

Experiments on **SURFACE TENSION** with video links



Arsha Saraf
India Book of records holder
Youngest to provide facility of
free Operational Science Laboratory

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2

Preface

This book is an attempt to make the concept of Surface Tension interesting to understand.

Science learning should be based on observations and experimentation .It includes step by step procedures to perform simple experiments along with the youtube links so that the STEM enthusiasts can decipher the way to perform easily.

The book presents before the Science enthusiasts a memorable experience in the form of illustrations.

Welcome to the world of STEM!



Content

Surface tension

1. BlackPepper Experiment	7
2. Dancing Milk	13
3. Penny Dome	19
4. Water Magic	25
5. Coin Magic	31
6. Paper Clip Experiment	37
7. Bubble inside Bubble	43
8. Bottle Fun	49
9. Bangle Fun	55
10. Strong Bubble	61

SURFACE TENSION

D e f i n a t i o n

Surface tension is the property of liquid that causes molecules at the surface to attract one another with cohesive force and forms elastic like membrane.

Experiment 1

Black Pepper Experiment

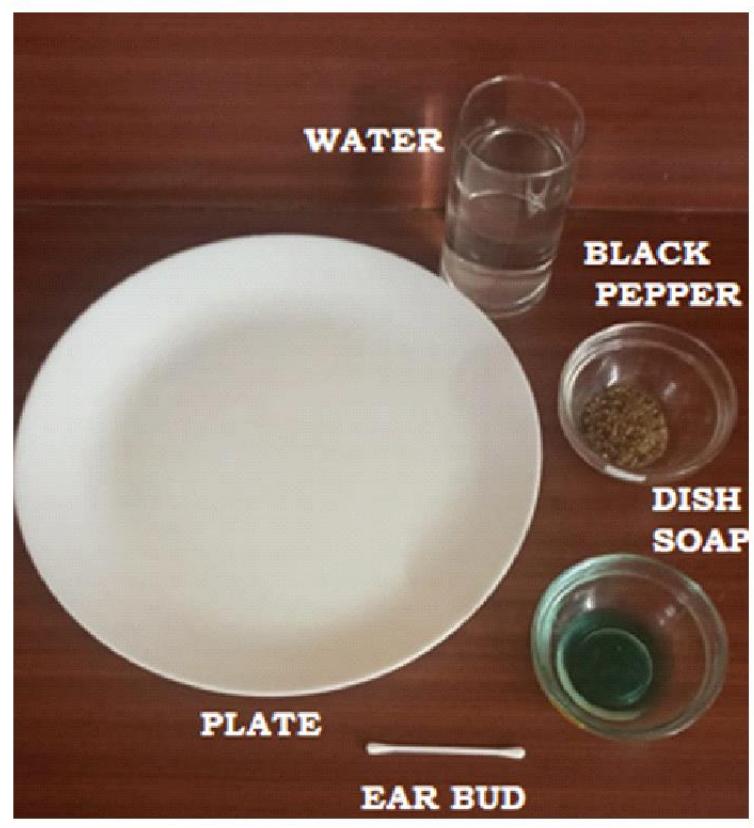
**Do you want to see whether
the black pepper powder
floats or sinks?
in water.....?**



Try This
out

7

Material Required



Now Just
Do it...

Procedure

1



POUR SOME
WATER IN A PLATE

2



SPRINKLE SOME
BLACK PEPPER ON IT

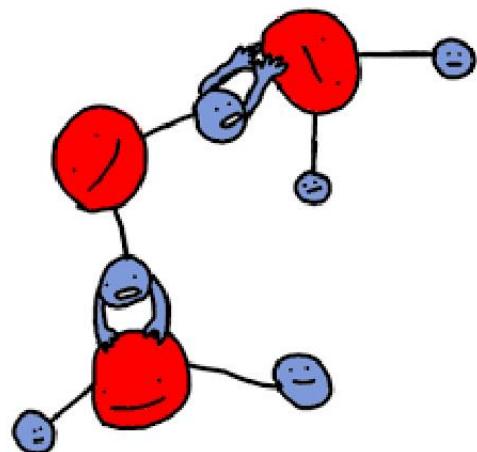
3



PUT AN EARBUD INSIDE THE PLATE
AND YOU WILL OBSERVE NO
MOVEMENT IN THE PARTICLES
OF BLACK PEPPER

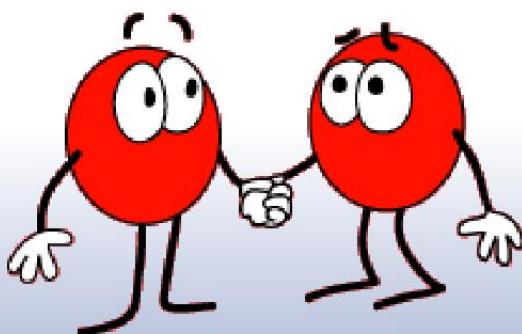
9

4



DIP ANOTHER EARBUD IN LIQUID DISH SOAP

5



PARTICLES OF BLACK PEPPER MOVE AWAY

10

CONCLUSION

Here surface tension exists in water as the molecules of water on the surface tend to stick one another with a cohesive force and make an elastic membrane. Black pepper sits on elastic membrane of water. When soap is added in the middle, it breaks the surface tension there, but surface tension still exists in other parts of water. So some particles of black pepper sink and some float.

Watch this experiment at



YouTube

<https://youtu.be/NoPSJeG1GuQ>



SCAN & VIEW

11

**DO YOU
KNOW?**

**Water striders can walk on water
because of the the**

SURFACE TENSION OF WATER



Experiment 2

DANCING MILK

EXPERIMENT

Do you
want to see
different colours
dancing
in milk??

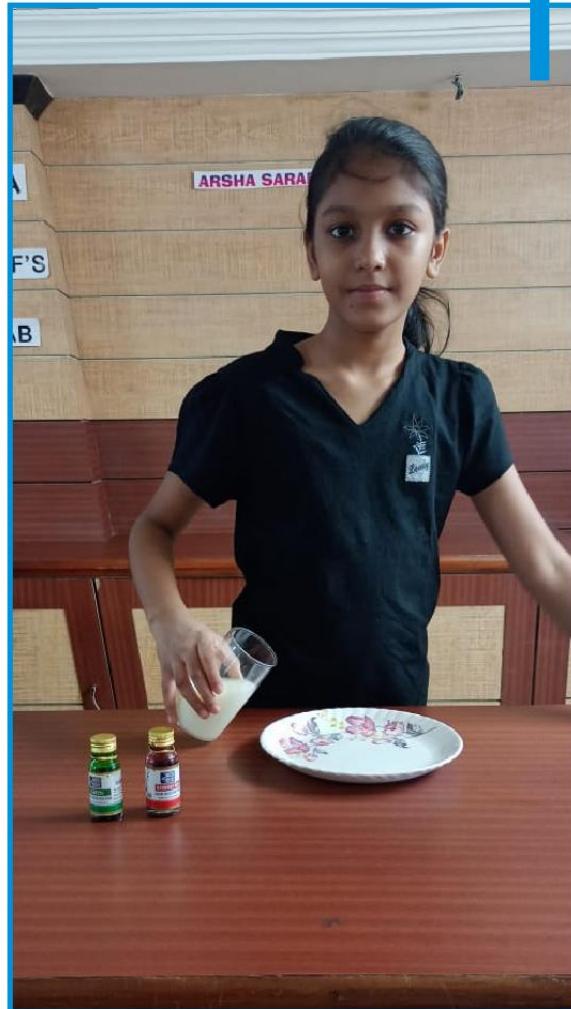
MATERIAL REQUIRED



Try this out...

PROCEDURE

1



POUR SOME MILK IN THE PLATE

14





2

PUT 2 DROPS OF RED COLOUR
ON THE MILK AS SHOWN

3

PUT 2 DROPS OF GREEN COLOUR
ON THE ALTERNATE SIDE



4

DIP AN EARBUD IN DISH SOAP



15

5

PUT THE EAR BUD
AT THE CENTER
OF THE PLATE



6

THE MILK STARTS
DANCING
IN THE PLATE

16



CONCLUSION

Milk is homogenized, fat particles are equally spread throughout the milk. Food colour is lighter than milk. The surface tension of the milk keeps the food colour in one place. When the dish soap is added, it binds with the fat molecules of milk and reduces the surface tension of milk.

This is why the food colour seems to “dance” after it is touched with dish soap.



SCAN & VIEW



Watch this experiment at



<https://youtu.be/HQzvuXLU01g>

**DO YOU
KNOW?**

Why liquid drops are spherical in shape?

Surface tension is responsible for spherical shape of liquid droplets. Cohesive force of water molecules tend to pull them inwards and minimize the surface area and spherical shape has minimum surface area. So water drops take the shape of sphere.



Experiment 3

PENNY DOME

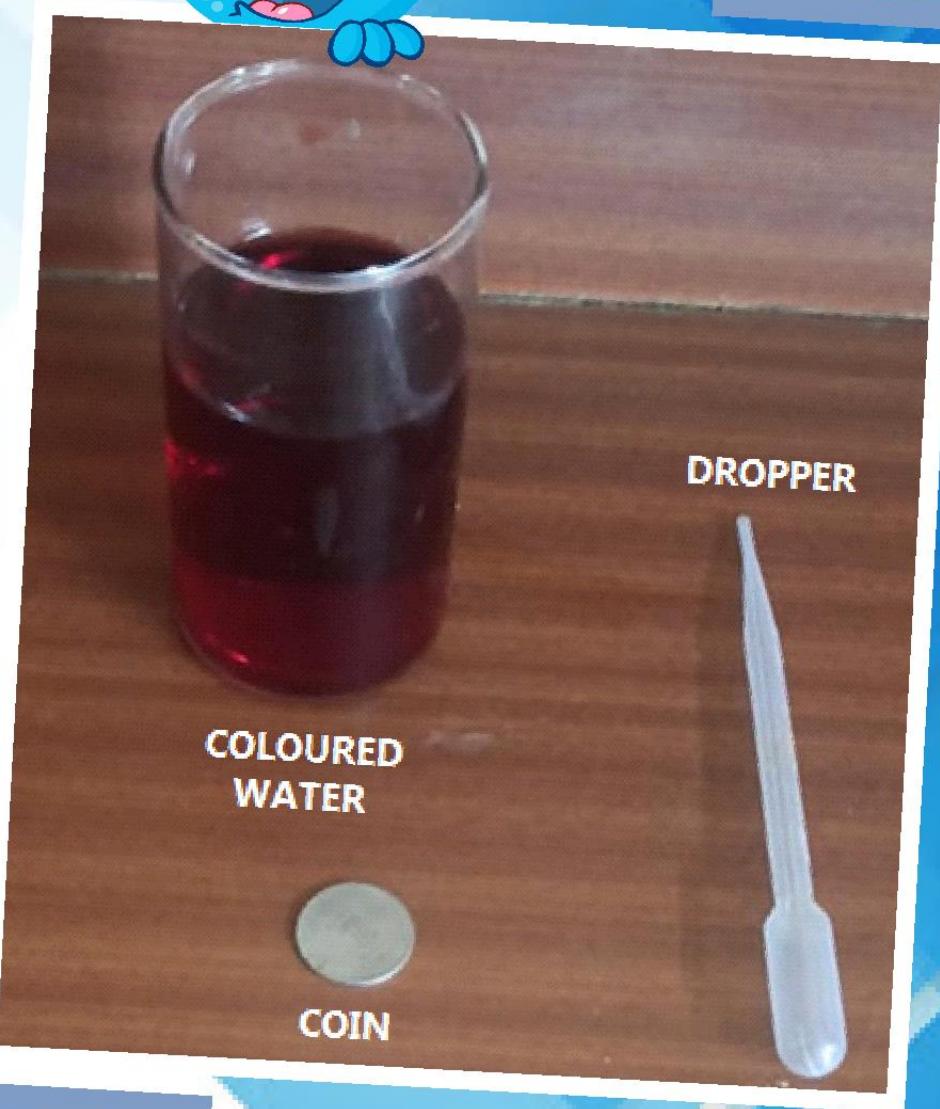


**Have you ever seen a dome
of water over a penny??**

Try this out...

19

MATERIAL REQUIRED



PROCEDURE



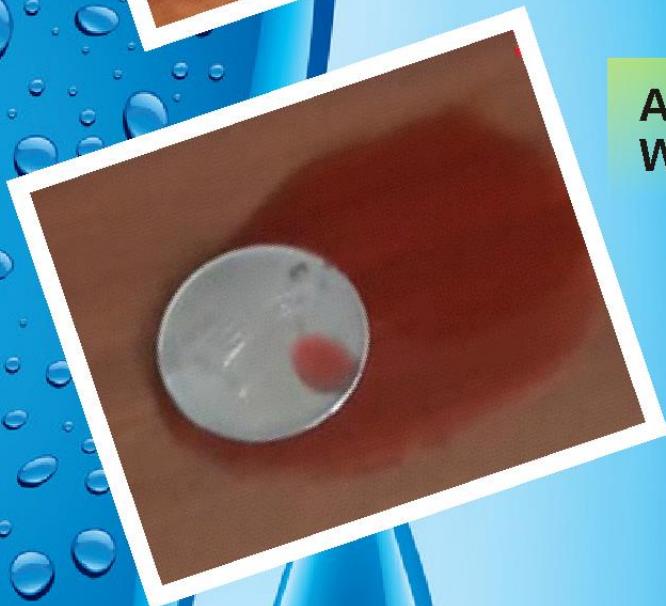
TAKE A COIN AND POUR SOME DROPS OF WATER ON THE COIN

POUR IT DROP BY DROP





APPROXIMATELY 34 DROPS
OF WATER ARE CONTAINED ON
COIN.
IT WILL MAKE
A DOME LIKE STRUCTURE



AFTER THAT WATER
WILL SPILL



CONCLUSION

Molecules of water holds each other and prevents them to falling out or spilling which is called surface tension.

You can keep adding water drops on the penny until the surface tension is strong enough to counter the gravitational pull on the water



SCAN&VIEW

Watch this experiment at
 **YouTube**
<https://youtu.be/7-X7ApS1by0>



SURFACE TENSION DISINFECTANTS

DO YOU
KNOW?

Disinfectants are usually solutions of low surface tension. This allow them to spread out on the cell walls of bacteria and disrupt them.

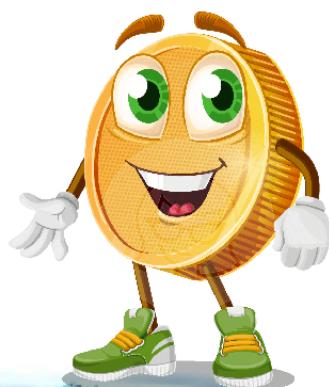


KnowledgeFact

Experiment 4

**WHAT WILL HAPPEN
IF YOU INVERT
THE GLASS OF WATER?
WILL THE WATER SPILL OUT??**

Water Magic



Try this out... **25**

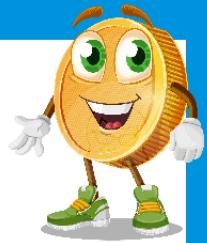
MATERIAL REQUIRED



26



PROCEDURE



POUR SOME COLOURED
WATER IN GLASS AND
PUT IT UPSIDE
DOWN ON PLATE

CAREFULLY PLACE
A COIN UNDER
THE GLASS



**LIKEWISE PUT ANOTHER
TWO COINS AS SHOWN.
OBSERVE,
WATER IS NOT SPILLING
OUT**



**PLACE ANOTHER
COINS CAREFULLY
ON THE
ABOVE THREE COINS.**

**NOW THERE IS A
GAP OF
APPROXIMATELY
3 MM BETWEEN
GLASS AND PLATE
BUT WATER IS NOT
COMING OUT**



CONCLUSION

There is a gap of approximately 3mm between glass and plate and water is not spilling out.

The molecules of water hold each other with cohesive force called surface tension.

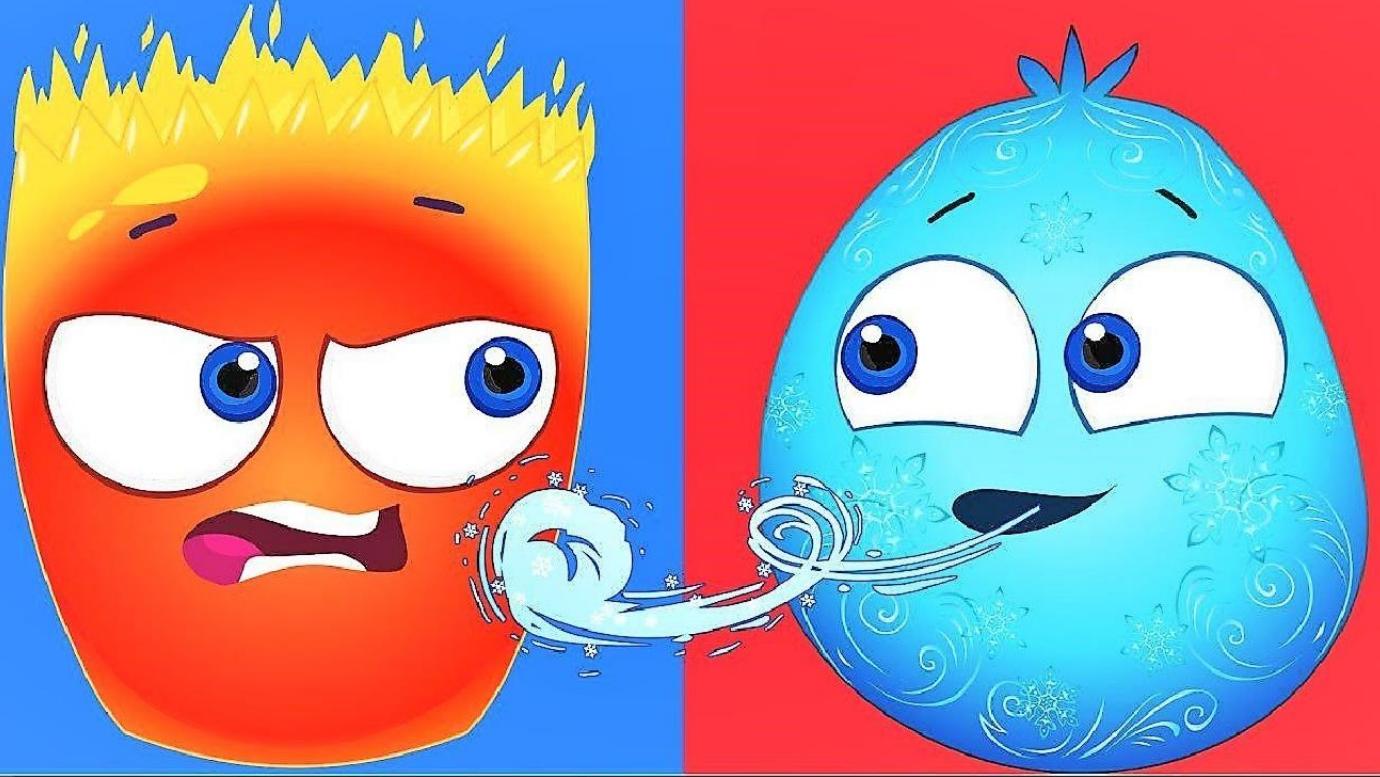
These water molecules make a thin membrane on the surface of water and hold it.



SCAN & VIEW



Watch this experiment at
 **YouTube**
<https://youtu.be/Ii7-pB7KBr8>



KnowledgeFact

SURFACE TENSION OF HOT WATER

Surface tension of hot water is less than that of cold water. Hence hot water is a good cleansing agent.

Experiment 5

**WHAT
WILL HAPPEN IF
YOU PUT
COINS
IN A GLASS
FULL OF WATER?
WILL THE WATER
SPILL OUT??**



CoinMagic

Try this out...

31

MATERIAL REQUIRED



32



PROCEDURE



**POUR THE WATER IN
GLASS AND FILL
IT TO BRIM**

**ADD SOME EXTRA
WATER
WITH DROPPER**



**PUT 12 TO 15 COINS
IN THE WATER
ONE BY ONE**



**WATER BULGES OUT
BUT DOES NOT
SPILL OUT**

CONCLUSION

Water has a high surface tension. The molecules of water stick to each other with cohesion force and make an elastic membrane.

This elastic membrane holds the extra water and makes a dome like structure. But gravity is trying to pull the water down. When gravity succeeds in collapsing the dome, water falls down and breaks the surface tension.



SCAN & VIEW

**Watch this experiment at
YouTube**
<https://youtu.be/T18gfXFYNac>

WASHING WITH COLD WATER

DO YOU
KNOW?

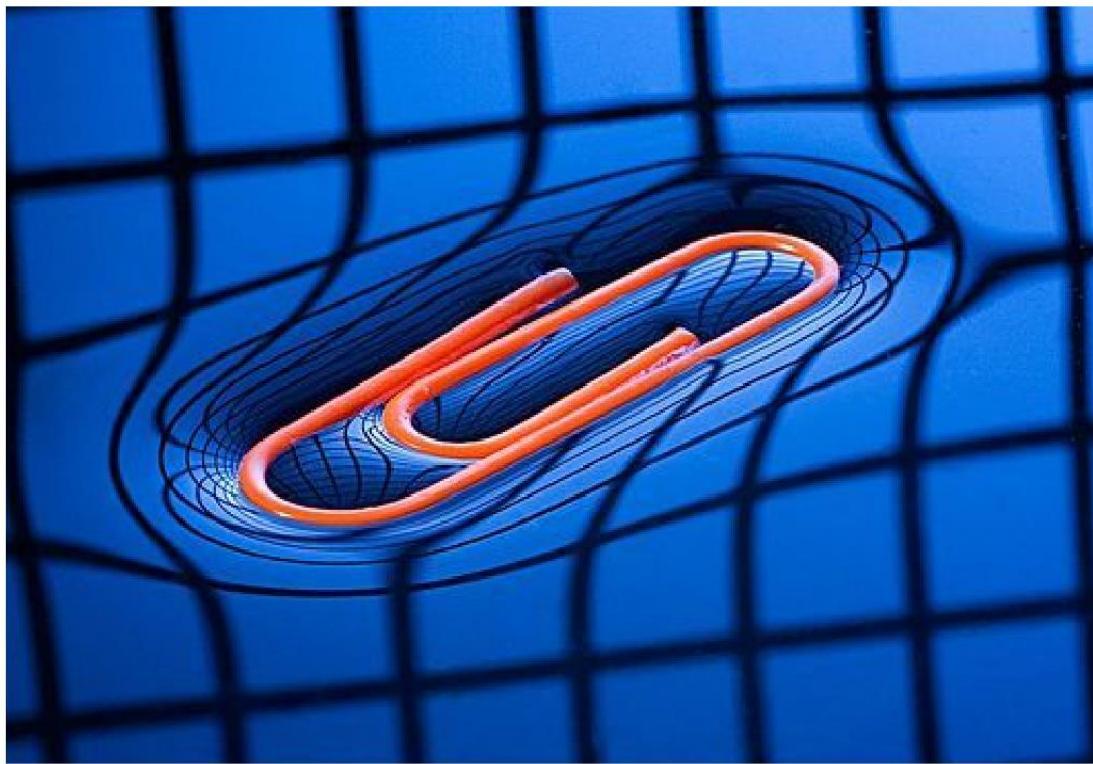
The major reason for using hot water for washing is that its surface tension is lower and it is a better wetting agent. But if the detergent lowers the surface tension, the heating may be unnecessary.



KnowledgeFact

Experiment 6

PAPERCLIP Experiment



[CAN A STEEL PAPER CLIP
HAVING MORE DENSITY
THAN WATER
FLOATS OR SINKS IN WATER??]

Try this out...

37

MATERIAL REQUIRED



PROCEDURE



PUT A STEEL PAPER CLIP IN THE WATER



IT WILL SINK



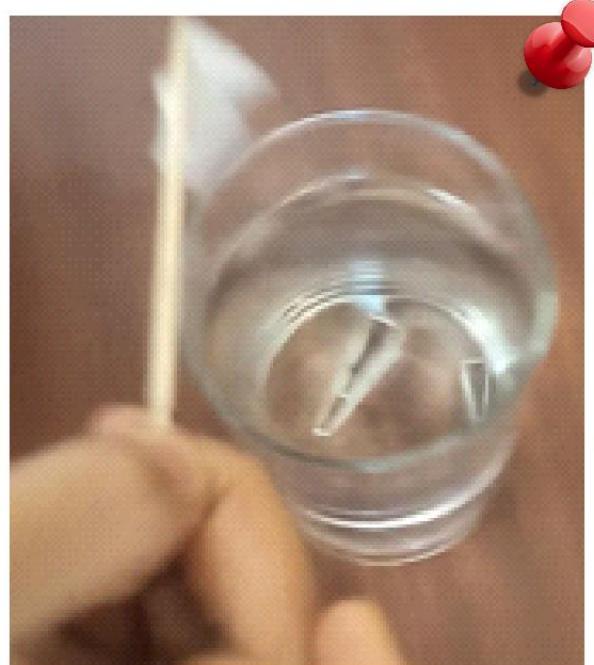
PUT A PIECE OF TISSUE PAPER ON THE SURFACE OF WATER





CAREFULLY PLACE A
PAPER CLIP ON THE
TISSUE PAPER

SLOWLY REMOVE THE
TISSUE PAPER



40



CONCLUSION

Surface tension makes a kind of skin by holding the water molecules tightly.

This thin elastic skin can hold paper clip which have even more density than water.



SCAN & VIEW Watch this experiment at

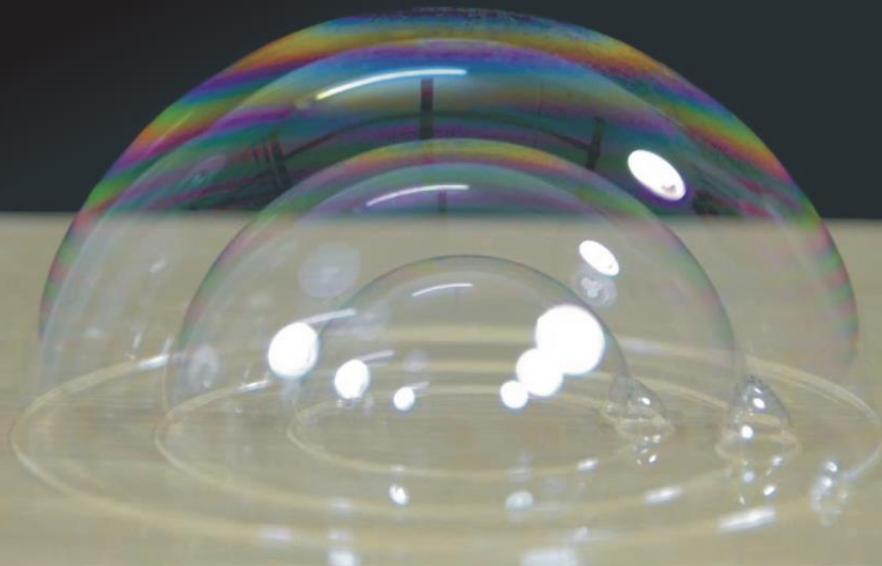


<https://youtu.be/pujtNSztQC8>



Experiment 7

BUBBLE INSIDE BUBBLE



**HAVE YOU EVER SEEN
A BUBBLE INSIDE A BUBBLE??**

Try this out...

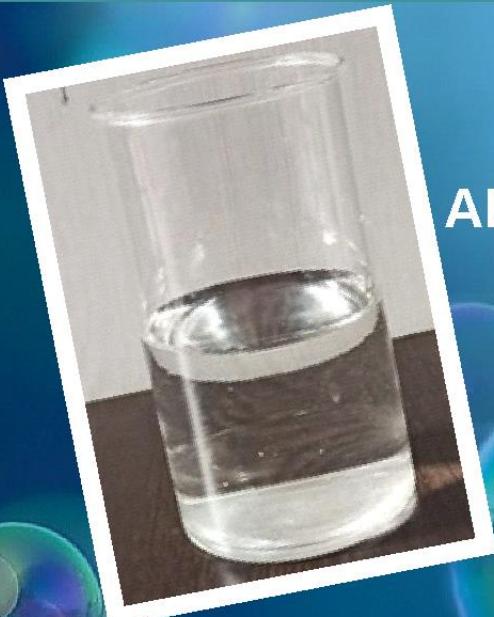
43

MATERIAL REQUIRED



PROCEDURE

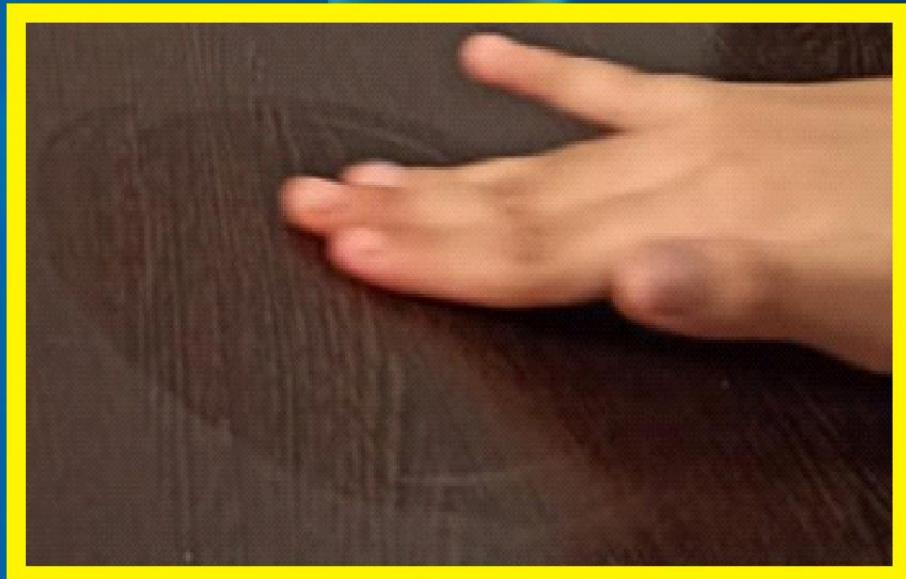
ADD SUGAR IN WATER



ADD DISH SOAP
IN THE SOLUTION



MIX IT WELL



**SPREAD SOME SOLUTION ON
THE FLAT SURFACE WITH HAND**

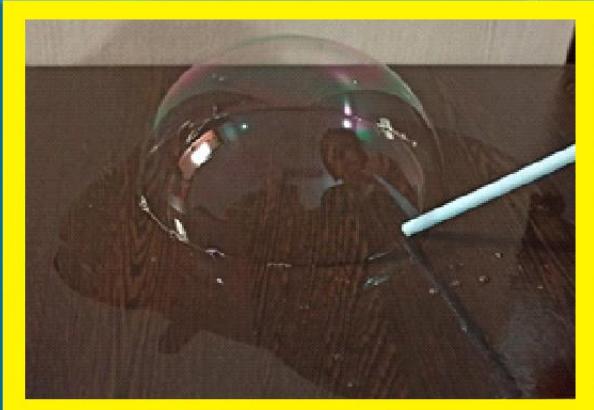


**RUB THE
SOLUTION ON
THE STRAW
ALSO**

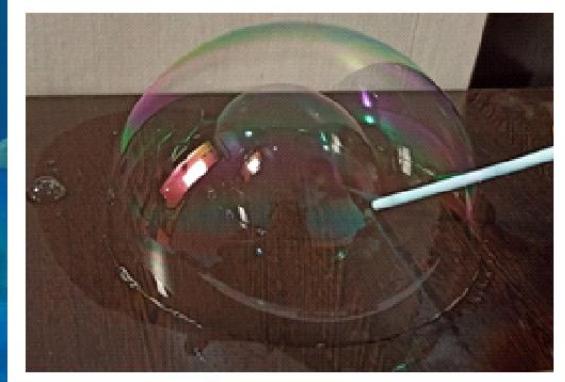


46

**DIP A STRAW IN
THE SOLUTION**



**MAKE THE BUBBLE
WITH THE
HELP OF STRAW
ON FLAT SURFACE**



**DIP THE STRAW IN
THE SOLUTION
AGAIN AND BLOW
THE SECOND
BUBBLE INSIDE
THE FIRST BUBBLE**



**REPEAT THE SAME
PROCESS AND
BLOW THIRD BUBBLE
INSIDE THE SECOND BUBBLE**



**NOW BLOW FOURTH
BUBBLE INSIDE
THE THIRD BUBBLE**

CONCLUSION

Bubbles are formed from soap solution because of water's reduced surface tension due to the soap.

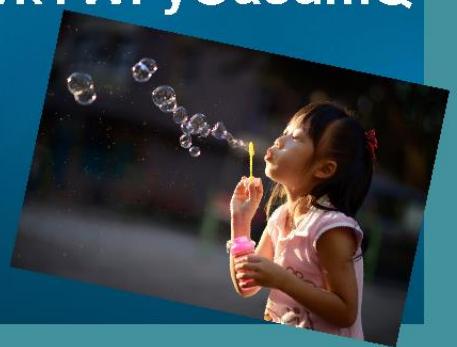
Soap molecules make bubble more "stretchy" by decreasing the force of the attraction. Soap (and sugar) also slows down evaporation of water molecules so that bubbles can last longer.

A bubble's worst enemies are oil, dirt, and gravity. Sugar gives more strength to bubble which helps it to last longer. we see colors on a bubble due to reflection and refraction of light waves of the bubble wall.



SCAN & VIEW

Watch this experiment at
 **YouTube**
<https://youtu.be/kYWFyOasumQ>



Experiment 8



BOTTLE



HAVE U EVER SEEN THE INVERTED
BOTTLE WITHOUT SPILLING THE WATER
BUT TOOTHPICKS ARE GOING INSIDE??

Try this out...

49

MATERIAL REQUIRED



BOTTLE



TOOTH PICK



RUBBERBAND



BANDAGE



PROCEDURE



POUR SOME COLOURED
WATER IN BOTTLE



TIE BANDAGE WITH
RUBBER BAND





**INVERT IT.
WATER WILL NOT
SPILL DOWN.**

**SLOWLY INSERT
TOOTHPICK IN
THE BOTTLE**



**TOOTHPICK INSERTED
INSIDE THE BOTTLE
AND STARTS FLOATING
ON WATER**

CONCLUSION

SURFACE TENSION OF THE WATER holds the water together to form a water seal with cohesion between each small openings in the bandage. The toothpick is made of wood and has density less than density of water. When we insert toothpick inside the bottle, it floats on the top of water.

Watch this experiment at



YouTube

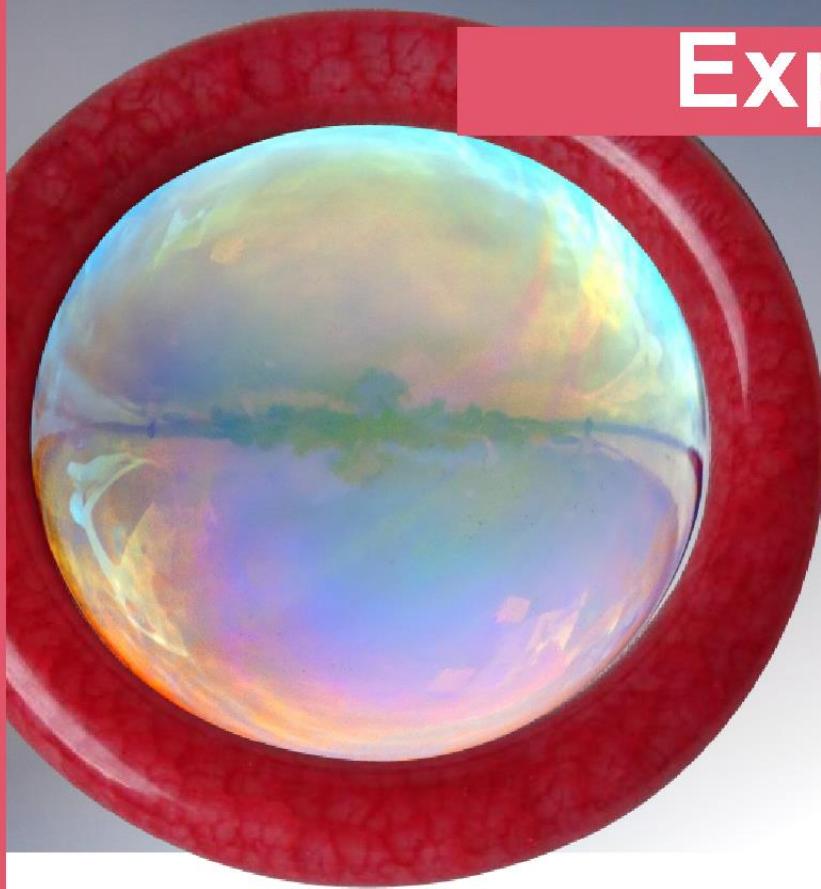
<https://youtu.be/klvhKWiTBSk>



SCAN & VIEW



Experiment 9



**Have you ever
seen a bubble
inside
a bangle?**

BANGLE Magic

Try this out...

55

MATERIAL REQUIRED



56



PROCEDURE



POUR SOME DISH
SOAP IN THE BOWL

ADD SOME WATER
AND MIX IT WELL



DIP THE BANGLE IN
THE SOLUTION
A BUBBLE OF SOAP
IS FORMED INSIDE
THE BANGLE

DIP THE PAPER FLOWER IN THE SOLUTION



CAREFULLY PLACE THE PAPER FLOWER ON THE BANGLE BUBBLE



PLACE THE SECOND PAPER FLOWER ON THE BUBBLE AND PLAY WITH IT

CONCLUSION

Bubble is made of soap solution and soap solution has less surface tension than water.

When we dip the bangle in soap solution, a bubble is formed in the bangle and this bubble holds the paper flower on it.





Experiment 10

STRONG BUBBLE

DO YOU WANT TO
PLAY WITH BOUNCY BUBBLE ?



Try this out...

61

MATERIAL REQUIRED



PROCEDURE

POUR SOME GLYCERINE IN THE SOAP SOLUTION



MIX IT WELL



MAKE THE BUBBLE OF THE SOLUTION AND WEAR THE WOOLEN HAND GLOVES



**PLAY WITH
THE BUBBLE**



**U CAN HOLD THE
BUBBLE IN THE
HAND**

CONCLUSION

STRONG BUBBLE IS FORMED BY ADDING GLYCERIN TO SOAP SOLUTION. GLYCERIN GIVES STRENGTH TO THE BUBBLE AND WOOLLEN HANDGLOVES REDUCES AREA OF CONTACT WHICH HELPS TO MAKE BUBBLE BOUNCY.

SCAN & VIEW



Watch this experiment at



[HTTPS://YOUTU.BE/QSRXKHT0KL4](https://youtu.be/QSRxKht0KL4)





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