**Capillary Action and Chromatography**

*Two kids are sitting under a desk discussing something.*

*MOM comes in and looks around for them.* *She looks puzzled since she can’t see them, then she looks under the desk.*

MOM

Why are you playing under the desk? Sit on the bed and play your game. You will catch a cold from sitting on the floor.

CU of two kids smiling at each other.

Uff! Moms! They never understand.

MS of kids and mother.

We like sitting under the table! Why do you always trouble us? It’s nice and cosy in here. Besides this is our cave. And we like staying in our cave.

CU of mother. *She is straigtening things in the room.*

MOM

Fine then. Just go to the kitchen and drink your milk OK?

LS of mother.

Yes Ma

*Ma finishes picking up dirty clothes and walks out of frame.*

Two Shot.

So did you figure out who wrote the note?

CU. *Boy looking at a sheet of paper with a magnifying glass.*

Well, it boils down to two suspects. Either Dr Sengupta or Motu, our Doodhwala.

CU. *Grabs sheet of paper from the other boy and looks at it carefully.*

“What? Their handwritings must be completely different though- one is a Doctor, the other a Doodhwala.

CU. *Boy smiling knowingly.*

No, do you believe it they went to the same school till class 12? And their handwriting is quite similar.

CU. *Looks up from sheet and looks surprized*

Really that’s strange! But Dr Sengupta always writes with a fountain pen. That should help.

MS. *Boy turns around and first takes a prescription and then a bill out of a hard-cover book lying on the floor. He points his hands to the different sheets as he explains.*

“My sister went to Dr Sengupta for a check up last night so we have his prescription. I have also got the doodhwala's receipt from last night.

CU of sheets of prescription and receipt.

Both are using inks that are the same colour as the note. And I don’t know how to distinguish between any of the inks.”

Two shot. *Scratches head. Frowns and puts down sheet while getting up. Other child also nods head in agreement and puts hand on belly.*

“Oh Well! All this thinking is making me hungry.”

“Yeah, lets go to the kitchen and see what is there to eat.”

Scene2

*Kids in kitchen. Opening drawers and looking for tasty food*.

*Over the shoulder of kid opening refrigerator*.

“Do you want juice?”

“Sure. I just found some chips and biscuits.”

“Let’s go up and eat in your room.”

“Good idea.”

*MS of 2 full glasses of milk left on table. Kids move out of kitchen without even looking at the glasses of milk.*

Superimpose: Kids take things they love into smaller and smaller spaces. Leave things that they do not love - behind.

Scene3.

TEACHER

“I am going to make marks on this paper towel with two different brands of black markers. Do the marks look different?”

*LS of class kids shaking heads.*

“No. Now I will dip the end of the paper towel into this glass of water.”

CU of glass.

“Let’s see what happens. Can you see the water rising up the towel? Why should water move up the towel against gravity?”

*Child raises hand.*

“The towel absorbs the water.”

TEACHER

Correct! Now why does the towel absorb water? Because water likes to climb into teeny tiny spaces.

*Kid raises hand,*

*”*Ma’am, How can water move up?”

TEACHER

You don’t believe me? Let’s look at these 2 glass plates.

CU of plates.

I will put them together and place them in this container that has some coloured water. Can you see the water rising in between the two plates?

MS of teacher.

“Now we will take two other plates. But this time I will put this matchstick in between the plates on one side. And I will put an elastic band around them so that the plates stay together.

CU.

“Now you can see that there is no space between the plates on one side. There is a lot of space between the plates on the other side separated by the matchstick.”

Small space Lot of space

Let’s put these plates in the coloured water. See the gradient? The water rises higher on the side that has less space.

This property of liquids is called Capillary action.

Can you write capillary on the board for me?

*MS of kid writing on board. KapilLarry*.

No! Not Kapil Dev and Larry!

*Classmates laugh/snicker.*

Here, let me correct that spelling.

CU of board. “

It’s ~~K~~Capil La~~r~~ry. Capillary.”

Now let’s get back to the paper towel that I left in the glass.”

*Pulls out paper from glass for everyone to see.*

Classroom kids. “

STUDENT

Wow! Ma’am, Where did so many colours come from?”

STUDENT

 Yes Ma’am.

 STUDENT

You only put black coloured marker on the paper. Why did nothing happen to one of the black marks?”

TEACHER

Wait! Wait! Let me answer one question at a time! First let me tell you that black colour is made up of many different pigments.

STUDENT

What Miss! Black colour is made out of pigs?

TEACHER

Not pigs! Black colour is made out of many pigments. Pigments are colourful compounds. When we mix certain coloured pigments together we get black colour.

STUDENT

Yes Miss! I have seen that when I am mixing blue and brown paints the paint often turns black in colour.

TEACHER

Yes! But there are many other combinations of colours that can make black colour. When the water comes in contact with the marker on the paper some of the pigments dissolve in the water. While the water climbs up the paper the pigments that have dissolved in the water also climb up the paper.

STUDENT

But why did nothing happen to the other black mark?

TEACHER

Oh that’s because that marker was a water proof marker where none of the pigments are soluble in water.

*Kids- sitting on adjacent tables- look at each other* –

I think we have figured out how to solve who wrote the note!

Scene 4 – *back in bedroom*

*Kids doing something with glasses and paper under the desk.*

You know I was just thinking that we are like water.”

What do you mean?”

“I mean just like water likes small places we also like small cosy places just like our cave.”

True.”

*Pause.*

“We even carry things we like to these smaller spaces- just like water does.”

“So what do the notes look like after you dipped their ends into water?”

“Here. Let’s see the results.” “We have the doctor’s prescription – the black ink is intact. And we have the Doodhwalas bill- Ink has risen up and is now multi-coloured!

“Now the note- it is also multi-coloured. It must have been the doodhwala who wrote the note then.”

“Are you sure? The colours made by the doodhwalas receipt are different from the note. I read in our textbook that different brands of black inks are made from different combinations of pigments”.

“You are right! The note has spread into different colours than the doctor or the doodhwala. Then who has written the note?”

Plots for two other related scripts

**Water soluble and Oil soluble compounds**

The two kids are walking on a street. They pass a yellow house with a green fence when they hear a scream and look towards the house. Through the window they see the silhouette of a person being stabbed and falling down.

The kids are frightened. It rains very heavily that night. They don’t tell anyone what they have seen till the next day. Next day they go to the police office and report what they have seen.

Police take them along to identify the house. There is only one yellow house with a green fence on that street. They go in and question the people inside. But there has been no murder in this house. It is a happy family. Kids are confused. They were sure of what they saw.

In school they learn about water soluble and oil soluble compounds.

Next day the children go to investigate the road by themselves. They notice a yellow house with a blue fence. But on certain sections of the blue fence there are smudges of green. They use a wet hanky and saw that when they wipe the green sections a yellow paint comes off.

They realise that the yellow paint is water soluble and the fence must have been painted just on the day of the murder. That night the heavy rains must have washed out the yellow paint and that is why the fence looked blue the next day.

They go back to the police and tell the results of their investigations.

They clean up many stains of their building/clothes etc with kerosene or spirit that were not cleaning up with water before. And wonder about what happened to the police investigation. The police friend comes to their home and appreciates how clean and different it looks. He says that the occupants had been acting in a murder mystery drama hence there was no real murder happening there.

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**Capillary action of water**

The kids notice that the next door neighbour has gone out of town and has locked their door. They have told their family to keep track of their house. Yet they theft their plants in the balcony and even after a week the plants look as though they have been freshly watered. How can that be?

They make a number of traps to figure out who is entering the flat. They think an intruder may be staying in the house. They can not figure out any way someone may be entering the flat from the main door, or windows. Then how are the plants getting watered? In school they learn about capillary action. Water moves into small spaces. It can rise along strings and wet new areas. They think they may have an answer. They try it at home. Water plants with yarn dipped in soil on one side and in a bucket on the other side.

Mystery solved!

They set this system up so that the plants in their building are properly watered, including an ugly balcony which was not so accessible as before.

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Bucket of water with a cloth hanging over the side- wets the floor. Who is pouring the water out of the bucket? Use this method to clean aquariums of their water too!