Pioneer Federation
Medium term plan
UKS2- Cycle 1 Term 3
Science

Subject: Science

Key Concept/ Theme:

- Compare and group materials together, according to whether they are solids, liquids or gases
- Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius
- Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.
- Compare and group materials together, according to whether they are solids, liquids or gases
- Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius

Prior Learning links:

KS1:

- Children will have learnt to compare and group materials on the basis of their simple properties.
- They will have explored how to change the shape of solids by bending, twisting, squashing and stretching

Vocabulary:

States of matter - Solid, liquid and gas

Examples of gases (at room temperature and pressure) – Oxygen, hydrogen, helium, carbon dioxide, methane

Examples of liquids (at room temperature and pressure) – Water, milk, juice, petrol, oil

Examples of solids (at room temperature and pressure) –Wood, rocks, metal, plastic, glass, wool, leather, etc

Processes – Melting, condensation, evaporation, solidifying, freezing

Steam

Heating

Cooling

Pioneer Federation
Medium term plan
UKS2- Cycle 1 Term 3
Science

1.	**Prior learning reconnection (year group, cycle & term):** Cycle 1, LKS1, Term 5, Materials **LO:** To be able to compare and group materials together, according to whether they are solids, liquids or gases **Hook – The Science Laboratory** You could set up your classroom as a science laboratory. This might help the children make an association with 'materials' and doing particular types of scientific enquiries. A 'Careful, scientists at work' sign could be placed on the door. On entering the 'laboratory' for the first time the children could be faced with tables on which you have placed a range of scientific equipment. A digital microscope could be showing something interesting on the white board. 'Lab jackets' (used white blouses/shirts) could be hung up on the back of each of the children's chairs. You could begin this area of science by showing some of the jobs related to chemistry. These can be found on the Royal Society of Chemistry website - http://www.rsc.org/diversity/175-faces/all-faces **Identifying and classifying – Solid, liquid and gas balloon** Before the lesson make sure you have prepared plenty of balloons. In some of the balloons make sure you have frozen water. In other balloons fill with liquid water. Just fill the remaining balloons with gas by blowing into them. Ask the children to feel each of the balloons and decide what a solid is, a liquid and a gas is. http://www.bbc.co.uk/learningzone/clips/properties-of-solids-liquids-and-gases/10587.html The video above shows some clear models of solids, liquids and gases. http://www.brainpop.com/science/matterandchemistry/statesofmatter/ The video above shows an animation explaining the three states of matter. **Drama – Being a solid, liquid and a gas.** Children can wear one of three bibs; solid, liquid or gas. Demonstrate how solid particles are all close together and moving slowly. As they become liquids, they remain in close contact but move around more. Finally, as gases, they move around quicker and in a random fashion. **Recording** The children could record their definitions of what a solid, liquid and gas are. These could include drawings.

Pioneer Federation
Medium term plan
UKS2- Cycle 1 Term 3
Science

	Comparing and sorting solids, liquids and gases – Which state of matter are you materials? Provide all the small groups of children with access to a variety of materials in different states. They must decide whether they are solid, liquid or a gas. They must explain to each other the decisions that they have made. **Recording** The children could draw three overlapping circles (Venn diagram). They can draw some of the objects in the correct place within the diagram. For instance, a bottle of salad cream might go in the part where the 'solids' and 'liquids' overlap. Resources: • Balloons (some filled with water and then frozen, some with liquid water, and others with air. • Bibs to wear: solid, liquid and gas • Many objects made from a variety of materials • Various household liquids: milk, vinegar, juice, etc
2.	**Reconnection:** Can you identify a solid, liquid or a gas? How can you identify them?  **LO:** To be able to set up a fair test. **Skill:** Fair test **Fair-test - Which liquid moves the fastest?**

Pioneer Federation
Medium term plan
UKS2- Cycle 1 Term 3
Science

Hook – Do it badly!

Show the children that they are about to do in their small groups, but show it badly! You are trying to demonstrate how NOT to do a fair-test. So, for example, place a tray at a particular gradient and use syringe to place 5ml of honey at the top. Measure how far it has travelled after 30 seconds. Now, place the tray at a higher gradient, and place 10ml salad cream at the top. Ask the children whether a fair comparison is being made between the two liquids. If not, how could it be made fair?

The children can now carry out the investigation in their own groups.

Recording

Children could record their results in a table
The children could communicate the answer to the question using just one sentence.

 Skill- Fair test 	Me	Adult
I can, with help, say if the method is fair or not. With help, I can say if the method is fair or not and start to explain why? I can use the correct scientific language to explain my understanding?		
I can, with help, say if the method is fair or not.		
I can, from the list provided by my teacher, select things I will keep the same.		
I can say why I need to do a fair test. I can list all the things (variables) I will keep the same. I can say what thing I will change (vary).		
I can explain why I have chosen to investigate a certain variable and explain the outcome I expect will happen.		
I can explain how it is a fair test using the terms independent and dependent variables		

Pioneer Federation
Medium term plan
UKS2- Cycle 1 Term 3
Science

	Resources: A range of different liquids; ensure that they each take a little time to run down a tray set at a gradient
3	**Reconnection:** What are some steps you can take when you do an investigation to ensure that it is a fair test? **LO:** To be able to compare and group materials together, according to whether they are solids, liquids or gases. **Skill:** explain conclusions **What can we find out about gases?** **Simple test - Does gas have weight?** Ask the children to devise a test to find out whether gas has weight. They might choose simply to measure a balloon before inflating and then compare it to an inflated balloon. They could tie a deflated balloon on one end of a stick and an inflated balloon on the other. By holding the stick horizontally by a piece of string tied to the middle they can see which end is heaviest. **Simple test - What happens to gas when it is heated?** Give each group a balloon, a small plastic bottle and a bowl of warm water. Ask them to find out what happens to gas when it is heated. They should place the balloon over the neck of the bottle and then place the bottle into the warm water. They could investigate this further by changing the size of the bottle, or changing the temperature of the water. **Simple test - Can gas be made from a solid and a liquid?** Provide children with a small plastic bottle, water, an effervescent tablet and a balloon. The children should place the water and tablet in the bottle. The balloon can be fitted over the neck of the bottle in order to capture the gas (carbon dioxide) created. **Recording** For each of these tests, the children can draw what they did and draw what happened.

Pioneer Federation
Medium term plan
UKS2- Cycle 1 Term 3
Science

To help the children in developing an explanation, break it down into three stages. Firstly, allow them to do something active; they could act out, draw or discuss what they thought was going on. Secondly, identify the correct scientific vocabulary. Finally uses this thinking and vocabulary to construct a sentence or two.

 Explain conclusions	Me	Adult
I can use my observations and ideas to answer questions from my teacher.		
I can use my observations and ideas to answer questions from my teacher. I can use simple scientific words to describe my findings. I can, with help, say whether what happened was what I expected. Say if anything was different happened.		
I can, on my own, use my results to answer my original question. I can, with help, make an 'er/er' statement. I can use simple scientific words / symbols / units. I can draw a simple diagram with some labels.		
I can, on my own, draw simple conclusions from my results & make an 'er/er' statement. I can say which results have helped me make a conclusion. I can use correct scientific words / symbol / units. I can compare my results with my prediction. I can draw a simple diagram or model with labels & a basic explanation of what is happening.		
I can make a conclusion that uses more than one piece of evidence, including numerical data & line graphs. I can show workings for my calculations, including correct scientific or mathematical symbols. I can, on my own, compare my results to my prediction. I can use a scientific diagram or model with clear explanations. I can make other predictions from my results.		
I can make detailed conclusions that fit the pattern of my results. Explain all scientific terminology I use. I can identify the most important aspects of my scientific diagram & any limitations it has.		

Pioneer Federation
Medium term plan
UKS2- Cycle 1 Term 3
Science

	Resources: • Balloons • Light lengths of dowelling • String • Small plastic bottles • Elastic bands • Bowls • Warm water • Vitamin C effervescent tablets
4	**Reconnection:** Can you recall the outcome of your experiment? What was the conclusion? **LO:** To be able to observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C). **Skill:** Take measurements **Simple test – What happens to solids when they are heated?** Discuss with the children the different ways they could find the answers to this question. Discuss with children the unit of measurement for measuring temperature. Allow the children some time to explore using thermometers and temperature probes attached to data-loggers. Show children the equipment that they are going to use and ask them to work out how they could use this equipment to answer the question. They can then place different materials (e.g. soft and hard fats, chocolate and wax) in separate transparent bags or in small metal trays and place them in warm water (up to 60 degrees Celsius) inside of a bowl. **Health and Safety** – discuss with children how they should be handling warm water.

Pioneer Federation
Medium term plan
UKS2- Cycle 1 Term 3
Science

Simple test – At what temperature will a solid begin to melt?

Then ask the children how they would find out at which temperature each material would begin to melt. Each group of children can have a bowl of water into which they can add more hot water can be added (children should not be handling water warmer than 60 degrees Celsius). They will need to monitor the temperature of the water. This is a great opportunity to use data-loggers. Just like above, they will place bags containing the solids or small metal trays holding the solids into the water.

Recording

A table and a bar graph could be made of the results. The children could refer back to the drama that they have previously done to help to develop an explanation about melting.

Research

The children could use secondary sources to find out more about the melting point of a range of materials.

 Take measurements	Me	Adult
Sometimes independently, can take simple measurements using standard units.		
I can take simple measurements.		
I can take accurate whole number measurements (e.g. 7 cm). With prompts I start to identify when to can repeat sets of measurements.		
I can take sets of detailed measurements (e.g. 72mm or 7.2cm) I can start to know when to can repeat sets of measurements.		
I can accurately take a combination of different units of measure. I can confidently convert between different units of measurement when recording. I can use a range of scientific equipment to take accurate and precise measurements or readings, with repeat readings where necessary.		

Pioneer Federation
Medium term plan
UKS2- Cycle 1 Term 3
Science

	Resources: • A variety of solid materials that will melt at different temperatures. • Washing-up bowls • Thermos flasks (for adults to have easy and safe access to warm water) • Data-loggers and temperature probes • Thermometers (Health and safety - check that they have been designed to measure to above 60 degrees Celsius) • Transparent bags
5	**Reconnection:** What items can we use when we need to take measurements? **LO:** To be able to observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C). **Skills: S**uggest improvements **Simple test - Can we change the state of wax?** Provide children with a nightlight standing in a nightlight holder on some sand in a metal bowl (like a dog bowl). Place a small metal tray containing candle wax on the top of the nightlight holder. A metal teaspoon can be leant inside the bowl. Light the candle. Once the wax in the metal tray has melted carefully pick it up with the wooden peg attached to the metal tent peg. Carefully pour the liquid wax down the back of the spoon. Ask the children to explain what is happening to the wax. **Recording** The children could draw the wax in its different stages and explain what happened. Again, break this explanation down into three stages. They can act out being a solid and liquid – other children in the groups can call out 'add heat' and 'take away heat'. Help children to identify the key process words: 'melt' and 'solidify', and the means by which the changes occurred: 'heating' and 'taking away heat '('cooling'). Finally, the children can construct a sentence or two.

Pioneer Federation
Medium term plan
UKS2- Cycle 1 Term 3
Science

Problem-solving – Using the processes of melting and solidifying, can you make a candle of wax with holes in it?

Inform the children that they have been employed by a candle making factory. Challenge the children to develop method for making a candle with holes in it, but only by using melting and solidifying.

1. The children will need to make a mould for their candle using foil.
2. They can then remove a nightlight from its case and place it in the centre of their mould.

3. They must then pack the space between the nightlight and mould with broken but not crushed ice cubes.

4. They can then pour more molten wax over the ice, to fill the mould.

5. It can be left to stand for around 10 minutes. When it has solidified, run under a warm tap to loosen the wax and push firmly out of the mould.

Health and Safety - Once again this will require close supervision.

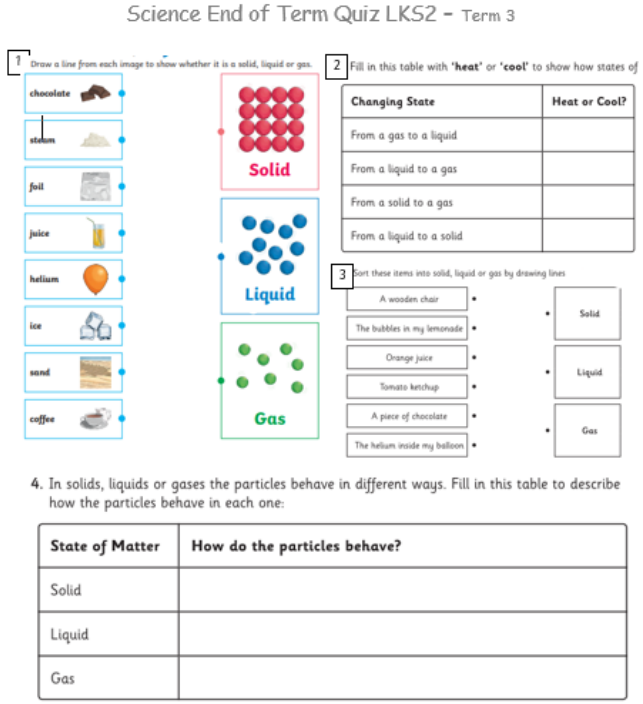
Pioneer Federation
Medium term plan
UKS2- Cycle 1 Term 3
Science

 Suggest improvements	Me	Adult
I can review my work and recognise some of the difficulties I encountered.		
I can, with help, suggest different ways I could have done things.		
I can, on my own, suggest improvements to my method. I can identify what I could change in the future. I can explain what went wrong.		
I can suggest improvements to my method & say why. I can say describe and evaluate my own ideas. I can identify what I could change in the future.		
I can say how accurate my results are & how they could be improved. I can describe and evaluate my own and other people's scientific ideas using a range of sources. I can suggest how to improve my experiment after reflecting.		
I can use my results data to reason how my method could be improved. I can describe and evaluate my own and other people's scientific ideas using a range of sources, then link these to my results. I can confidently suggest a new experiment to improve my findings and results.		

Resources:

- Chunks of candle wax
- Nightlights
- Nightlight holders
- Metal bowls (like dog bowls)
- Wooden pegs attached with elastic band to the end of metal tent pegs
- Small metal trays (e.g. the ones that nightlight are in)
- Metal teaspoons

Pioneer Federation
Medium term plan
UKS2- Cycle 1 Term 3
Science

	• Plastic washing-up liquid bottles (cut down) • Candles Ice cubes (broken)
	Quiz/assessment 

Science End of Term Quiz LKS2 - Term 3

1 Draw a line from each image to show whether it is a solid, liquid or gas.

chocolate, steam, foil, juice, helium, ice, sand, coffee

Solid | Liquid | Gas

2 Fill in this table with **'heat'** or **'cool'** to show how states of

Changing State	Heat or Cool?
From a gas to a liquid	
From a liquid to a gas	
From a solid to a gas	
From a liquid to a solid	

3 Sort these items into solid, liquid or gas by drawing lines

A wooden chair	Solid
The bubbles in my lemonade	
Orange juice	Liquid
Tomato ketchup	
A piece of chocolate	Gas
The helium inside my balloon	

4. In solids, liquids or gases the particles behave in different ways. Fill in this table to describe how the particles behave in each one:

State of Matter	How do the particles behave?
Solid	
Liquid	
Gas	

End points:

. To know the stages of the water cycle.

Pioneer Federation
Medium term plan
UKS2- Cycle 1 Term 3
Science

To know and understand the vocabulary linked to the stages of the water cycle.

To know what solids, liquids and gases are and the differences between them.

To know what solids, liquids and gases are and the differences between them.

To know that water freezes at 0 degrees and boils at 100 degrees.

To know the particles structure in Solid, Liquid and Gas.

Future learning links:

5	• Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets • Understand that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution • Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating • Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic • Demonstrate that dissolving, mixing and changes of state are reversible changes • Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.