***McWizKid Science Two* Explanations to the Science Activities**

**“EXPLANATIONS FOR PARENTS WHO WANT TO KNOW!”**

**Discovery Activity #1 How can a balloon float in “mid-air”?**

With the stream of air – came a lowering of the air pressure. This created a column or chimney of lower air pressure where the ping-pong ball or balloon was. Therefore, the stronger air pressure surrounding that stream of air was keeping the objects trapped in the lower air pressure stream. **BONUS!** Does the same thing work with a stream of water? Attach a ping-pong ball to a long piece of string and let the ball come close to a stream of water while you hold the string. You’ll be amazed at what happens! It will actually “stay” under the force of the water stream! Yep…it what they call Bernoulli’s Law in action. It works with air OR water. Did you ever have a paper get sucked out of a car window? Fast flowing air lowered the air pressure outside of the car and pulled the paper out. Tornadoes lower the air pressure outside of a building and the greater air pressure inside explodes the windows toward the lower air pressure.

**Discovery Activity # 2 Can you snuff out a candle with an “air cannon”?**

In this experiment we observe that when we tap – tap – tap the plastic, we vibrate the air molecules and they “shoot out” of the bottle to put the candle flame out. See how far away you can do this! You’ll be surprised when you get to six feet – IF you’re a good shot! Sound is vibration of molecules and is another form of energy – or the ability to do work. “Energy is a property of many objects and is associated with heat, light, electricity, mechanical motion, and sound.” If you were to hold the bottle horizontally and place aluminum foil with lit incense on the inside bottom, tapping slowly over a lamp with the lights turned out you’d see what happens. Smoke donuts (toroidal vortexes) come out of the bottle if you tap lightly. WOW is that cool. Make sure to dispose properly of the burning incense which can be a fire hazard!

**Discovery Activity # 3 Does sound travel faster through air or through a solid?**

SOUND travels faster in solids. That’s why native Americans would get down with their ear to the ground and listen for buffalo, or people would put their ear on a railroad track to see how far away a train was. In this experiment the banging of the utensils causes vibrations that travel up through the string to your ears, and you hear a very different sound. Tap your desk with your knuckles. Now do the same thing and place your ear down on the desktop. Hear the difference? Ask anybody “Does sound travel faster through air, land or water?” – and guess what? Most will NOT say “land”.

**Discovery Activity # 4 Can you make a really cool *balloon rocket*?**

This experiment demonstrates Newton’s Third Law of Motion – for every action there’s an opposite but equal reaction. When the air pushes back, the balloon rocket pushes forward. Actually, if you think about, that’s the way you walk! You have to push back on the ground to go forward. You have to row a boat the same way! Could you make a “booster rocket” for this model? How? Design one! We see that when the balloon was blown up it had the *potential* energy to go somewhere. When you took off the clothespin, or let go, it turned into “kinetic energy” – or energy in motion, and made the balloon go forward! So potential energy is the energy that is ‘READY’ to do work, like a bowstring pulled back - and “kinetic” energy is *energy in motion* – like the arrow traveling through the air. Could you say that most everything is either potential or kinetic energy in the final analysis?

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 **Discovery Activity # 5 Can you get a steel paper clip to float on water?**

This is a fun experiment where we find that the surface tension or “thin skin” on top of water holds up not only steel paper clips, but also bugs and other things as well…like leaves and flower petals! Even some lizards like the “Jesus Christ Lizard” runs across the water! Look it up on YouTube. Because of the attraction of water molecules to stick to other water molecules as in the principle of cohesion – we find that the closer these molecules are to the surface – the greater is their attraction to each other. As a consequence, you have a “thin skin” of “surface tension” that is created – strong enough to hold up a paper clip, a water bug, spider or a snake. Try sprinkling pepper on a large pan of water. Then drop just ONE drop of dishwashing soap in the center. Pretty cool reaction!

**Discovery Activity #6 What holds that water up?**

The water is held up by *about* 15 pounds of air pressure per square inch (psi) in this experiment. You have about 15 pounds of air pressure all around your body right now. The air pressure pushing up against the lid is stronger than the mass of the water that gravity is pulling down on. At sea level, air pressure is about 14.7 pounds per square inch. The concept of air pressure is similar to you having ten or twenty kids pile on top of you if playing football. You’d feel the weight of their bodies. What if you had *one hundred*? The bodies would be like air molecules above pressing down on the molecules below – from as high as 300 miles up in our atmosphere! The closer to the ground the greater amount of air molecules above - that are pushing down on an object.

**Discovery Activity #7 A collage of color mystery!**

Here the milk fat will hold tight or *bond* with the dish soap. When this happens you’ll see that the food coloring and the water are pushed away **because** of the strong bonding going on with *the dish soap* and *the milk fat*. As a result, everything in path of the bonding milk fat and dish soap is pushed away – which means the food coloring starts swirling and convulsing in a rather majestic display of visual coloration. What would you expect to happen with skim milk or 1 percent milk? Try it and see!

**Discovery Activity #8 Can you make a compass out of a paper clip?**

In this experiment we introduce something called “magnetic induction.” The helter-skelter polarity of the molecules of the steel paper clip have been “rearranged” by the magnet so that all the molecules north and south poles line up in a magnetic “domain” that is all polarized in the same direction. In other words, all the molecules have a north and south position in the steel paper clip. As a result, the paper clip magnet now tries to align itself with the magnetic field of the earth! By placing it over the Styrofoam on the water, we simply reduce the friction on motion, so that it can find it’s way “north and south.” As early as the 1100’s – the Chinese navigators used compasses. Western European sailors used compasses by the 1300’s.

**Discovery Activity # 9 Can water stick to water?**

Basically, water will stick to water because of something called “cohesion” and *polar molecules* sticking to *polar molecules* of water. Cohesion is basically when *like molecules* stick to **the same kind** of molecules. Place some water on the side of the plastic bottle. Now take some wet paper and see if it doesn’t stick! It’s called **adhesion**! Adhesion is different in that different molecules will sometimes stick together, like paper and water, or water and plastic. Cohesion is when the “same kind of molecules stick together.” That’s the difference. So this is why the water coming out of the bottle will stick to the water stream next to it. Do you notice that sometimes a showerhead does the same thing when you take a shower? Perhaps it depends how fast the water is coming out and how close the sprays are to one another? **KIDCOOLBOOKS.COM**

**Discovery Activity # 10 Why does the water go in but NOT come out?**

This experiment demonstrates that water can go through the holes of the cheesecloth when the water is poured “down,” through it. However, when the container is turned back over or inverted, you have “air pressure” that is being exerted up against the water coming down and it will stop if the jar is held vertically. Surface tension is somewhat involved here as well.

When you’re in a canvas tent and it’s raining, you don’t touch the top of the tent from within – or you get drips! You break the surface tension of the water trying to come through the holes!

**Discovery Activity #11 Make frost in a fairly warm kitchen?**

Here you made the temperature drop because you not only added ice, but “salt” to the can’s contents. Salt lowers the freezing/melting point of water You observed that as the temperature dropped – you began to see water droplets forming on the outside of the can. This happens because there is moisture in the air that condenses (or comes together) to make “dew” – just like the dew on metal objects outside in the early morning hours – or even grass! Clouds and fog are made of minute droplets of water! Condensation is the opposite of evaporation. Next, the metal can overall gets colder and colder and the dew turns into “frost.” Did you scrape your fingernails in it? FUN.

**Discovery Activity # 12 Can you make a stream of water move with a comb or balloon?**

Actually water atoms have north and south poles on them called “ions.” Ions are electrically charged atoms. These ions of positive attraction *are pulled* by the negative charges of electricity on the rubber or plastic comb making the water move slightly. This is kind of like a south (S) side of a magnet pulling on a north (N) side of another magnet. Were you surprised? Can you hold a charged balloon next to a small stream of running faucet water and see what happens? Charge the balloon or comb by rubbing it on wool or your hair – the more strokes the better! Check and see if there is a correlation between the amount of strokes and the intensity of the pull on the stream of water.

**Discovery Activity # 13 Can you make a ketchup package go up and down in water – without touching it?**

According to what we call Pascal’s Law, any pressure placed on one area of a fluid is “equally” distributed throughout the whole container. In this experiment, when you press the bottle, the pressure squeezes the air in the condiment package…kind of like a snowball is squeezed and made smaller. With the smaller amount of compressed air, the condiment sinks because it’s now denser. When you let up on the pressure, the ball of air in the condiment expands and the condiment package rises. This is basically the idea for the “Cartesian diver.” Check it out!

**Discovery Activity # 14 Can you make a pop (or soda) can move with static electricity?** Static electricity is simply “still” electricity, or the “build-up” of relatively non-moving charges on matter. It’s electricity that is all around us, especially on our clothes during the winter months where there is snow. Here we use the “negative” charges of electricity on the balloon to “pull” (or push) a tin can that is positively or negatively charged. Try rubbing the balloon on your hair or wool sweater and then sticking it to the wall or television monitor! Try sprinkling some *very* small pieces of cork from a wine bottle on a comb after you comb your dry hair. You’ll be surprised what happens if you watch long enough! They will “pop off” like little rockets if you wait a while!

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**Discovery Activity # 15 Can yeast blow up a balloon?**

Yeast are actually tiny microbes that are inactive as long as they are cold. However, place them in *warm* water with some sugar - and the yeast come alive! They begin to feed off of the sugar and produce carbon dioxide gas as a “by-product.” With millions of microbes producing enough carbon dioxide gas – they can even blow up your balloon! Yeast are harmless microbes compared to Salmonella, a very dangerous disease. Yeast can even be used to make wine, as well as bread and pizza dough. What if you changed not only the amount of sugar or the amount of yeast, or even the temperature of the water? Would it make any difference?

**Discovery Activity # 16 Static people – How do they move?**

Here we see how negatively charged particles on the balloon attract the positively charged tissue people in and through the plastic carton. These charges are much like the clothes that stick together coming out of your clothes dryer. The positively charged electron particles in the socks are attracted to the negatively charged particles in the shirt. When you walk across the carpet in your socks in January in temperate zones, the negatively charged electrons rub off your socks – leaving you positively charged. Then you touch a doorknob, and the negative charges jump on to your finger and give you a “zap.” Now you are “balanced” again with basically the same amount of positive and negative electrical charges – leaving you “neutral.” Did you know that lightning is a spectacular example of a static discharge? THERE’S a huge spark for you! There is really a “two-lane” street of charges flowing from the lightning bolt. One lane is positively charged particles and the opposite lane is negatively charged particles. After the lightening the clouds are “balanced” or neutralized with electrons.

**Discovery Activity # 17 Can you make this KID COOL “shoe box” guitar?**

Sound is basically “vibration” of molecules that transmits waves of energy to your ears. The closer the molecules are together, the faster they can vibrate a sound. Consequently, sound travels fastest in solids, then liquids, and lastly, air. In this experiment the rubber bands vibrate sound very similar to your vocal cords. Do some research on the “larynx” or voice box and learn some more! Hold two fingers over your larynx and say “Buzzzzzzz”. You’ll feel the vibration. Thomas Alva Edison invented the very first sound recording device in 1877. Try inventing your OWN musical instrument and giving it a name. In the air, sound travels in waves that go in all directions from a source - like a rock that falls into a pond of water.

**Discovery Activity # 18 Oh no! Don’t let it “kiss you on the lips!”**

This experiment shows that air – like a snowball – can be compressed into a smaller space than originally. Can water? The particles of atoms and molecules in air actually have a small amount of space that surrounds them – enough to give up a little bit of room. Water has less space between its molecules, and solids have even less. The tissue ball *bounced off of a wall* of compressed air in the bottle that you made with your blast of air. That’s why it bounced right back at you! You compress air every time you use your tire pump to air up your tires, don’t you. If you blow up a paper bag and pop it, it makes a loud sound because you compressed the air in the bag really fast and it made waves of vibrating air.

**Discovery Activity # 19 Is this a trick on your eyes?**

Light travels through water differently than through air because it’s a different medium of molecules in a different state of matter. When you look at a fish in a fish bowl, you are actually looking through three mediums – namely, air, glass, and water. **KIDCOOLBOOKS.COM**

When light hits various mediums of matter, the light is slowed down somewhat and refraction or bending of light takes place. However, in the case of the liter bottle, the light is bent and twisted in a reverse pattern, which makes the arrow look just the opposite. Your eyeballs do that and turn everything you look at upside down in the back of your eyeball. Thank goodness your brain turns it right side up! Light is energy we can see.

**Discovery Activity # 20 Do things float at different levels?** Briefly stated, things simply float if they have a *density* of less than ***1 gram per cubic centimeter***. Density is the amount of “stuff” (or molecules) that is packed into a given volume of matter. One cubic centimeter of lead is denser than one cubic centimeter of cork. A duck’s body is basically *less dense* than 1 gram per cubic centimeter. THAT’S why ducks float! Then there’s “viscosity.” Viscosity is the thickness of fluids. Some fluids’ molecules are more densely packed together than others. Consequently, in this experiment – a crayon, a cork, a grape, a small cherry tomato, and a metal nut all sink to a different level of thickness in the respective fluids. Each has a density per cubic gram that’s greater than the fluid above it, but less than the fluid that’s below it. Obviously, you always have other items that float because of pockets of air trapped within them! Then there are huge boats float because of “buoyancy” or the “pushing back” of the water against the hull of a ship. Maybe this helps a little on why things float?

**Discovery Activity # 21 What colors come out of black ink?**

*Chromatography* is an examination of mixtures of chemical compounds - by separating the chemicals or colors. As you know this is done in various ways, and sometimes even used by police in investigations of such things as writing instruments. Here we see how the colors of the black pen separated over the paper towel to show us some of the colors that were inside the black mixture. If you try different colored markers – do permanent or non-permanent markers work best? The water travels “up” against gravity by something called “capillary action.” Capillary action is where water or fluids are attracted to one another as they climb up material with pores or narrow openings. Paper towel is made from cellulose, and these fibers are bundles of cellulose. Cellulose is made in plants – and gives plant cells their structure. Cohesion takes place when water molecules stick to water molecules, and “adhesion” is where molecules stick to molecules that are different than themselves. So we see in this capillary action experiment that water molecules are clinging to the paper molecules and finding pores to continue climbing up the paper fibers as other water molecules are attracted to the ones above them!

**Discovery Activity # 22 Are all metals attracted to magnets?**

The word magnet came from the name “Magnesia.” Magnesia was a region in Greece where people discovered the interesting rock called “lodestone” some 2000 years ago. Magnets are attracted to steel, nickel, cobalt and iron. Tin cans can attract a magnet only because they are made of steel and not tin! You might be surprised to find that most coins are **not** attracted to a magnet. basically, anything that has iron or steel in it is attracted to a magnet. U.S. coins are not attracted to magnets because there are none of these metals mentioned usually present. Alnico magnets are among the strongest types of magnets.

**Discovery Activity # 23 Can YOU defy gravity?**

Obviously, magnets CAN defy gravity because of their strong attraction to metal objects made of steel or iron for example. Magnets are used in a variety of products like televisions, doorbells, and computers. Actually, a man named Sir William Gilbert from the 1600’s was noted to declare the earth is actually *a giant magnet* with a huge magnetic field surrounding it. In this experiment we simply

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demonstrate that magnetism can be strong enough to pull these paper clips against the force of gravity. A force is simply defined as a “push or a pull” that can affect the motion of an object. The trick here is you obviously don’t see the hidden magnet under the lid.

**Discovery Activity # 24 Tricks with Magnetic Power**

It’s amazing how many toys and magic shows will use the power of magnets to entertain the curiosity of their guests! Can you make a toy out of a magnet? Why not get an empty matchbox from your parent or teacher and place a magnet inside. Then make it look like a car, truck, or animal that will move across a thin piece of cardboard while you place your hand underneath another magnet. Have fun creating your own magic show! Here again we see *the property* of magnetic attraction. **A property** is a quality, power, or “characteristic” of something. A property of magnets is the power of attraction or repulsion to other magnets or some metals. A property of other items might be: color, size, shape, texture, boiling point, etc., that are special to that particular object.

**Discovery Activity # 25 Have you ever seen a really cool classic chemical reaction – with dish soap?**

In this experiment we saw two reactants, vinegar and baking soda, combine to form a product of carbon dioxide gas with foaming bubbles. If you measured the temperature with a thermometer you might have been surprised! You would have seen that energy from the reactants *was absorbed* and **the temperature lowered several degrees** – usually three or four. Whenever you have a chemical reaction, you will find that energy is either released or absorbed. But the greatest fact to remember is that UNLIKE a physical reaction that ONLY has a change in FORM, a chemical reaction changes to a NEW substance. This substance almost always CANNOT be changed back to what it was before the reaction. When a new substance is created by combining two or more materials, it has properties that are unique or different from the original materials. The dish soap merely traps much of the escaping carbon dioxide gas and makes a more dramatic reaction. Don’t you agree?

**Discovery Activity # 26 Can water “zip line” along a string?**

The water doesn’t fall straight down when held at an angle because there is something called “adhesion” (like a bandage is an adhesive) that holds the water to the string. Water molecules are “polar” covalent bonded molecules that attract other polar molecules – like water. So water sticks to water, because like a magnet, water molecules are polar and stick to one another. Consequently, the water travels along the wet string and down the angle to the cup, unless a stronger pull like gravity takes over! You observe that the water doesn’t travel down the string without the string being wet first!

**Discovery Activity # 27 Can you make your own movies?**

In these experiments we see how persistence of vision works. It’s much like movies where you might see about 23 pictures a second – and even after the image has gone, your brain “persists” in holding on to the image. It’s really an optical illusion! Thomas Edison capitalized on this phenomenon when he invented movies in the late 1800’s. In these two experiments your brain captures an image and holds it long enough to give the illusion of motion when other pictures are in slightly different positions. If you need paper pads for this – go to your local printer. Sometimes they will sell them very inexpensively or even give them to you for free! OR you can just use an old spelling or workbook.

**Discovery Activity # 28 Can you blow the bridge over?**

In this experiment you saw that the top of the paper bridge moved downward slightly when you blew underneath the bridge. This is because your moving air lowered the air pressure below the bridge and the *greater air pressure above* pushed down on the bridge – **KIDCOOLBOOKS.COM**

keeping it pretty much in the same position. Try blowing over a thin strip of paper about nine or ten inches long. Hold it just under your lips and outward. Predict what will happen first – then give it a hard sharp blast of air and hold it! You should see “lift off” – the same principle that taught the Wright brothers the secret of flight. Blow a large blast of air straight across a dime on a table and see if you can pop it into a saucer about 4 inches away. Can you explain that one? (Hint: Air pressure difference.)

**Discovery Activity # 29 Can you make a sound like a turkey?**

Here we hear some strange sounds caused by the “vibration” of the sponge moving along the wet string. The vibration is caused by “friction” between the sponge and the wet string. Amplification of the sound is made by the plastic cup, which creates a larger “sound wave” than you would have without it. What *variables*, or things that could change the result, could you change - to make a different or louder sound? How about a larger plastic cup? A large popcorn cup?

**Discovery Activity # 30 Can you put a coin in a cup without touching it?**

Inertia is the tendency of objects in the universe to stay still if still, or to keep moving if moving, in a certain direction – UNLESS acted upon by another force! This is basically Isaac Newton’s First Law of Motion. Objects tend *to resist* a change in position or motion. Here we shot the paper out from under the nickel, but the nickel wanted to stay right where it was! Since nothing was now holding it up – gravity took over and it dropped into the cup! If you were out in space and on a spaceship and could throw a baseball - it would keep traveling forever in a straight line at a given speed! Forever, unless another force like gravity pulled on it from somewhere. **What was your favorite experiment? Let us know how your child enjoyed the science activities!**

“What was your favorite experiment? Please drop us a line and let us know why. Would you like more of these books?”

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