Index

Interesting chemistry demonstrations

Safety information:

- ✓ Wear shoes that completely cover your feet for initial protection in the case of dropped container, spilled chemical and hazards on the floor.
- ✓ Wear Safety goggles,Lab coats and Hand gloves.
- ✓ Long hair and loose clothing must be confined.
- ✓ Kids must perform the demonstrations under adult supervision.
- ✓ Never look directly into mouth of an open flask or test tube if it contains a reaction mixture.
- ✓ Use glassware which is in a good condition. Defective glassware can lead to accident.
- ✓ Perform demonstrations in well ventilated room or open ground
- ✓ Dispose hazardous chemical properly.
- ✓ Concentrated acids should be handled with care.

1. Making gold and Silver

Requirements:

Beaker

Container of water

Tweezers or tongs

Sodium hydroxide pellets or solution

Zinc dust

Source of heat/flame

To Make Silver Pennies:

1. Pour a spoonful of zinc (1 gram) into a small beaker or evaporating dish containing water.
2. Add a small quantity of sodium hydroxide.
3. Heat the mixture to near-boiling, and then remove it from heat.
4. Add clean small pieces of copper or copper coins to the solution, spacing them so that they are not touching each other.
5. Wait 5-10 minutes for them to turn silver, and then use tongs to remove the pennies from the solution.
6. Rinse the pieces/coins with water, and then set them on a towel to dry.

Explanation:

This chemical reaction plates the copper in the coin/piece with zinc. This is called Galvanization. The zinc reacts with the hot sodium hydroxide solution to form soluble sodium zincates, Na2ZnO2, which is converted to metallic zinc when it touches the surface of the penny.

To make the Silver piece turn Gold:

1. Grasp a silver piece/coin with tongs.
2. Gently heat the piece/coin in the outer (cool) part of a burner flame or with a lighter or candle (or even set it on a hotplate).
3. Remove the penny from heat as soon as it changes color.
4. Rinse the gold penny under water to cool it.

Explanation:

Heating the piece/coin fuses the zinc and copper to form an alloy called brass. Brass is a homogeneous metal that varies from 60-82% Cu and from 18-40% Zn. Brass has a relatively low melting point, so the coating can be destroyed by heating the piece/coin for too long.

Reference: www.stevespenglerscience.com

2. Shiny copper

Requirement:

1/4 cup white vinegar

Water

A few old (not shiny) copper pieces/coins

Salt (NaCL)

Non-metal bowl or plastic bowl

Paper towels (Tissue paper)

Procedure:

1. Pour the vinegar into the bowl and add the salt - stir it up.
2. Put about 5 pennies into the bowl and count to 10 slowly.
3. Take out the pennies and rinse them out with some water.

Explanation:

Vinegar is an acid and it reacts with the salt to remove what chemists call copper oxide which was making your copper pieces/coins dull.

Reference: www.exploratorium.edu

3. Carbon Snake

www.emaze.com

Requirement:

Beaker

Powdered sugar

Conc. Sulphuric acid

Water

Procedure:

1. In a 25 mL beaker take 10g powdered table sugar to which add 10 mL of Conc sulphuric acid.
2. To this add 4 drops of water and stir the solution or mixture.

Explanation:

Sugar is a carbohydrate and Sulphuric acid is dehydrating agent. The acid dehydrates sugar and forms elemental carbon. The reaction is Exothermic and leads to formation of black smoky mass.

Reaction**:**

$C_{12}H_{22}O_{11} + H_2SO_4 \rightarrow 12\ C + 11\ H_2O$ + mixture water& acid

Reference: Chemical Demonstration – A handbook for teachers of Chemistry,Vol. 1 – Bassa Z. Shakashiri Page No-77

4. Non-Burning paper

Requirements:

Paper

Isopropyl alcohol

Water

Beaker

Burner

Tong

en.wikipedia.org

Procedure:

1. Make 50% solution of Isopropyl alcohol with Water.
2. Dip a piece of paper in this solution and hold on flame of burner.

Explanation:

This demonstration illustrates the variation in the temperature required to support combustion in different substances. Generally paper burns when held in a flame. Wet paper cannot burn but when wet with alcohol, both paper and alcohol burns. In the mixture of alcohol and water, the paper will not burn as there is sufficient water.

Reference:

Chemical demonstrations – A handbook for teachers of chemistry, vol. 1 – Bassam Z. Shakashiri page-13

5. Reactions of Zinc with Acid (Hydrogen gas liberation)

Requirement:

Conical flask

Spatula

Balloon

Rubber cork

Glass tube

Zinc dust

Conc Hydrochloric acid

www.youtube.com

Procedure:

1. Take pinch of Zinc dust in a conical flask.
2. Add 2ml of Concentrate hydrochloric acid in it.
3. Immediately apply balloon on the flask.

Explanation:

In this reaction hydrogen gas evolved which accumulates in the balloon, due to which it expands.

$Zn + 2HCl \rightarrow ZnCl_2 + H_2\uparrow$

Reference: lecturedemos.chem.umass.edu

6. Acid in the Eye Demonstration

An introductory demo for chemistry illustrates the damage that can be done to the human eye if acid was to come in contact with it.

Requirement:

Egg white

Two Petri dishes

Marker to draw eye on the Petri dish.

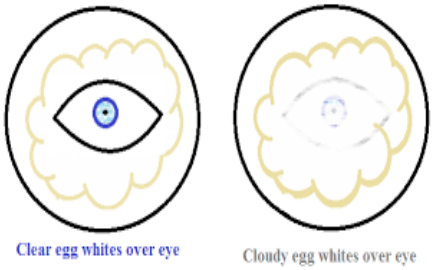
Droppers

Conc. HCL

Conc. Sulfuric acid

Conc. Nitric acid

Ammonium hydroxide



Procedure:

1. Draw an eye at the bottom of petri dish.
2. Crack open the egg and separate egg white and yolk.
3. Place the egg white on petri dish.
4. Place the petri dish on the overhead projector so the eyes drawn becomes visible.
5. Place drop of acid on the egg white.
6. Try to reverse the damage by rinsing the eye with water.

Explanation:

Proteins that make up the egg whites are similar to what is found in the vitreous humor of the eye. The acid will react with egg whites causing it to become cloudy due to denaurization which is change in the natural shape of protein. Once protein is denatured it cannot come back to normal shape. So similarly, if person gets acid in the eye the damage has been done and it cannot return to normal. Therefore it is important to wear safety goggles, gloves and lab coat.

Reference: www.roanstate.edu

7. Instantaneous Ice Cream

www.youtube.com

Requirements:

Sodium Bicarbonate

Lemon Juice

Dish washing Liquid

Glass

Procedure:

1. Take glass bowl and put sodium bicarbonate, pour dishwashing liquid and lime juice into it and stir.
2. Add sodium bicarbonate lemon juice for more gassy reaction.

Explanation:

The reaction between baking soda and lemon juice is an acid-base reaction, because it involves an acid (citric acid in the lemon juice) reacting with a base (sodium bicarbonate, more commonly known as baking soda).

Reaction: $C_6H_8O_7 + 3NaHCO_3 \longrightarrow Na_3C_6H_5O_7 + 3H_2CO_3$

Lemon juice may contain citric acid, but it is mostly water. When the carbonic acid formed in the above reaction dissolves in the water from the lemon juice, it dissociates according to the following

Reaction: $H_2CO_3\ (aq) \longrightarrow CO_2\ (g) + H_2O\ (l)$

Combined reaction: $C_6H_8O_7(aq) + 3NaHCO_3(aq) \longrightarrow Na_2C_6H_6O_7(aq) + 3CO_2(g) + 3H_2O(l)$

Reference: sites.jmu.edu/chemdemo

8. Chemical Chameleon

Requirement:

potassium permanganate

Saccharine (plain sugar, also called sucrose)

Sodium hydroxide

Distilled water

Conical flask

Test tube

Spatula

Weigh boat

Procedure:

1. Dissolve a very small amount (a few mm^3) of potassium permanganate in a few ml of water in a test tube.
2. Put 100 ml of water in the conical flask and add a spatula full of solid sodium hydroxide and add three spatula's full of sugar. Dissolve all the solid material, such that a colorless and clear solution is obtained
3. Pour the contents of the test tube into the 100 ml of sugar / NaOH solution and Swirl, such that the liquid is mixed well. Then let the beaker stand for a while and watch the color change.

Explanation:

Permanganate is slowly reduced by sugar in alkaline environments. This reaction requires hydroxide ions. The observed speed of the reaction indeed is strongly depending on the concentration of sodium hydroxide. When a lot of sodium hydroxide is dissolved, e.g. a teaspoon full of solid, then the first part of the reaction only takes a few seconds instead of tens of seconds.

In alkaline environments, permanganate ion first is reduced to manganese ion:

$$MnO_4^- + e \rightarrow MnO_4^{2-}$$

The left is deep purple, the right is deep green. When both are present, then light in the red end of the spectrum is absorbed by the green manganate, and at the same time, light at the blue end of the spectrum is absorbed by the violet permanganate. This combination of absorptions make the

solution almost appear black, hence the darkening at the start of the experiment. When almost all permanganate is reduced to manganate, then the liquid looks beautifully deep green.

When there is excess sugar, then the manganate in turn is reduced further as follows:

$$MnO_4^{2-} + 2H_2O + 2e \rightarrow MnO_2 + 4OH^-$$

At the very low concentrations, used in this experiment, the MnO_2 does not precipitate, but a colloidal solution of hydrous MnO_2 is formed, which remains clear. Hydrous MnO_2 is brown, but at the low concentrations, used in this experiment, it is more yellow than brown. When a very dilute solution of permanganate is slowly reduced to colloidally dispersed manganese (IV) oxide, then a beautiful range of colors is traversed, starting from purple/violet and ending in yellow/brown. It is amazing to see the solution change color. For this reason, in the past, permanganate sometimes was called 'chemical chameleon'. Only at a later time, it was understood that this remarkable phenomenon just is the result of change of oxidation state, and the mixing of colors of different compounds. From a chemical point of view, this experiment is not that special, but it still makes a nice display, maybe even more so, now it is well understood.

Reference: www.instructables.com

9. Evolution of CO_2 gas

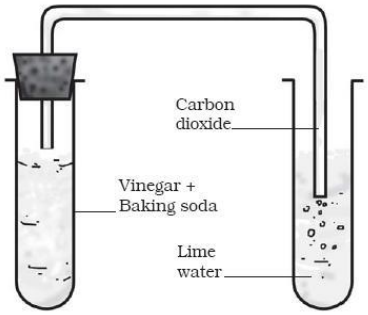
Requirements:

Vinegar

Baking soda

3 test tubes

Lime water (calcium hydroxide solution)



Procedure: www.ekshiksha.org.in

1. Make a hole in the cap of the plastic bottle using a hot nail.
2. Insert infusion tube in hole and attach to plastic bottle.
3. Put the second end of tube into test tube.
4. Put some baking soda in plastic bottle
5. Add some amount of vinegar and close the bottle immediately.
6. Collect the gas into test tube.
7. Burn a match stick and put in test tube.
8. Put some lime water into 2 test tubes and pass gas into one of them it will turn milky because of CO2

Explanation:

CO_2 is formed by the action of carbonates or bicarbonates with acids.

$NaHCO_3 + CH_3COOH$ □ Salt + $CO_2 + H_2O$

The presence of CO_2 gas extinguishes the candle.

Carbon dioxide reacts with calcium hydroxide (lime water) to form calcium carbonate and water. Calcium carbonate is insoluble therefore exist in the form of a white precipitate which turns the solution cloudy.

$CO_2 + Ca(OH)_2 \longrightarrow CaCO_3 + H_2O$

Reference: www.hometutoring.co.nz

10. Bouncy ball

Requirement:

1 tablespoon white glue
1/2 teaspoon borax
1 tablespoon cornstarch
2 tablespoons warm water
2 plastic cups
2 wooden craft sticks
Food coloring

Procedure:

1. Pour the glue into one of the plastic cups. Add a few drops of food coloring to the glue and mix with one of the craft sticks until your desired color is achieved.
2. In the second cup, combine the water and borax together and mix with the second craft stick. Stir until dissolved.
3. Add the cornstarch and 1/2 teaspoon of the borax solution to the glue and let stand for 15 seconds.
4. Stir with a craft stick until fully mixed together and then mixture mould the ball in your hands.

Explanation:

The white glue contains polyvinyl acetate, a strong and flexible polymer that gives the ball strength. Cornstarch contains amylopectin, a polymer whose shape is best described as 'branched' - it sticks out like the branches of a tree - and gives the ball the property of elasticity. Elasticity allows the ball to return to its original shape after being compressed or stretched, such as hitting the floor. So instead of splattering everywhere, the ball bounces back up. The borax is needed to help the glue and the starch stick together. This connects the two polymers into a netlike formation, keeping the ball from crumbling or becoming slime when it is bounced.

Reference: www.hometrainingtools.com

11. Magic splinter

Requirements:

Conical flask

Manganese (IV) dioxide (MnO2)

Hydrogen peroxide

Wooden splinter

Candle and matchsticks.

Procedure:

1. Place the hydrogen peroxide solution in the flask.
2. Add a small amount of manganese dioxide. Note that the solution is bubbling.
3. Light a candle.
4. Holding a wood splint with tongs, light the end of the wood splint.
5. Allow it to burn for a few seconds until you notice that the end of the wood splint is glowing red.
6. Blow out the flame. Insert the glowing end of the wood splint into the flask if sufficient oxygen has been generated, the wood splint will burst into flame.

Explanation:

This reaction is catalytic decomposition of Hydrogen peroxide.MnO_2 acts as catalyst which increases the rate of decomposition of H_2O_2 in O_2 and H_2O prepared O_2 helps to burning of the splinter.

Reference: www.stevespanglerscience.com

Caution:

6% hydrogen peroxide is caustic to the skin and eyes. Handle with care. In case of skin contact, rinse the affected areas well with water. Manganese dioxide is a strong oxidant it is assumed to be harmful if swallowed. Avoid dust. Wash hands well after handling. This reaction generates heat. Use only Pyrex-type or heat-proof containers.

12. Orange Flash

Requirements:

Orange peels

Candle

Match sticks

Procedure:

1. Peel the orange.
2. Place the candle into a holder and light it.
3. Pick up a piece of the orange peel holding it near the flame, bend the peel and squeeze it. Be sure that the outside of the peel is facing towards the flame and you should get some very nice flashes and flares from the flame.

Explanation:

The orange peel has oil glands which contain oil of orange. Orange oil is an essential oil produced by cells inside the rind of an orange fruit. It is composed of mostly

d- Limonene. This oil gives the orange a lot of its smell, but it is also quite flammable. As you bend the orange peel, the orange oil squirts into the flame, producing a nice flash.

Reference: http://practicum.melscience.com

13. Match Stick Rocket

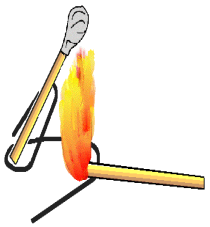
Requirements:

2 match book matches or wooden stick matches

Small Square of aluminum foil

Paper clip

Safety pin



Procedure:

1. Take one match stick and wrap a small piece of aluminum foil around the match-head tightly
2. Make a small opening in the foil wrapped around the match head by inserting the point of a safety pin and bending upward slightly.
3. Bend the paper clip to form a launch pad as shown in the diagrams. Erect the match stick rocket on the pad.
4. Make sure the pad is set up on a surface that will not be damaged by the rocket's exhaust.
5. Ignite the match by holding a second lighted match under the foil until its combustion temperature is reached.

Caution: Be sure that the matchstick rocket is pointed away from people or burnable materials. It is recommended to have water or some other fire extinguisher available. The foil head of the rocket will be very hot!

Explanation:

The match stick rocket demonstrates Isaac Newton's Laws of Motion as they relate to rocketry. Newton's third law states that for every action, there is an opposite and equal reaction. The exhaust of the fire products from the burning match (smoke and gas) is the "action" and the movement of the rocket in the other direction is the 'reaction.' The action thrust is produced when the match burns in an enclosed environment. The aluminum foil acts as a rocket combustion chamber. Because the opening in the foil is small, pressure builds up in the chamber that eventually escapes as a rapid stream of smoke and gas.

Reference: www.grc.nasa.gov

14. Water to Grape Juice to Milk

Requirement:

Saturated Barium nitrate solution

9M Sulphuric acid

Sodium bicarbonate

0.1M Sodium hydroxide solution

6M Sodium hydroxide solution

Water

6 Plastic glasses

Procedure:

1. Prepare 6 glasses.
2. Fill the first glass with water. Add a few drops of phenolphthalein solution.
3. Add a few drops of sodium hydroxide to glass 2.
4. Pour some small amount (about 1-2 ml) of sulfuric acid to glass 3.
5. Put 1 gram of baking soda to glass 4. Add a few milliliters of water and mix it carefully.
6. Pour about 7-9 ml of saturated barium nitrate solution to glass 5.
7. Pour 5-6 ml of concentrated sodium hydroxide solution to glass 6.
8. Starting with the first glass pour the liquid in each glass to the next in turn
9. The color and state of solutions will change from resembling water to grape juice, lemonade, 7-up, milk and Pepto-Bismol

Explanation:

Phenolphthalein indicator solution is an acid–base indicator that remains colorless in an acid solution but turns from colorless to pink at about pH of 9, having a distinct pink color in a basic solution. The following is a summary of what is occurring in each glass.

Glass 1: Phenolphthalein + Water → Colorless solution

Glass 2: Phenolphthalein + Base → Pink solution

Glass 3: Phenolphthalein + Acid → Colorless solution

Glass 4: $HCO_3^-(aq) \rightarrow CO_3^{2-}(aq) + H^+(aq) \rightarrow CO_2(g) + H_2O(l)$

Fizzing Glass 5: $Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(s)$ *White precipitate*

Glass 6: Phenolphthalein + Base → Pink and cloudy

Reference: www.flinnsci.com

15. The Chemical Volcano

Requirements:

Ammonium dichromate,
Potassium permanganate,
Glycerol,
Sodium bicarbonate,
Vinegar,
Red food colour.
Spray bottle,
Dropper,
Spatulas.
A pile of sand to resemble a mountain,

Procedure:

1. Make a pile of sand to resemble a mountain, with a cavity at the top.
2. Fit a stand with a flat surface into the cavity. The flat surface should be made up of material that is able to withstand the heat of reactions. The stand should be fitted in such a Manner that some space should remain between the cavity and the stand.
3. Add enough sodium bicarbonate in the space available in the cavity after fitting the stand.
4. Place enough ammonium dichromate on the stand (towards the edges of the flat surface).
5. Inside the ammonium dichromate layer, put a spatula full of potassium permanganate powder.
6. Put 3-4 drops of glycerol on the potassium permanganate pile.
7. When the reaction between potassium permanganate and glycerol is about to begin, spray coloured vinegar from the spray bottle on sodium bicarbonate layer.

Explanation:

Using acid-base reaction and two oxidation-reduction reactions, it is possible to get an effect similar to a volcano. The current experiment uses exothermic decomposition of ammonium dichromate {$(NH_4)_2CrO_7$)} which is triggered by the potassium permanganate-glycerol reaction. The acid-base reaction between sodium bicarbonate and vinegar is also used in the experiment

Reference:

Chemical Demonstrations: A source book for Teacher's vol 1; LeeR. Summerlin and J. Ealy, Jr. pp 122.Classic Chemistry Demonstrations: Page No 69-70 and 136-138.

16. Dancing Spaghetti

Requirement:

Large Transparent Glass

Baking Soda

Pieces of spaghetti

Vinegar

Procedure:

1. Fill up the glass with water.
2. Add sufficient amount of baking soda.
3. Put some broken pieces of spaghetti in the glass
4. Slowly add vinegar, until the spaghetti begins to dance.

Explanation:

Uncooked spaghetti placed in a large glass constantly rise to the top and then slowly sink to the bottom. Addition of vinegar, which reacts with baking soda, produces carbon dioxide gas. The gas bubbles get attached to the spaghetti, and carry it to the top. Release of the attached gas bubbles at the surface of solution makes spaghetti to falls down.

Reference:

Chemical Demonstrations: A source book for Teacher's vol 2; Lee R. Summerlin, C. Borgford, J.B. Ealy. Page no 35.

17. Fireflies

Requirement:

Conical Flask

Rubber Cork

Spatula

Burner

Ammonia Solution

Ammonium Dichromate (Solid)

Procedure:

1. Pour 10 mol of aq. Ammonia solution in to a conical flask and cork the bottle to saturate the ammonia vapors in a conical flask.
2. Take some amount of Ammonium Dichromate solid in spatula
3. Heat the spatula containing Ammonium Dichromate solid on the flame of a Burner containing low flame
4. Then hold the above spatula in presence of ammonia vapors which is present in previously saturates conical flask.

Reactions: $NH_4OH \rightarrow NH_3 + H_2O$ **and** $4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$

Explanation:

When ammonium dichromate is burn in presence of Oxygen it forms Chromium Oxide Cr_2O_3 . Chromium (III) oxide is a catalyst. It speeds-up the reaction between ammonia and oxygen.The heat of the oxidation reaction occurring on the surface of chromic oxide particles is sufficient to keep particles of the catalyst glowing bright red.

Reference: www.faceofchemistry.com

18. Mentos – Soda Volcano

Requirement:

Mentos candies

Diet soda bottle

Narrow test tube

Procedure:

1. Keep the diet soda bottle on the flat surface
2. Open the bottle and drop the mentos candies in it
3. Stand back and watch it.

Explanation:

When the mentos candy is dropped into the carbonated soda, which is filled with carbon dioxide gas, the gelatin and gum arabic from the dissolving candy create an energy that breaks the surface tension of the soda. The pits around the surface of the candy act as nucleation sites, which are conduits for carbon dioxide bubbles to form. Once the mentos hit the soda, bubbles immediately begin to form on their surface. When the candy hits the bottom of the bottle, the gas is released and pushes all the soda from the bottle up in the air in an amazing eruption!

Reference: www.weatherkidz.com

19. Colorful electrolysis

Requirement:

U-shaped test tube

clamp stand

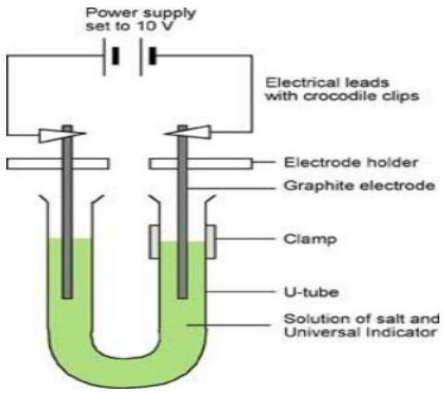
Carbon electrodes and electrode holders

100 mL Beaker

Sodium chloride (salt)

Universal Indicator

Distilled water



Procedure:

1. Put about 75 cm^3 distilled water into the beaker.
2. Add 2 tb sp sodium chloride and stir till it dissolves.
3. Add enough indicator to give the water a reasonable depth of green color.
4. Pour colored salt solution into the U-shaped test tube and clamp it as shown in the diagram.
5. Wash the carbon electrodes carefully with distilled water and then fix them so that there is about 3 cm of electrode in each side of the tube
6. Attach leads and connect to a power pack set to 10 V.
7. Turn on the power pack and observe closely what happens. A piece of white paper held behind the U-tube can help. Make sure the U-tube is kept very still during the experiment.
8. Turn off the power as soon as you notice any change at the positive electrode.

Explanation:

At the positive electrode, the indicator turns red initially, and is then bleached to colorless. This indicates the presence of chlorine. At the negative electrode the indicator turns purple. The remainder of the solution stays green.

The product at the negative electrode is hydrogen. Some of the water will ionize, that is, turn to hydrogen (H^+) and hydroxide (OH^-) ions. When the sodium chloride is dissolved in water, the ions forming the ionic solid separate out. This means that there are actually 4 ions present in the solution: H^+, OH^-, Na^+ and Cl^-.

The negative ions are attracted to the positive electrode. The chloride ions are discharged (giving chlorine) in preference to the hydroxide ions. These are left behind in solution.

At the negative electrode, the hydrogen ions are discharged (producing hydrogen gas) in preference to the sodium ions. These are also left behind in solution. Thus sodium hydroxide solution remains. This is the cause of the purple color of the indicator at the negative electrode.

In time, the green color of the indicator in the middle would change too, as the ions diffuse through the resulting solution.

Equations:

$2H^+ + 2e^- \rightarrow H_2$ [negative electrode, cathode]

$2Cl^- \rightarrow Cl_2 + 2e^-$ [positive electrode, anode]

$H_2O \rightarrow H^+ + OH^-$

Reference: www.rsc.org

20. Chalk Chromatography.

chemisty.about.com

Requirement:

Ink, dye or food coloring

White chalk

Rubbing alcohol- isopropyl alcohol

Plastic wrap

Procedure:

1. Make a band of color with ink, dye or food coloring around chalk, about one centimeter from end.
2. Pour about half centimeter of rubbing alcohol in the cup so that the level of alcohol is below the band of your chalk.
3. Place the chalk carefully inside the cup with the color band side closet to the alcohol. Cover the cup with plastic wrap
4. After separation of colors. Allow it to dry.

Explanation:

Scientists have developed ways to separate mixtures into pure substances. Chromatography means color writing. It is one way in which mixtures can be separated. The iso propyl alcohol will move up the chalk by surface tension. As the alcohol moves up the chalk, it picks up the ink pigments as it travels. In this experiment the separation occurs because the different colors of the ink have different weights and sizes, therefore, some will travel further up the chalk than others

Reference: www.chymist.com

21. Elephants tooth paste

Requirement:

A clean plastic soda bottle

20 volume hydrogen peroxide

1 tb spoon dry yeast

Liquid dish washing soap

Warm water

Small cup

Youtube.com

Procedure:

1. Carefully pour hydrogen peroxide to a clean plastic soda bottle.
2. To this add one table spoon of dish washing soap
3. In another cup combine warm water and yeast together
4. Pour this to a soda bottle and observe foam.

Explanation:

In this experiment, the yeast works as a catalyst to release the oxygen molecule from the hydrogen peroxide. Oxygen filled bubbles, which make up the foam are actually the remainder of what happens when the hydrogen peroxide breaks down into water H_2O and O_2

The bottle will feel warm to the touch because this is an exothermic reaction in which energy, in the form of heat, is given off.

Reference: http://sciencebob.com

22. Secret message with invisible ink

Requirement:

One half of a lemon One half teaspoon of water
Small bowl
Spoon
White paper
Q-tips
A lamp with a light bulb that puts off a lot of heat

howtomakeinvisibleink.com

Procedure:

1. Soak the Q tip in the lemon juice and water solution.
2. Use the damp Q-tip to write your top secret message on the piece of paper.
3. Wait a few minutes for the paper to dry
4. When the paper is dry, hold it up to the hot lamp for few minutes.

Explanation:

Lemon juice and the juice of most fruits contain carbon compounds. These compounds are Colorless at room temperature but on heat, this compound breaks down releasing carbon. If A carbon comes in contact with air, a process called oxidation occurs, and the substance turns light or dark brown.

Reference:

www.scientificamerican.com