EXPERIMENT 489—How to make envelope or postage stamp mucilage

Put five measures of sugar, two measures of gum arabic and two measures of starch in a test tube one-half full of water. Shake the contents of the tube and allow the tube to stand for five or six hours. Then heat the contents of the tube to boiling and allow the tube to cool. With a soft brush paint some of this mucilage on a piece of paper and allow it to dry. Now when moistened with water you will be able to stick the paper to any surface. Postage stamp and envelope mucilage is made similar to this. In order to keep this mucilage from going bad, a drop or two of some preservative, such as oil of sassafras or wintergreen, must be added.

EXPERIMENT 490—A common household adhesive paste

Make a starch paste by shaking 12 measures of powdered starch in a test tube one-fourth full of water. Stir a little with a stirring rod if necessary. Now to this paste add half a test tube full of boiling water containing three measures of calcium chloride. Pour this solution into the test tube containing the starch paste and heat the contents of the test tube to boiling. Allow the test tube to cool. This gives a paste which is very good for ordinary household use, such as pasting on labels.

EXPERIMENT 491—Another household adhesive paste

Another practical adhesive paste can be made from wheat flour, water and calcium chloride.

Put eight measures of ordinary wheat flour and two measures of calcium chloride in a test tube one-half full of water. Heat the test tube over a flame and boil the contents of the tube until it becomes thick and pasty. Then stop heating and allow the test tube to cool.

In order to keep the pastes prepared in the last two experiments for any length of time one or two drops of a preservative, such as oil of sassafras or wintergreen oil must be added.

EXPERIMENT 492—Labels for your bottles

Cut small pieces of adhesive tape from the roll and stick on the bottles. Then write the name of the chemicals or the formula on the tape with a pen and ink and varnish the label. However, you can purchase gummed labels at your local drug store quite cheaply. LABEL *ALL* POISON BOTTLES WITH *POISON!*

INK

Most of the common black inks are made from nut galls and ferrous (iron) sulphate. The nut-galls are rich in tannic acid and this with ferrous sulphate gives a black precipitate. Colloidal or jelly-like substances, such as gum arabic or dextrin are sometimes added, as these substances delay the precipitation, although the very black color is produced at once. Some preservative is usually added to prevent the ink from moulding.

Today very good black inks are made from derivatives of the organic compound aniline. Aniline is a compound obtained indirectly from coal tar.

Much time has been devoted to finding an ink that would be permanent and resist all attempts to remove it from paper. Most inks can be erased from paper without much difficulty. Printer's ink, however, which is made from lampblack has been found to be the most permanent, as the finely divided carbon which is held firmly within the pores of the paper is insoluble in all liquid solvents so that it cannot be removed by washing. It is also very difficult to erase it without destroying the paper.

Silver nitrate, when in contact with an oxidizable material such as cloth, is reduced in the presence of light to black metallic silver. Because of this fact it is used in the manufacture of indelible inks.

Quite often it is desirous of making several copies from a single document. In order to do this an exact copy of the document is made on heavy paper, using copying ink. The desired copies are then made by using very thin unsized paper and placing them on the copy prepared with copying ink. Pressure is then applied to the copies so that the inks penetrate through the duplicates. It is possible by this method to prepare as many as half a dozen duplicate copies at one time from the original copy.

EXPERIMENT 493—How to make black writing ink

Dissolve one measure of tannic acid in a test tube one-third full of water. Then in another test tube one-third full of water dissolve one measure of ferric ammonium sulphate. Now mix the two solutions and notice the intense dark black color formed by the reaction of the two substances. The black color and precipitate is due to the formation of iron tannate. Try writing with this ink, using a clean pen.

If you wish to make up a bottle of black ink to use permanently proceed as follows: Dissolve four measures of tannic acid in a test tube three-quarters full of water. Pour this solution into a glass containing six test tubes full of water. In another test tube three-quarters full of water dissolve four measures of ferric ammonium sulphate and one measure of gum arabic. Heat the test tube in order to dissolve these substances. Then pour the contents of this tube into the glass and stir well with a stirring rod. Add one or two drops of oil of wintergreen to keep the ink from moulding and pour the ink into a bottle. This will give a black writing ink that can be used from time to time.

EXPERIMENT 494—How to make blue ink

Prussian blue ink may be made by dissolving two measures of ferric ammonium sulphate in a test tube one-third full of water and adding this solution to a solution of sodium ferrocyanide made by dissolving two measures of sodium ferrocyanide in a test tube one-quarter full of water. The blue precipitate formed in the reaction is a compound of ferro-ferricyanide. Write with the ink.

EXPERIMENT 495—How to make purple ink

Put three measures of logwood into a test tube one-third full of water and boil for several minutes until the solution is deeply colored. Then add 1 measure of aluminum sulphate and heat to boiling again. Notice the beautiful dark colored purple ink which is formed. Write with the ink, using a clean pen. By repeating this experiment and adding one measure of sodium bisulphate in addition to the other compounds, it is possible to make a red ink. Write with an ink made in this way, using a clean pen.

EXPERIMENT 496—How to make carmine ink

Put two measures of cochineal in a test tube one-third full of water and boil for several minutes until the solution is deeply colored. Cool the solution and, using a clean pen, write with it. Notice that this gives a crimson or purplish-red ink. This color is due to carminic acid occurring in cochineal.

EXPERIMENT 497—How to make a green ink

Put two measures of nickel ammonium sulphate and one measure of sodium ferrocyanide in a test tube one-third full of water and shake well. Now add one-half measure of ferric ammonium sulphate and shake well again. Notice the formation of a deep green color and precipitate. Write with this solution, using a clean pen.

EXPERIMENT 498—How to make a commercial blue-black ink

Put one measure of ferric ammonium sulphate and one measure of tannic acid into a test tube one-third full of water and shake well. In another test tube one-quarter full of water add one measure of sodium ferrocyanide and one measure of ferric ammonium sulphate and shake thoroughly. Mix the two solutions and notice the bluish-black ink produced. Write with this ink, using a clean pen. Notice that the writing is blue. After two or three days the writing will turn black.

EXPERIMENT 499—How to make printer's ink

Put a spoonful of water glass (sodium silicate) in a test tube and add two measures of powdered charcoal or, better, lampblack. By means of the stirring rod, stir the mixture until it is quite uniform. Then fill the test tube one-third full of water and shake thoroughly.

Now add one measure of ferric ammonium sulphate and one measure of tannic acid. Shake thoroughly for several minutes and notice the heavy dark black liquid produced. Printer's ink is made similar to this. Writing done with this ink will last for a long time and is very difficult to remove. This is because the charcoal or lampblack gets into the pores of the paper, where it is held fast.

EXPERIMENT 500—A commercial ink powder

Mix together on a sheet of paper three measures of tannic acid, six measures of ferric ammonium sulphate, and six measures of sodium ferrocyanide. Place this mixture in a small dry bottle and whenever you wish to make a good blue-black ink add water to the bottle and shake thoroughly.

EXPERIMENT 501—A red ink powder

Crush into the form of a powder a little cochineal by grinding it in the mortar and put five or six measures of the powder into a small dry bottle. Whenever you wish red ink simply add water to the bottle and shake thoroughly for several minutes.

EXPERIMENT 502—An ink remover

Dissolve one measure of tartaric acid and one measure of calcium hypochlorite (bleaching powder) in a test tube one-third full of water.

By means of a small camel's hair brush, paint the ink to be removed with some of the solution just prepared and notice that the ink disappears. The bleaching powder and tartaric acid react to form chlorine gas, which in the presence of water bleaches the ink or makes it colorless. Not all inks can be bleached in this manner. Prussian blue for example is not affected by this solution.

EXPERIMENT 503—Ink powder

Mix together one measure of tannic acid and one measure of ferric ammonium sulphate. Place the powder thus formed in a small bottle, and when you need ink simply add some of this powder to a little water.

EXPERIMENT 504—Blue ink powder

Blue ink powder may be made by mixing together two measures of sodium ferrocyanide and one measure of ferric ammonium sulphate. When this powder is mixed with water you have blue ink all ready to write with.

EXPERIMENT 505—Red ink powder

Put two or three measures of cochineal in your mortar and grind the material up to a very fine powder. When this powder is mixed with water it will make red ink. Ink powders are sometimes very convenient to use.

EXPERIMENT 506—How to make carbon paper

Obtain a cake of Ivory soap and by scraping the soap with a knife, make a pile of fine soap shavings. Put 15 measures of the soap shavings in a glass or cup. In a test tube one-third full of water, put one measure of sodium ferrocyanide and one measure of ferric ammonium sulphate and shake thoroughly until the solids are all dissolved. Pour this blue solution into the glass or cup with the soap shavings and stir thoroughly for five minutes until the mixture forms a smooth thick paste.

Now using a small brush or piece of absorbent cotton spread this paste smoothly over a piece of paper. Set the paper away to dry for a day and then use it like you would ordinary carbon paper.

EXPERIMENT 507—How to make blue typewriter ribbon

Obtain a quantity of soap shavings by scraping a piece of Ivory soap with a knife. Put 15 measures of these shavings in a glass or cup and add four or five drops of glycerine.

Now dissolve one measure of ferric ammonium sulphate and one measure of sodium ferrocyanide in a test tube one-half full of water. Shake this solution well so that the solids will be entirely dissolved and then pour it into the glass or cup containing the soap shavings and glycerine. Stir this mixture with your stirring rod until it forms a smooth paste.

Now get a piece of cloth or tape about the width and thickness of a typewriter ribbon and apply the paste which you have made evenly to the cloth or tape. Now hang the tape up to dry for half an hour or so and then roll it up into a roll just like a typewriter ribbon. In order to use it on a typewriter you will of course have to roll it on to an empty spool of the same kind used on your typewriter.

EXPERIMENT 508—A finger print record

Prepare some blue ink as in the experiment "Blue Ink." Paint the thumb or finger with this blue solution. Do not get too much solution on the finger, but just cover it thinly. Now press the finger against a clean sheet of white paper being careful not to smear, and there you have your finger print. An album can be made by taking the finger prints of all your friends and marking them. Wash your hands after taking your finger print.

EXPERIMENT 509—Detecting finger prints

Obtain a smooth piece of white paper, breathe on one of your fingers a few times and press it on the paper. Prepare a mixture of one measure of sulphur and one measure of powdered charcoal. Put this mixture on the paper which you have touched with your finger and tap the underneath side of the paper gently so that the powder will be spread over the part of the paper where you have pressed your finger. Shake the excess powder off the paper and you will find that the finger prints instead of being invisible are now plainly seen.

EXPERIMENT 510—Blue Ink

Dissolve two measures of sodium ferrocyanide in a test tube one-quarter full of water. In another test tube dissolve one measure of ferric ammonium sulphate. Pour the second solution into the first. Prussian blue will be formed. Try to write with the ink. Prussian blue is used in laundry blueing.

EXPERIMENT 511—Violet ink

Put two measures of logwood in a test tube one-quarter full of water. Warm to extract color and then add one-half measure of aluminum sulphate to the hot solution.

EXPERIMENT 512—Lemon ink

Dip your pen into a container of lemon juice and write as if with regular ink. Upon heating the paper, your writing will become visible.

EXPERIMENT 513—Red ink

Put two measures of logwood in a test tube and fill tube one-quarter full of water. Warm to extract color and add one-half measure of aluminum sulphate and one-half measure of sodium bisulphate.

EXPERIMENT 514—Safety ink

Put one spoonful of water glass in a mortar or cup and stir in one measure of powdered charcoal. Stir for some time to properly mix. Keep bottled up in a tight stoppered bottle if it is desired to keep for any length of time. Writing done with this ink is very hard to remove.

EXPERIMENT 515—Copying ink

Place in a test tube one measure of sodium ferrocyanide and one-half measure of ferric ammonium sulphate. Fill test tube one-quarter full of water and shake to dissolve salts. Blue ink is formed.

Now add to this 10 drops of glycerine. Shake. Write on paper with this mixture making your letters very large. Lay the copy on a flat surface and spread over it a piece of soft tissue paper and then a piece of damp blotting paper and over the blotting paper place a board. Press down on the board and then remove the board and blotting paper and see if you have produced a readable copy. The copying ink should have penetrated through the tissue paper so that writing will appear on reverse side.

EXPERIMENT 516—Making a camphor ball float

Fill a wide mouth bottle with vinegar and drop some camphor balls into the vinegar and sodium bicarbonate. Carbon dioxide will be generated and little bubbles of gas will collect on the camphor balls. Soon the camphor balls will become "lighter" and will float to the top of the vinegar and sink again. This process is repeated several times.

EXPERIMENT 517—Formation of lead iodide

In a convenient sized test tube place two spoonfuls of water and add six drops of sodium iodide solution. In another test tube place about one measure of lead nitrate or lead acetate obtainable at any drug store and dissolve by adding about one test tube of water. Now pour the lead nitrate solution into the sodium iodide solution. A heavy bright yellow precipitate of lead iodide will form. Now heat until it begins to boil, then set aside to cool. On cooling watch closely what happens. Most of the lead iodide will have settled to the bottom, but there also appears above it, numerous little scales or specks of all colors,—some golden, some silver, blue, green, red, pink, orange, and violet which sparkle beautifully. The lead iodide, which by this time has all settled to the bottom of the test tube, leaves the most beautiful colored specks in the almost clear liquid above it. Its beauty cannot be very easily described but soon the beautiful specks settle to the bottom of the test tube leaving only a few lingering above them. Even at the bottom they produce a striking effect. It is very interesting to watch the colored particles.

EXPERIMENT 518—Magic transfer solution

This solution transfers pictures to cloth, paper dishes, etc., in their original color. The solution is made as follows: common castile soap, half bar; turpentine, quarter pint; water, half gallon. Dissolve the soap in the water and then add the turpentine. To use, apply with a small brush to any printed paper or picture and then lay a clean

paper or cloth over the picture and rub quite hard with the back of a spoon. To transfer to glass or to dishes use white varnish and do the same as above. You can make up a few bottles of this solution and sell some to your friends at school.

EXPERIMENT 519—Partition solubility of iodine

To a half test tube of water add about ten drops of tincture of iodine (this you will find in the medicine closet.) The solution in the test tube will be of a reddish-brown color. Add to this an eighth test tube of carbon tetrachloride. The carbona will sink to the bottom. Shake the test tube and then let the carbon tetrachloride layer settle to the bottom of the tube. The bottom layer will be of a rich violet color.

Reaction: Tincture of iodine is a solution of iodine and potassium iodide in water and alcohol. When carbon tetrachloride is added, it dissolves the free iodine. The carbon tetrachloride settles to the bottom of the test tube because it is heavier than the water and it is not miscible with water.

FERMENTATION

Fermentation is the decomposition or breaking down of complex organic compounds into simpler substances by certain living organisms called ferments. There are many different kinds of fermentation depending upon the different kinds of organisms or ferments. The most familiar illustration of fermentation is the fermentation of fruits or fruit juices, the decay of vegetable matter or nitrogenous matter, the souring of cider or of milk and that taking place in bread making by action of yeast. Most organic substances, especially the complex substances, are subject to fermentation changes. The chemical changes brought about by ferments consist in the breaking down of complex molecules to form simple groups of atoms. In some cases it consists in a rearrangement of the atoms in the molecule to form a compound with different properties. There are many kinds of living organisms or ferments, each of which produces its special change. Most ferments are microscopic plants of simple structure which multiply very rapidly when placed in the proper medium or substance. They are variously known as microbes, germs and bacteria. Yeast which is used so commonly in bread making is a microscopic plant found in the air and about certain fruit trees. The yeast cakes which you buy in the store are these same living organisms which have been grown in some suitable culture medium as the potato or corn meal. The above class of ferments are known as organized ferments. The other class of ferments are called chemical or unorganized ferments and are known as enzymes. Examples of these are pepsin, trypsin and diastase.

The action of ferments on organic substances always works best at definite temperatures. Above these temperatures the ferments or organisms are destroyed or their action delayed.

EXPERIMENT 520—Changing sugar into carbon dioxide

Put two spoonfuls of corn syrup or molasses in a tumbler half full of water and stir it up. Then dissolve one-quarter of a cake of yeast in a small tea cup full of luke warm water. This is best done by allowing the yeast to stand in the water for about a half hour and then stirring. Now pour the solution of yeast into the tumbler containing the syrup and set the tumbler aside in a warm place for several hours. Notice that after some time a reaction is taking place, small bubbles of gas being given off.

Hold a lighted match over the surface of the liquid in the tumbler and notice that it goes out, due to the carbon dioxide gas which is given off. The syrup or molasses contains a large amount of sugar and during the fermentation produced by the yeast this sugar is changed into carbon dioxide gas.

EXPERIMENT 521—Changing starch into sugar and carbon dioxide

Put a half teaspoonful of starch in a tea cup and add a spoonful of water. Stir the starch in the water until it is in the form of a paste and then fill the teacup three-quarters full of boiling water and stir for a few moments. Now dissolve one-quarter of a cake of yeast in a teacup one-quarter full of luke warm water and put this solution into a teacup containing the starch. Set the teacup away in a warm place and examine it carefully from time to time. Notice the formation of bubbles of gas, due to the liberation of carbon dioxide gas. It will require several days before the starch will be converted into sugar and carbon dioxide.

This illustrates the way starchy foods are converted in the body into sugars which, in turn, are burned up through the process of assimilation into carbon dioxide and water.

EXPERIMENT 522—The formation of mould

Mould is another form of ferment. You have probably noticed the formation of mould on such substances as sour milk, vinegar and starch which have been exposed to the air for some time. These substances contain the proper food material for certain bacteria in the air. As a result these bacteria, under proper condition of heat get into these substances and multiply very rapidly, producing the mould.

Prepare a starch solution as follows: Put a half spoonful of starch in a tea cup and add one spoonful of water. Stir until the starch forms a paste with the water. Then fill the cup with boiling water and stir until the starch forms a very gelatinous paste. It may be necessary to boil this mixture in a tin cup or pan for a few minutes to form a heavy paste.

Now set the starch solution aside in a warm place for a few days and notice after some time the formation of mould on the surface of the starch.

EXPERIMENT 523—Growth of mould

Place one-half teaspoonful of ordinary starch in a small pan and add to this a small amount of water. Stir to form a perfect paste and then add about one-third of a cup of boiling water. Set the pan on a stove and continue to boil until a perfect paste is formed. This paste is now bacteria free. Finally pour the paste into an ordinary tumbler and set it away in a warm place. It will soon become infected with bacteria from the air. Examine it from time to time and notice when mould begins to form. After some mould has formed examine its appearance under a microscope.

EXPERIMENT 524—Composition of mould

Carefully remove some mould from the surface of the starch mixture and test it for sugar, starch, protein and ammonia.

EXPERIMENT 525—Sugar fermentation

Dissolve one spoonful of ordinary sugar in about one-half cup of water, using an ordinary tumbler for the experiment. Place in the sugar solution a small piece of yeast, which has first been masticated with water to form a paste and set aside in a warm place to stand. Notice what happens after a few hours. Test the gas that is generated. Will it burn? Will it dissolve in water, in sodium hydroxide solution?

EXPERIMENT 526—Fermentation of corn syrup

Apply the previous experiment using commercial corn syrup or ordinary molasses.

EXPERIMENT 527—Making vinegar

Take about one cup of freshly made sweet cider and add to this two or three drops of strong vinegar. Place the mixture in an ordinary tumbler and set aside, after covering with a plate or piece of cardboard to keep the dust out. At the end of

each day taste a little of the cider. You will notice that it becomes more sour daily, and that finally it will have become unfit for drinking and has turned into vinegar. This is a well-known case of fermentation brought about by means of a bacterial organism. The sweetness of the original cider is due to the presence of sugar. By the prolonged action of a special low form of organic life the sugar is transformed into acetic acid. Test your original cider and the final fermented product with a blue litmus paper.

EXPERIMENT 528—Souring of milk

Take a tumbler of sweet milk and set it in a warm place where you can watch it. Observe the changes that take place day by day. The milk will become infected with bacteria and undergo fermentation with formation of lactic acid. This organic acid is formed from the milk sugar in the fresh milk. The lactic acid causes the milk to curdle.

EXPERIMENT 529—Artificial butter

Oleomargarine is an artificial butter made from cotton seed oil and other vegetable oils. It is a wholesome food product and is not necessarily inferior to real butter made from cows' milk. Renovated butter is a process butter made from rancid butter by a chemical process.

EXPERIMENT 530—Testing butter

Place a small lump of pure butter in a silver spoon and heat over your alcohol lamp. Good fresh butter will melt and boil over, producing at the same time some foam. If it is an oleomargarine preparation it will sputter and crackle, giving a sound like that of a burning green stick.

EXPERIMENT 531—Testing butter

Heat a small pan of sweet milk to boiling. When hot add a teaspoonful of butter to be tested and stir until melted. Now pour into a tumbler and cool while stirring. The added butter will solidify when the milk is cooled to ice temperature.

EXPERIMENT 532—Testing butter

Repeat the preceding experiment using a sample of artificial butter. When the milk sample is cooled the renovated sample will solidify in a granular condition and be distributed through the milk in small particles. Oleomargarine will solidify to one cake and may be lifted from the milk with a spoon or stirring rod.

EXPERIMENT 533—Milk and the common cold

Fresh pure milk is a perfect food and contains necessary vitamins for promoting growth. Faithful use of this food will aid in protection against the common cold. The true cause of a cold is not known but it is known that a diet high in vitamin A shortens a cold's duration and lessens its severity. Therefore, eat foods rich in this vitamin. Some of these are the following: milk, butter fat, cream, cheese, eggs, liver, cod-liver oil, fish-liver oils, red salmon, green and yellow vegetables, fruits, tomatoes and olives.

EXPERIMENT 534—Changing cider into vinegar

Put two or three drops of vinegar in a glass full of cider and stir a few times with a stirring rod. Taste a little of this mixture and notice that it still has the characteristic cider taste. Now set it aside in a moderately warm place for a few days and again taste a little of the cider. After several days you will notice that the cider has a very decided vinegar taste, having fermented into vinegar.

The small amount of vinegar which you added furnished the necessary organisms or ferments which started the fermentation of the cider into vinegar.

EXPERIMENT 535—The souring of milk

Set a half glass of milk aside in a warm place for several days and notice that the milk soon curdles or precipitates out and a mould forms on the surface of the milk. This is another illustration of fermentation taking place with the formation of mould.

ESSENTIAL OILS AND PERFUMES

The use of perfumes dates back as early at 2000 years ago. For instance, in ancient India the sacred fires in the temples were perfumed with kusa or kus, the fragrant root of a native grass. This odor is a constituent of many of the present popular perfumes as in the azurea bouquet perfumes. In the early days of China and Egypt perfumes were used in the form of incense and even today the Chinese still burn large quantities of this material as a perfume. All the ancient perfumery materials consisted of crude drugs, flowers, herbs, aromatic gums, resins and woods of the Orient, also many of the fragrant flowers which are used in making some perfumes today. Perfumes are extracted from the crude materials, such as flowers, herbs, etc., in three different ways. First, by treating the finely ground material with oil or fats in which the perfume is soluble. Second, by steam distilling the crude materials during which process the perfume passes over with the steam. Third, by extracting or treating the finely ground materials with volatile solvents such as petroleum ether, carbon tetrachloride or chloroform. The last process or treating the crude materials with a volatile solvent is the one most commonly used now.

For many years chemists throughout the world have been devoting much research to the synthesis or building up of these natural occurring perfumes until today a new industry has been made possible, the industry of synthetic perfumes and flavoring materials. These materials can be made commercially at a much lower cost than when they are extracted from the natural occurring substances. Besides this a great many chemical substances have been found which have most delightful odors and flavors and which at the present time do not exist in nature as such. The synthetic materials of today are successfully utilized in goods of the highest grade and many odor and flavor effects would be impossible without them.

Let us try making some sweet smelling oils and perfumes from flowers, fruits and spices.

EXPERIMENT 536—Making rose water

Fill an iron or tin vessel half full of rose petals and add enough water to cover the petals. Now place the vessel on the stove and, when the water starts to boil, cover the vessel with a piece of absorbent cloth. When the cloth is wet with water from the condensed steam, remove it and squeeze out the water into a cup. Repeat this operation five or six times and then discontinue the boiling. Smell the water in the cup and notice that it has the sweet odor of the rose.

The rose oil which was originally in the petals volatilized, that is, passed off with the steam and condensed in the cloth along with the water. This is the way oil of rose was made in the very early times. Today rose water is obtained by steam distillation in a little different manner.

EXPERIMENT 537—Making geranium water

Prepare geranium water the same way as you prepared rose water in the preceding experiment, using the leaves and flowers of the geranium plant in place of the rose petals. Notice this time that you have a liquid which has the characteristic geranium odor.

EXPERIMENT 538—Making lilac water

Repeat Experiment 537, using lilac flowers in place of rose petals. Notice this time that the liquid obtained has the characteristic lilac odor.

EXPERIMENT 539—Making violet water

You can make violet water the same way as you made rose water in Experiment 536 by using violet petals in place of the rose petals. Notice that the liquid obtained has the characteristic violet odor.

EXPERIMENT 540—How to make sachet powder

Mix together in a mortar one teaspoonful of cloves, one teaspoonful of cinnamon, one teaspoonful of allspice and half a teaspoonful of vanilla extract. Now obtain a cupful of dry geranium or sage leaves and grind them up into a powder by means of the pestle.

Mix the ground geranium or sage leaves with the mixture of cloves, cinnamon, allspice and vanilla extract and place the powder thus formed in a jar with a cover. Notice the fragrant odor produced from this powder. You can vary the odor of this powder somewhat by using the dried petals of different flowers.

EXPERIMENT 541—How to make incense

Place together in a mortar four measures of cinnamon, three measures of allspice and five measures of cloves. Grind this mixture by means of a pestle.

Now pour this mixture on a sheet of paper and mix it with eight measures of potassium nitrate. Do not grind this mixture.

Heat a little of this mixture in a spoon over a flame and notice the fragrant odor given off which resembles that of burning incense.

EXPERIMENT 542—How to make wintergreen extract

Place some wintergreen berries in a mortar and grind them up by means of a pestle. Pour the oil obtained into a test tube and notice the fragrant odor. Taste a little of the oil and satisfy yourself that it is oil of wintergreen.

EXPERIMENT 543—How to make lemon extract

Remove the skin from a lemon by means of a sharp knife and grind it up in a mortar the same way as you did in the preceding experiment. Pour the oil into a test tube and notice the fragrant odor. Taste a little of the oil.

EXPERIMENT 544—How to make orange extract

Remove the skin from an orange, using a sharp knife, and grind it up the same as in Experiment 543. Notice the fragrant odor. Taste a little of this oil.

EXPERIMENT 545—Potpourri sachet

Mix together in a mortar the following spices or any of them which you can obtain: Half a teaspoonful of cloves, half a teaspoonful of allspice, half a teaspoonful of cinnamon and about half a teaspoonful of extract of vanilla. Grind these materials together until they are thoroughly mixed.

Now obtain about a quart of dried rose petals and mix this spice which you have just prepared with the rose petals. When it is thoroughly mixed you will find that it gives a very sweet, pleasant odor, and it can be used in sachets or put in jars, thus making rose jars. Whenever the cover is removed from these jars the sweet odor will fill the room.

EXPERIMENT 546—Sage

One of our common plants which has a very sweet odor is the sage. The leaves of this plant when dried retain their odor for a long time, and they can be used to good advantage in sachets and other places where a sweet smell is desired.

COLLECTED FROM THE MAILBAG

Experiments with Flowers

EXPERIMENT 547—Action of ammonia on a violet

Use a pint fruit jar with a tight cover and place in the bottom of the jar a mixture of ammonium chloride and calcium oxide to which several drops of water have just been added. Ammonia will be generated. Now attach the violet to a string or silk thread and suspend it in the fruit jar and replace the cover. Note the change of color in the violet as it remains exposed to the ammonia gas.

EXPERIMENT 548—

Repeat experiment 547 suspending different pansy blossoms in ammonia vapor.

EXPERIMENT 549—

Ammonia gas and a red rose.

EXPERIMENT 550—

Ammonia gas and a pink rose.

EXPERIMENT 551—

Ammonia gas and a red tulip.

EXPERIMENT 552—

Ammonia gas and petunias of different colors.

EXPERIMENT 553—

Ammonia gas and red geraniums

EXPERIMENT 554—

Ammonia gas and red carnations.

PRACTICAL CHEMISTRY

EXPERIMENT 555—Heat by chemical reaction

Place six measures of crystalline sodium acetate which is obtainable at your drug store in the bottom of a test tube. Heat the tube over your alcohol lamp and the sodium acetate will melt in its water of crystallization to form a liquid. Cool, after suspending a crystal of sodium acetate in the liquid. Crystallization will set in with evolution of heat. Suspend a thermometer in the crystallizing fluid and note the rise in temperature.

EXPERIMENT 556—Freezing with chemicals

Place a glass upon a wooden block and pour water around the glass so that it stands in water. Fill the glass about three-quarters full of water and add one teaspoonful of ammonium sulphocyanide or ammonium nitrate and stir. The glass will soon become frozen in the block.

EXPERIMENT 557—Glycerine-litharge cement

Litharge (lead monoxide) which is obtainable in any drug store, is mixed with glycerine in various proportions depending on the use to be made of the cement. If a slow setting cement is desired use pure glycerine. If a quick setting cement is desired, dilute the glycerine equally with water. This cement is useful for making water-tight connections between plumbing fixtures and porcelain. It is very hard when it sets.

EXPERIMENT 558—Casein-borax glue

Shake some pulverized borax with water until no more dissolves, using four ounces of water. Now rub casein into a paste with the borax solution, adding the casein until a thick glue is formed. Add a little copper sulphate solution as a preservative. This is useful for repairing wood, porcelain and glass.

EXPERIMENT 559—Protecting book bindings

a. Petroleum jelly is a fine preservative when rubbed into the covers.

b. Beeswax dissolved in gasoline is also excellent for treatment of book covers. Lanolin can also be introduced with the beeswax to great advantage.

EXPERIMENT 560—Stains for wood

Chemical solutions for staining wood are useful for many purposes in which a liquid color is wanted.

Chemical	Color
Solution of potassium permanganate	brown
Solution of copper chloride and pyrogallic acid	brown
Potassium ferrocyanide and oxalic acid	blue
Potassium ferrocyanide and ferrous sulphate	blue
Ferric ammonium sulphate and tannic acid	black
Picric acid	yellow

TEXTILE CHEMISTRY AND DYEING

Textile fibers may be grouped in two classes according to their source: vegetable fibers and animal fibers. Cotton, linen, and rayon are all of vegetable origin, the first two being the natural fibers as gotten from the cotton and flax plants, respectively, while rayon is a very interesting textile material produced by first dissolving the cotton substance, called cellulose, and then from the viscous liquid spinning a thin filament which is hardened chemically into a thread so fine and lustrous that it was originally called artificial silk. But since its chemical and physical properties were in many ways unlike true silk, it was soon given a name of its own, rayon. Cellulose is a common material in the woody structure of all plants and trees, so it is not necessary to destroy good cotton fiber to make rayon. It is of further interest that the solubilized cellulose enters the composition of many of our lacquers, and also that, if formed into a sheet instead of fine thread it becomes the well-known cellophane.

Silk and wool are produced by animals, the first being the cocoon of the silk worm, and the other, as you all know, is the warm coat of a sheep. These fibers are therefore very different from the cellulose group, and are spoken of chemically as proteins. The chemical differences between these classes of textile fibers are important to remember, especially in connection with dyeing and with spot and stain removal.

The cellulose of vegetable fibers is very easily damaged by strong acids, but is uninjured by quite severe treatment with alkali. These fibers do not combine with dyes very readily, and it is frequently necessary to deposit the dye on the fiber in a water-soluble form, then convert it to an insoluble product, in order to hold it permanently on the fiber.

Animal fibers, on the contrary, are much more resistant to acid and more easily damaged by alkali than the vegetable fibers. They combine with many dyes so firmly that the problem of dyeing colors fast to washing is greatly simplified.

Years ago most dyeing was done with the colored extracts of various plants. There were a limited number of these and many of the bright colors so common today could not be obtained.

Gradually there were discovered ways of making new dyes in the laboratory, building them up from simpler compounds obtained, in many cases, from coal tar. These dyes, sometimes called aniline dyes, now supply every hue of the rainbow and have almost completely displaced the natural dyes.

TESTING TEXTILE FIBERS

EXPERIMENT 561—The burning test

Obtain samples of several fabrics. Take a few threads from a sample and light one end in the flame of your alcohol lamp. If the sample is an animal fiber it will not burn rapidly but will char into little black knobs and will produce an odor like burning feathers or hair. If the threads burn readily, leaving a clean white ash, they are vegetable fibers. This test is particularly useful in recognizing whether a sample is silk or rayon. One type of rayon, cellulose acetate sold under the trade name "Celanese," does not burn readily like the other rayons, but more like silk, except that it does not give an odor like burning feathers. Hence an additional test is needed if cellulose acetate is suspected of being present.

EXPERIMENT 562—Aceton test for cellulose acetate

Moisten the textile fibers with acetone. Ordinary animal and vegetable fibers are not changed, but cellulose acetate softens and may even dissolve completely.

EXPERIMENT 563—Microscopic examination

With experience one can soon learn to recognize most of the fibers by appearance and feel. A magnifying glass or microscope is a great help. With it, wool is seen to have a rough scaly surface while silk is quite smooth. Rayon appears much like silk, but of course the burning test will show them different. The cotton fiber is seen to be an irregular, flattened tube.

EXPERIMENT 564—Wetting test to identify linen

Linen is more readily wet through than the other fibers. This property is made use of in the following test. Put a small piece of cloth in a test tube half full of water and add one measure of sodium bisulphate. Heat the solution to boiling. (Be sure that the sample is very small so that it does not prevent free circulation of the water.) Take out the sample, wash it several times with water and dry it. After it is dry, loosen several of the fibers with a pin or needle and moisten them with a drop or two of glycerine. Press the cloth between two blotting papers and then examine very carefully the fibers which were moistened with glycerine. If they are linen they will be semi-transparent, while other fibers will appear opaque.

EXPERIMENT 565—A quantitative test for fabric composition

The fact that caustic soda dissolves animal fibers without attacking vegetable fibers serves as a basic for one method of determining their percentage in a fabric.

Put six measures of calcium oxide and six measures of sodium carbonate in a glass containing two test tubes of water. Boil for several minutes, then let stand to settle and pour the clear liquid, which is sodium hydroxide into a clean cup while you wash the solid residue from the glass. Return the sodium hydroxide solution to the clean glass.

Now take a sample of cloth which you suspect is made of a mixture of animal and vegetable fibers such as wool and cotton. Weigh it carefully, then immerse it in the sodium hydroxide solution and boil it for a few minutes. This should dissolve any wool or silk. Remove the remainder of the sample, rinse it in water, dry, and weigh. The loss in weight represents the wool or silk which had been in the fabric.

DYEING

You will find it very instructive in the following dyeing experiment if you prepare small patches of cloth containing threads of several kinds. Cut squares of white cotton, about two inches each way. Cotton from an old sheet or pillow case is better than new cloth for by many washings the fibers have become easier to dye. Next obtain coarse white threads or yarns of wool, silk, rayon, and linen. With a needle, stitch one of each of these threads across each square of cotton, using long stitches to keep most of the thread showing on one side. Trim the threads even with the edges of the patch.

EXPERIMENT 566—Dyeing with an aniline dye

Aniline dyes are now supplied ready for household use, and the beginner will find these very interesting to experiment with. You will undoubtedly find some on hand in the home laundry.

Dye one of your patches of cloth in one of these dyes, following the directions on the package. Are all the kinds of textile fiber in the patch dyed alike?

EXPERIMENT 567—Using an aniline dye with a mordant

Dissolve five measures of tannic acid in one test tube of water in a glass. Soak a patch of cloth in this solution for an hour or more. Squeeze it out and dry it. Now dye this patch with the same aniline dye and in the same way as in the experiment above. When the dyed cloth has dried, compare it with the previous dyeing. How has the tannic acid influenced the intensity of color on each fiber?

EXPERIMENT 568—Dyeing with a natural vegetable dyestuff

Dissolve three measures of ferric ammonium sulphate in one test tube of water and soak one of your cloth squares in this solution. Remove the cloth, press it between layers of paper towel to remove excess liquid, and allow it to dry.

Next dissolve two measures of tannic acid in one test tube of water and soak the cloth in this solution. Press out the cloth and dry it again.

Finally put three measures of logwood into one test tube of water and boil it in your beaker until it is a bright red. Put the cloth into this solution and continue to boil it a short time. Remove the cloth, wash it well in water, and dry it. What color have you produced? Are all the fibers dyed equally well?

EXPERIMENT 569—Another black dyeing

Repeat the dyeing as above, but omit the logwood treatment. Compare the quality of black in the two dyeings.

EXPERIMENT 570—Mordant dyeing with cochineal

Dissolve three measures of aluminum sulphate in one test tube of water in a beaker and soak one of your cloth squares in this solution. Add two measures of sodium carbonate to the solution, stirring quickly and thoroughly. After a few minutes remove the cloth, squeeze out the water, and let it dry.

Next put one test tube of water in your beaker, add three measures of cochineal and boil until the liquor is a dark red. Now put the cloth in and continue boiling a short time. Remove the cloth, wash it in clean water and dry it. What color effects have you produced this time?

Can you dye with other natural coloring matters with or without a mordant? Try the colors from butternut or black-walnut shucks, or the extract from chips of osage orange.

EXPERIMENT 571—How to make a brown sulphur dye

Put five drops of glycerine in a dry test tube and add one measure of sulphur and one measure of sodium carbonate. Heat the test tube over an alcohol or gas flame for several minutes and then allow the test tube to cool.

Now add a little water to the test tube and allow the test tube to stand for half an hour until the cake is loosened in the bottom of the tube. Now pour the contents of the tube into a glass of water and notice that the dye dissolves and the water is colored brown.

EXPERIMENT 572—How to make a black sulphur dye

Mix together on a piece of paper one measure of tannic acid, one measure of sodium carbonate and one measure of sulphur. Put this mixture in a clean, dry test tube and heat the tube over an alcohol or gas flame for four or five minutes.

Now remove the tube from the flame and after it is cool fill the test tube half full of water and allow the test tube to stand for half an hour. Now shake the contents of the tube thoroughly and then pour it into a glass three-quarters full of water. If any dye remains in the test tube add a little more water, shake again and pour it into the glass. Notice the dark black color of the water produced by this dye.

EXPERIMENT 573—How to make black logwood dye

Dissolve one measure of ferric ammonium sulphate in a test tube one-third full of water.

In another test tube half full of water put two measures of logwood and boil for four or five minutes until the soluiton is colored a bright red. Pour this solution into the test tube containing the solution of ferric ammonium sulphate and notice the black colored solution which is formed.

EXPERIMENT 574—How to make dark red logwood dye

Dissolve one measure of cobalt chloride in a test tube one-third full of water.

In another test tube half full of water put two measures of logwood and boil this solution for four or five minutes. Pour this solution into the test tube containing the solution of cobalt chloride and notice the dark red solution which is formed.

EXPERIMENT 575—How to make green logwood dye

Dissolve one measure of copper sulphate in a test tube one-third full of water.

In another test tube half full of water put two measures of logwood and boil the solution for four or five minutes. Pour this solution into the test tube containing the solution of copper sulphate and notice the green color which is formed.

EXPERIMENT 576—How to make blue horse chestnut dye

Put several chips of the bark from a horse chestnut tree into a test tube half full of water and boil four or five minutes. Now add a little household ammonia and boil again for two or three minutes. Notice the blue colored solution which is formed.

EXPERIMENT 577—Changing red logwood solution yellow, then blue

Boil two measures of logwood in a test tube half full of water for four or five minutes. Then pour this solution into a test tube containing one measure of sodium bisulphate. Notice that the solution turns from red to yellow in the presence of an acid.

Now add to this solution two or three measures of sodium carbonate and notice on shaking the color changes from yellow to reddish-blue or purple. Red logwood solution is yellow in the presence of an acid and blue in the presence of an alkali.

EXPERIMENT 578—Changing yellow turmeric solution brown

If you can obtain a little turmeric dissolve one measure in a test tube half full of water by boiling the solution for three or four minutes. Then add one measure of sodium carbonate and notice that the solution turns brown. Turmeric is yellow in the presence of acids and brown in the presence of alkalies.

EXPERIMENT 579—Changing red cochineal solution violet, then orange

Put one measure of cochineal in a test tube half full of water and boil until the solution is bright red. Then add one measure of tartaric acid to this solution and shake the contents of the test tube. Notice that the solution turns from red to orange. Now add two measures of sodium carbonate and shake the contents of the tube again. Notice that the orange solution now turns violet.

Red cochineal solution is orange colored in the presence of an acid and violet in the presence of an alkali.

EXPERIMENT 580—How to dye cloth red

Put two measures of ferric ammonium sulphate in a test tube one-third full of water and shake the tube until all the solid is dissolved. Now place a small piece of cloth to be dyed in this solution and after it is thoroughly wet, remove the cloth and allow it to dry.

Now dissolve two measures of sodium sulphocyanate in a test tube one-third full of water and place in this solution the dry cloth which was treated with the ferric ammonium sulphate solution. Notice that the cloth is dyed red. Remove the cloth from the solution and allow it to dry.

EXPERIMENT 581—How to dye cloth dark blue

Dissolve two measures of sodium ferrocyanide in a test tube one-third full of water and place in this solution a small piece of cloth to be dyed. When the cloth is thoroughly wet, remove it and allow it to dry.

Now dissolve two measures of ferric ammonium sulphate in another test tube one-third full of water. Place the dry cloth in this solution. When the cloth is thoroughly wet, remove it and allow it to dry. This time the cloth is dyed a beautiful dark blue known as Prussian blue.

EXPERIMENT 582—How to dye cloth a light blue

Dissolve three measures of sodium ferrocyanide in a test tube one-third full of water and place in this solution a small piece of cloth to be dyed. When the cloth is thoroughly wet, remove it and allow it to dry.

Now dissolve two measures of ferrous ammonium sulphate in a test tube one-third full of water. Place the dry cloth into this solution and shake the test tube a few times. Remove the cloth and allow it to dry. This time the cloth will be dyed a light blue, known as Turnbull's blue.

EXPERIMENT 583—How to dye silk gray

Dissolve two measures of sodium bisulphate in a test tube half full of water. In another test tube put two measures of logwood and boil the solution until it is colored bright red. Pour this red solution into the solution of sodium bisulphate.

Now place a small piece of white silk to be dyed in this solution and heat the solution to boiling. Remove the silk and notice that it is dyed gray.

EXPERIMENT 584—How to dye cotton iron buff

Make a solution of ferric ammonium sulphate by dissolving two measures of the compound in a test tube one-third full of water. Place in this solution a small piece of cotton cloth to be dyed and shake the contents of the test tube thoroughly. Remove the cloth and allow it to dry.

Now dissolve two measures of sodium carbonate in a test tube one-third full of water and place the cloth in this solution. Shake the contents of the test tube thoroughly and then remove the cloth. Wash the cloth with water and allow it to dry. The cloth will be dyed an iron buff. This color is produced by the precipitation of iron oxide upon the fiber by the alkaline salt, sodium carbonate.

SPOT AND STAIN REMOVAL

Chemical treatment is often required in order to remove spots and stains from fabrics. To do this successfully, you need to know, not only what chemical will remove the stain, but how well the fabric will withstand the chemical action. When the fabric is colored, the problem is still more complicated for the dyes may be attacked by the chemical. The following general rules may save you many mistakes.

1. If you use acid in cleaning cotton, be sure it is very thoroughly washed out before dyeing.
2. Do not use alkali on silk or wool. If possible, avoid the use of water and clean with a dry-cleaning solvent such as carbon tetrachloride. Many silks may be washed in soapy water, but you should first be sure that they have been dyed with colors fast to washing.
3. Many spot removers act by bleaching with chlorine. Never use these on silk for chlorine damages silk. Chlorine is also very likely to attack dyestuffs. If silk must be bleached, use a solution of hydrogen peroxide made slightly alkaline with sodium silicate.

EXPERIMENT 585—To remove grease from clothing

A grease stain which has been in clothing for some time can be removed by treating the stain with alcohol, gasoline or carbon tetrachloride. Carbon tetrachloride is the best solvent to use, as it is non-inflammable, cheap and vaporizes quickly. In removing a grease stain in this way, always begin at the edge and work into the center, rubbing the stain thoroughly with a cloth containing some of the solvent. This is a case of solution. A fresh grease spot when removed in this way often leaves a ring on the clothing. To remove a grease spot place a little talc or starch over and under the spot and warm the spot with an iron. The talc will absorb the grease and can be easily brushed off afterwards. Repeat the process until the spot is removed. This is a case of absorption.

A grease spot may also be removed by rubbing neutral soap on the spot until a lather is obtained and then rinsing off with water. This is a case of detergency.

EXPERIMENT 586—To remove paint from clothing

If paint is fresh it is not difficult to remove. First rub turpentine, lard, or linseed oil into the stained spot. Then clean it with carbon tetrachloride as in the experiment above.

EXPERIMENT 587—To remove ink spots

First rub the spot lightly with a bleaching solution. This is made by dissolving four measures of calcium hypochlorite in a test tube half full of water. This will change the spot to a yellow color. Then pour a little hydrogen dioxide on the spot and again rub lightly. Notice that the spot is now entirely removed. This is a case of bleaching. This is a chlorine bleach and should not be used on silk and only for a short time on wool.

EXPERIMENT 588—To remove iron rust

Obtain a small amount of oxalic acid and dissolve four measures in a test tube half full of water. Rub the spot with some of this solution and notice that the stain is removed. Dilute hydrochloric acid can be used in place of the oxalic acid. Remove the oxalic by washing with water.

EXPERIMENT 589—How to remove acid spot

If acid is accidentally spilled on the clothing, pour a litle ammonia on the spots and rub lightly with a cloth. Wash the spot with water in order to remove the salts that are formed in the reaction. This is a case of neutralization, the ammonia neutralizing the acid to form a salt.

EXPERIMENT 590—How to remove alkali from clothing

If caustic soda is accidentally spilled on the clothing pour some tartaric acid solution or vinegar on the spot and then wash the spot out with water. This is another case of neutralization.

EXPERIMENT 591—How to remove grass stain

Grass stains may be removed by rubbing the spot with a little alcohol or carbon tetrachloride.

EXPERIMENT 592—How to remove mildew

Dissolve three measures of calcium hypochlorite in a test tube half full of water and rub the stain lightly with a little of this solution. Remove the calcium hypochlorite by washing with water.

EXPERIMENT 593—How to remove iodine stain

Dissolve three or four measures of sodium thiosulphate in a test tube one-third full of water and rub some of this solution on the fabric stained with iodine. Notice that the blue or brown stain is quickly removed. Then wash the spot with water to remove the sodium thiosulphate.

TEXTILES AND AGRICULTURE

It is a far cry from woolen mittens worn by the country school boy, and a silk scarf adorning the costume of his sister, to a five thousand acre sheep ranch in Texas or Australia, and the primitive industry of reeling raw silk from cocoons in eastern China, but chemistry is constantly providing new and practical products from agricultural resources to provide pleasure, comfort and health in every corner of our country. The boy, who today is performing his first experiments with a Gilbert Chemistry Set, may tomorrow be the chemist who will be making life happier and more secure for nearly every person in our land.

Several attempts have been made to develop silk culture in this country, but without financial success on account of the high labor cost. Agricultural experiments organized