

**CRYSTAL
SCIENCE
EXPERIMENTS**

**Learn
&
Climb**

**INSTRUCTION
MANUAL**

**GROW
GLOW
SHOW**

&

**CREATE
AND 10 DAZZLING CRYSTALS
AND PAINT YOUR DISPLAY!**

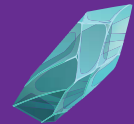
15

**AMAZING
EXPERIMENTS!**

IN THE BOX:



3 Litmus Paper Rounds
1 Purple String
3 Paint Brushes
1 Tweezers
1 Magnifying Glass
1 Tablespoon Measuring Spoon
1 Yellow Measuring Spoon
6 Pipe Cleaners
Thread
4 Cups
1 Large Container
3 Petri Dishes
1 Beaker

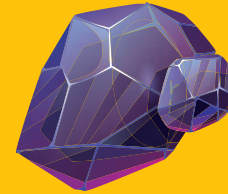


Red, Blue and Yellow Coloring Agent
10 Stirring Sticks
Urea
ADP
Borax
1 Moon Growing Seed
4 Round Growing Seeds
1 6-pack Paint
1 Customizable Display
1 Instruction Manual
1 Scientific notebook
1 paint palette
1 Glow-in-the-Dark Powder



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SAFETY WARNING AND ADVICE FOR SUPERVISING ADULTS:

- Read this manual before use and refer to it while conducting your experiments.
- Adults should read and discuss the information found herein with all participants before beginning.
- This experiment set is for children over 8 years of age.
- Adults should handle hot water and hot solutions.
- Use Potholders to safely handle any vessel containing boiling water.
- Do not mix ingredients in any other way than how it is shown in this manual.
- Always use eye protection.
- Wash all equipment and tools before and after doing the next experiment.
- Wash hands well after each experiment.
- Do not eat, drink or smoke in the experiment area.
- Do not allow any materials to contact mouth or eyes.
- Do not apply to the body, eat or drink any chemical or solution.
- Store all unused chemicals in a sealed container away from children or pets.
- Do not inhale chemicals.
- Do not allow pets to have access to any experiment or materials.
- Do not get chemicals in eyes, see GENERAL FIRST AID below.
- Keep all chemicals and experiments with liquid away and out of reach of children under 8 years of age.

GENERAL FIRST AID:

In case of CONTACT WITH EYES: Rinse immediately with plenty of water. If irritation occurs, seek medical attention.

In case of CONTACT WITH THE SKIN: Rinse with plenty of water for at least 10 minutes.

If case of SWALLOWING: FIRST Rinse mouth with water THOROUGHLY. THEN DRINK a LARGE amount of water. DO NOT induce vomiting. Seek medical attention.

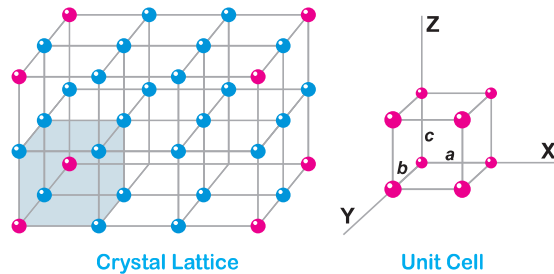
In case of INHALING: Seek FRESH air.

In case of DOUBT OR INJURY: Seek medical attention immediately and bring the chemical or container with you.

WELCOME TO THE WONDER FILLED WORLD OF CRYSTALS!

WHAT IS A CRYSTAL ?

A crystal is a solid, formed by a substance hardening mainly from either evaporation (like the urea crystals you will make) or liquid cooling (like the borax crystals you will make). Some of the atoms in the liquid will cling to each other in a uniform and repeating geometric pattern from a single unit cell, and a crystal is formed. A unit cell is the building block of a crystal, it is the smallest part of a crystal lattice (the arrangement) that repeats over and over again in a 3-dimensional pattern to form the entire crystal. Crystallography is the scientific study of crystals and their formation.



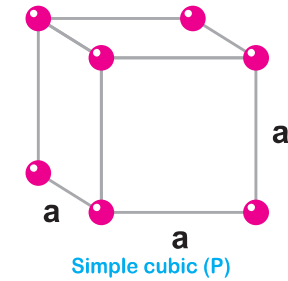
When we study crystals, it is important to understand the concept of symmetry. If something is very symmetric, it looks the same when you look at it from any angle, for example, the cubic unit cell. If it is not very symmetric, different angles will look quite different, like when we are looking at a triclinic unit cell.

A CRYSTAL STRUCTURE IS THE SHAPE OF THE CRYSTAL.

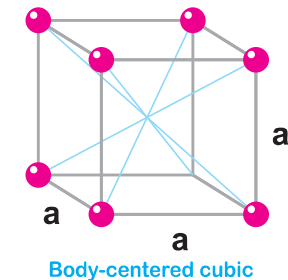
Crystal formations can be found in different levels of hardness, shape, size and texture. When the atoms in a crystal are held together with a covalent bond (pairs of electrons are shared by atoms), this is typically a strong bond and the resulting crystal is usually hard. Sometimes the atoms are held together in a non-covalent bond (one where the atoms do NOT share a pair of electrons) and this is typically a weak bond, so the resulting crystal may be soft.

In this scientific experiment kit, you will create both soft and hard crystals from evaporation and liquids cooling. We will create saturated solutions to grow crystals. A saturated solution is a solution where no more solute can be dissolved in the solvent at the current temperature. In this kit your solutes are salt, sugar, ADP, Borax and urea and water is the solvent.

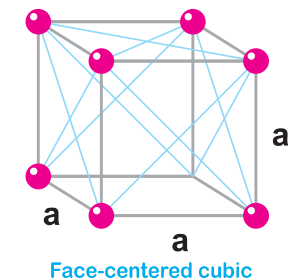
One of the most important things to know about crystals is that they are 3 dimensional with flat surfaces and are shaped according to 7 main systems, these shapes are also called lattices: Triclinic, Monoclinic, Orthorhombic, Tetragonal, Trigonal, Hexagonal, and Cubic.



Simple cubic (P)



Body-centered cubic



Face-centered cubic

LET'S LEARN A LITTLE MORE ABOUT EACH CRYSTAL SYSTEM. HERE IS A SIMPLIFIED OVERVIEW:

A Cubic- (also known as Isometric) (Example: Salt)- Sounds like a simple square, right? Some cubic crystals can have eight (octahedrons) or ten (decagon) or even 12(dodecahedrons) faces!

B Tetragonal- (Example: ADP) This crystal system is like cubic crystals and looks kind of like a rectangular prism box with a square base.

C Hexagonal- (Example: Graphite)- crystal system where there are six-sided prisms, so if you look at the crystal from one end, the cross section is a hexagon.

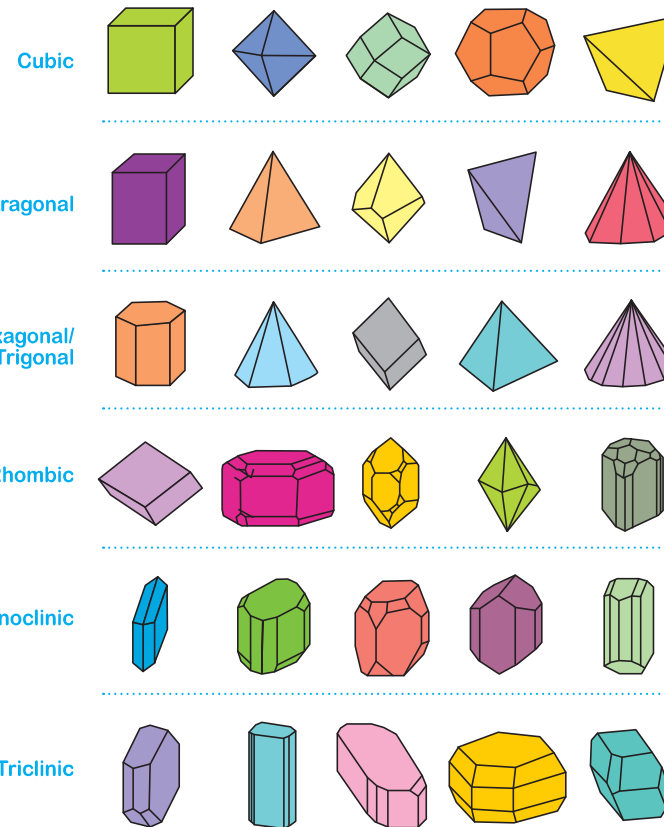
D Trigonal, also known as Rhombohedral- (Example: Cinnabar) - This crystal system where the crystal faces all have the same size and shape and is sometimes considered to be a sub-division of the hexagonal system because it has 3 sides.

I Orthorhombic/ Rhombic- (Example: Marcasite) This crystal system forms rhombic prisms and look like two pyramids stuck together (dipyramids). It looks like tetragonal crystals except when you look from the end, the cross section is not square.

F Monoclinic- (Example: Borax) This crystal system looks kind of like a tetragonal crystal, often forming prisms and double pyramids, or like a box with a lot of different sides.

G Triclinic (also known as anorthic) (Example: Turquoise) - This crystal system is not usually symmetrical, and there are no restrictions on angles or sides, so most of the time one side is not in equal proportion to the others so the final shape is random and can be a really strange shape too!

Crystal Systems and Examples



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WHEN WE ARE GROUPING CRYSTALS BY THEIR CHEMICAL AND PHYSICAL PROPERTIES, THERE ARE FOUR MAIN CATEGORIES. LET US EXPLORE THESE

As we begin to experiment making different crystals by methods of evaporation and creating saturated solutions, try to keep in mind which category your resulting crystals fit best into. These categories are not conclusive, they are simplified examples to introduce you the beautiful, mystical and interesting world of crystals!



COVALENT CRYSTALS METALLIC CRYSTALS

A covalent crystal has true covalent bonds between all the atoms in the crystal, kind of like one big molecule. Many covalent crystals have extremely high melting points and are very hard- like diamond crystals.

When individual metal atoms of metallic crystals sit on lattice sites, this leaves the outer electrons of these atoms free to float around the lattice. Metallic crystals are usually dense with high melting points- like gold nuggets.



IONIC CRYSTALS MOLECULAR CRYSTALS

The atoms of ionic crystals are held together by electrostatic forces (ionic bonds). Ionic crystals are hard and have high melting points. An example of this type of crystal is common table salt.

These crystals contain recognizable molecules within their structures. A molecular crystal is held together by non-covalent bonds. Molecular crystals are usually soft with lower melting points. An example of a molecular crystal is ice (solid water).



TIPS FOR SUCCESS!

- Always use cleaned and dried containers.
- Never use aluminum containers, only use containers provided.
- Read all instructions thoroughly before starting any experiment.
- Phosphorescent molecules need energy either from the sun or a light. They absorb this energy and slowly release it. So, to give your glow in the dark crystals an extra boost of glow, shine a flashlight on it or hold it under a lamp for a minute or two. This will give the glow molecules a boost of energy so you get the best glowing power!
- Some random crystals will likely form on the sides or in the bottom of the containers while growing your shapes, this is expected. You can dry and keep these extra crystals in a jar and collect them from all your experiments!
- Depending on the cooling rate, water quality and room temperature, your shape may become stuck to a crystal bed that forms on the bottom of the cup. This is common. Simply use a fork or stirring stick to gently pry your shape from the crystal bed.
- To make your crystals look as crystal clear as possible, give each completed crystal a quick rinse (just a second or 2) under water to remove any solution residue. For colored crystals, much of the color will rinse away, leaving only a hint of color in the final crystal. This is normal. You can skip the rinse, but your crystal may look slightly cloudy because of the film on the outside.

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THE COOLING EFFECT



From Kit

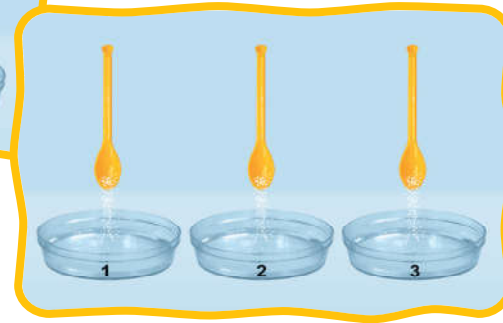
3 Petri Dishes
Yellow Measuring Spoon
Urea
Beaker



From Home

Water
Sugar
Salt
Tape
Pen or Pencil

6



1. Using your tape and pen or pencil, label your petri dishes 1, 2 and 3.
2. Add 15 ml of water to the beaker (you will need to do this 3 times). Then pour 15ml water into each petri dish.
3. Using your yellow measuring spoon, add 3-5 large spoonful of sugar to petri dish 1.
4. Using your yellow measuring spoon, add 3-5 large spoonful of salt to petri dish 2.
5. Using your yellow measuring spoon, add 3-5 large spoonful of urea to petri dish 3.
6. Stir the contents of each petri dish well until the grains disappear.
7. Place each dish in the palm of your hand and take note of the temperature.

RECORD
YOUR RESULTS
in YOUR
SCIENTIFIC
NOTEBOOK



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- Using your tape and pen or pencil, label your petri dishes 1, 2 and 3.
- Add 10 ml of water to the beaker (you will need to do this 3 times). Then pour 10 ml water into each petri dish.
- Using your yellow measuring spoon, add 1 large spoonful of sugar to petri dish 1.
- Using your yellow measuring spoon, add 1 large spoonful of salt to petri dish 2.
- Using your yellow measuring spoon, add 1 large spoonful of urea to petri dish 3.
- Mix the contents of each dish until the grains are dissolved.
- Repeat the instructions on adding one spoonful of salt, sugar

- and urea into the correct petri dish and stir well between each spoonful.
- Keep adding large spoons of salt, sugar and urea until the grains will not dissolve any more.
- You have now created 3 saturated solutions- a solution in which no more solute can be dissolved in the solvent.
- You can color your litmus rounds with your markers or add drops of coloring agent to make a design.
- Next take your 3 decorated litmus paper rounds and form a teepee shape as shown and secure the shape with a staple or paper clip.
- Place one litmus shape into each saturated solution with the point up so it stands.
- Wait 2-5 days and watch as

your saturated solution evaporates leaving behind crystal formations.

When you are writing your results in your scientific notebook. Think about the different amounts of solute needed for each saturated solution. Was it the same amount for each?

Use your magnifying glass and try to identify the different crystal structures you have created.

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2

TOO MUCH OR NOT ENOUGH

FROM KIT

3 Petri Dishes
Yellow Measuring Spoon
Urea
Beaker
3 Litmus Paper Rounds

FROM HOME

Water
Sugar
Salt
Stapler OR 3 Paper Clips
Tape
Pen OR Pencil
Colored Markers OR Coloring Agent



7

3

THE KINGDOM OF THE CRYSTAL BRIDGE



From Kit

3 Petri Dishes
Yellow Measuring Spoon
Purple String
Beaker



From Home

Water
Salt
Tape
Pen or Pencil



8



1. Using your tape and pen or pencil, label your petri dishes 1, 2 and 3.
2. Place the petri dishes in a place where they will not be disturbed for a few days and align them in a row as shown.
3. Pour 20 ml of water into your beaker.
4. Add a little salt to the beaker with water. Stir until the salt dissolves and keep adding salt and stirring until the salt does not dissolve anymore.
5. Divide the saturated solution in your beaker between petri dish 1 and 3, leaving petri dish 2 empty.
6. Next, carefully make a bridge with your purple string between the 3 petri dishes. The purple string should touch the bottom and rest inside each petri dish.
7. Wait a few days and see what happens!

RECORD YOUR RESULTS
(and you can even
DRAW A PICTURE OF THE
FINAL RESULT) IN YOUR
SCIENTIFIC NOTEBOOK!



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1. Ask an adult to prepare boiling water and have it nearby.
2. Using your Tablespoon Measuring Spoon, measure 2 LEVEL Tablespoons of Crystal Chemical into the plastic cup.
3. Using your beaker, let an Adult measure and pour 50ml of boiling water into the cup with the crystal chemical.
4. Carefully stir to dissolve completely. There should not be any crystals remaining, the saturated solution should be clear.
5. Add a few drops of blue food coloring to the same cup and stir.
6. Allow to cool almost to room temperature, about 15-30 minutes.
7. Drop the dome shaped seed into the solution in the cup. Make sure the flat part is on the bottom and the rounded part is facing upward. Use your tweezers to position your seed in the center and not touching the sides of the cup.
8. Put in a place where it will not be disturbed.
9. Gently lay an opened napkin or tissue over the cup so dust cannot disturb the crystals.
10. Wait 1-5 days to see the magic happen! The longer you wait, the

larger the crystals will grow! (you will see results after 24 hours).

11. This time we colored the solution only, notice if the crystals took on color. Next, we will color the seed!

RECORD YOUR RESULTS in your SCIENTIFIC NOTEBOOK.



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4

COOL BLUE CRYSTALS

FROM KIT

CLEAR PLASTIC CUP
 TABLESPOON MEASURING SPOON
 ADP CRYSTAL CHEMICAL
 (AMMONIUM DIHYDROGEN PHOSPHATE)
 BLUE FOOD COLORING
 DOME SHAPED CRYSTAL SEED
 STIRRING STICK

FROM HOME

AN ADULT TO HELP
 BOILING WATER
 NAPKIN OR TISSUE



5

RED CRYSTALS

From Kit

Clear PLASTIC cup
TABLESPOON MEASURING SPOON
ADP CRYSTAL CHEMICAL
(ammonium Dihydrogen PHOSPHATE)
RED FOOD COLORING
DOME SHAPED CRYSTAL SEED
STIRRING STICK

From Home

AN ADULT TO HELP
BOILING WATER
NAPKIN OR TISSUE
PAPER TOWEL OR PLATE



1. Ask an adult to prepare boiling water and have it nearby.
2. Using your Tablespoon Measuring Spoon, measure 2 LEVEL Tablespoons of Crystal Chemical into the plastic cup.
3. Using your beaker, let an Adult measure and pour 50ml of boiling water into the cup with the crystal chemical.
4. Carefully stir to dissolve completely. There should not be any crystals remaining, the saturated solution should be clear.
5. Allow to cool almost to room temperature, about 15-30 minutes.
6. Meanwhile, place your dome crystal seed on top of a folded

paper towel or plate (to protect the work surface from food color stains) and drop 5 drops of red food coloring onto the rounded top of the seed, allowing each drop to absorb before dropping the next. Allow the seed to partially dry while you are waiting for the solution to cool.

7. Drop the seed into the solution in the cup. Make sure the flat part is on the bottom and the rounded part is facing upward. Use your tweezers to position your seed in the center and not touching the sides of the cup.

8. Put in a place where it will not be disturbed.
9. Gently lay an opened napkin or

tissue over the cup so dust cannot disturb the crystals.

10. Wait 1-5 days to see the magic happen! The longer you wait, the larger the crystals will grow! (you will see results after 24 hours).

11. This time we colored the seed only, notice if the crystals took on color more or less than the last experiment. What is different? What looks the same? Next, we will color both seed and solution!

RECORD YOUR RESULTS
in YOUR SCIENTIFIC
NOTEBOOK.



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1. Ask an adult to prepare boiling water and have it nearby.
2. Using your Tablespoon Measuring Spoon, measure 2 LEVEL Tablespoons of Crystal Chemical into the plastic cup.
3. Using your beaker, let an Adult measure and pour 50ml of boiling water into the cup with the crystal chemical.
4. Stir to dissolve completely. There should not be any crystals remaining, the saturated solution should be clear.
5. Next add 5 drops of red food color and 3 drops of blue food color to the solution and stir.
6. Allow to cool almost to room temperature, about 15-30 minutes.

7. Meanwhile, place your dome crystal seed on top of a folded paper towel or plate (to protect the work surface from food color stains) and drop 5 drops of red food coloring onto the seed, allowing each drop to absorb before dropping the next. Next add 3 drops of blue food coloring to the top of the seed and allow to partially dry while you are waiting for the solution to cool.
8. Drop the seed into the solution in the cup. Make sure the flat part is on the bottom and the rounded part is facing upward. Use your tweezers to position your seed in the center and not touching the sides of the cup.
9. Put in a place where it will not be disturbed.

10. Gently lay an opened napkin or tissue over the cup so dust cannot disturb the crystals.

11. Wait 1-5 days to see the magic happen! The longer you wait, the larger the crystals will grow! (you will see results after 24 hours)

12. This time we colored both the seed and solution. Notice if the crystals took on more color than in the last experiments. What is different? What looks the same?

**RECORD YOUR RESULTS
in your SCIENTIFIC
NOTEBOOK.**



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6

PURPLE CRYSTALS

FROM KIT

CLEAR PLASTIC CUP
TABLESPOON MEASURING SPOON
ADP CRYSTAL CHEMICAL
(AMMONIUM DIHYDROGEN PHOSPHATE)
RED AND BLUE FOOD COLORING
DOME SHAPED CRYSTAL SEED
STIRRING STICK

FROM HOME

AN ADULT TO HELP
BOILING WATER
NAPKIN OR TISSUE
PAPER TOWEL OR PLATE



11

7

MAKE A SPARKLY CRYSTAL STAR

From Kit

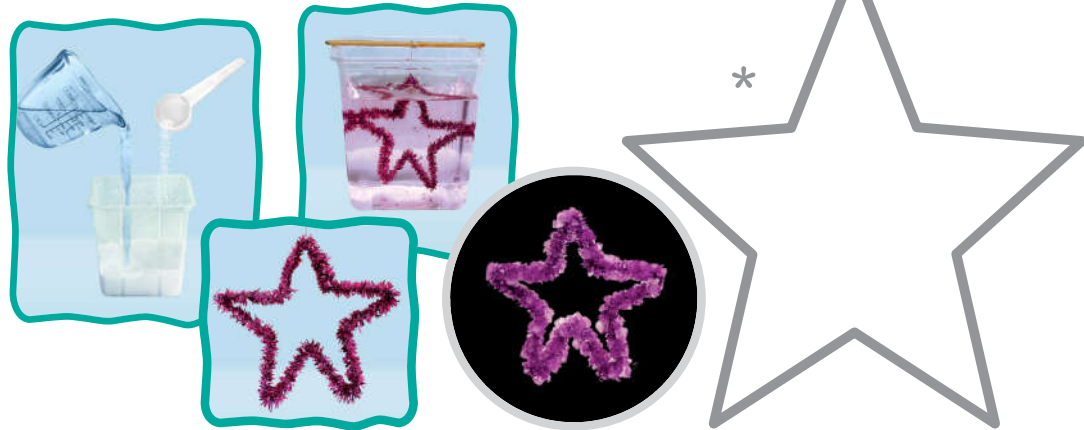
- Mixing Container
- Tablespoon Measuring Spoon
- Borax
- 1 OR 2 Metallic Pipe Cleaners
- Thread
- 2 Stirring Sticks

From Home

- An adult to help
- 1 cup of boiling water
- Scissors
- Napkin or tissue



12



1. Ask an adult to prepare boiling water and have it nearby.
2. Shape your star. You can twist two pipe cleaners together lengthwise for 2 colors if desired. Shape your pipe cleaner(s) into a star shape that is no larger than 2 1/2" tall and 2 1/2" wide. You can do this by hand, you can wrap it around the outside of a star shaped cookie cutter or you can lay your pipe cleaner on top of the attached template of a star and bend to shape. If the pipe cleaner is too long, simply trim off the end with your scissors.
3. Cut about a 10" piece of thread and tie one end around a point of the star.
4. Tie the other end of the thread around a stirring stick.
5. Let an Adult measure and carefully pour 1 cup boiling water into the large container.
6. Measure and add 3 LEVEL Tablespoons of Borax into the container with hot water.
7. Carefully stir until completely dissolved. This solution and the resulting crystals are usually a little cloudier than the ADP versions, this is expected.
8. Next, ask an adult to help you gently immerse your star shaped pipe cleaner hanging from the string into the hot solution (Borax crystals will grow better if the solution is hot and allowed to cool slowly). We will be suspending the star by laying the stirring stick across the top of the container while the star dangles in the solution. It is important that the star does not touch the sides or bottom, it should be fully suspended and immersed in the crystal growing solution. This may take a little measuring and adjusting to get it to hang in the right spot. You can "roll" the stirring stick to tighten the slack in the thread and move the star up and down to position it.
9. Put in a place where it will not be disturbed and lay a napkin or tissue over the container to protect from dust and to allow the solution to cool slowly. Wait and watch the magic happen!
10. After a few days, remove your star and allow to dry. Leave the thread attached, we will be hanging it later.
11. Store your crystal star in a dry, safe place until you are ready to create your display.

RECORD YOUR RESULTS IN YOUR SCIENTIFIC NOTEBOOK.

ARE THEY THE SAME SHAPED CRYSTALS AS IN OTHER EXPERIMENTS?

USE YOUR MAGNIFYING GLASS TO TRY TO IDENTIFY THE CRYSTAL STRUCTURE.

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1. Ask an adult to prepare boiling water and have it nearby.

2. Shape your pipe cleaner into a star shape that is no larger than 2 1/2" tall and 2 1/2" wide. You can do this by hand, you can wrap it around the outside of a star shaped cookie cutter, or you can lay your pipe cleaner on top of the attached template of a star and bend to shape. If the pipe cleaner is too long, simply trim off the end with your scissors.

3. Dampen your star with water and lay it flat on a paper towel or plate.

4. Carefully open your glow powder and position the tip of the bottle over one corner of the star. Slowly turn the bottle up-side-down over the star (powder may pour right out or may need a little squeeze) and while holding it very close to the star, begin at one corner and move the bottle around the top of the wet star while covering it with glow powder. Go around the star 3-5 times to really load it with glowing action! Then let the star dry while completing the next few steps. Be sure to save some Glow Powder for another experiment!

5. Cut about a 10" piece of thread and tie one end around the tip of your pipe cleaner star.

6. Tie the other end of the thread around a stirring stick.

7. Let an Adult measure and carefully pour 1 cup boiling water into the Mixing Container.

8. Measure and add 3 LEVEL Tablespoons of Borax into the Mixing Container with hot water.

9. Carefully stir until completely dissolved. This solution and the resulting crystals may be a little cloudier than the ADP versions, this is expected.

10. Next, ask an adult to help you gently immerse your star shaped pipe cleaner hanging from the string into the hot solution (Borax crystals will grow better if the solution is hot and allowed to cool slowly). We will be suspending the star by laying the stirring stick across the top of the container while the star dangles in the solution. It is important that the star does not touch the sides or bottom, it should be fully suspended and immersed in the Borax solution. This may take a little measuring and

adjusting to get it to hang in the right spot. You can "roll" the stirring stick to tighten the slack in the thread and move the star up and down to position it.

11. Put in a place where it will not be disturbed and lay a napkin or tissue over the container to protect from dust and to allow the solution to cool slowly. Wait and watch the magic happen!

12. After a few days, remove your star and allow to dry. Leave the thread attached, we will be hanging it later.

13. Hold near a bright light for a few minutes to charge the phosphorescence. Take it into a darkened room and see the glow!

14. Store your crystal star in a safe place until you are ready to create your display.

RECORD YOUR RESULTS
in YOUR SCIENTIFIC
NOTEBOOK.

HOW LONG DOES A 1-MINUTE
CHARGE OF LIGHT GIVE GLOWING
POWER TO YOUR STAR?

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8

MAKE A GLOWING CRYSTAL STAR

FROM KIT

Mixing CONTAINER
TABLESPOON Measuring SPOON
BORAX
GLOW POWDER
PIPE CLEANER (non-metallic WORKS
BEST FOR THIS EXPERIMENT)
THREAD
2 STIRRING STICKS

FROM HOME

AN ADULT TO HELP
1 CUP OF BOILING WATER
WATER SUFFICIENT TO DAMPEN THE PIPE
CLEANER OR A SINK
SCISSORS
PAPER TOWEL OR PLATE



9

GROW CRYSTAL STARTER SEEDS-ALLOW CRYSTALS TO FORM ON THE BOTTOM OF A DISH AND USE THESE SEED CRYSTALS TO START BIGGER CRYSTALS



From Kit

ADP CRYSTAL CHEMICAL
(ammonium Dihydrogen Phosphate)
Beaker
Yellow measuring spoon
Petri Dish



From Home

An adult to help
Boiling water



14



1. Using your yellow measuring spoon, add 5 heaping large spoonfuls of ADP to the beaker.
2. Ask an adult to prepare boiling water.
3. With the help of an adult, add 20 ml boiling water to the beaker.
4. Carefully stir until the ADP is completely dissolved in the water.
5. Pour the mixture from the beaker into a petri dish.
6. Put in a place where you can allow the seed crystals to form. Depending on the humidity in the environment, this can take from 1-4 days. The liquid will evaporate, and you will be left with a bed of crystals!

Once the crystals have formed on the bottom of the petri dish, you will choose the largest one and save it for the next experiment.

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1. Ask an adult to prepare boiling water and have it nearby.
2. Using your Tablespoon Measuring Spoon, measure 2 LEVEL Tablespoons of Crystal Chemical into the plastic cup.
3. Using your beaker, let an Adult measure and pour 50ml of boiling water into the cup with the crystal chemical.
4. Stir to dissolve completely. There should not be any crystals remaining, the saturated solution should be clear.
5. Next add 10 drops of food color, or mix colors if desired, to the solution and stir.
6. Allow to cool almost to room temperature, about 15-30 minutes.
7. Cut a 10" piece of thread.
8. While your solution is cooling, choose a nice, large crystal from the previous experiment. Carefully take just one crystal piece and tie the piece of thread around the crystal.
9. Tie the other end of the thread around a stirring stick. We will be suspending the star by laying the stirring stick across the top of the container while crystal dangles in the solution. It is important that the crystal does not touch the sides or bottom, it should be fully suspended and immersed in the ADP solution. This may take a little measuring and adjusting to get it to hang in the right spot. You can "roll" the stirring stick to tighten the slack in the thread and move the crystal up and down to position it.
10. Put the cup with suspended

crystal in a place where it will not be disturbed.

11. Gently lay an opened napkin or paper towel over the cup so dust cannot disturb the crystals.

12. Wait 1-5 days to see the magic happen! The longer you wait, the larger the crystals will grow! When you remove the crystal from the solution, give it a quick rinse under fresh water and allow to dry. Safely store this and all your crystals so you can display them later!

Did you get a Bigger Crystal? If you added color, did the crystals take on the color?

RECORD YOUR RESULTS in YOUR SCIENTIFIC NOTEBOOK.



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10!

USE A CRYSTAL. GROW A CRYSTAL

From Kit

PLASTIC CUP
ADP CRYSTAL CHEMICAL
(ammonium Dihydrogen PHOSPHATE)
COLORING AGENT
2 STIRRING STICKS
THREAD
TABLESPOON MEASURING SPOON

From Home

AN ADULT TO HELP
1 CRYSTAL FROM THE PREVIOUS
EXPERIMENT
BOILING WATER
SCISSORS
NAPKIN OR TISSUE



11

MAKE A GLOWING MOON

From Kit

ADP CRYSTAL CHEMICAL
(ammonium dihydrogen phosphate)
GLOWING MOON SHAPED STARTER SEED
TABLESPOON MEASURING SPOON
THREAD
MIXING CONTAINER
2 STIRRING STICKS

From Home

AN ADULT TO HELP
1 CUP OF BOILING WATER



16



1. Cut a 10" piece of thread and tie one end around the "grooves" found in your moon seed and tie a good, strong knot to hold it in place.
2. Ask an adult to prepare boiling water and have it nearby.
3. Using your tablespoon, add 8 tablespoons of ADP Crystal Chemical into your Mixing Container.
4. Let an adult measure 1 cup of boiling water and add it carefully into the container with the crystal chemical.
5. Carefully stir with your stirring stick until completely dissolved.
6. Allow to cool almost to room temperature, about 15-30 minutes.
7. In the meantime, tie the other

end of the thread around your other stirring stick.

8. Gently place your Glow in the dark moon shaped starter seed into the solution while suspended from the stick. We will be suspending the moon shaped seed using the stick across the top of the container while the moon dangles in the solution. It is important that the moon does not touch the sides or bottom, it should be fully suspended and immersed in the ADP solution. This may take a little measuring and adjusting to get it to hang in the right spot.

9. Put in a place where it will not be disturbed. Gently lay an opened napkin or paper towel over the cup so dust cannot disturb the crystals.
10. Wait 1-5 days to see the magic

happen! The longer you wait, the larger the crystals will grow!

11. Once grown to your satisfaction, remove the moon from the solution and give it a quick rinse of fresh water and allow to dry. Leave the thread attached- we will be hanging the moon later!

12. Hold your completed moon under a light for a few minutes, then take it into a dark room and watch it glow!

13. Place your Glowing moon in a safe place until you are ready to create your display.

RECORD YOUR RESULTS
in YOUR SCIENTIFIC
NOTEBOOK.



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1. Add a few drops of coloring agent to the inside of your prepared eggshell.
2. Use your paint brush to evenly spread out the food color so the whole inside of your eggshell is coated with color.
3. Ask an adult to prepare boiling water and have it nearby.
4. Add 3 tablespoons of Borax to the large container.
5. Add a few drops of the same color food coloring to the container with the Borax.
6. Let an Adult measure and carefully pour 1 cup boiling water into the large container with Borax in it.

7. Stir the Borax, water and food color until completely dissolved.
8. Now ask an adult to help and use your tweezers to gently immerse your 1/2 eggshell into the hot solution. Borax crystals will grow better if the solution is hot and cools slowly. Lay a napkin or tissue over the container to protect from dust and allow the solution to cool slowly.
9. Put in a place where it will not be disturbed, wait 1-5 days.
10. Carefully remove your egg geode with your tweezers from the liquid solution and discard any remaining liquid. Some random crystals may be in the bottom or on the sides of the container, this is expected. You can

keep the random crystals in a jar if you like!

RECORD YOUR RESULTS
in your SCIENTIFIC
NOTEBOOK.



DID THE CRYSTALS TAKE ON
THE COLOR YOU PAINTED
INSIDE THE SHELL?

OR CAN YOU SEE THE
COLOR THROUGH THE
CRYSTALS?

📺 How to Video - learnandclimb.com/pages/video-library

12

MAKE AN EGG GEODE- WITH BORAX

📦 FROM KIT

LARGE CONTAINER
TABLESPOON MEASURING SPOON
TWEEZER
BORAX
COLORING AGENT
PAINT BRUSH
STIRRING STICK

📦 FROM HOME

AN ADULT TO HELP
1 CUP OF BOILING WATER
EGG SHELL (CAN BE A WHITE OR BROWN
EGG) CLEANED AND INSIDE MEMBRANE
REMOVED. MAKE SURE YOU PEEL OUT THE
MEMBRANE WHEN THE EGG SHELL IS NEWLY
CRACKED AND CLEANED. IT SHOULD BE WET
FOR EASIER PEELING.



17

13

MAKE A GLOWING EGG GEODE- WITH BORAX

FROM KIT

- | | |
|------------------------|----------------|
| Large Container | Tweezer |
| Beaker | BORAX |
| Yellow measuring spoon | GLOW POWDER |
| Spoon | PAINTBRUSH |
| Tablespoon | STIRRING STICK |

FROM HOME

An adult to help
 Egg shell (can be a white or brown egg)
 Cleaned and inside membrane removed.
 Make sure you peel out the membrane
 when the eggshell is newly cracked and
 cleaned. It should be wet for easier
 peeling.
 1 cup of boiling water
 Napkin or tissue



18



- Using the small end of your yellow measuring spoon, add 3-5 spoonfuls of water to the beaker.
- Add 3-4 squeezes of glow powder to the water and stir well, your mixture should be thick and pasty.
- Use your paint brush to coat the inside of the prepared eggshell with the glow powder mixture, let dry. It does not have to be perfect, more and less in different areas is fine! This will add fun and dimension to your final geode!
- Ask an adult to prepare boiling water and have it nearby.
- Add 3 tablespoons of Borax to the large container.
- Let an Adult measure and carefully pour 1 cup boiling water into the large container with Borax in it.
- Stir the Borax and water until completely dissolved.
- Ask an adult to use the tweezers and gently immerse your 1/2 eggshell into the hot solution.
- Put in a place where it will not be disturbed, wait a 1-5 days.
- Carefully remove your egg geode with your tweezers from the liquid solution and discard any remaining liquid.
- Give your geode a quick rinse with fresh water and let dry.
- Hold near a bright light for a few minutes to charge the phosphorescence. Take it into a darkened room and see the glow!

RECORD YOUR RESULTS
 in your scientific
 notebook.

How to Video - learnandclimb.com/pages/video-library



1. Ask an adult to prepare boiling water and have it nearby.
2. Shape your pipe cleaner. This time we are going to make a kind of cup shape. Twist the pipe cleaner around itself forming a kind of spiraled circle shape, but don't make it perfect! Little gaps and bumps will give it some cool features! Now, gently form the circle into a cup type shape.
3. Cut a 10" piece of thread and tie a knot around the outermost edge pipe cleaner so you can suspend it in the solution in the same way you did with the star in a previous experiment.
4. Add 3 tablespoons of Borax to the 2-cup sized container.

5. Let an Adult measure and carefully pour 1 cup boiling water into the large container with Borax in it.
6. Stir the Borax and water mixture until completely dissolved.
7. Now we will tie the other end of the thread around your stirring stick. We will be suspending the shape using the stirring stick across the top of the container while the cup shaped pipe cleaner form will dangle in the solution you have created in the large container. It is important that the pipe cleaner does not touch the sides or bottom, it should be fully suspended and immersed in the Borax solution. This may take a little measuring and

adjusting to get it to hang in the right spot.

8. Now ask an adult to help you gently immerse your cup shaped pipe cleaner hanging from the string into the solution while it is still hot.

9. Put in a place where it will not be disturbed, wait and watch the magic happen!

DID YOU KNOW?

You can grow Borax crystals the same way we did here on a lot of things you find in nature - a dry leaf, seashells, pinecones and even rocks!

Give it a Try!

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14

MAKE A PIPE CLEANER GEODE

From Kit

- Large container
- Tablespoon Measuring Spoon
- Borax
- Pipe Cleaner
- Thread
- 2 Stirring Sticks

From Home

- An adult to help
- 1 cup of boiling water
- Napkin or Tissue

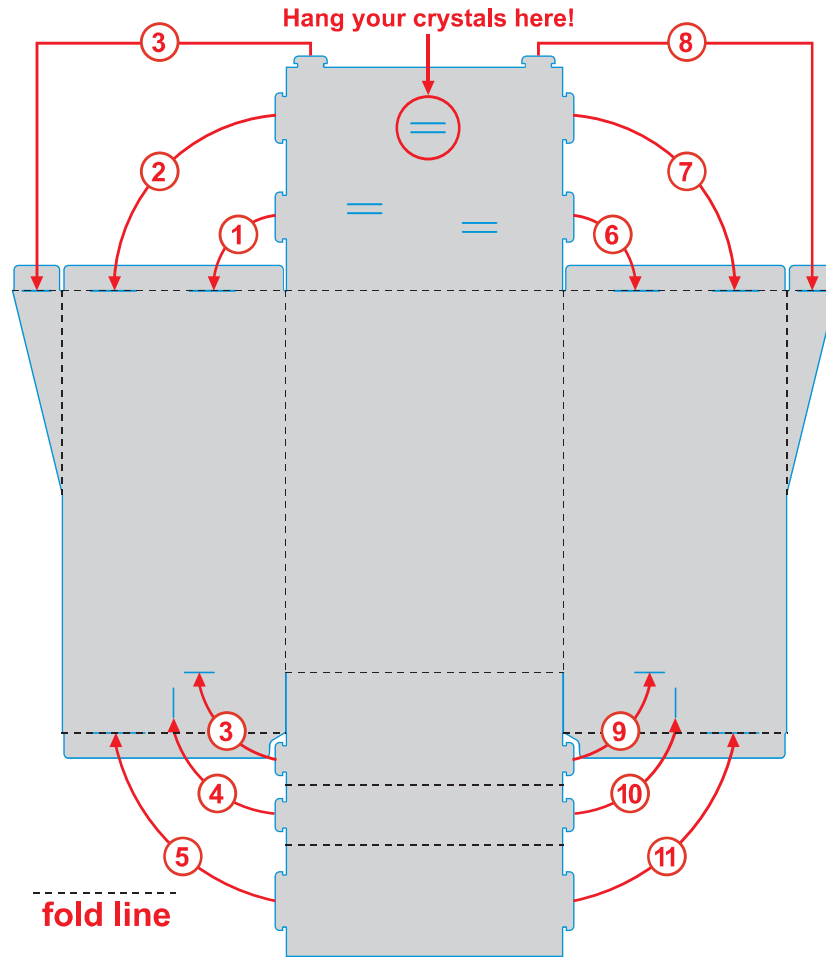


15

CREATE YOUR FABULOUS DISPLAY!

 **From Kit**

- CUSTOMIZABLE DISPLAY
- ACRYLIC PAINT
- PALETTE
- PAINTBRUSHES
- ALL THE CRYSTALS YOU HAVE CREATED
- 3 STIRRING STICKS

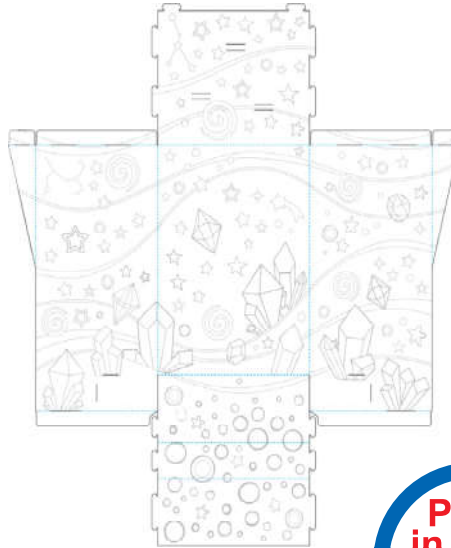


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1. Unfold your display and lay it out on your prepared painting surface.
2. Paint your display, use your palette to mix your colors! Allow to dry.
3. Fold on the dotted lines.
4. Insert all tabs into the appropriate slots to build your display. For example: insert tab 1 into slot 1, tab 2 into slot 2 and so forth until all 11 tabs are inserted into all 11 slots.
5. Take your crystals that are hanging on thread and sticks and insert each stick one by one all the way through each of the 3 holes found in the top. You will push one end of the stick with thread attached up through one hole from the inside until the whole stick is outside, then allow the stick to rest flat on the top of the display while your creations float inside! Feel free to cut and adjust the length of the thread to your liking for the display.
6. Place the rest of your cool creations on the stage area in the bottom and show off your Grow, Glow and Show Crystal creations!

Nice WORK!



Paint in your favorite colors



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FAQ



Q1. There are crystals on the bottom of the cup but not on the growing seed, what happened?

A1. Water quality, temperature and cooling rate can all play a factor in this. Do not worry! Crystals may form on the bottom or sides of the cup first, but after a few days they will appear on the seed as well. Sometimes dust or other impurities in the water stimulate growth by becoming nucleation points, the crystals grow quicker and in random areas rather than on the seed. You can save the “extra” crystals that grow in a jar for an added bonus!

Q2. When I removed the crystal after it grew it came apart from the seed, is this ok?

A2. Yes! This will occasionally happen due to the reasons mentioned above but this does not affect the final result, you will have a cool dome of crystals that light can penetrate!

Q3. Can I just use hot water from another source or do I have to use boiling water?

A3. You must use boiling water for the ADP and Borax experiments.

Q4. My crystals are very small, why?

A4. Please do not disturb the crystals while growing. Do not swish the solution around while waiting, leave the dish still for a few days- be patient- they will grow larger in a dust free and still environment.

Q5. No crystals have grown at all, what happened?

A5. Usually this is because a saturated solution was not achieved. Please be sure to use the exact amounts of water and chemicals for each experiment. Double check your amounts and adjust accordingly. If you need to add more chemical, you must reheat the solution.

First, remove the seed and place on a paper towel nearby. **DO NOT REHEAT IN A MICROWAVE!!** We suggest transferring the solution to a glass, heat safe container and reheat it in a boiling water BATH. Do not allow the solution to boil. Then allow to cool with a dust cover, place the seed back in, wait a few days and watch your crystals grow!

Q6.
The pipe cleaner has leaked color into the solution, is this ok?

A6.
Yes, it is perfectly fine and expected. There will be no negative effect on your resulting crystals!

Q7.
I have spilled crystal solution on my carpet or clothes, what can I do?

A7.
You can wait until it dries and vacuum up the powdery residue, then wipe up any remains with a damp cloth. If there is food color agent in the mixture, follow the

same steps. You may need to spot treat the area with a carpet cleaner for best results. Remember the coloring is bio-degradable and should fade further over time.

Q8.
My glowing moon, star or egg will not glow, why?

A8.
The glowing agent's phosphorescence must be charged before going into a dark room by holding the moon or star near a bright light for 1-2 minutes. This will give your creations a super glow!

Q9.
I have a little bit extra of each chemical, can I mix them?

A9
No, never mix chemicals in this kit. Perform each experiment as directed and discard any unused chemicals safely that you did not use.

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Notes



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