



C

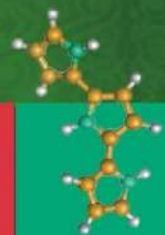
H

R

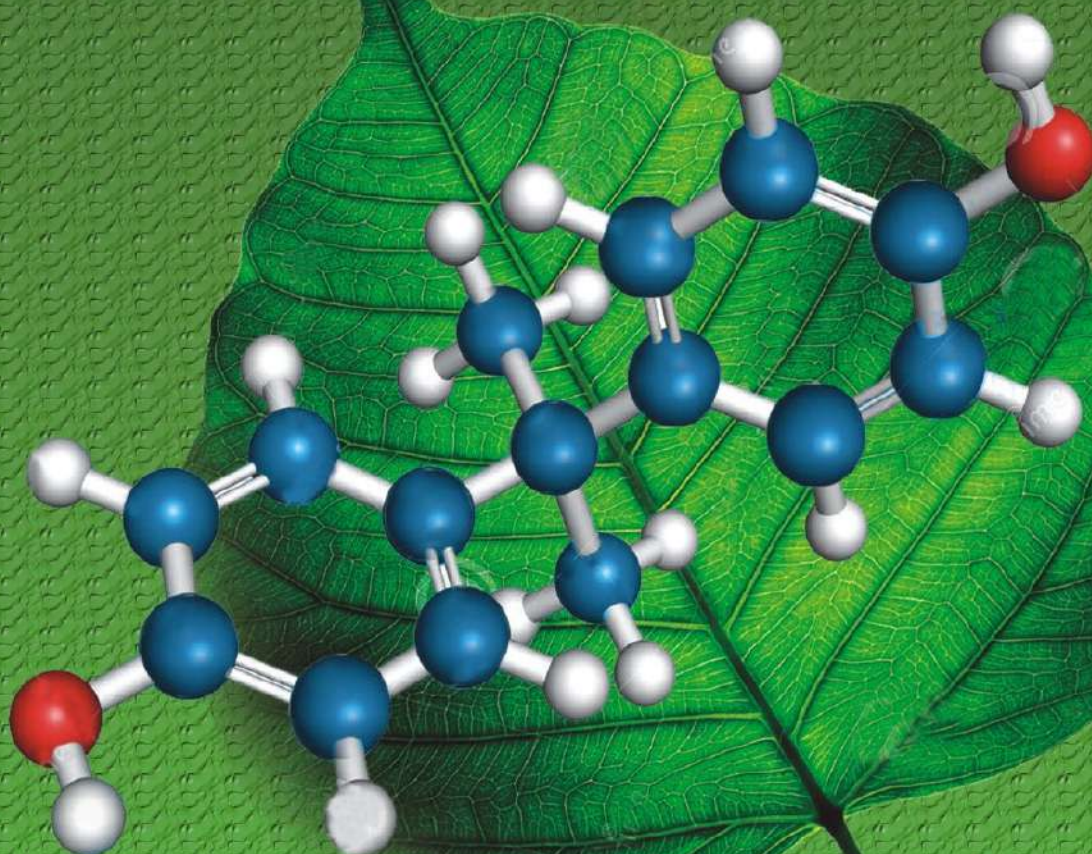
Y



L



Vol XXI - 2025



Post Graduate & Research Department of Chemistry  
Auxilium College (Autonomous)

(Accredited by NAAC with A<sup>+</sup> Grade in the 4<sup>th</sup> cycle)  
Vellore-632006



*Value Presentation on Work Ethics (08/07/2024)*



*Resource Talk on Green Chemistry:  
Advanced Photocatalysts for Sustainable  
Organic Reactions by Dr. Mohana Roopan,  
Associate Professor, VIT, Vellore (26/07/2024)*

# CHRYSL

# VOL XXI

Post Graduate & Research Department of  
Chemistry

Auxilium College (Autonomous)

(Accredited by NAAC with A<sup>+</sup> Grade in the 4<sup>th</sup> cycle)

Vellore - 632006

## **EDITORIAL**

“Educating the mind without educating the heart is no education at all”

**- Aristotle**

“Only as high as I reach can I grow  
Only as far as I seek can I go  
Only as deep as I look can I see  
Only as much as I think can I be”

Education means “bring up” which is related to “bring out” “bring forth what is within”, “bring out potential” of the students thinking. Students must be taught how to think not what to think. Their talents and thinking can be showcased in the form of innovations, creativity, knowledge, skills and their writing abilities. CHRYSL magazine is a platform to express their creative pursuits.

The twenty first edition of the magazine “CHRYSL” is a milestone that marks our growth, unfolds our imaginations and gives life to our thoughts and aspirations of the students and the staff. It unleashes a wide spectrum of creative skills ranging from writing to editing and even of designing the magazine.

We express our sincere and special gratitude to our beloved Secretary Dr.(Sr.) Mary Josephine Rani A, Principal Dr.(Sr.) Arokia Jayaceli A, and Vice Principal Dr. (Sr.) Amala Valarmathy A, for their unconditional support and guidance. Hearty congratulations to the Dr. Rosaline Ezhilarasi J, Head of the Department, for the splendid spirit of harmony and her contribution always acted as a catalyst to shape the magazine to the best. I appreciate and thank our staff members for rendering their support in preparing the magazine. I hope this CHRYSL of ours will find a special place in the heart of the readers. Wishing everyone great success and enjoy reading.

**Dr. R. Lakshmi,**

**Assistant Professor of Chemistry**

**&**

**Dr. D. Badma Priya,**

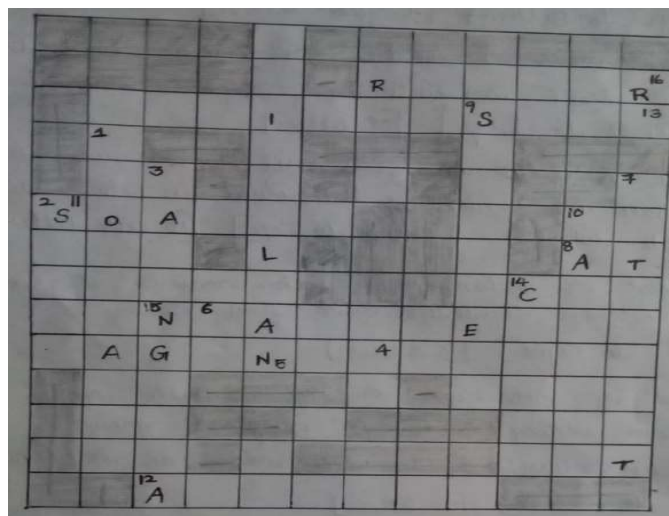
**Assistant Professor of Chemistry**

## Contents

<b>S.No.</b>	<b>Contents</b>	<b>Page No.</b>
1	Chemistry in Daily Life - Crossword Puzzle	1
2	"Fizz, Bang, Pop: The Wonders of Chemical Magic"	3
3	"Bubbles, Browning, and Beyond: The Chemistry in the Kitchen"	5
4	Chemistry Connections	9
5	Chemistry in Everyday Life Who AM I?	11
6	Explore the Elements: A Puzzle Game for Chemistry Buffs!	13
7	The Dance of Atoms	14
8	The Atoms Tale	14
9	Chemistry is everywhere!	15
10	Riddles	16
11	Chemistry Lab: The Place of Magic through the Blast	17
12	Redox Catalysis Through Photoinduced Electron Transfer (PET)	18
13	Zinc: The Hidden Ingredient Behind the Flavours of Life	19
14	Cisplatin (A Miraculous Anticancer Drug)	21
15	Connections	24
16	3D Bioprinting	27
17	The Chemistry of Chocolates	28
18	CuNd <sub>2</sub> O <sub>4</sub> : A Promising Photocatalyst for Antibiotic Degradation	29
19	Carbon Quantum Dots (CQDs)	30
20	Chemistry of Emotions	31
21	Applications of Nuclear Physics	33
22	Demis Hassabis	34
23	Chemistry Facts	35
24	Decoding Protein Structures	36
25	Applications of Calcium Hydroxide Nanoparticles	36
26	Poster of Green Chemistry	38
27	Dr. APJ Abdul Kalam	39
28	Dorothy Hodgkin	40

29	Marie Curie	41
30	Environmental Chemistry	42
31	Graphitic carbon nitride (g-C <sub>3</sub> N <sub>4</sub> ) and its applications	43
32	Plastic Alternatives: The Chemistry of Plant based Materials and Innovations to Combat Plastic Pollution	44
33	Article on Green Chemistry	45
34	Article on Biopolymers	46
35	The Story of Ultramarine Pigment	47
36	Dead Sea is Salty	49

## Chemistry in daily life - Crossword Puzzle



1. Clean, clean, clean! I have fluoride (1450 ppm) mainly in the form of sodium fluoride. With fluorides I have 20 to 40 % of water, 50 percentage abrasive that includes aluminium hydroxide, calcium carbonate and hydroxyapatite. You lay me on the bristles first thing in the morning. **[Top to bottom] [10 letters]**.

2. Clean, clean, clean! I am the combination of fat and oil of an alkaline usually of plant or animal oil with lye. **[Left to right] [4 letters]**.

3. Puff, puff! put me in dough and I make the roti pop. I consist of sodium bicarbonate. **[Top to bottom] [10 letters]**.

4. I add flavor, I consist of acetic acid in water along with trace amount of other chemicals. **[Right to left] [7 letters]**.

5. I make a film on your nail with nitro cellulose, a polymer within me which is dissolved in ethyl acetate or butyl acetate solvents. **[Bottom to top] [10 letters]**.

6. I consist of metamorphic rock, mainly of calcium carbonate, I am used in kitchen counter tops and floor tiles. **[Left to right] [6 letters]**.

7. I consist of potassium /sodium salts of a long alkyl chain ending with a sulfonate group. I am even soluble in hard water. **[Top to bottom] [9 letters]**.

8. I am the constituent of nail polish remover. **[Diagonal, up to down, right to left] [7 letters]**

9. I protect you from UV rays. I constitute of organic chemicals such avobenzene octinoxate and oxybenzone. **[Top to bottom] [9 letters]**.

10. I am a thermosetting plastic, used in cooker handles. **[Top to bottom] [8 letters]**.

11. I taste sweet and I constitute of a polysaccharide, sucrose. [**Top to bottom**] [**5 letters**].

12. I relieve you from fever, pain, swelling and headache. I constitute of salicylate medication. [**Left to right**] [**7 letters**].

13. I keep your skin smooth. I consists of humectants such as honey, propylene glycol, sorbitol, hyaluronic acid and emollients and occlusion such as lanolin, petroleum, mineral, oil, silicon. [**Right to left**] [**11 letters**].

14. I used in between bricks and consists of calcium oxide, Silicon dioxide, aluminium oxide, ferric oxide, gypsum ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ), magnesia. [**Top to bottom**] [**6 letters**].

15. I am the main constituent of your brush bristles. [**Diagonal, down to up, left to right**]. [**5 letters**].

16. I am the main constituent of eraser. [**Right to left**] [**6 letters**].

**Answers:**

1. Toothpaste
2. Soap
3. Baking soda
4. Vinegar
5. Nail polish
6. Marble
7. Detergent
8. Acetone
9. Sunscreen
10. Bakelite
11. Sugar
12. Aspirin
13. Moisturizer
14. Cement
15. Nylon

**Jerlin Rose A.**  
**II B.Sc. Chemistry**

---

## "Fizz, Bang, Pop: The Wonders of Chemical Magic"

The fascinating taste transformation of amla (Indian gooseberry) can be attributed to its unique chemical composition and the interactions with our taste buds and saliva. Let's delve into the chemistry behind this



### **1. Presence of Polyphenols and Tannins**

Amla is rich in polyphenols, including tannins like emblicanin A and B. These compounds are responsible for the sour and bitter taste. When you eat amla, these tannins interact with proteins in your saliva, creating an astringent sensation that feels puckery and dry.

### **2. Vitamin C Content**

Amla contains a high concentration of ascorbic acid (vitamin C), which adds to its sour taste. The acidic nature of vitamin C further stimulates your taste buds, enhancing the sour sensation.

### **3. Taste Bud Interaction**

The initial sourness and bitterness stimulate various taste receptors on your tongue, including those for sour (due to acids) and bitter (due to polyphenols).

### **4. Salivary Enzyme Reaction**

After consuming amla, your saliva contains enzymes that start breaking down these complex polyphenols and acids. When you drink water, these interactions are altered, and the water helps to wash away some of the acids, reducing the sour and bitter stimulation.

### **5. Perception Shift**

Once the stronger acidic and bitter compounds are washed away or neutralized by the water, your taste buds can then perceive the subtle sugars and other sweet compounds that were overshadowed before. This is why amla tastes sweet when you drink water after eating it.

### **6. Potential Hydrolysis**

There is also a possibility that the tannins and polyphenols undergo hydrolysis in the presence of water, breaking down into smaller, less bitter molecules, which can taste sweeter. So, the taste shift from sour and bitter to

sweet is essentially due to the way your taste buds and saliva interact with the compounds in amla, and how water alters these interactions.

### **Is an Orange Can Blast the Balloon**

Squeezing an orange near a balloon can cause it to burst, and it's all thanks to chemistry! Here's why:



#### **1. Limonene:**

- Oranges contain a natural oil called **limonene** in their peel. Limonene is a hydrocarbon that is capable of dissolving the latex material of balloons.

#### **2. Weakening the Latex:**

- When you squeeze an orange, tiny droplets of this oil are released. If these droplets come into contact with the balloon, the limonene begins to break down the latex. This weakens the balloon's structure.

#### **3. Surface Tension:**

- The latex material of the balloon is under tension, stretched tight by the air inside. When the latex is weakened by the limonene, it can no longer contain this pressure, causing the balloon to burst.

Helium balloon makes you voice change

Yes, inhaling helium from a balloon can make your voice sound higher-pitched. Here's why:



### 1. Speed of Sound:

- Helium is much less dense than air. Sound travels faster through helium than through normal air because of this lower density.

### 2. Voice Frequencies:

- Your vocal cords vibrate at their natural frequencies when you speak. The speed of sound in the gas they're vibrating in affects the sound waves produced. When you inhale helium, these sound waves travel faster, which shifts the frequencies of your voice upward, making it sound higher-pitched.

### 3. No Change to Vocal Cords:

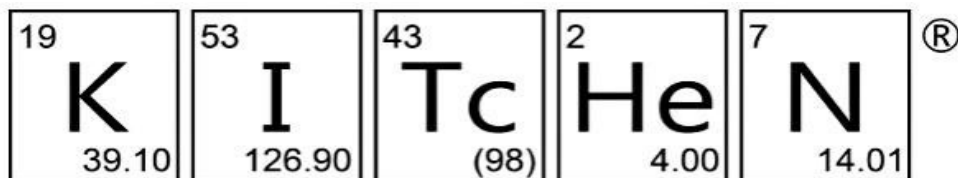
- Importantly, helium doesn't actually change your vocal cords; it just changes the speed of the sound waves they produce.

While it can be funny to hear your voice change, it's important to be cautious. Inhaling too much helium can displace the oxygen in your lungs, which can be dangerous. Always prioritize safety!

**Lakshmi Priya A.**  
**II B.Sc. Chemistry**

---

## "Bubbles, Browning, and Beyond: The Chemistry in the Kitchen"



# Chemistry

'Kitchen Chemistry' is a live stage performance of identifying and studying the basic science we practise daily in our home's kitchen. Heating, boiling, freezing, mixing, smashing, blending, etc., are all varied processes we perform daily in our kitchen. While cooking food, many physical and chemical reactions simultaneously convert the ingredients involved into their desired

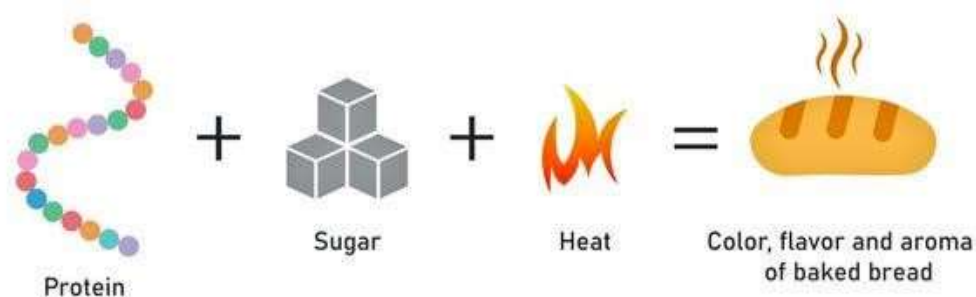
forms. The art of cooking involves various chemicals. Their compositions keep changing whenever we apply heat or cold and even cut our foods.

### **Chemistry in kitchen**

Cooking is full of fascinating chemical reactions that transform raw ingredients into delicious meals. These reactions are often part of what makes food taste and look good, as well as affecting its texture and aroma. Cooking and a chemistry lab are closely related because they both involve the transformation of materials through chemical processes.

Cooking can be seen as a form of applied chemistry, where everyday ingredients act as chemicals, recipes function as protocols, and the kitchen serves as a laboratory. Both involve curiosity, precision, experimentation, and observation to achieve the desired outcome, making the art of cooking and science of chemistry inherently interconnected. Some of the chemical processes that occur in the kitchen are:

### **Maillard Reaction**



The Maillard reaction is a complex chemical reaction that occurs between amino acids (the building blocks of proteins) and reducing sugars when exposed to heat.

This reaction is a form of non-enzymatic browning, typically above 285°F (140°C). It creates new flavour compounds, aromas, and brown coloration in food. It is a key process in cooking that contributes to the taste, smell, and appearance of many cooked foods.

Examples: The grilled or seared meats, toasted bread, roasted coffee beans and fried potatoes.

### **Caramelization**

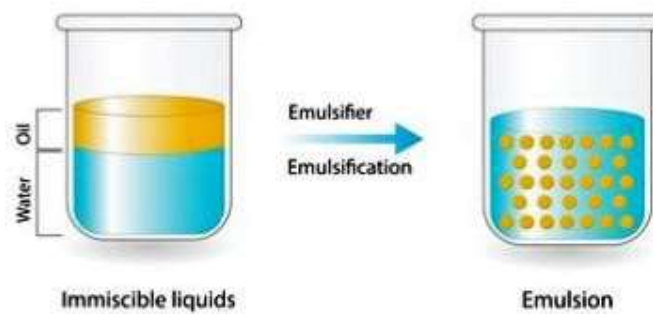


Caramelization is a slow procedure that happens when the sugar cook over low heat, changing the build and flavour of the item being cooked.

Through pyrolysis, the sugar gets oxidized, turning into a brown colour. The sugar is observed to melt, boil, produce foam, and darken through this process. It typically begins at temperatures around 320°F (160°C) and does not require proteins, unlike the Maillard reaction. Caramelized sugar has a rich sweet, but nutty flavour.

Examples: Caramel sauce, Toast marshmallows, Toffee and the crust on baked goods.

### **Emulsification**



Emulsification is the process of mixing two liquids that normally do not combine, such as oil and water. This is achieved by dispersing tiny droplets of one liquid throughout the other, creating a stable mixture called an emulsion.

An emulsifier, such as lecithin in egg yolks or mustard, is often used to stabilize the mixture by reducing the surface tension between the liquids. Emulsification used to create a smooth and creamy texture without separation.

Examples: Making mayonnaise, vinaigrette, hollandaise sauce and cream dressings.

### **Fermentation**



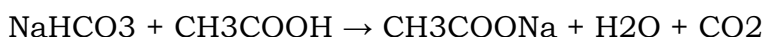
Fermentation is a metabolic process where microorganisms like bacteria, yeast, or fungi convert carbohydrates (sugars and starches) into alcohol, gases, or acids under anaerobic (oxygen-free) conditions. This process is used in cooking and food preparation to preserve food, develop flavours, and improve texture.

It helps to produce complex flavours, often with tangy, sour, or umami notes due to the production of organic acids or alcohol.

Examples: Baking breads (yeast produces CO<sub>2</sub>), making yogurt (lactic acid bacteria), fermenting beer and wine.

### **Acid-Base Reaction**

Acid and base reactions play an important role in our everyday life, from the digestion of food we eat to the functioning of the medicines we take and even the cleaning products we use. Bases are essential in baking as they can react with acids and release carbon dioxide bubbles.



Baking soda is the most frequently used base in the kitchen. When baking soda (sodium bicarbonate) reacts with vinegar (acetic acid), it produces sodium acetate, water, and carbon dioxide gas. This reaction is often used in baking and cooking processes, such as in the preparation of baked goods or as a homemade cleaning agent.

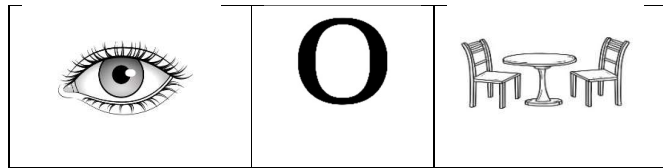
Baking soda (a base) reacts with acids like vinegar, lemon juice, or buttermilk to release carbon dioxide, causing baked goods like pancakes, cakes, and muffins to rise. Reactions between acidic and basic ingredients that can influence flavour and texture. It alters pH, which can affect texture (making things crispier or softer) and flavour (balancing or enhancing taste).

Examples: Baking soda neutralizing an acidic batter, adding vinegar to make buttermilk, using baking soda in cookies to create a crisp texture.

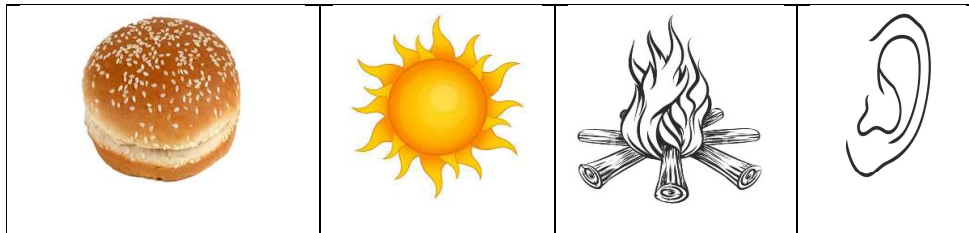
**Mahalakshmi S.**  
**II B.Sc. Chemistry**

## Chemistry Connections

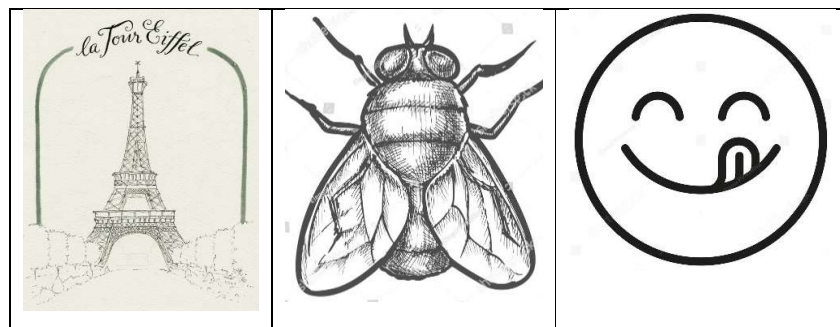
1. Name of an element in periodic table



2. Name of an apparatus



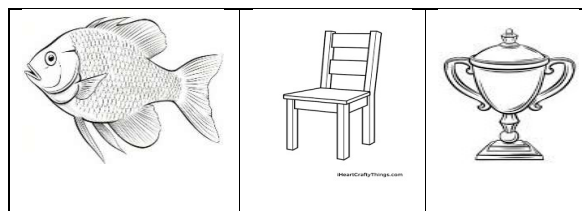
3. Name of an element in periodic table



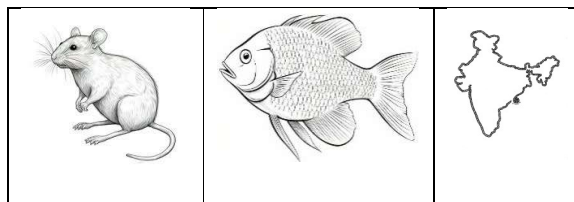
4. Name of a catalyst



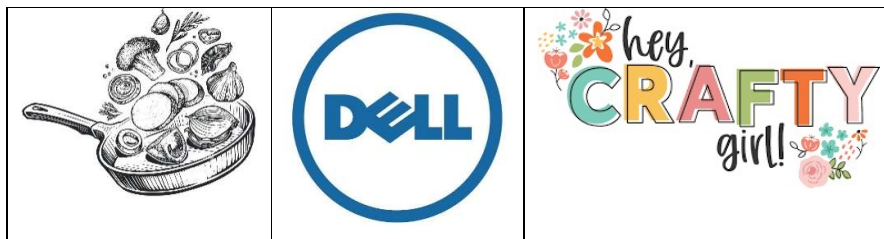
5. Chemical reaction for the production of liquid fuels



**6. A type of chemical reaction**



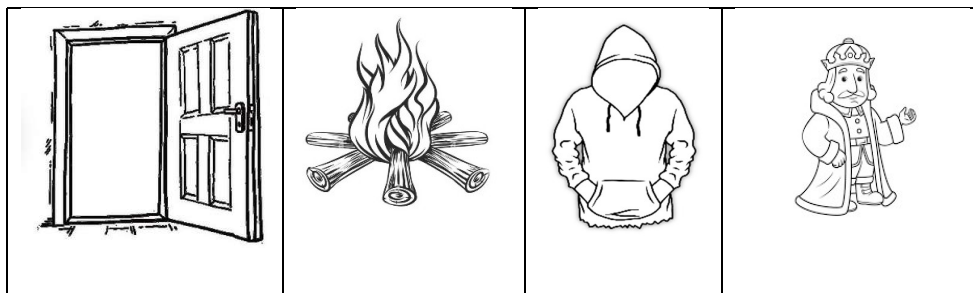
**7. An electrophilic substitution reaction**



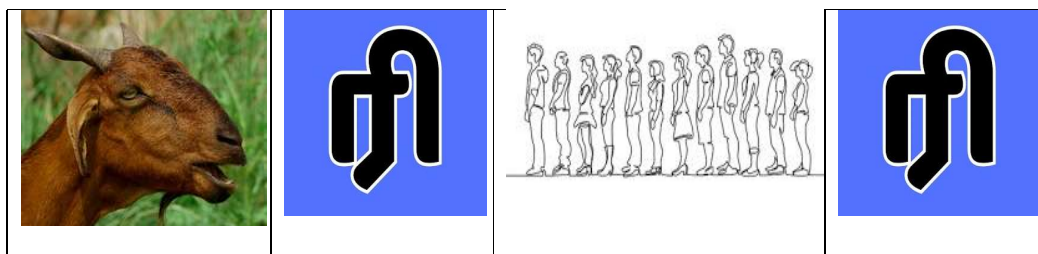
**8. Name of a scientist**



**9. Name of a chemist**



**10. Name of a female chemist**



**ANSWERS:**

1. Iodine
2. Bunsen burner

3. Francium
4. Ziegler Natta Catalyst
5. Fischer Tropsch Reaction
6. Elimination reaction
7. Friedel Craft's reaction
8. John Dalton
9. Dorothy Hodgkin
10. Marie Curie

**Vigneshwari G.**  
**II B.Sc Chemistry**

---

### **Chemistry in Everyday Life Who AM I?**

1. I am made from phenol and formaldehyde and used for containers and many other purpose replacing metals. Who am I ?
2. I am the first Known metal on the earth in the Neolithic age and possess colour and bright lustre. Who am I?
3. I am an Uranium ore obtained by Madame curie by only a fraction of gram of radium salt after a Very long and tedious process of fractional Crystallisation from tons of natural material. Who am I?
4. I am present in the atmosphere. I am released when materials are burned and I am often referred as gas sylvestre. Who am I?
5. I am referred as rare element but much more abundant than Carbon and twice abundant as chlorine. Who am I?
6. I am the reason for the acidity of sour milk and contain an alpha - hydroxyl group. Who am I?
7. I am used as medicine in treatment of eye disease and present as colloidal solution of silver . Who am I?
8. I am a cell used for working electric bell consists of Zinc rod. Who am I?
9. I am referred as heavy hydrogen and contain three isotropic forms. Who am I ?
10. I accelerate the rate of the reaction without Undergoing any permanent chemical change who am I?
11. I am a gas prepared when phosphorous burn in  $O_2$  with an exceedingly brilliant white. who am I ?

12. I am a weak solution of acetic acid .I am made by the Oxidation of alcohol in beer or wine when exposed to air in presence of a ferment .Who am I?
13. I am an acid obtained by distilling potassium perchlorate with concentrated Sulphuric acid. Who am I?
14. I am an element used as an antiseptic and occur in cold liver oil and thyroid gland and foods such as milk, butter and green Vegetable contains trace amount. Who am I?
15. I am the king of acid also referred as oil of Vitriol. Who am I?
16. I am the purified form of  $\text{NaNO}_3$  used as a fertilizer and in the manufacture of  $\text{HNO}_3$ .Who am I?
- 17.I am allotropic form of Carbon often referred as plumbage or black lead. Who am I ?
18. I am referred as amorphous phosphorous and microcrystalline in nature. Who am I ?
19. I am protein giving Viscous character to Saliva and other body fluids. Who am I?
20. I am an antiscorbutic vitamin preventing Scurvy disease. Who am I?

**Answers:**

1. Bakelite plastics
2. Gold (Au)
3. Pitch blende
4. Carbon di oxide ( $\text{Co}_2$ )
5. Titanium
6. Lactic acid
7. Collargol
8. Lechlanche cell
9. Deuterium
10. Catalysts
11.  $\text{P}_2\text{O}_5$
12. Vinegar
13. Per chloric acid or  $\text{HClO}_4$
14. Iodine
15. Sulphuric acid  $\text{H}_2\text{SO}_4$
16. Chile saltpetre

17. Graphite
18. Red phosphorous
19. Mucin
20. Vitamin C

**VARSHA D.G.**  
**II B.SC CHEMISTRY**

### Explore the Elements: A Puzzle Game for Chemistry Buffs!

Q	E	I	R	O	N	F	D	G	O	Q	S	A	F	H	O	A	G
T	J	O	Y	G	G	S	U	S	J	V	Y	J	M	B	L	B	Y
G	G	T	B	H	F	X	S	K	L	N	N	K	P	V	P	T	U
J	P	K	S	U	P	Z	H	J	K	M	U	I	N	A	R	U	K
H	U	I	I	J	O	N	D	S	O	V	E	Y	L	O	J	N	U
Y	H	J	L	T	I	M	P	I	L	Y	A	K	A	S	H	G	G
C	H	K	V	R	U	B	K	C	A	I	Y	H	I	O	O	S	H
H	B	M	E	R	T	F	D	N	J	O	G	P	U	N	A	T	L
L	V	X	R	T	Y	S	O	K	I	P	S	U	R	S	G	E	S
O	U	G	S	U	R	A	K	L	V	G	C	D	H	A	U	N	F
R	T	V	O	I	W	S	D	A	N	T	H	I	D	H	J	F	H
I	P	O	G	O	S	I	L	I	C	O	N	N	A	N	S	A	A
N	E	W	M	P	Q	T	H	D	O	K	O	P	M	A	V	G	A
E	U	T	I	Q	G	L	I	S	U	N	Y	R	U	C	R	E	M
C	A	R	B	O	N	F	M	N	B	Y	I	O	P	R	Y	I	P

**Left to right:**

- Which element is known as the “King of the Elements due to its versatility in chemistry?
- Which element is commonly used in semiconductors?
- Which transition metal is crucial in the production of steel and in the main component of the Earth’s core?

**Right to left:**

- Which element is widely used in nuclear reactors and atomic bombs? This element is known as “quick silver” and is liquid at room temperature

**Up to down:**

- Which element has the highest melting point of any element, reaching over  $3,400^{\circ}\text{C}$ ? Which element is used in photography, electronics, and jewellery?
- Which element is used in a variety of industrial processes, including the production of PVC?

**Savitha S.**  
**I M.Sc. Chemistry**

---

### **The Dance of Atoms**

Atoms spin and dance with glee.  
Their motion a wonder to see.  
Electrons jump and protons sway,  
As molecules form in a chemical way.

Chemical bonds, strong and weak,  
Hold molecules together, unique.  
Hydrogen bonds, ionic too,  
Help shape the world, both old and new.

In the lab, chemists mix and match,  
Creating compounds, with properties to attach.  
Reactions occur, with energy to spare,  
As chemists seek, to show and share.

The periodic table, a guide so fine,  
Helps us understand, the elements' design.  
From hydrogen to oganesson, and all in between,  
The elements properties, a story to be seen.

Chemistry's magic, a wonder to behold,  
Helps us understand, the world, young and old.  
From the air we breathe, to the earth below,  
Chemistry's secrets, waiting to be known.

**Kaviya S.**  
**I M.Sc. Chemistry**

---

### **The Atoms Tale**

In the lab, I'm born one day  
A tiny atom, in a molecular way.  
Protons and neutrons, in my nuclear tight,

Electrons spinning, with a gentle delight

I bond with others, to form a crew,  
Covalent, ionic, or metallic, too.  
We dance and vibrate, with energy so fine,  
Our molecular structure, a wondrous design.

In the periodic table, I find my place,  
Among the elements, with a designated space.  
My properties and reactivity, a story to tell,  
Of acids and bases, and chemical bonds that swell.

In the world of chemistry, I'm a tiny part,  
But with my fellow atoms, we create a work of art.  
From the air we breathe, to the earth below,  
Chemistry's magic, is a wonder to know.

**Brindha S.**  
**I M.Sc. Chemistry**

---

### **Chemistry is everywhere!**

- Hydrogen gas is used as fuels in vehicles.
- Helium gas is used to fill balloons.
- Lithium ions are used in battery cells.
- Beryllium is used as a sample holder in x-ray emission studies.
- Boron is used as a semiconductor in electronic devices.
- Carbon allotrope is used in pencils.
- Nitrogen liquid is used to preserve specimens.
- Oxygen is used in the respiration process. Fluoride is used in toothpastes.
- Neon is used in television tubes.
- Sodium ions are used to stimulate nerve signals.
- Magnesium is used as antacids for heartburn.
- Aluminium is used to make medical equipment.
- Silicon is used to make glasses and bricks.
- Phosphorus is used to make matchsticks and fertilizer. Sulphur is used to make pigments and detergents.
- Chlorine compound is used in bleaching powder.
- Argon is used in light bulbs and vacuum tubes.
- Potassium ions are used to maintain fluid balance in our body.
- Calcium compound is used to make chalk pieces.

**Keerthana Priya V.**  
**I M.Sc. Chemistry**

---

## Riddles

1. I'm a metal that's shiny and bright, Used in jewelry, but also in flight. What am I?

Answer: Aluminum (Al)

2. I'm a gas that's toxic and bad, formed from burning fossil fuels, quite sad. What am I?

Answer: Carbon Monoxide (CO)

3. I'm a compound that's sweet and fine, added to foods to make them taste divine. What am I?

Answer: Sugar (C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>)

4. I'm a reaction that's slow and cold, forming rust on metal, growing old. What am I?

Answer: Oxidation

5. I'm a substance that's slippery and bright, Used in lubricants, day and night. What am I?

Answer: Oil (Petroleum)

6. I'm a process that's used to clean, removing impurities, making things serene. What am I?

Answer: Filtration

7. I'm a type of bond that's weak and rare, forming between molecules, showing they care. What am I?

Answer: Hydrogen Bond

8. I'm a metal that's dense and gray. Used in batteries, every single day. What am I?

Answer: Lead (Pb)

9. I'm a substance that's solid at room temperature, but when heated, I melt and become a liquid to measure. What am I?

Answer: Ice (H<sub>2</sub>O)

10. I'm a process that's essential for life. Converting energy from one form to another, no strife. What am I?

Answer: Photosynthesis

11. I'm a type of bond that's strong and true, between atoms, I form, to create something new. What am I?

Answer: Covalent bond

12. I'm a chemical reaction that's fast and bright, Releasing heat and light, a wondrous sight.

What am I?

Answer: Combustion

13. I'm a substance that's highly reactive, with water, I react, to form a new compound, quite active. What am I?

Answer: Sodium (Na)

14. I'm a type of mixture that's homogeneous and fine. Composed of two or more substances, intertwined. What am I?

Answer: Solution

15. I'm a gas that's colorless and odorless too, But without me, life on Earth wouldn't get through. What am I?  
Answer: Oxygen (O<sub>2</sub>)

**Kavitha P.**  
**I M.Sc. Chemistry**

---

### **Chemistry Lab: The Place of Magic through the Blast**

The moment we enter the place brings us the awareness of where we are. The place of Chemicals fame, Chemistry lab. Others may be over concerned over the time we spend in there but the only one who's connected with the chemical will be astonished every minute. As a student, I personally felt both tried and excited to be there but I wish there is no after work like writing records and observation and I know which is inevitable.

At first one will have limited idea of lab but at that time the professor who is in charge of lab, making us understand we should do and shouldn't and their role is vital. During the demo-class of particular practical for instant during titration, we will always be astonished how the colour could change with One drop and how the one would own and doing it so perfectly, this makes us to be more precise about what we are doing.

While analysing Organic mixture, this never disappointed us for what it is. I always excited to see if the mixture has any one of these amine, amide or dicarboxylic acid. If you know you know!

By adding saturated solution of sodium nitrite the appearance of Red dye makes my face bright ! And I will be more happy if the amine and amide is given together! Now got why Amine and for Amide, it is always a diamide that is Urea, if it is present in Biuret test it gives Purple colour solution as we add the sodium hydroxide and this brings the optimistic feel that has embraced thru' the tough times.

OMG! For Dicarboxylic acid with fluorescence test the appearance of fluorescence solution as soon the addition of heated mixture of dicarboxylic acid, resorcinol and sulphuric acid, it just feels unreal.

As this all happening a side, the fear of handling the sodium will makes shiver till it was broken in the beaker smoothly. And if the Nitrogen was present then it will feel cool as we bring the Teal or Turquoise in our test tube, as we do this the feeling of proud of ourself about how we making things systematically, none of the other feels this way !!

There is no way one can end the experience over the place, Chemistry lab and only a chemist can really relate to that feel. There is always a reason and an answer for the questions, Why and How and it's getting more interesting when the reasons justify the chemistry happens in the Lab! It always be logical

and more clear if we didn't confuse with things. There will be peculiar change for every tiny change we do in our Life, the same here each drop of a particular chemical leads to either unexpected or expected changes. The professor who's incharge, their presence feels like there is someone to guide when things that we do is wrong this gives the feel of cautious and makes us to be more authentic over the things we do in Lab as well as in the Life, the role professor will be taken up by mentors, parents and we'll wishers!

I conclude that Chemistry Lab is not just Lab but it also helps us how to be responsible over our actions and drastic effect that brings out. This also makes us to believe in magic of commitment, efforts and sincerity over the things we do. This Place is not just a chemical reactions that's happening but also a place where we try learn how to be a better person everyday, though it is blasting!

**Sarah Grace K.**  
**I M.Sc. Chemistry**

---

## **Redox Catalysis Through Photoinduced Electron Transfer (PET)**

### **INTRODUCTION:**

Redox catalysis through PET is the process where light energy is used to drive electron transfer reactions, enabling oxidation or reduction processes that would not typically occur under normal conditions. This mechanism plays a crucial role especially in the field of solar energy conversion, organic synthesis and environmental remediation.

### **WORKING:**

#### 1. Photoexcitation:

The catalyst (often a photoactive molecule or complex) absorb light, which excites one of its electrons to a higher energy level, creating a "PHOTOEXCITED" species.

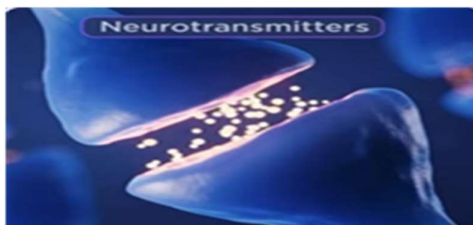
#### 2. Electron Transfer:

The excited state of the catalyst can transfer an electron from a donor. In this step only the key redox reaction takes place either oxidation (electron loss) or reduction (electron gain).

#### 3. Catalytic Cycle:

After the electron transfer, the catalyst usually returns to its ground state or an alternative stable state. In some cases, the catalyst may undergo further transformations.

## **APPLICATIONS:**



1. Energy Conversion: In artificial photosynthesis PET is used to drive water splitting to generate hydrogen gas, or to reduce carbon dioxide to useful chemicals, mimicking natural photosynthesis.
2. Organic Synthesis: PET allows for the activation of substrates that are difficult to oxidize or reduce under traditional conditions, enabling new chemical transformations.
3. Environmental Cleanup: PET based catalytic systems can be used to degrade pollutants through photooxidation or photoreduction processes.

## **CONCLUSION:**

Photoinduced electron transfer is a powerful tool because it enables the use of light to initiate and control redox processes with high specificity and efficiency, offering significant potential for sustainable chemistry and energy conversion technologies.

**YAZHINI S.K.**  
**III B.Sc. CHEMISTRY (2022-2025)**

---

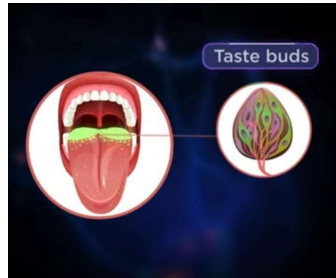
## **Zinc: The Hidden Ingredient Behind the Flavours of Life**

"Did you know that the tastiest meal needs more than just the perfect recipe or the best chef? It needs zinc."

"Zinc is the unsung hero behind the magic of taste, a vital element that breathes life into flavors. It nurtures and regenerates the taste buds, allowing us to experience the world in vibrant detail. Without zinc, the orchestra of taste would falter, leaving the melody of flavors incomplete. It's the essential key that unlocks the joy of savoring every bite and every moment."

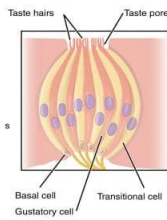
## The Role and Importance of Zinc in the Sense of Taste

Zinc, an essential trace element, is vital for numerous physiological functions, including growth, immunity, and cellular repair. One of its lesser-known yet significant roles is in maintaining and regulating the sense of taste. Deficiencies in zinc can lead to a range of taste-related issues, from mild changes in flavor perception to complete loss of taste, known as ageusia.



## Understanding the Role of Zinc in Taste Perception

The sense of taste is a complex process involving taste buds, nerve signals, and brain interpretation. Zinc plays a crucial role in several aspects of this process:



**Development and Maintenance of Taste Buds:** Zinc is essential for the growth and regeneration of taste bud cells. Taste buds, located on the tongue and other parts of the oral cavity, are replaced every 10-14 days. Zinc is a co-factor in the synthesis of DNA and RNA, processes that are critical for cell division and repair. Without adequate zinc, taste buds may atrophy or function poorly.

**Regulation of Gustin:** Gustin is a zinc-dependent protein crucial for the development and maintenance of taste buds. This protein is thought to regulate the differentiation of basal cells into mature taste receptor cells. Zinc deficiency can impair gustin activity, leading to structural and functional alterations in taste buds.

Neurotransmission in Taste Pathways: Zinc also influences neurotransmitter function in the gustatory system. It modulates synaptic activity between taste receptor cells and gustatory neurons, affecting how taste signals are transmitted to the brain. This modulation ensures proper perception of taste stimuli.

### **Impact of Zinc Deficiency on Taste**

Zinc deficiency can have a profound impact on taste perception, leading to conditions such as:

- Hypogeusia: Reduced ability to detect flavors.
- Dysgeusia: Distorted taste perception, where food may taste metallic, sour, or unpleasant.
- Ageusia: Complete loss of taste.

These conditions can result from various factors, including inadequate dietary intake, malabsorption syndromes, chronic illnesses, or the use of certain medications that inhibit zinc absorption or increase its excretion.

### **Conclusion**

"No matter how exquisite or flavorful a dish may be, its true essence can only be appreciated through a well-functioning sense of taste. This underscores the vital role of zinc in ensuring we can fully enjoy the sensory experience of food. By prioritizing zinc intake in our diet, we not only safeguard our sense of taste but also enhance our overall quality of life. After all, savoring life's flavors starts with a healthy foundation."

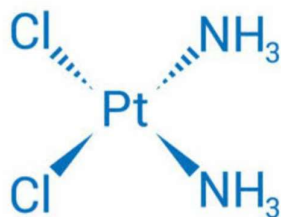
**NABEELA KHAN S.**  
**III B.Sc. CHEMISTRY**

---

### **Cisplatin (A miraculous anticancer drug)**

Cisplatin, also known as cis-diamminedichloroplatinum(II), is a coordination compound that has revolutionized the field of chemotherapy. It is a metallic (platinum) coordination compound with a square planar geometry. It is a white or deep yellow to yellow-orange crystalline powder at room temperature. Cisplatin consists of a platinum(II) center surrounded by two chloride ligands and two ammonia ligands. It has been used for treatment of numerous human cancers including bladder, head and neck, lung, ovarian,

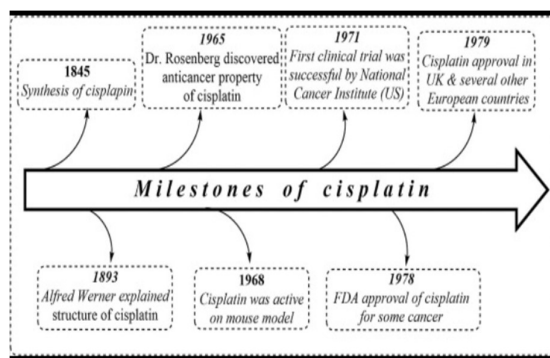
and testicular cancers. It is effective against various types of cancers, including carcinomas, germ cell tumors, lymphomas, and sarcomas



### **Milestone of cisplatin:**

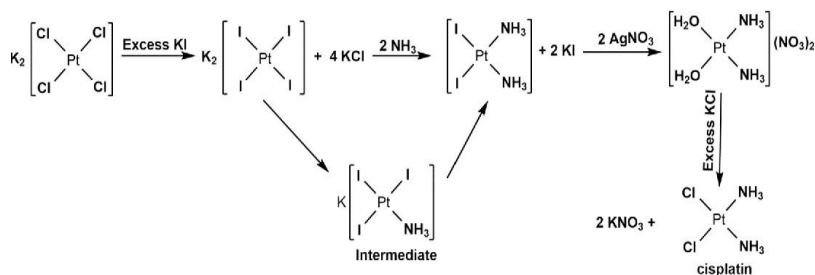
Cisplatin was first synthesized by M. Peyrone in 1844 and its chemical structure was first elucidated by Alfred Werner in 1893. However, the compound did not gain scientific investigations until the 1960's when the initial observations of Rosenberg (Rosenberg, Vancamp et al., 1965) at Michigan State University pointed out that certain electrolysis products of platinum mesh electrodes were capable of inhibiting cell division in *Escherichia coli* created much interest in the possible use of these products in cancer chemotherapy. Since the identification of cis-dichlorodiammineplatinum(II) (cisplatin) as the agent responsible for this activity, much interest has been generated in the use of coordination complexes of platinum, palladium, and other noble metals in the treatment of cancer.





### Synthesis of cisplatin :

The most efficient method for synthesis of cisplatin was given by Dhara which was published in 1920 entitled as 'A rapid method for synthesis of cis[PtCl<sub>2</sub>(NH<sub>3</sub>)<sub>2</sub>]' .It is a multi step process in which aqueous K<sub>2</sub>[PtCl<sub>4</sub>] is treated with excess of KI to form K<sub>2</sub>[PtI<sub>4</sub>]. Then NH<sub>4</sub>OH is added to this dark brown solution, resulting in yellow precipitate of cis-[Pt(NH<sub>3</sub>)<sub>2</sub>I<sub>2</sub>]. It is collected and dried. To this two equivalents of aqueous solution of AgNO<sub>3</sub> is added resulting in the formation of soluble [Pt(NH<sub>3</sub>)<sub>2</sub>(H<sub>2</sub>O)<sub>2</sub> ]<sup>2+</sup> and insoluble AgI. AgI is filtered and discarded. The filtrate containing [Pt(NH<sub>3</sub>)<sub>2</sub>(H<sub>2</sub>O)<sub>2</sub> ]<sup>2+</sup> is then treated with excess KCl to get isomerically pure yellow solid crystal of cisplatin. It is purified by recrystallization from hot water containing either 0.1M HCl or 0.9%NaCl.



### Mechanism of action:

Cisplatin is administered intravenously to the patient as a sterile saline solution. Cisplatin becomes activated once it enters the cell. In the cytoplasm the chloride atoms on cisplatin are displaced by water molecules. This hydrolyzed product is a potent electrophile that can react with any nucleophile, including the sulfhydryl groups on proteins and nitrogen donor atoms in nucleic acids. Cisplatin binds to the N7 reactive center on purine residues and as such can cause deoxyribonucleic acid (DNA) damage in cancer cells, blocking cell division and resulting in apoptotic cell death. The 1,2-intrastrand cross-links of purine bases with cisplatin are the most notable among the changes in DNA. These include the 1,2-intrastrand d(GpG) adducts 1,2-intrastrand d(ApG) adducts representing about 90% and 10% of

adducts, respectively. 1,3-intrastrand d(GpXpG) adducts and other adducts such as interstrand crosslinks and nonfunctional adducts have been reported to contribute to cisplatin's toxicity. Cisplatin is primarily eliminated from the body through the kidneys, with a small amount eliminated through the liver and gastrointestinal tract. The renal clearance of cisplatin is approximately 50-70 mL/min, with an elimination half-life of 20-30 minutes and a terminal half-life of 24-48 hours.,



**Side effects:** The major toxicities of a cisplatin overdose include nausea and vomiting, renal insufficiency, electrolyte abnormalities, myelosuppression, ototoxicity, peripheral neuropathy, hepatotoxicity and retinopathy. and retinopathy.

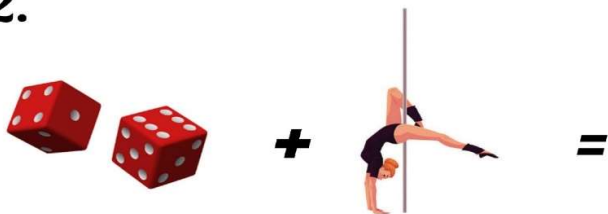
**AMREEN BANU R.  
III B.Sc. CHEMISTRY**

### Connections

1.



2.



3.



4.



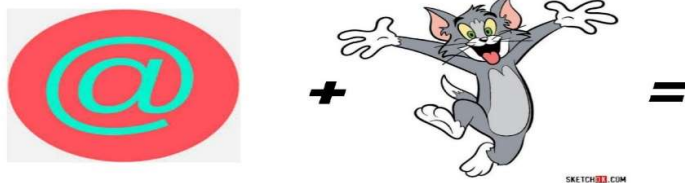
5.



6.



7.



8.



**ANSWERS:**

1. Specs + Drum = Spectrum
2. Dice + Pole = Dipole
3. Cat + eye + ion = Cation
4. Bee + Car = Beaker
5. K+Miss+Tree = Chemistry
6. Test + Tube = Test tube
7. @ + Tom = Atom
8. Cat + A + List = Catalyst

**SAFREEN M.  
III B. Sc. CHEMISTRY**

## 3D Bioprinting

3D bioprinting is a technology where bio inks, mixed with living cells, are printed in 3D to construct natural tissue-like three-dimensional structures. Currently, this technology can be used in various research areas, such as tissue engineering and new drug development.

The technology and bio printed structures enable researchers to study functions of the human body in vitro. 3D bio printed structures are more biologically relevant compared to in vitro studies performed in 2D. Mostly, 3D bioprinting can be used for several biological applications in the fields of tissue engineering, bioengineering and materials science. The technology is also increasingly used for pharmaceutical development and drug validation. Clinical settings such as 3D printed skin and bone grafts, implants and even full 3D printed organs are currently at the center of bioprinting research. Three-dimensional bioprinting plays an important role in tissue engineering which aims to fabricate functional tissue for applications in regenerative medicine and drug testing. Tissue regeneration and reconstruction could enable the possibility to repair or replace damaged tissues and organs. Essentially, bioprinting allows for the fabrication of 3D tissue constructs with pre-programmed structures and geometries containing biomaterials or living cells by synchronizing the bio ink deposition/cross-linking with the motorized stage movement. The bioprinting process is usually accomplished in multiple steps that include computed-tomography or magnetic resonance imaging of the desired tissue, and subsequent use of computer-aided design or computer-aided manufacturing software to obtain the tomographic and architectural information of the tissue, selection of physiologically relevant biomaterials and cells, and bioprinting of the tissue construct followed by tissue maturation in vitro.

The main strategies of 3D bioprinting include biomimicry that aims to emulate the structural and functional features of tissue or organs. 3D bioprinting it involves the creation of bio inks made from various chemical compounds, such as hydrogels, proteins, and cells. These materials must be carefully engineered to mimic the properties of human tissues. Additionally, chemical reactions influence the curing or crosslinking processes during printing, which ensures that the printed structures maintain their integrity and functionality. Hydrogels are highly water-absorbing materials that provide a supportive matrix for cells. The chemistry of hydrogels, including their crosslinking mechanisms, affects the stiffness, porosity, and biodegradability of the printed tissue. Examples include PEG (polyethylene glycol) and hyaluronic acid. These are designed to mimic the natural environment of cells. The chemistry behind these molecules, including their stability and binding to specific cell types, is vital for guiding cell behavior. Bio inks like **hydroxyapatite** (a mineral form of calcium phosphate) is used to mimic bone's mineral content and provide mechanical strength. One of the biggest advantages is the ability to **customize** tissues or organs to match a specific patient's needs. Unlike traditional methods that may take weeks or months, 3D bioprinting allows for the **rapid production** of tissue models or prototypes, enabling researchers to quickly test and refine designs. The

technology is being explored for regenerating more complex tissues such as **liver, heart** or **kidney**. While we are still in the early stages, bioprinting could one day provide a source of bioengineered organs for transplantation, potentially solving the organ shortage crisis.

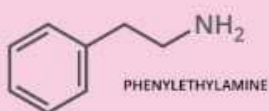
**MONISHA S.**  
**III B.Sc. CHEMISTRY**

---

# THE CHEMISTRY OF CHOCOLATE

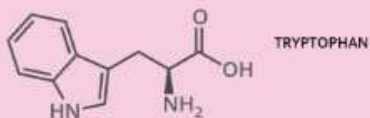
---

## IS CHOCOLATE AN APHRODISIAC?

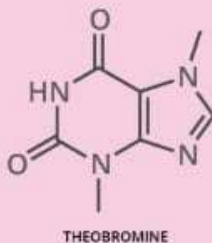


Phenylethylamine occurs naturally in the brain, and is often referred to as 'the love drug' due to its ability to produce feelings of well-being and contentment. It is also present in significant concentrations in chocolate, but since it is broken down after ingestion, it has been ruled out as causing a significant aphrodisiac effect.

Tryptophan is a chemical in the brain linked to the production of serotonin, the neurotransmitter that produces feelings of elation. It is present in chocolate, but only in small quantities, and it is unlikely that it causes any aphrodisiac effect.



## WHY IS CHOCOLATE TOXIC TO DOGS?



Theobromine is a mild stimulant, similar in effect to caffeine, found in chocolate. This compound is harmless to humans at the levels found in chocolate - a fatal dose would require eating tens of kilograms of milk chocolate!

In cats & dogs, theobromine has a much more potent effect; small doses can lead to vomiting & diarrhoea, whilst as little as 50g of dark chocolate could kill a small dog.

**Sreena J.**  
**I B.Sc. CHEMISTRY**

---

# CuNd<sub>2</sub>O<sub>4</sub>: A Promising Photocatalyst for Antibiotic Degradation

## INTRODUCTION:

Water contamination by antibiotics is a critical environmental issue due to their persistence and harmful effects. Conventional wastewater treatments often fail to remove these pollutants. Photocatalysis has emerged as a sustainable solution, with CuNd<sub>2</sub>O<sub>4</sub> (Copper Neodymium Oxide) gaining attention for its excellent optical and catalytic properties.



## Synthesis and Properties:

CuNd<sub>2</sub>O<sub>4</sub>, a p-type semiconductor with a spinel-like structure, is synthesized using methods such as:

- **Solid-state reaction:** Heating metal oxides (CuO and Nd<sub>2</sub>O<sub>3</sub>) at 1000–1200°C.
- **Sol-gel method:** Mixing metal precursors in a sol-gel matrix, followed by calcination at ~800°C.
- **Hydrothermal synthesis:** Using temperatures of 200–250°C to create nanostructures.

Its bandgap of ~1.5–2.5 eV enables efficient solar energy utilization.

## PHOTOCATALYTIC MECHANISM:

1. **Photon Absorption:** Visible light excites electrons (e<sup>-</sup>) from the valence band (VB) to the conduction band (CB), creating holes (h<sup>+</sup>).
2. **Charge Separation:** Nd enhances charge separation, reducing recombination.
3. **Reactive Oxygen Species (ROS):** Electrons react with O<sub>2</sub> to form superoxide radicals (•O<sub>2</sub><sup>-</sup>), while holes react with H<sub>2</sub>O to generate hydroxyl radicals (•OH).
4. **Degradation:** ROS break down antibiotic molecules into less harmful compounds.

## **BENEFITS AND CHALLENGES:**

**Benefits:**  $\text{CuNd}_2\text{O}_4$  absorbs visible light better than  $\text{TiO}_2$ , enhances charge mobility, and is eco-friendly.

**Challenges:** Long-term stability, scalability, and ensuring non-toxic by-products remain areas of improvement.

## **CONCLUSION:**

With its excellent light absorption, charge separation, and eco-friendliness,  $\text{CuNd}_2\text{O}_4$  is a promising photocatalyst for wastewater treatment. Future research should address stability, scalability, and product safety for practical use.

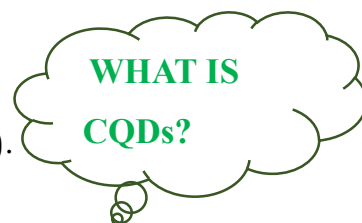
**Rebecal U.  
II M.Sc. Chemistry**

---

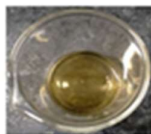
## **Carbon Quantum Dots (CQDs)**

### **Interesting Content About CQDs**

- ❖ It is tiny, glowing particles made of carbon atoms.
- ❖ They are extremely small (typically 2-10 nm in size).



### **SYNTHESIS OF CQDs**



- It is synthesized from sugarcane bagasse using the hydrothermal method, which does not involve the use of harmful chemicals.
- It is a green synthesis technique.

### **PROPERTIES**

It can conduct electricity. Chemically stable and resistant to degradation. Non-toxic and compatible with biological systems. CQDs are **quasi-spherical, crystalline in shape and zero dimensions.**

## Biomedical applications



- Anti-inflammatory effects of CQDs derived from bovine serum.
- Offering a new avenue for the treatment of inflammation-related diseases.
- The efficiency of CQDs and standard are 85% and 90% respectively. Efficiency of CQDs 5% less than that of standard (Diclofenac sodium).
- CQDs have good anti-inflammatory activity.

**Harini S.**  
**II M.Sc. Chemistry**

---

## Chemistry of Emotions

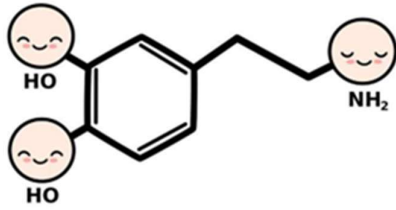
Emotions are caused by chemical reactions in the brain. Different neurotransmitters cause different emotional reactions.

### Meet your Happy Chemicals:

- Dopamine
- Serotonin
- Oxytocin
- Endorphin

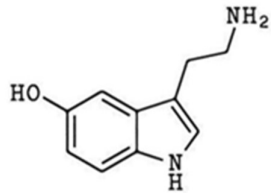
### Dopamine: The Reward Chemical

Dopamine, a happy hormone that is made naturally in the brain, associated with pleasure and reward when we experience something pleasurable. It releases when we achieving a goal, complete a task and eating food. It is often called the “**molecule behind our sins**”



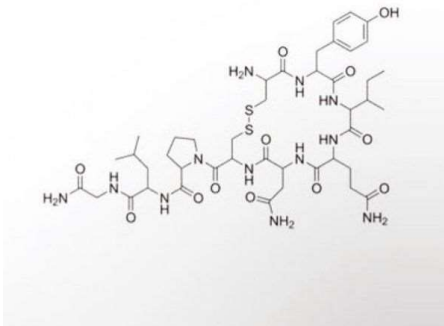
### **Serotonin: The Mood Stabilizers**

Serotonin (5-hydroxytryptamine or 5-HT) is a neurotransmitter and hormone that plays a key role in mood regulation, sleep, appetite, and cognitive functions. It releases when we do meditation, be with nature and sun exposure.



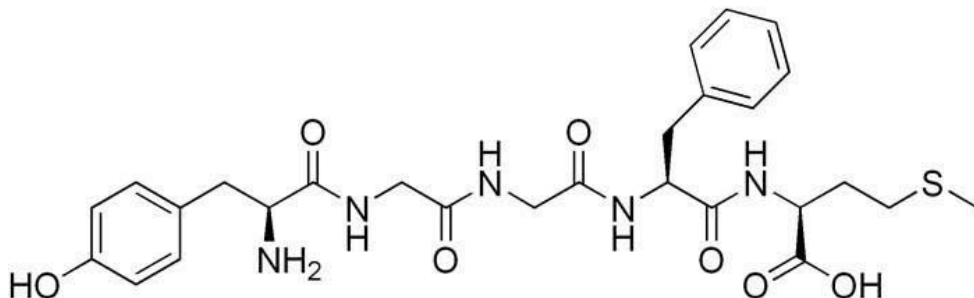
### **Oxytocin: The Love Hormone**

Oxytocin, often called the “love hormone” or “**bonding hormone,**” is a neuropeptide that plays a crucial role in social bonding and emotional regulation. It releases when we socializing, petting animals and helping others.



### **Endorphin: The Painkiller**

Endorphins are neuropeptide, it makes a person feel happy. Also reduces the pain. Equivalent to a narcotic pain reliever. It releases when we do exercising, eating dark chocolate and laughing.



**Priyadarshini M.  
II M.Sc. Chemistry**

---

### **Applications of Nuclear Physics**

The discovery of nuclear physics began with the discovery of radioactivity by Henri Becquerel in 1896. Later, Ernest Rutherford's famous gold foil experiment in 1909 led to the discovery of the atomic nucleus. Since then, nuclear physics has evolved rapidly, with major advances in our understanding of the atomic nucleus and its interactions. It has various applications.

1. Nuclear Power: The use of nuclear energy to generate electricity.
2. Medicine: The use of nuclear physics in medical imaging and cancer treatment.
3. Industry: The use of nuclear physics in industrial processes, such as radiation sterilization and food irradiation.
4. Space Exploration: The use of nuclear physics in space exploration, including the study of cosmic rays and the development of nuclear-powered propulsion systems.

**Reena Devi M.  
I B.Sc. Chemistry**

---



---

## Chemistry Facts

Helium can make your voice squeaky – Inhaling helium changes the speed of sound in your vocal cords, making your voice high-pitched.

You can't taste food without saliva – Chemicals in food must dissolve in saliva before taste receptors can detect them.

Chocolate contains a mood boosting chemical – It has theobromine, which is similar to caffeine and can make you feel happy.

Fireworks get their colors from metals – Strontium makes red, copper makes blue, and sodium makes yellow.

You glow in the dark (a Little) – Humans emit a faint glow due to biochemical reactions, but it's too weak for the naked eye.

Water can exist in three states at once – At the triple point, water is solid, liquid, and gas at the same time.

A drop of water contains billions of molecules – One single drop has around 1.5 sextillion ( $1.5 \times 10^{21}$ ) molecules!

Ice is less dense than water – That's why ice floats; most substances shrink when they freeze, but water expands.

Astatine is the rarest natural element – Less than 1 gram exists in the entire Earth's crust at any time.

A glass of water might contain Dinosaur Pee – Water is recycled continuously, so the molecules you drink today could have been part of a dinosaur's drink millions of years ago!

**Harini N.**  
**I B.Sc. Chemistry**

---

## Decoding Protein Structures

The Nobel Prize 2024 in Chemistry was awarded to David Baker, John Jumper, and Demis Hassabis for their groundbreaking work in decoding the structure of proteins. Their development of AlphaFold, an AI platform capable of predicting protein structures quickly and accurately, has significantly advanced the field, aiding in understanding antibiotic resistance and creating enzymes that can break down plastics.

Proteins are fundamental molecules in biology, performing a vast range of functions, from catalyzing chemical reactions to supporting cell structure. Their function is determined by their three-dimensional structure, which arises from the folding of a linear chain of amino acids. However, determining this structure, especially for large and complex proteins, has been a long-standing challenge. Recent breakthroughs in protein structure prediction, particularly the development of the AlphaFold system, have revolutionized our understanding of biology and opened new possibilities for medical and scientific advancements.

### Impact on Biology and Medicine

1. Drug Discovery
2. Understanding Disease Mechanisms
3. Personalized Medicine
4. Biotechnology Advancements

**Priyadarshini R.S.**  
**I B.Sc. Chemistry**

---

## Applications of Calcium Hydroxide Nanoparticles

Calcium hydroxide nanoparticles ( $\text{Ca}(\text{OH})_2$  NPs) have various applications across different fields due to their high reactivity, antimicrobial properties, and biocompatibility. Here are some key applications:

### **1. Cultural Heritage Conservation**

\*Used for stone and mural restoration, helping to consolidate degraded surfaces.

\*Applied as a protective layer on historic artworks and frescoes to prevent further deterioration.

## **2. Biomedical Applications**

\*Dentistry: Used in root canal treatments as an antimicrobial agent to promote healing.

\*Wound healing: Exhibits antibacterial properties, aiding in skin and tissue repair.

## **3. Environmental Applications**

\*Water purification: Helps in neutralizing acidic water and removing heavy metals.

\*Air pollution control: Used in gas scrubbing systems to capture CO<sub>2</sub> and SO<sub>2</sub>.

## **4. Agriculture**

\*Improves soil pH balance, enhancing crop growth.

\*Acts as an antimicrobial agent in agricultural formulations.

## **5. Construction Industry**

\*Used in cement and mortar to improve mechanical properties and durability.

\*Enhances hydration processes, reducing cracking in concrete.

## **6. Paper and Textile Industry**

\*Used in the alkaline treatment of paper to prevent aging.

\*Helps in dye fixation for textiles.

**Mohana Meena S.**  
**II M.Sc. Chemistry**

---

## Poster of Green Chemistry

**EARTH'S PREBIOTIC ATMOSPHERE**  
↑  
NEARLY REDUCING ATMOSPHERE  
↓  
O<sub>2</sub>

**EARTH'S MODERN ATMOSPHERE**  
↑  
OXIDIZING ATMOSPHERE  
↓  
O<sub>2</sub>

**CURRENT SITUATION OF EARTH**  
CO<sub>2</sub> SOLAR RADIATION CHLORINE FLUORINE CARBON MONOXIDE

**WASTE PREVENTION**  
**ATOM ECONOMY**

**LESS HAZARDOUS CHEMICAL SYNTHESIS**

**SAFER SOLVENTS & AUXILIARIES**

**SAVE**

**Green**

**EARTH**

**DESIGNING SAFER CHEMICALS**

**DESIGN FOR ENERGY EFFICIENCY**

**USES OF RENEWABLE FEED STOCKS**

**REDUCE DERIVATION**

**GO**

**CHEMISTRY**

**GREEN**

**DESIGN FOR DEGRADATION**

**CATALYSIS**

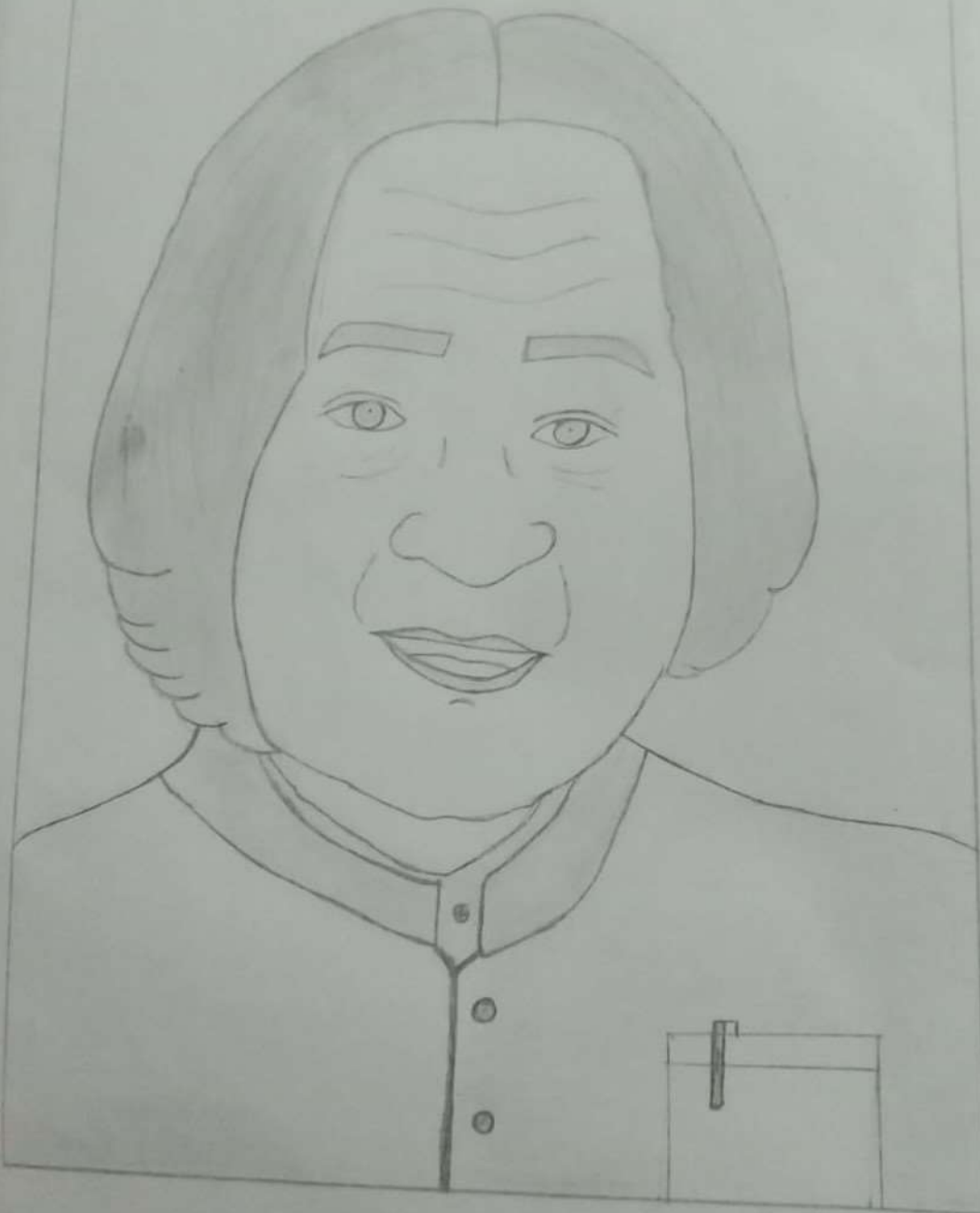
**REAL TIME POLLUTION PREVENTION**

**SAFER CHEMISTRY FOR ACCIDENT PREVENTION**

SWETHA.T  
III B.Sc. CHEMISTRY

Swetha T. (27.06.2005)  
III B.Sc. Chemistry

Dr. APT ABDUL KALAM



L.N. PADMASRI

I B.Sc CHEMISTRY

# DOROTHY HODGKIN



She was awarded the 1964 Nobel Prize in Chemistry for solving the atomic structure of molecules such as penicillin and insulin using X-ray crystallography

By  
S. Abinaya  
I- B.Sc. Chemistry



## MARIE CURIE

She won the 1911 Nobel Prize in Chemistry for her discovery of the elements polonium and radium and for isolating radium

BY  
S. Atchaya  
I. B. Sc Chemistry

## **Environmental Chemistry**

**“Earth provides enough to satisfy every man’s needs, but not every man’s greed.”**

Environmental chemistry is the study of the chemical processes that occur in the environment. It involves the application of chemical principles to understand and address environmental issues, such as air and water pollution, climate change, and waste management. Environmental chemists examine the sources, transport, and fate of pollutants in the environment, as well as their impact on human health and ecosystems.

One of the key areas of focus in environmental chemistry is the study of pollutants in the atmosphere. This includes gases such as carbon dioxide, methane, and ozone, which contribute to climate change and air pollution. Environmental chemists also study the formation and transport of particulate matter, such as aerosols and dust, which can have negative impacts on human health and ecosystems. By understanding the chemical processes that govern the behaviour of these pollutants, environmental chemists can develop strategies for reducing their emissions and mitigating their impacts.

In addition to studying pollutants in the atmosphere, environmental chemists also examine the chemical processes that occur in aquatic ecosystems. This includes the study of water pollution, eutrophication, and the fate and transport of pollutants in surface and groundwater. Environmental chemists also develop and implement technologies for treating and managing wastewater, as well as strategies for protecting and restoring aquatic ecosystems. By applying chemical principles to environmental problems, environmental chemists play a critical role in protecting human health and the environment.

Environmental chemistry is an interdisciplinary field that draws on principles from chemistry, biology, ecology, and other sciences. Environmental chemists use a variety of techniques, including laboratory experiments, field measurements, and computational modeling, to study environmental systems and develop solutions to environmental problems. By combining knowledge from multiple disciplines, environmental chemists can develop a comprehensive understanding of the complex interactions between human activities and the environment.

The applications of environmental chemistry are diverse and far-reaching. Environmental chemists work in a variety of settings, including government agencies, private industry, and academia. They develop and implement policies and technologies for reducing pollution and mitigating the impacts of human activities on the environment.

By applying the principles of environmental chemistry, we can create a more sustainable future and protect the health and well-being of both humans and the environment.

**“Protect the Environment by reducing waste, conserving water and using renewable energy.”**

**Vaishnavi D. S.  
II M.Sc. Chemistry**

---

### **Graphitic carbon nitride (g-C<sub>3</sub>N<sub>4</sub>) and its applications**

Graphitic carbon nitride has the general formula C<sub>3</sub>N<sub>4</sub> and is mainly composed of carbon and nitrogen. The history of carbon nitride and its precursor begins in 1834 with Berzelius synthesis, after which Liebig named it “melon”. Franklin explained the structure of this compound in 1992. It is a poly conjugated semiconductor material with a unique layered structure similar to grapheme. Graphitic-C<sub>3</sub>N<sub>4</sub> is stable under high temperatures and resistant to acids and bases, making it suitable for harsh environments. It has a moderate bandgap (~2.7 eV), allowing it to absorb visible light and function as a photocatalyst. It Provides more active sites for catalytic and adsorption applications. Graphitic carbon nitride (g-C<sub>3</sub>N<sub>4</sub>) is a versatile material with a wide range of applications due to its unique electronic structure, thermal stability, and chemical properties.

- **Photocatalysis:** g-C<sub>3</sub>N<sub>4</sub> is used for photocatalytic water splitting, degradation of pollutants, and CO<sub>2</sub> reduction.
- **Solar Cells:** g-C<sub>3</sub>N<sub>4</sub> is used as a photoanode or photocathode in solar cells, improving their efficiency.
- **Fuel Cells:** g-C<sub>3</sub>N<sub>4</sub> is used as a catalyst support in fuel cells, enhancing their performance.
- **Water Purification:** g-C<sub>3</sub>N<sub>4</sub> is used for removing pollutants, heavy metals, and dyes from water.
- g-C<sub>3</sub>N<sub>4</sub> is used for detecting biomolecules, such as DNA, proteins, and glucose.
- **Drug Delivery:** g-C<sub>3</sub>N<sub>4</sub> is used as a carrier for delivering drugs, such as anticancer agents and it also used as a scaffold for tissue engineering applications.
- **Catalytic Applications:** g-C<sub>3</sub>N<sub>4</sub> is used as a catalyst for hydrogen evolution reaction (HER), oxygen evolution reaction (OER) and also used for various organic synthesis reactions.
- **Sensors:** Used in gas and biosensors for detecting pollutants and biomolecules.
- **Transistors:** g-C<sub>3</sub>N<sub>4</sub> is used as a channel material in transistors, showing high mobility and stability.

- **Sensors:**  $g-C_3N_4$  is used for detecting various physical and chemical parameters, such as temperature, pressure, and humidity.

**Logeshwari M.  
II M.Sc. Chemistry**

## **Plastic Alternatives: The Chemistry of Plant based Materials and Innovations to Combat Plastic Pollution**

Plastic pollution is one of the most pressing environmental issue of our time, with millions of tons of waste accumulating in landfills and oceans each year. To combat this crisis, scientists are turning plant-based materials and



innovative technologies to develop sustainable alternatives to conventional plastics. These solutions aim to reduce reliance on fossil fuels and minimize environmental harm.

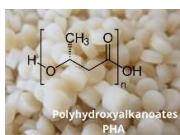
The Chemistry of plant-base materials

Plants-based plastics, also known as bioplastics, are derived from renewable resources like corn, sugarcane, or algae. Unlike traditional plastics, which are made from petroleum, bioplastics harness natural polymers such as starch, cellulose, and lactic acid.

1. **Polylactic acid (PLA):** A biodegradable polymer made from fermented plant sugars. PLA is widely used in food packaging, disposable cutlery, and 3D printing due to its compostability under industrial conditions.



2. **Polyhydroxyalkanoates (PHAs):** Produced by bacteria that feed on plant oils, PHAs are fully biodegradable and suitable for medical implants and agricultural films.



3. **Cellulose-based plastics:** Extracted from wood pulp or cotton, cellulose is transformed into flexible and durable materials like cellophane or cellulose or acetate.



### **Innovations to combat plastic pollution:**

1. **Edible packaging:** Made from materials like seaweed or rice, edible films eliminate waste entirely, especially for single-use applications.
2. **Mushroom Mycelium:** This fungal root system can be molded into packaging or building materials, offering a biodegradable alternative to polystyrene foam.
3. **Waste-to-resource technologies:** Agricultural residues like sugarcane bagasse or rice husks are repurposed to create bio-based polymers, reducing agricultural waste.
4. **Algae-based plastics:** Fast-growing algae are processed into bioplastics, capturing carbon dioxide during growth and reducing greenhouse gas emissions.

### **Challenges:**

While promising, these alternatives face challenges such as higher production costs, limited scalability, and the need for composting infrastructure. Governments, industries, and consumers must collaborate to create a circular economy where materials are reused, recycled, or safely decomposed.

**Kayalvizhi S.**  
**III B.Sc. Chemistry**

---

### **Article on Green Chemistry**

Green chemistry is the process of thinking and utilizing existing knowledge to reduce the adverse impact of pollution on the environment. Green chemistry can also be thought of as a production process which will reduce pollution in the environment. During any process, byproducts are generated and if not utilized properly then they add to the environmental pollution.

These processes are cost ineffective if the by-products are not utilized. Waste generation and disposal are economically unsound processes. The utilization of knowledge for reducing chemical hazards with the development activities is the foundation of green chemistry.

In a chemical reaction, if the entire chemical reactants are converted into useful products then no chemical waste will be generated. Hence, the environment will be free from any pollution. This can only be achieved if the conditions are optimized for the reaction. Green chemistry has many applications in our day-to-day life. The following points will show its uses:

**Dry cleaning of clothes** – In earlier days **tetrachloroethylene** was used as a solvent for dry cleaning. This compound is carcinogenic and also pollutes the groundwater. Nowadays, liquefied carbon dioxide with suitable detergent is used for this purpose. It generates liquid carbon dioxide as a by-product and hence causes less pollution.

2. **Bleaching of paper** – Initially chlorine gas was used for this purpose but now it has been replaced by hydrogen peroxide. Hydrogen peroxide along with a suitable catalyst which promotes its bleaching action is used.

Green chemistry is promoting a healthy environment for human society. Being responsible citizens we all should follow this. A world free from pollution will improve living conditions and increase the age of life on this planet.

**GAYATHRI S.**  
**III B.Sc. CHEMISTRY**

---

### **Article on Biopolymers**

**Biopolymers** are the organic substances present in natural sources. The term biopolymer originates from the Greek words bio and polymer, representing nature and living organisms. Large macromolecules made up of numerous repeating units are known as biopolymers. As per the IUPAC definition, a macromolecule defines a single molecule.

The biopolymers are found to be **biocompatible and biodegradable**, making them useful in different applications, such as edible films, emulsions, packaging materials in the food industry, and as drug transport materials, medical implants like medical implants organs, wound healing, tissue scaffolds, and dressing materials in pharmaceutical industries.

The main focus of this review is to provide a piece of knowledge about biopolymers and their uses in the food and medical industries.

A major difference can be identified by their structure. All polymers are composed of monomers, the repetitive units. **Lignocellulose** is a biopolymer with a finite structure. In proteins, primary structure consists of specific chemical composition, and all units are arranged in sequence. **Numerous biopolymers** naturally fold into compact shapes which defines biological functions.

**Relatively synthetic polymers** are simple and arbitrary structures. Their synthesis is regulated through template-directed process, this factor may point to the molecular mass distribution that is not found in biopolymers.

**Convention Sugars:** Polymers of sugar are either branched or linear and are attached with glycosidic bonds. Various chemical modifications can occur in many saccharide units. This type of biopolymer is often difficult in terms of convention.

**Polypeptides:** Conventions regarding polypeptides are to list residues of amino acids occurring from amino terminus. Residues of amino acids are held together by peptide bonds. One of the prime examples for this type of polypeptide is protein. They can even be modified to add non-peptide components

**Nucleic acids:** Conventions regarding nucleic acids are to list the nucleotides sequence occurring from the fifth end to the third end of the polymer chain. Where fifth and third represent the numbering of carbons that is present around the ribose ring participating in the formation of phosphodiester linkages of the chain.

**Impacts on Environment:** Biopolymers are renewable. They are composed of plant material which can be grown endlessly. These polymers would create a viable industry as these plant materials are derived from non-food crops. These are compostable. They are used in industrial composting process. They are biodegradable. Microorganisms breakdowns biopolymers into water and carbon dioxide. Minute number of biodegradable biopolymers are compostable.

**Nithiya Devi K.  
III B.Sc. CHEMISTRY**

---

### **The Story of Ultramarine Pigment**

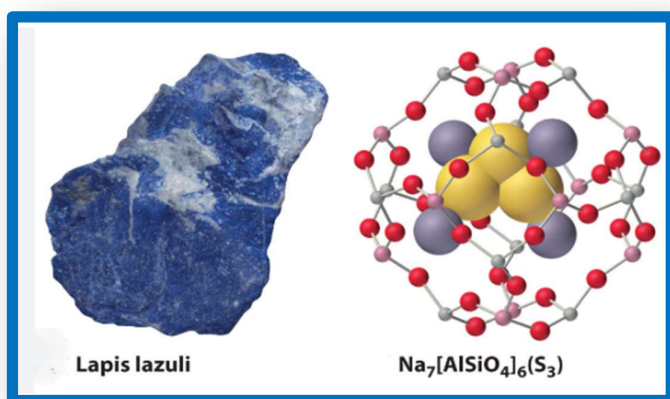


#### **Lapis Lazuli stone**

For centuries, the vibrant blue of lapis lazuli, a precious stone mined in Afghanistan, captivated artists and artisans. This "ultramarine" pigment, so named for the arduous journeys required to obtain it, was highly prized but

incredibly expensive. The natural pigment was so valuable that it was sometimes called “blue gold”.

The intense blue colour of lapis lazuli originates from the presence of the trisulfur radical anion ( $S_3^{\bullet-}$ ) within its crystal structure. This unique chemical structure, found within the mineral with the chemical formula  $Na_7Al_6Si_6O_{24}S_3$ , absorbs specific wavelengths of light, resulting in the vibrant blue hue we perceive.



In the 19th century, a scientific breakthrough revolutionized the art world. French chemist Jean-Baptiste Guimet successfully synthesized Ultramarine Blue, making this once-elusive colour accessible to all.

Today, this vibrant pigment continues to enrich our lives. It adds vibrancy to our homes, enhances the whiteness of our clothes, and finds its way into a myriad of products, from cosmetics to plastics.

India plays a significant role in the global Ultramarine Blue industry, with states like Tamil Nadu being major producers. The nation is a leading exporter, supplying this vibrant pigment to countries worldwide.

The story of Ultramarine Blue is a testament to human ingenuity and our enduring fascination with colour.

**Sr. Melinda Syngkon**  
**III B.Sc. Chemistry**

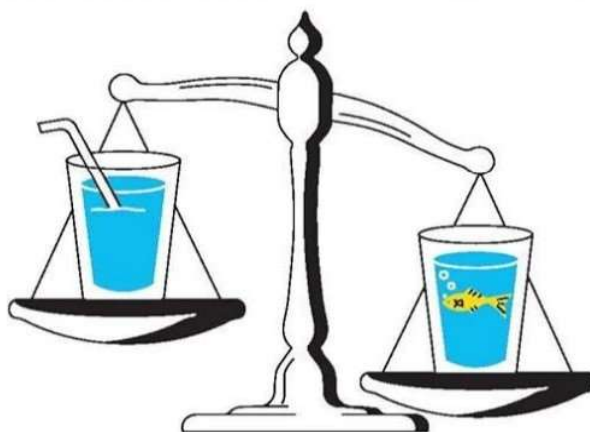
---

### Very salty!

The Dead Sea is about ten times as salty as most seawater. The whole Dead Sea contains around 37 billion tons of salt, or enough to provide cooking salt for thousands of years. If you evaporated 1,000 g (35 oz) of Dead Sea water, there would be about 250 g (9 oz) of salt left when the water had all gone.

### DID YOU KNOW?

All plants and animals are made of many of the same chemicals, just differently organized.



### Uplifting molecules

Water is made of molecules that have two hydrogen atoms and one oxygen atom. Salt (sodium chloride) molecules are made of one atom of sodium and one of chlorine. A sodium chloride molecule has more than three times the mass of a water molecule. These molecules make salt water heavier than plain water. The same volume of salt water has a higher mass than the same volume of freshwater, so it's denser. That means it holds you up better than freshwater. As the Dead Sea is extra salty, it's even denser and holds you up even better than most seawater. It's not good for living in, though. The salt is bad for plants and animals, and very few of them can live in the Dead Sea—which is why it's called the "Dead" Sea.

**Dhanusri A.  
II M.Sc. Chemistry**



*UG Quiz Competition (30/08/2024)*



*PG Paper Presentation (23/09/2024)*

Auxilium College Vellore

Madame Marie Curie Endowment Lecture - 7  
Applications of Novel Heterocycles in Pharmacology



16-10-2024

*Madame Marie Curie Endowment Lecture-7 (16/10/2024)*



*RUSAC Intercollegiate Chem Fest 2025 (25/01/2025)*

Auxilium College (autonomous)  
Gandhi Nagar, Vellore

INTERNATIONAL CONFERENCE ON  
"MATERIALS FOR BIOMEDICAL APPLICATIONS"

Auxilium College (autonomous)  
Gandhi Nagar, Vellore

INTERNATIONAL CONFERENCE ON  
"MATERIALS FOR BIOMEDICAL APPLICATIONS"



06-02-2025



06-02-2025

*International Conference on Materials for Biomedical Applications in collaboration with TANSCST (06/02/2025)*