in the oven	Plain flour, salt, oil, water, boards, rolling pins, access to oven, baking trays, cutters, craft knives
Heat Ivory soap(trademark and available off internet) in microwave – the heat turns it to a foam. Can try other cheap soaps. Explore making foams by making cinder toffee http://www.planet-science.com/categories/experiments/messy/2012/06/make-your-own-cinder-toffee.aspx , whipping egg whites and cream. Look at them and marshmallows with magnifiers. Cover blocks of ice cream with whisked egg whites and cook in oven.	

Making new materials P1-3

Objective 2: To explore a range of reversible and irreversible changes

Points to Note:

Salt dough can sting open cuts.

Salt dough is not for eating!

Salt dough recipe: 300g plain flour, 300g salt, 1 tablespoon cooking oil, 200 cm^3 water. Mix in bowl with knife to make pliable dough – bit more water might be needed. Knead until elastic. Cook on lightly oiled tray for 10-20 mins gas mark 4/ 180^oC.

Making new materials P1-3

Objective 2: To explore a range of reversible and irreversible changes

Possible Activities:	Resources:
Investigate different sized 'ice-bergs' floating in water. Which one melts the quickest? Does the water level rise? Or have the same sized ice bergs and try different temperatures of water	Icebergs made by freezing water in balloons, bowls, water, hot water, thermometers, tape to mark starting water level.

Optional activities you might like to try include:	Resources:
Investigate burning materials using night lights or Bunsen burners in a tray of sand Investigate a couple of mystery materials. 1) Making worms -Squeeze small amounts of Gaviscon into the orange juice with extra calcium to form 'worms'. Vary the amount of time they are left in and see what difference it makes to the properties of the worms. Put a couple of worms -straight after forming -into strong salt solution and watch what happens. 2) Slime - the best slime recipies contain borax solution. Refer to the CLEAPSS website for a safe way to make slime. • Try gently throwing onto a smooth, hard surface. • Leave the ball of slime on newspaper – what happens? • Pull slowly apart and then try pulling quickly. • Push slime into a small pot to see if it makes a rude noise. • It can be kept for a few weeks by sealing in air tight bag.	Safety glasses, night lights/ Bunsen burners, peg holders, trays of sand. Small samples of fabric, paper, cotton, twig/splints, sugar in foil container Gaviscon, orange juice, CLEAPSS website: making slime instructions

Making new materials P1-3

Objective 2: To explore a range of reversible and irreversible changes

Points to Note:

Pegs with an extra bit of wood glued on one side can be used to heat things safely over a night light.

Use very small samples when burning and keep room well ventilated.

Slime - refer to CLEAPSS website for safety

Not all brands of eye wash/eye drops contain the active chemical required for making slime (boric acid/sodium borate).

Check the ingredients to ensure boric acid or sodium borate is present.

Children must wash their hands thoroughly after handling slime.

Slime should not be taken home.

Making new materials P1-3

Objective 3: To experience materials being separated

Descriptions of intended outcomes at different levels of attainment

- Is present during the experience but shows no or just reflex response (P1i)
- Shows intermittent responses to the different 'material' experiences (P1ii)
- Accepts and engages in coactive or shared exploration (P2i)
- Communicates consistent preferences /dislikes for particular materials (P2ii)
- Begins to communicate intentionally e.g. requests a repeat by gesture (P3i)
- Chooses the activity they want to do (P3ii)

Making new materials P1-3

Objective 3: To experience materials being separated

Possible Activities:	Resources:
Experience and explore rice and peas separately and then when mixed together in the resulting mixture.	Rice Dried peas Other pulses Bowls

Optional activities you might like to try include:	Resources:
Experience and explore sand and shells separately and then when mixed together in the resulting mixture.	Sand, shells, bowls
Experience and explore different sizes and shapes of pasta separately and then when mixed together in the resulting mixture.	

Points to Note:

Be aware of students who are likely to put small objects in the mouth.
Be aware that dried beans are toxic especially red kidney beans.

Making new materials P1-3

Objective 3: To experience materials being separated

Possible Activities:	Resources:
Experience the feel of water and sand separately and then mixed together	Water, sand Bowls or sand trays

Optional activities you might like to try include:	Resources:
Experience the feel of Ice-cubes/ shapes and water separately and then mixed together	Ice cubes or shapes, water, containers
Experience the feel of soaked or cooked pasta shapes first singly and then mixed together. Some shapes can interlock which has an interesting effect when mixed.	

Points to Note:

Be aware of choking hazards and food allergies.

Making new materials P1-3

Objective 3: To experience materials being separated

Possible Activities:	Resources:
Experience the feel of corn flour and water separately and then make 'gloop'	Corn flour, Water, appropriate container, spoons

Optional activities you might like to try include:	Resources:
Experience the feel of flour and water separately and then make a mixture of flour and water	Flour, water Container, spoons
Experience the feel of icing sugar and water separately and then make icing. Experiment with different quantities of water.	

Points to Note:

Be aware of choking hazards and food allergies.

Making new materials P1-3

Objective 3: To experience materials being separated

Possible Activities:	Resources:
Separate by hand two materials of a similar size. Talk about how easy it was to do.	Peas, beans of similar size to peas Breakfast cereals of similar size

Optional activities you might like to try include:	Resources:
Try to separate by hand two materials of a similar but small size and talk about how easy it was to do.	Lentils/sand, coffee granules/salt
Experience different ways of separating used in the kitchen using different mixtures.	

Points to Note:

Be aware of choking hazards and food allergies.
Be aware that many dried beans are toxic.

Making new materials P1-3

Objective 3: To experience materials being separated

Possible Activities:	Resources:
Mix sand with water and filter using different materials. Which is best?	Sand, muslin, coffee filters, kitchen roll, fishing net, tights,

Optional activities you might like to try include:	Resources:
Explore stirring brown sugar in cold water and then warm water. Leave some out on a tray/ dish to dry out and observe what happens.	Brown sugar, spoons, water, hot water, trays or dishes
Explore mixing different solids in water to indicate any before or after changes.	

Points to Note:

Be aware of choking hazards and food allergies.
Be aware that many dried beans are toxic.

Making new materials P1-3

Objective 3: To experience materials being separated

Possible Activities:	Resources:
Mix different solids in water and filter using filter paper.	Warm water, spoons/stirrers, containers, flour, salt, icing sugar, bicarb, chalk, coffee, coffee filters of filter paper and funnels, beaker to collect filtrate RV1: salt, different sugars, coffee, jelly crystals, milk shake mix, lemonade powder, hot water bottle, night lights, sand tray, peg holders, foil containers, RV2: sugar beet, pan, water, cotton wool, potatoes, pestle and mortar, sieves,

Optional activities you might like to try include:	Resources:
Make simple solutions under hygienic conditions so that pupils can taste them. Let them heat small amounts in a foil container over a night light or on a hot water bottle. What do they see once the water has all gone?	Warm water, spoons/stirrers, containers, flour, salt, icing sugar, bicarb, chalk, coffee, coffee filters of filter paper and funnels, beaker to collect filtrate RV1: salt, different sugars, coffee, jelly crystals, milk shake mix, lemonade powder, hot water bottle, night lights, sand tray, peg holders, foil containers, RV2: sugar beet, pan, water, cotton wool, potatoes, pestle and mortar, sieves,
Try extracting sugar out of sugar beet: wash beet, chop into cubes, cover with water and boil till soft, filter through cotton wool and warm juice to evaporate the water. OR starch from potatoe s: wash potato – keep skin on, cut up 100g potato and grind up with 100cm^3 of water, strain the potato and then re-grind with another 100cm^3 water, stain again and put both lots of water together and allow to settle, starch should settle out at the bottom,try filtering or evaporating the water off to leave starch behind.	

Points to Note:

Be aware of food allergies.

Making new materials P1-3

Objective 3: To experience materials being separated

Possible Activities:	Resources:
Find out which materials dissolve in different liquids Find out if the colour can be got out of a fizzy drink e.g. try filtering or evaporation	Water, vinegar, cooking oil, lemonade beakers, salt, sand, various sugars, bicarb, baking powder, coffee, flour, foamy peanuts (from packaging), spoons or stirrers. Range of coloured fizzy drinks, filter paper and funnels, night lights or Bunsen burners

Optional activities you might like to try include:	Resources:
Find out if the temperature effects how much something dissolves in water. Extend by finding out if the type of substance makes a difference by comparing how much dissolves in warm water of a specific temperature.	Hot and cold water, salt, various sugars, thermometers, beakers, stirrers
Find out if there is a limit to the amount that you can dissolve. Lead on to explain about saturated solutions and rowing crystals. Alum is the best to use. Make saturated solution with hot water and stir until no more dissolves. Pour off into clean jars leaving any undissolved alum behind. Hang thread off a pencil that sits across the jar. Cover the jar with paper and tape down to keep dust out and slow down evaporation. Leave undisturbed for a few days. Take photos each day as crystals grow.	

Making new materials P1-3

Objective 3: To experience materials being separated

Points to Note:

Many students confuse dissolving with disappearing and melting.

The best substance to use is alum (aluminium potassium sulphate) – it is easiest to ask a local secondary school to buy this for you or you can buy from places like Amazon if you search under the full name. Sugar and salt really don't work as well.

Making new materials P1-3

Objective 3: To experience materials being separated

Possible Activities:	Resources:
Investigate how to extract salt from rock salt. Show pupils rock salt and ask for ideas.	Rock salt, pestle and mortar, stirring rods beaker, water, filter paper, filter funnel, evaporating basin, bunsen burner. tripod, heat proof mat, gauze

Optional activities you might like to try include:	Resources:
Investigate how to separate salt, paperclips and saw -dust	Beakers and water, magnets, paperclips, salt, saw dust .

Making new materials P4-6

Objective 1: To explore a range of materials, their properties and their uses

Descriptions of intended outcomes at different levels of attainment

- Initiates interactions with different materials e.g. puts a soft sponge to face (P4i)
- Explores materials in intended way and observes the outcomes (P4ii)
- Anticipates activities and takes turns (P5i)
- Tries out the activities and responds to simple questions (P5ii)
- Recognises the property of a material by finding a match (P6i)
- Makes sensory based comparisons with support and may show a clear preference for a material (P6ii)

Making new materials P4-6

Objective 1: To explore a range of materials, their properties and their uses

Possible Activities:	Resources:
Provide pairs of materials with opposing properties to explore and compare e.g. rough/ smooth, shiny/ dull, soft / hard. Use symbols for properties.	Range of fabric, rock, wood, objects made of plastic, metal, ceramics

Optional activities you might like to try include:	Resources:
Use sensory boxes filled with something different like oats or dry beans containing a range of different objects. Pupils have to find an object which they think feels hard or smooth or rough	Plastic boxes, oats/ beans, cotton wool balls, Velcro, twigs, plastic mirror, feathers, stones
Use TACPAC activities and resources to explore materials	Ref to TACPAC website

Points to Note:

Some pupils think that material just means fabric and that everyday materials are single substances e.g. brick, glass

Some pupils think thicker or larger or heavier materials are strongest

Some pupils are sensitive and allergic to certain materials, animals and plants.

Making new materials P4-6

Objective 2: To explore a range of reversible and irreversible changes

Descriptions of intended outcomes at different levels of attainment

- Initiates interactions with different materials e.g pulling and releasing a slinky spring (P4i)
- Communicates an awareness of changes in the materials (P4ii)
- Tries out the activities/equipment and responds to simple questions (P5i)
- Identifies where changes have taken place (P5ii)
- Recalls the stages in a simple procedure as it is carried out (P6i)
- Begins to show an awareness of treating things in the same way (P6ii)

Making new materials P4-6

Objective 2: To explore a range of reversible and irreversible changes

Possible Activities:	Resources:
Explore different Slinkys and springs to experience stretching and compression e.g. 1) try holding Slinky vertically and fully extended and then dropping 2) make some springs by coiling wire round different diameter cylinders and seeing if they make good springs	Various Slinkys (plastic and metal) and springs, car springs, bed springs, wire to make springs, cylinder objects to make springs e.g. pens, dowel,

Optional activities you might like to try include:	Resources:
Explore elastic bands to experience different stretchiness and if they return to the original shape e.g. finding ones easy and hard to stretch e.g. linking bands together in a chain to stretch e.g. pulling two to three or four in parallel.	Various sized elastic bands, hair bands and scrunchies, animal shaped rubber bands, wrist bands
Explore twistability of materials and find out which are easy to twist.	

Points to Note:

Some springs are easily over-stretched as they go past their elastic limit i.e. the point at which they go back to the size they were.

Wear safety glasses in case elastic bands snap.

Making new materials P4-6

Objective 3: To experience materials being separated

Descriptions of intended outcomes at different levels of attainment

- Follows a simple procedure to separate materials (with support) (P4i)
- Begins to explore differences in materials (P4ii)
- Responds to and follows instructions involving more than one step (P5i)
- Groups objects based on an obvious criterion (P5ii)
- Responds to simple scientific questions (longer than ones used in P5) (P6i)
- Begins to make connections e.g. between size of particles and ease of separation by hand (P6ii)

Making new materials P4-6

Objective 3: To experience materials being separated

Possible Activities:	Resources:
Separate by hand mixtures of two very different materials which can easily be separated. Can extend by giving them 3 materials to separate this way. Discuss whether it was easy to do.	Containers or trays, Conkers/ dry leaves/ acorns, sand/stones/ wood pieces

Optional activities you might like to try include:	Resources:
Separate by hand mixtures of two very different materials which can easily be separated. Can extend by giving them 3 materials to separate this way. Discuss whether it was easy to do	Containers or trays, dried pasta shapes/ dried peas/ dried butter beans
Separate by hand mixtures of two very different materials which can easily be separated. Can extend by giving them 3 materials to separate this way. Discuss whether it was easy to do .	

Points to Note:

Be aware of choking hazards and food allergies.
Be aware that many dried beans are toxic.

Making new materials P7-8

Objective 1: To explore a range of materials, their properties and their uses

Descriptions of intended outcomes at different levels of attainment

- Names some properties of materials either verbally or with symbols (P7i)
- Makes a pictorial representation of results (with help) (P7ii)
- Identifies some common materials and knows some of their properties (P8i)
- Locates the right equipment to use for simple investigations (P8ii)

Possible Activities:	Resources:
Sort everyday objects using obviously different properties e.g. metal and plastic or glass and wood Hoops could be used for sorting, or plastic trays.	Collections of objects made from metal and plastic OR glass and wood, hoops, plastic trays

Optional activities you might like to try include:	Resources:
Show BBC clip on recycling. Sort materials for recycling based on properties e.g could use a magnet to sort steel objects.	Paper, card, cans, glass bottles, pop bottles milk containers, hoops or plastic trays
Explore which materials keep things warm best by wrapping small bottles of warm water in different types of fabric and seeing which feels the warmest after certain amount of time outside or in the fridge. If appropriate measure the temperature with a simple thermometer or data logger. Record the temperatures using Unifix cubes in a 'tower'.	

Making new materials P7-8

Objective 1: To explore a range of materials, their properties and their uses

Points to Note:

Some pupils think that material just means fabric and that everyday materials are single substances e.g. brick, glass.

Some pupils have difficulty in distinguishing the material from the object made from the material. It is helpful to have pieces of the material which has not been made into an object.

Some pupils think thicker or larger or heavier materials are strongest.

Some pupils are sensitive and allergic to certain materials, animals and plants.

Making new materials P7-8

Objective 2: To explore a range of reversible and irreversible changes

Descriptions of intended outcomes at different levels of attainment

- Responds to questions requiring an informed decision e.g. how much potato should we use? (P7i)
- Indicates the 'best' result (P7ii)
- Describes changes in materials(using their preferred mode of communication) when questioned directly (P8i)
- Begins to order results (P8ii)

Making new materials P7-8

Objective 2: To explore a range of reversible and irreversible changes

Possible Activities:	Resources:
Cook spaghetti for different amounts of time. Look at how bendy it is after 2,4,6,8 10 mins. Try different types of spaghetti .	Range of dried spaghetti, access to stove and water, Timers

Optional activities you might like to try include:	Resources:
Cook potato for 5, 10, 15,20,25,30, 40 mins to see how soft it is and any other changes e.g. colour of water. Try different types of potato and/or different sized pieces.	Different potatoes, method to boil potatoes, knives chopping boards, Cocktail sticks to test potatoes Timers
Poach or boil eggs for 1 min, 2 min, 3 min, 4 min to see how it changes.	

Points to Note:

Take care when cooking spaghetti – with boiling water and steam.

Making new materials P7-8

Objective 3: To experience materials being separated

Descriptions of intended outcomes at different levels of attainment

- Separates materials using a range of implements (P7i)
- Uses skills of separating in different contexts (P7ii)
- Records results simply e.g. using camera or actual materials (P8i)
- Observes changes during their practical work (P8ii)

Possible Activities:	Resources:
Separate mixtures using different implements. Make a pictogram of the different parts possibly using the actual ingredients.	Containers or trays Tweezers Colanders Sieves, slotted spoons, sand containing counters, rice, stones, dried peas, flour. RV1: Muesli, Containers or trays Tweezers Colanders Sieves, slotted spoons RV2: Containers or trays Tweezers Colanders Sieves, slotted spoons

Making new materials P7-8

Objective 3: To experience materials being separated

Optional activities you might like to try include:	Resources:
Separate the different ingredients in muesli. e.g how many raisins are there in a bowl? Make a pictogram of the different parts possibly using the actual ingredients.	Containers or trays Tweezers Colanders Sieves, slotted spoons, sand containing counters, rice, stones, dried peas, flour. RV1: Muesli, Containers or trays Tweezers Colanders Sieves, slotted spoons RV2: Containers or trays Tweezers Colanders Sieves, slotted spoons
Separate the different seeds in mixed bird foods. Make a pictogram of the different parts possibly using the different ingredients.	

Points to Note:

Some pupils think that all liquids contain water and that dissolving means a substance has disappeared.
Be aware of choking hazards and food allergies.
Be aware that many dried beans are toxic.
Be aware of choking hazards and food allergies.
It may be a good idea to make your own muesli so that constituents are easier to separate.

Making new materials L1-3

Objective 1: To explore a range of materials, their properties and their uses

Descriptions of intended outcomes at different levels of attainment

- Recognises and names a variety of everyday materials and some of their properties (L1i)
- Presents results of investigations in prepared tables and/ or bar graphs (L1ii)
- Communicates findings of an investigation in everyday language (L1iii)
- Identifies a property of a material that makes it suitable or unsuitable for a job (L2i)
- Sorts and groups materials according to properties (L2ii)
- Compares results and ranks results in order (L2iii)
- Explains why some materials are suitable for specific purposes (L3i)
- Identifies simple patterns in results (L3ii)
- Suggests improvements to their working methods (L3iii)

Making new materials L1-3

Objective 1: To explore a range of materials, their properties and their uses

Possible Activities:	Resources:
Explore and name the different materials in a 'shopping bag'. Decide which is the most common material in the shopping bag and make a tally chart/ bar chart. Compare difference plastics: a) flexible or stiff? b) soft or hard? (easy to scratch) c) easy to cut? Does it leave a smooth or jagged edge? d) does it float?	Shopping bag containing different packaged items e.g. glass jars, plastic bottles and shrink wrap, cereal packs, juice cartons, cans, rice packet, foil container

Optional activities you might like to try include:	Resources:
Find out which is the runniest liquid by timing how long they take to flow down a gutter.	Plastic gutter, syrup, treacle, oil, tomato sauce, washing up liquid, paint, timers
Find out which are the stretchiest tights by putting a heavy object in each toe e.g. tin of food or bag of sugar or by adding masses onto a holder. The amount of stretch could be measured with standard or non-standard measures.	

Making new materials L1-3

Objective 1: To explore a range of materials, their properties and their uses

Points to Note:

Some pupils think that material just means fabric and that everyday materials are single substances e.g. brick, glass.

Some pupils have difficulty in distinguishing the material from the object made from the material. It is helpful to have pieces of the material which has not been made into an object.

Some pupils think thicker or larger or heavier materials are strongest.

Some pupils are sensitive and allergic to certain materials, animals and plants.

Be aware that some plastic packaging can be brittle and sharp.

Making new materials L1-3

Objective 2: To explore a range of reversible and irreversible changes

Descriptions of intended outcomes at different levels of attainment

- Recognises and begins to describe changes in materials using everyday vocabulary e.g. soft, hard (L1i)
- Responds to prompts to say what happened and if it was expected (L1ii)
- Identifies what has changed when making observations (L1iii)
- Draws on their observations and ideas to offer answers to questions (L2i)
- Identifies things to observe or measure that help to answer the question being investigated (L2ii)
- Responds to prompts to suggest different ways they could have done things (L2iii)
- Describes changes using correct vocabulary e.g. freeze, melt, reversible (L3i)
- Makes quantitative measurements (L3ii)
- Explains what they have found out in their experiments linking cause and effect (L3iii)

Making new materials L1-3

Objective 2: To explore a range of reversible and irreversible changes

Possible Activities:	Resources:
Circus of changing activities-pupils to identify if the change is reversible or irreversible.	Matches to burn, jelly cubes, hot water, ice pop, candles, bicarb +vinegar, lemon juice+ milk, chocolate, hot water bottle to put chocolate on (in container),

Optional activities you might like to try include:	Resources:
Investigate what affects the time for an ice lolly to freeze e.g. type of liquid? concentration of squash in water? position in freezer? Shape of mould?	Coke, water, milk, lemonade, squash, fruit juice, various shaped moulds, access to freezer,
Have a look around school to see if they can see rust anywhere e.g. on cars, metal fencing, metal playground equipment or fastenings, PE equipment or fastenings, picnic benches. Investigate if the type of liquid affects how much a nail rusts. Follow up by trying to find substances that might stop rusting – let pupils try own suggestions.	

Points to Note:

Refer to CLEAPSS website for safety advice on burning and heating materials in the classroom.

Making new materials L1-3

Objective 3: To experience materials being separated

Descriptions of intended outcomes at different levels of attainment

- Recognises and begins to describe methods to separate materials e.g. suggests how to separate something (L1i)
- Makes sensible suggestions about how to find the answer to a question (L1ii)
- Begins to use comparative language e.g. more, less (L1iii)
- Makes suggestions about how to find out about dissolving (L2i)
- Identifies things to measure or observe that are relevant to the investigation (L2ii)
- Spots when a simple test is 'not fair' (L2iii)
- Identifies one or more control variables in investigations from those provided (L3i)
- Selects equipment from that provided to address idea under investigation (L3ii)
- Constructs tables that have quantitative units and appropriate headings (L3iii)

Making new materials L1-3

Objective 3: To experience materials being separated

Possible Activities:	Resources:
Investigate how we can stop sand going down the plug hole	Beakers, sand and water. A selection of materials to try as filters.

Optional activities you might like to try include:	Resources:
Cleaning muddy water investigation. http://www.planet-science.com/categories/experiments/chemistry-chaos/2012/07/can-you-clean-water.aspx	Dirty water, sand, stones, pebbles, fabric, cotton wool, charcoal, grass sods, large plastic bottles with bottom removed.
Investigate making cheese adding lemon juice or vinegar to milk and then trying different cloths to strain through. http://www.planet-science.com/categories/experiments/messy/2011/06/say-cheese!.aspx Try different milks and compare the amount of cheese. Does using vinegar or lemon juice make a difference? The amount of cheese produced can be compared by eye or weighed.	

Points to Note:

If milk is warmed to just over 55^{o}C the 'cheese' or plastic milk formed is rounder and more like Ricota. This can be coloured and left to dry.