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Year 6 Induction

Welcome to Science

Practical Investigation Booklet

Welcome to the Year 6 Science Induction booklet. In this booklet you will find several investigations you could do in the comfort of your own home. I hope you will give some of them a go and send any pictures or videos of what you have done to: aperry@Kinverhigh.co.uk .

Each investigation has been rated out of 4 on two things:

1) How messy it is
2) How much your parents/carers may need to help you

Each investigation comes with an equipment list, safety precautions and instructions.

Here is the list of experiments you can choose from. We would love to see you do at least one a week until the summer holidays. The additional equipment column shows some of the things you need for the investigation that you may not have at home. Please remember to check the full equipment list anyway.

Investigation	Level of Mess	Adult Supervision	Additional Equipment	Page
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Investigating indicators	3	4	• Small disposable containers • Red cabbage/Beetroot/ Red rose petals/ blackberries • Lemon Juice • Bicarbonate of soda	7
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Double Bubble

Children love bubbles and these stay in one place! This activity allows children to make their own bubble solution by following a simple procedure and supports the development of hand-eye co-ordination and observation skills.

Safety

- Ensure you do not taste or drink the bubble mixture.
- Should any washing-up liquid get in an eye, rinse with water by getting the child to lie on their back on a table or near a sink and gently pouring cool water from a jug, or similar, over the open eye continuously for 10 minutes.
- If you are seriously allergic or sensitive to soap or detergent products, you should not do this activity.
- Ensure you wash your hands after the practical

Equipment

- 1 cup
- 1 straw
- ½ teaspoon of sugar
- 1 teaspoon of washing-up liquid

Procedure

1) Place 2 tablespoons and 2 teaspoons of warm water into a cup
2) Add ½ teaspoon of sugar and stir it until dissolved
3) Add 1 teaspoon of washing-up liquid and stir well
4) Wet a small section of desk by dipping your fingers into the bubble mixture and spreading it over approximately $10cm^2$
5) Submerge one end of the straw in the bubble solution so that it's completely coated.
6) Place the coated end of the straw vertically onto the wet section of your desk. Then through the other end of the straw blow a fairly large bubble.
7) Dip the straw back into the bubble solution, then, aiming for the centre of the first bubble, gently push it inside.
8) Gently blow a second bubble on the surface of the desk inside the first bubble.
9) Try blowing a third bubble inside the inner bubble and possibly even a fourth inside the third bubble.

Possible further activities

- Who can blow the biggest bubble? Coat a small plastic ruler with bubble solution and slide it vertically into the middle of your bubble to measure its height.
- Do larger bubbles take longer to pop?
- Investigate which, if any, of the ingredient makes the bubbles last longer.

Background notes – The Science behind this investigation

Soap bubbles are a thin layer of water and washing-up liquid. Mixing washing up liquid with water forms a stretchy and sticky solution. When you blow on this it is sticky enough to hold together but will also stretch, which is how a bubble is formed. The sugar gives the bubble wall even more strength, flexibility and stability. It also slows down the evaporation of water so that the bubbles last longer.

Blowing a bubble inside a bubble causes the outer bubble to expand. As the inner bubble grows, the fixed volume of air in the outer bubble becomes compressed; it pushes against the outer bubble wall, making the bubble bigger.

As time passes the water in the bubble solution evaporates making the bubble wall thinner. Because the walls of bigger bubbles are thinner to start off they should pop faster than smaller bubbles.

Making ice cream without a freezer

Children love ice cream. This engaging activity demonstrates how adding salt to ice reduces its freezing point, so that they can make their own.

Safety

- You must wash their hands with soap and water before the activity
- Thoroughly clean the tables, you will need a piece of kitchen towel
- Use clean cooking equipment
- You must wear winter gloves during the shaking stage because the ice and salt mixture gets very cold; as low as -7 °C
- Ensure any spillages are cleaned up quickly

Equipment

- 1 tablespoon of full fat milk
- 1 tablespoon of double or whipping cream
- 2 level teaspoons of sugar
- ¼ teaspoon of vanilla extract
- 2 x tablespoons
- Kitchen towel
- Winter gloves (1 pair each)
- 6-8 large ice cubes
- 3 heaped tablespoons of salt
- Small zip/resealable food bag
- Large food bag
- 1 x teaspoon for measuring
- 2 teaspoons for eating

Notes

- Use good quality food bags otherwise they split during the shaking stage
- You may need to teach the children how to measure a level tablespoon of an ingredient
- Putting the ingredients in containers per table of children to share, helps them scoop out the correct amount
- Make sure that the tablespoon used to measure the salt does not get used to measure other edible ingredients
- If the ingredients don't appear to have frozen, add more salt and ice to the ice bag and re-shake
- Having a bowl/tray on the table for the used salt ice/water bags is useful

Procedure

1) Put 1 tablespoon of full fat milk into a small zip/re-sealable food bag
2) Put 1 tablespoon of double or whipping cream into the same food bag
3) Add 1 level teaspoon of granulated sugar and ¼ teaspoon of vanilla extract
4) Securely seal the bag and give it a little shake to mix the ingredients
5) Place the ice cubes and salt into the larger food bag and shake it
6) Place the smaller, sealed ingredients bag inside the larger bag containing the ice/salt mixture, seal/knot the larger bag
7) Put on winter gloves and shake the bags until ice cream has formed (approximately 10 minutes)
8) Remove the small bag containing the ice cream, discard the large bag, wipe off any excess salt water, open and serve

Possible further activities

- Observe what happens if you don't shake the ingredients
- Compare the temperature of the ice before adding the salt and then after 5 mins
- Observe how the ice cream mixture changes during the freezing time. Record the changes at different intervals eg 2, 4, 6, 8 mins
- Make ice cream without adding salt to the ice and compare the results
- Using alternatives to milk and cream eg yoghurt, lactose free dairy products, dairy free alternatives
- Use large salt crystals (used in salt grinders) instead of table salt. Compare the time taken for the ice cream to freeze and the texture of the ice cream

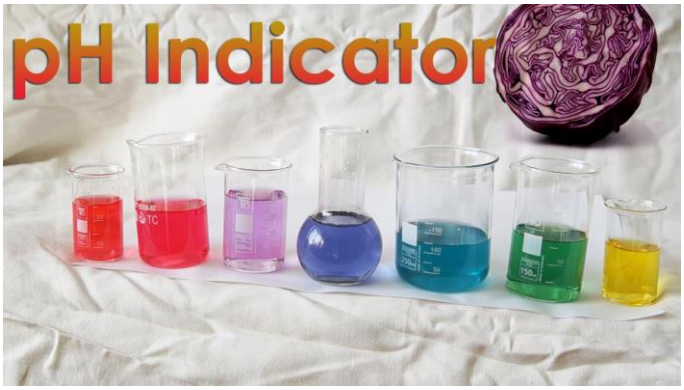
Background notes – The Science behind this investigation

Water freezes at 0 o C. Adding salt to ice lowers the temperature at which water freezes and forces the ice to melt. The energy needed to melt the ice is taken from the surroundings and hence the temperature goes down. This means that the children will observe the ice melting even though the temperature is going down. This drop in temperature (to around -7 o C) is cold enough to freeze the ice cream.

This science is used in everyday life when we salt roads on very cold days to help stop ice from forming and to melt any ice/snow already there.

Shaking the ingredients improves the texture making a smoother ice cream by adding air bubbles and by evenly distributing the tiny ice crystals.

Investigating indicators



Some chemical substances can tell you if a solution has acidic, neutral or alkaline properties by displaying colour changes. This practical is a simple, safe method to observe how everyday indicators behave and could provide opportunities for independent working, investigation skills or encouraging effective teamwork.

Safety

- Do not taste any of the food stuffs.
- You will need to use sharp knives with **extreme** care

Equipment (preparing the indicator)

- 1 chopping board
- 1 vegetable knife
- 1 tea strainer
- 2 beakers/plastic cups
- 1 plastic spoon
- 1 permanent marker pen
- Disposable shot glasses (or similar sized container)
- Plenty of paper towels
- Hand-hot water
- One or more indicators – Raw Red Cabbage/Red Rose Petals/Raw or cooked beetroot/Blackberries

Procedure (preparing the indicator)

1) Chop then mash your raw indicator material and put it into a beaker/cup. You will need to fill it to about ¾ full.
2) Add hand-hot water (approx. 15 cm3) to the fruit, vegetable or petals.
3) Mush and squidge each indicator and leave to soak for approximately 10 minutes.
4) Pour the mixture through a tea strainer and collect the indicator liquid in a new beaker.
5) Write on each shot glass the name of the indicator.
6) Pour the liquid into the shot glasses or dropper bottles.
7) Give each group a sample of the indicator made.

Equipment (observing the indicator)

- 1 laminated sampling grid/white plate
- 1 sample of lemon juice (acid)
- 1 sample of bicarbonate of soda solution (alkali) (Pre-prepare this solution by mixing ½ tsp bicarbonate & 4 tblsp of water)
- 1 sample of red cabbage indicator
- 1 permanent marker pen
- 2 plastic pipettes
- 1 disposable stirrer
- Plenty of paper towels

Procedure (observing the indicator)

1) On the sampling grid, drip 4 drops of lemon juice into a circle. Add 2–3 drops of red cabbage indicator. Watch for a few minutes and describe any observations. Is lemon juice an acid or an alkali?

2) Into the next circle drip 4 drops of bicarbonate of soda solution. Add 2–3 drops of red cabbage indicator. Watch for a few minutes and describe any observations. Is bicarbonate of soda an acid or an alkali?
3) Mix the liquids in the two circles together. Watch for a few minutes and describe any observations. (When the two are mixed together the resulting solution will turn a purple colour indicating that it is neutral. It will also fizz because a chemical reaction is taking place producing carbon dioxide gas.)

Possible further activities

Once the children have explored indicators and chosen one to use (red cabbage tends to work the best), there are a variety of research-based enquiries they could undertake, including:

- Which toothpaste is the most acidic and which is the most alkali?
- From a range of different toothpastes which one is best and why?
- Which hand cream is the most acidic and which is the most alkaline?
- From a range of different hand creams which one is best and why?
- Which soft drink is worst for your teeth?
- Which drinks might you avoid if you had an acid stomach?
- Which fruits or vegetables will fizz (react) if they are mixed with bicarbonate of soda?

Background notes – The Science behind this investigation

Children will cross-contaminate the sample if they use the same pipettes for more than one liquid.

Indicators are best made and used on the same day or kept refrigerated and used the following day.

For the observing indicators procedure, it's best to use only red cabbage.

Some reactions do not happen for several minutes. It is worth waiting, leaving and returning to any of the samples to see if any further changes have occurred.

Think carefully about which products are suitable for children to investigate. Cleaning products such as bleach and oven cleaner are not suitable for this activity as they are often strong alkalis.

Vinegar and bicarbonate balloons

The standard vinegar and sodium bicarbonate practical activity always generates enthusiasm and interest, but can get very messy when carried out in open containers! This practical offers a safe, controlled, and clean method for children to enjoy this reaction, whilst clearly being able to observe/identify the reactants and products.

In addition to this practical being exciting it provides children with an opportunity to practise their manual handling/ manipulation skills and a chance to practice handling liquids safely i.e. so that they do not splash or spill.

Safety

- Ensure you do not taste or eat any of the food.
- You should stand to carry out this activity. This ensures that you can step away easily if there is a spill and limits the amount of vinegar on clothing.
- There will be an increase in pressure inside the balloon at the end of the activity. Adults should help you remove the balloon when clearing away to minimise any vinegar/bicarbonate spray.

Equipment

- 1 empty small plastic bottle (Fruit shoot/small water bottle size is ideal)
- 1 balloon
- 1 dry plastic funnel
- Vinegar
- Bicarbonate of soda (available from supermarkets)
- Small plastic spoon/spatula

Hint and Tips

1) Ensure the plastic funnel is dry before pouring sodium bicarbonate through it. If damp, the bicarbonate will stick to the sides. If you haven't got enough plastic funnels, you can make a substitute by cutting the top off another small plastic bottle.
2) Ensure the balloon is securely fixed to the top of the bottle. If not the pressure of the resulting carbon dioxide may force the balloon off, or you may find the carbon dioxide/foam mixture sprays through any gaps.
3) You can substitute normal malt vinegar with white vinegar and add a drop of food colouring for a more eye-catching result. Alternatively you can use lemon juice which smells better than vinegar.
4) You can use baking powder as an alternative to bicarbonate of soda (sodium bicarbonate) if necessary.
5) Ensure good ventilation in the room to help dissipate the vinegar smell.

Procedure

1) Place 1-2 teaspoons of white bicarbonate of soda powder into a new balloon. The best way to do this is to insert the end of a dry plastic funnel into the balloon and carefully add the bicarbonate. Shake to ensure it goes into the balloon.
2) Remove the funnel and place the balloon on the table.
3) Place the funnel in the empty plastic bottle and fill the bottle with vinegar to a depth of 2-3 cm.

4) Remove the funnel and place to one side
5) Carefully fix the balloon to the top of the plastic bottle. Be careful not to position the balloon upright.
6) Place the bottle on a table and tip the bicarbonate into the vinegar by lifting the balloon upright.
7) Watch carefully what happens.

Possible further activities

Once you have seen and understood the reaction, there are a variety of enquiries they could undertake, including:

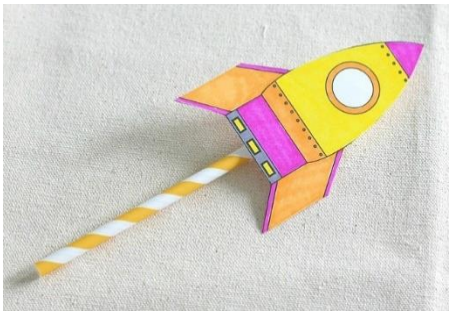
- Does the balloon blow up twice as big with double the amount of bicarbonate
- Does the balloon float or sink in air?
- What happens if you use lemon juice instead of vinegar?

There are also a number of variations on this theme, with the standard vinegar and bicarbonate reaction being used to make 'volcanos' etc.

Background notes – The Science behind this investigation

This is an example of an irreversible chemical reaction as a new product is made and the original substances can't be re-made. The reactants are vinegar, which is a liquid, and sodium bicarbonate (also known as sodium hydrogencarbonate), which is a solid. The main product seen via the balloon inflating is carbon dioxide gas.

Straw Shooter Rocket



Children love launching rockets. This activity allows children to make their own and investigate launching something into the air without leaving their home.

Safety

- Ensure the shooter is pointed away from any faces when launching

Equipment

- 1 clean dry empty carbonated drink bottle
- 1 narrow straw
- 1 wider straw (eg milkshake straw)
- 1 pencil
- 1 ball of plasticine or play dough
- Sticky tape
- Scissors
- Paper fins (optional)

Hints and Tips

- 2L lemonade bottles work well. Lids are not required.
- If air is escaping from the top of the bottle, an extra piece of tape wrapped around the neck could help improve the seal.
- Use the least amount of tape possible to seal the wider straw, otherwise it may nose dive.
- Use enough play dough to totally cover the opening of the bottle and the edges.
- An alternative to a wider straw is to make a tube out of a piece of paper. Wrap the paper around a pencil (bigger than the narrow straw) and tape along the seam.

Procedure

1. Put some plasticine into the opening of the bottle and mould it around the edges to make a good seal.
2. Using a sharp pencil, push it through the plasticine and remove it to leave a hole through the plasticine into the bottle.
3. Carefully push the narrow straw into the hole and mould the plasticine around the straw to ensure a good air tight seal. Be careful not to block the end of the straw with plasticine.
4. Take the wider straw and pinch one end together. Stick a small amount of tape over the pinched end to make it airtight.
5. Check for leaks by blowing into the wider straw. Re-tape the end if there is a leak.
6. Slide the wider straw over the narrow straw sticking out of the bottle.
7. Point the shooter/rocket away from people and give the bottle a hard squeeze.

Possible further activities

- Does changing the launch angle affect the distance travelled?
- Does changing the amount of force applied to the bottle affect the distance travelled?
- Does the length of the wider straw affect how far it will fly?
- Does adding fins to the wider straw make it fly further?

Background notes – The Science behind this investigation

Air is formed of tiny gas particles that whiz around freely. When the bottle is squeezed, the air that is inside is pushed out. Some of the air zooms through the narrow straw and pushes against the sealed end of the wider straw making it fly away.

Lava Lamps

This fun activity enables children to learn about density and dissolving, and supports the development of observation skills.

Safety

- You should not put any liquids or solids near their mouths

Equipment

- 1 pint clear colourless plastic cup or a large glass jar
- Measuring cylinder (ideally 100 ml)
- 100 ml vegetable or sunflower cooking oil
- 300 ml (approx.) water
- Food colouring (optional)
- Salt
- 1 x teaspoon
- Large container (per table)

Hint and Tips

- Place the oil, water and salt in labelled containers.
- Tall, slim curry sauce/Bolognese jars (labels removed) make good lava lamps.
- See the special note after the procedure about disposing of the oil.

Procedure

1. Pour approx. 250-300 ml water into the plastic cup/jar so the water half fills it.
2. Measure 100 ml of cooking oil and carefully pour it into the cup.
3. Pause to observe what happens. Once the liquids have settled identify which is which.
4. Optional - Add a few drops of food colouring, do not stir and observe what happens.
5. Stir the liquids and observe. Allow the liquids to settle.
6. Gently sprinkle 1-2 teaspoons of salt over the top liquid. Watch closely for at least one minute.
7. Repeat the salt sprinkling.

Disposal

The oil used in this practical must not be put down the sink; instead:

1. Pour the cups of liquid into a large container.
2. Put some absorbent material (eg old sand, newspaper, a nappy, cat litter) into a strong plastic bag and pour in (decant) the oil layer.
3. Tie the plastic bag and place in a normal refuse bin.
4. The remaining water and salt in the container can be washed down the sink with plenty of water

Possible further activities

• Add an effervescent vitamin C tablet to the glass and observe closely for at least one minute

Background notes – The Science behind this investigation

Density is the reason that we see different materials floating and sinking (search Floating and sinking for more activities). In this experiment, the oil is less dense than the water, so it floats on the water. When the food colouring is added, it spreads out in the water layer because it is soluble in water.

The salt is denser than the oil and water so it falls to the bottom, taking with it a 'ball of oil'. The salt slowly dissolves in the water, releasing the oil which floats back to the top because it is less dense than water.

Slime Time

Slime is a fascinating tactile substance with properties that are both solid and liquid. It oozes between your fingers but doesn't stick to them. This activity allows children to make and investigate their own slime. This method uses very small quantities of Optrex eye wash, or a closely-related solution.

Safety with slime

- Ensure you do not eat the slime or taste any of the substance used in this activity.
- Do not put eye drops or eye wash into their eyes.
- You should not put your fingers in your mouths.
- Do not make more than the amount specified in the instructions below.
- Do not complete the investigation if you have open wounds, broken skin or with skin conditions.
- You must wash their hands thoroughly after handling the slime.

Equipment

- Disposable plastic cups/bowls/clean yoghurt pots
- Dessert spoons
- Glue spreaders/lolly sticks/firm plastic or metal teaspoons
- White washable PVA glue
- Bicarbonate of soda (6 pinches needed)
- 5 ml eye wash/eye drops (see note below)
- 1 plastic pipette
- 1 small plastic shot glass/small container
- Ready mixed paint (optional)
- Shaving foam (optional; 1-2 squirts per sample)
- Plastic disposable table cloth (optional)
- Paper towels / tissue
- Baby talc (optional)

Hints and Tips

1) Not all brands of eye wash/eye drops contain the active chemical required for making slime (boric acid/sodium borate). Brands that we currently know work include Optrex, Boots own brand, Murine and Blink. Check the ingredients to ensure boric acid or sodium borate is present.
2) The slime produced is fairly firm. Use glue spreaders, baby spoons or wooden lolly sticks to stir.
3) The eye wash can be poured into dropper bottles or you can use a plastic shot glass with a plastic pipette to dispense 12-15 drops per child. 5 ml dropper bottles are ideal for younger children (Year 3- 4) and can be purchased online from Ampulla or science educational suppliers.

4) Shaving foam gives the slime a more tactile feel and makes the sample bigger. Shaving gel does not work as well.

Procedure

1) Put 1 level dessert spoon of white PVA glue into the bottom of a plastic cup. This can be very messy, so children may need help or be given a container with the PVA already in it.
2) Add a pinch of bicarbonate of soda (sodium bicarbonate) and mix well using a spoon or glue spreader.
3) For coloured slime, add 1 drop of ready mixed paint and mix well (deep colours work the best).
4) Optional step – for a smooth, tactile slime, add 1-2 squirts of shaving foam to the mixture and stir well.
5) Add 12-15 drops of eye wash/eye drops and mix well. Depending on the amount of PVA glue used, children may need to add more drops of eye wash until the slime sticks together. Be careful not to add too much or the slime will not be as elastic. In trials, we found you need no more than 19 drops for 1 'enthusiastic' dessert spoon of PVA.
6) Mix the slime for 2-3 minutes in the cup.
7) Take the slime out of the cup and continue mixing and kneading with fingers.
8) If the slime sticks to fingers too much, add another 1-2 drops of eye wash/eye drops. Also try dusting a little baby talc over the sample and kneading it some more.
9) The more you knead the slime, the better the texture. Pull it apart, mix it together, roll it into a ball and then put it on the table, tap it, rub it. What happens?
10) Enjoy investigating the properties of the slime.
11) Ensure you wash their hands properly with warm water and soap after making and handling the slime. Wash tables with soap and water, similarly, wash any equipment you plan to reuse.

Possible further activities

- Explore the difference between slime made with shaving foam and slime without shaving foam.
- Vary the mixture by: - Adding more PVA or using fewer eye drops. (do not add more eye drops) - Adding more bicarbonate of soda - Adding water to the sample.
- Observing what happens if you put your slime in a funnel?

Background notes – The Science behind this investigation

Properties of solids, liquids and gases and the differences between them are clearly defined and taught, however, some materials require a closer look. Slime is one of them. Slime is a special kind of liquid called a non-Newtonian fluid that can sometimes act like a liquid and sometimes act like a solid.

We do not believe that it is necessary for children with normal healthy skin to wear gloves to handle the quantity of slime used in this activity.

Washing hands with soap and water is the most effective way of removing slime from fingers.

Slime should not be kept for long after the investigation. It should be disposed of within 24 hours.