

Shri Sarda Education Society (Trust)'s
(A Linguistic Minority Education Institute)
**SMT RADHABAI SARDA ARTS, COMMERCE &
SCIENCE COLLEGE**
Anjangaon Surji 444705, Dist. Amravati

Department of Chemistry

AY 2023-24



Project Work On
INDUSTRIALLY
IMPORTANT MOLECULES/
CHEMICALS

Project Work On

INDUSTRIALLY IMPORTANT MOLECULES/ CHEMICALS

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Objectives of the activity

Chemicals are an integral part of industry, and we are all consumers of various types of chemicals. Some chemicals are fundamentally important because they serve as the basis of manufacturing other chemicals, and some are virtually ubiquitous across industries worldwide. Hence, the department of Chemistry assigned the project work pertaining to “Industrially important chemicals / molecules” to the students of BSc III with following objectives:

1. To inform students about industrially important chemicals / molecules and their effects on health and the environment.
2. To encourage students to share knowledge about these molecules/ chemicals with their families.



HEAD

Department of Chemistry
Smt. Radhabai Sarda Arts, Commerce
& Science College Anjangaon Surji

Head of the department



प्राचार्य
PRINCIPAL

SMT. RADHABAI SARDA COLLEGE
OF ARTS, COMMERCE & SCIENCE
ANJANGAON SURJI

Principal



Shri Sarda Education Society's
(A linguistic Minority Educational Institute)
Smt Radhabai Sarda Arts, Commerce and Science College Anjagaon Surji
(NAAC accredited with grade 'A' CGPA 3.21)

Department of Chemistry
AY 2023-2024

NOTICE

All the students of BSc III Sem V are informed that department of Chemistry is going to conduct a project work on "Industrially important molecules / chemicals" for this semester. All the students are directed to be present in seminar hall for further detailed instructions.

Venue: Science Building Seminar Hall

Date & Time: 01.03.2024 at 02:00 pm



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Department of Chemistry
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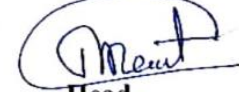
Attendance

Smt Radhabai Sarda Arts, Commerce and Science College Anjangaon Surji
Department of Chemistry
Session 2023-24 Summer 24
Class- B. Sc III Semester VI

Record of Project Assignment Project Title- Industrially Important Molecule/Chemical			
Sr.No	Name of Students	Date of Submission	Signature of Students
1	Aachal Sanjay Dhule	2-4-2024	Adh
2	Aakib Aasif Pathan	1-4-24	Aakib.A.Pathan
3	Absar Anjum Niyaz Ahmad Khan .	26-03-24	Absar Khan .
4	Adesh Bapurao Misar	02-04-24	Adesh
5	Alquama Baig Mirza Afsar Baig .		
6	Archana Chandrabhan Wanere	10-4-24	Archana
7	Asmita Chandrabhan Wanere	10-04-24	Asmita
8	Asmita Mahadev Rangire	• Absent	
9	Awais Sk Aziz Sk	2-4-24	Awais
10	Ayesha Humaira Syed Atique .	26-03-24	Ayesha
11	Bhumika Prashant Bhagat	02/04/24	Bhagat
12	Deep Rajendrarao Patil	10/04/24	Deep Patil
13	Dhanshri Ravindra Ghogare	26/03/24	Dhanshri Ghogare
14	DIKSHA DINESH ICHE	10-04-2024	Diksha
15	Farah Parveen Abdul Razique .	20-3-2024	Farah
16	Gayatri Rajesh Deshkar	10-04-2024	Gayatri
17	Javeriya Tabassum Aqueel Ahmad .	20-3-2024	Javeriya
18	Kanchan Gajananrao Ladole	02/4/24	Kanchan Ladole
19	Kashish Sharad Lahane	02/04/24	K.S.Lahane .
20	Khushal Nemchand Shahu	—	—
21	Krushnakant Mukundrao Kadu	02/04/24	Krushnakant
22	Mahvish Anam Mohd Nazim .	20-3-2024	Mahvish
23	Mohd Mohtashim Mohd Shareef .	1-4-2024	M. Mohtashim
24	Mohd Uzair Ziyaoddin .	02-04-2024	Uzair
25	Mohini Ramdas Kedar	26-3-2024	Mohini
26	Natiqu Kamran Zameeruddin .	01/04/2024	Natiqu

27	Nikita Gopalrao Tayade	02/04/24	Nikita
28	Nikita Nandu Raibole	26/03/2024	Nikita
29	Nilesh Vinayakrao Dhumale	01/04/2024	Nilesh
30	Nitesh Rameshwar Bhakare	02/04/2024	Nitesh
31	Om Pramod Khode	01/04/2024	Om
32	Om Prashantrao Ukhalkar	02/04/2024	Om
33	Prajakta Babarao Bansod	26/03/2024	Prajakta
34	Pranav Sharad Khandare	01/04/2024	Pranav
35	Pranjali Ravindra Hore	01/04/2024	Pranjali
36	Prathamesh Surendra Nimkar	02/04/2024	Prathamesh
37	PRATIK SHRIDHAR KALE	01/04/2024	Pratik
38	Priti Dipak Bodkhe	21/4/2024	Priti
39	Priya Wasudevrao Badan	26-3-2024	Priya
40	Rohit Ramdas Jadhav	1-4-2024	Rohit
41	Sanchit Vinod Kukade	2-4-2024	Sanchit
42	Saniya Firdous Shaikh Rauf.	20/3/24	Saniya
43	Sanket Surendra Bhele	01/04/24	Sanket
44	Sejal Sudhirrao Khalokar	2/04/2024	Sejal
45	Shital Gulabrao Hire	26/03/24	Shital
46	Shrushti Bhaurao Deshmukh	02/04/2024	Shrushti
47	Swaraj Ruprao Wankhade	1/04/24	Swaraj
48	Syed Noor Ahmad Syed Azhar.	01/04/24	Syed
49	Tejas Dilip Bhopale	01/04/2024	Tejas
50	Vaishnavi Prabhudas Yeul	01/04/2024	Vaishnavi
51	Yashasvi Satishrao More	02/04/24	Yashasvi
52	Jawariya Firdous Mohd. Ismail	26/03-24	Jawariya


Teacher in charge


Head
Dr Pavan V. Raut
Associate Professor & Head,
Dept. Of Chemistry
Smt Radhabai Sarda Arts, Commerce & Science College
Anjangaon Surji, Dist Amravati (MS)




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Report of the activity

Industrial chemicals are shaping the modern world. These chemicals are the backbone of various manufacturing processes and a key ingredient to make things happen. Industrial chemicals not only keep operations running smoothly but also help in developing new processes for new manufacturing processes.

Keeping this background in mind, the students of BSc III were assigned the project work pertaining to “Industrially Important Molecules/ Chemicals”. Total 51 students participated in the project work. During project work related to assigned project, the students collected information about assigned chemicals on websites and informed local citizens about their uses as well as health hazards.



HEAD

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Outcome of the activity

The department of Chemistry assigned the project work pertaining to “Industrially Important Molecules/ Chemicals” to the students of BSc III. Total 50 students undertook this project work and successfully completed it. After successful completion, the students

1. got information about various industrially important molecules / chemicals and their effects on health and the environment.
2. got informed about their role in industrially important molecules.
3. actively engaged in sharing knowledge about industrially important molecules with local citizens.



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Specimen project reports

Submitted by students along with geo-tag photos

**Smt. Radhabai Sarda Arts, Commerce and Science College,
Anjangaon Surji
Department of Chemistry
Session 2023-24
Class- B. Sc III Semester VI (CBZ)**

**A project report
On**

Industrially Important Molecules

Submitted by

1 = Mahvish Anam

2 = Javeriya Tabassum

3 = Saniya Firdous

4 = Farha parveen.

Guided by

Dr. Pavan Raut

(Signature)

20.03.2024

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2. IUPAC Name
3. Discoveries
4. Mode of action
5. Uses
6. Adverse effects of overdose
7. Conclusion
8. Reference

INTRODUCTION

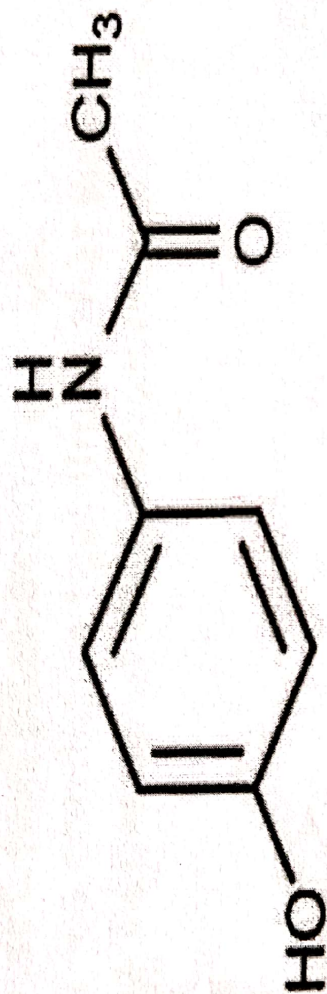
Paracetamol

- Paracetamol is one of the most widely used of all drugs.
- Paracetamol is also known as **Acetaminophen** (*Generic name*)
- It is an *anti-pyretic* and *analgesic*
- It is a medication used to *treat fever and mild to moderate pain*.
- It is in WHO's list of essential medicines.
- 15th commonly prescribed medicine all over the world in 2019.
- It is widely available over the counter (OTC).
- Trade names *TYLENOL* and *PANADOL*, etc

Page no.1

IUPAC name

- N-(4-hydroxyphenyl)acetamide
- N-(4-hydroxyphenyl)ethanamide



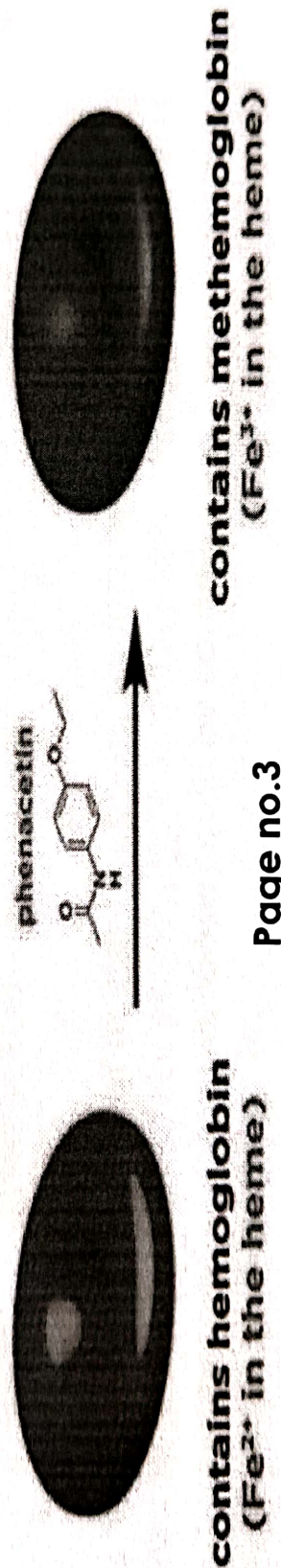
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Discoveries

Acetaminophen was first produced by Harmon Northrop Morse Hopkins University in 1877.

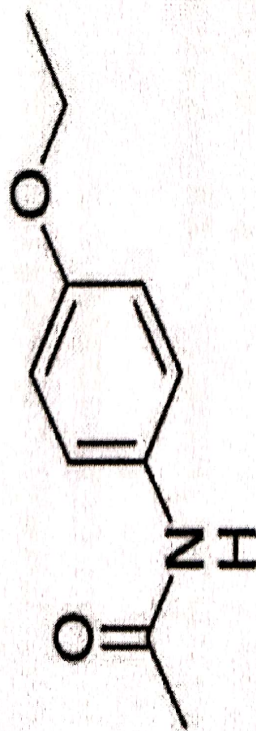
But was first used clinically by Joseph von Mering in 1893 when it was compared with another leading analgesic of the time, Phenacetin.

Mering noted that when phenacetin was used it could lead to methemoglobin – a condition that limits the supply of oxygen to the cells of the body. Because of this phenacetin was used extensively only till 1949.



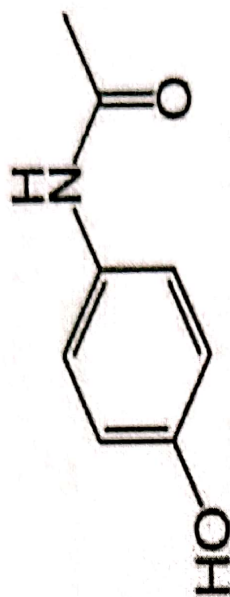
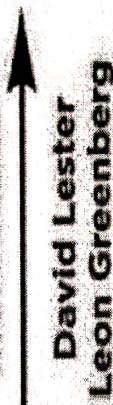
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At this point, biochemist David Lester and Leon Greenberg showed that the body not only metabolises phenacetin into acetaminophen but also that acetaminophen is as effective as phenacetin. Acetaminophen even had the advantage of not causing methemoglobin and is not carcinogenic.



phenacetin

metabolism



acetaminophen

This led to the wide use of acetaminophen. In normal use paracetamol exhibited a consistent safety profile. Its exemplary safety record was marred by the discovery that a major overdose could be complicated by severe and sometimes fatal liver damage.

Mode of action

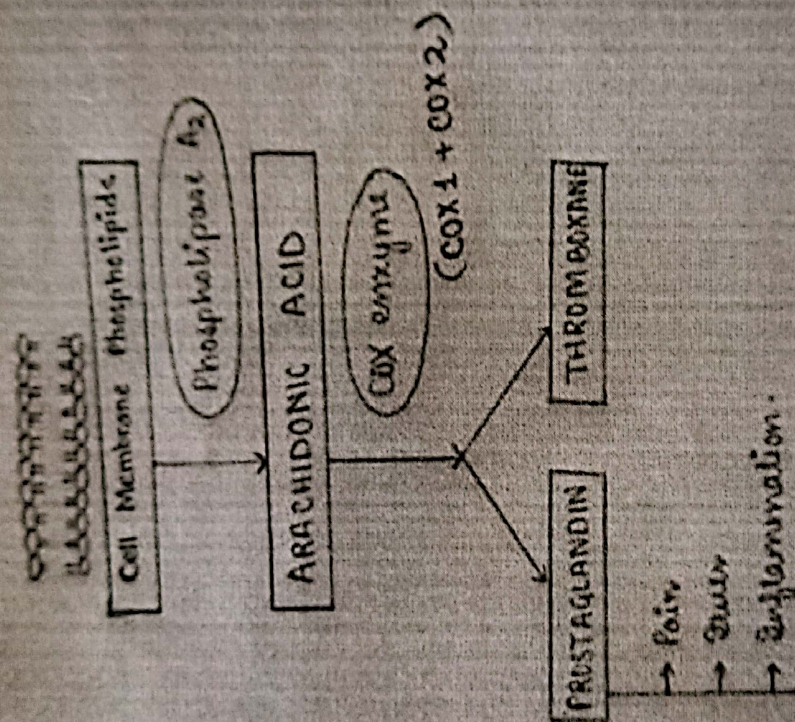
• It has been suggested that acetaminophen can inhibit COX enzymes more effectively in the brain and central nervous system leading to its antipyretic and analgesic effects. These sites have a lower concentration of compound called peroxides which are produced at the sites of inflammation and have shown to effect how well acetaminophen can inhibit COX enzymes.

• Others have suggested that this drug could actually inhibit COX-3 enzyme. Although human possess the gene that encodes this third COX enzyme, no studies have demonstrated its expression or function in humans.

So COX is considered to be two types-

1. COX-1
2. COX-2

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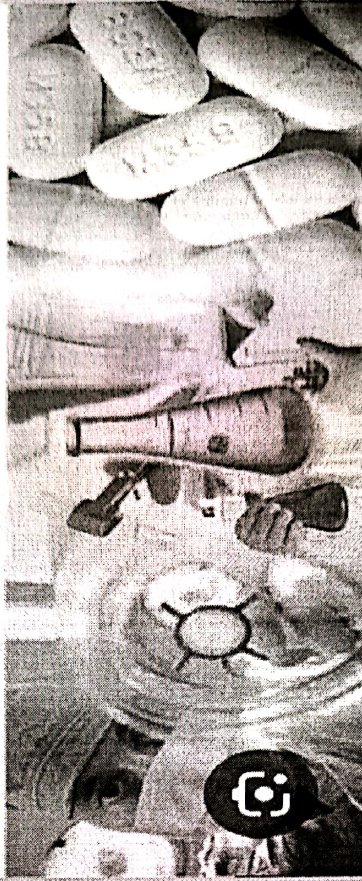
Uses

- In reduction of pain- moderate to severe pain, helps in migraine ,tension headache, kidney stone pain, etc
- Controls fever in a variety of patients, including children, pregnant women, the elderly.
- Osteoarthritis - pain of hip, hand ,knee can be healed by paracetamol.
- Even during the pandemic, paracetamol was recommended to treat symptoms of COVID-19. It was more proffered than ibuprofen because it has fewer side effects and so is the safer choice for most people.

Paracetamol



farmson Analgesics



Adverse effects of overdose

- Liver damage - a major overdose could be complicated by severe and sometimes fatal liver damage.
- Pregnancy – rare cases of asthma inheritance was reported due to consumption of paracetamol.
- Cancer - some cases found increase risk of cancer.

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Conclusion

Paracetamol may find applications in other therapeutic areas, such as the prevention of atherosclerosis via a potential antioxidant activity. In summary, although it is more than a century since the first clinical use of paracetamol, it continues to be a first-line therapy of choice in adults and children with fever and pain. In addition, current research suggests that paracetamol may have a much broader clinical utility in years to come.

References

- Paracetamol: past, present, and future - <https://pubmed.ncbi.nlm.nih.gov/11319582/>
- Mechanism of action of Paracetamol- <https://youtu.be/Khd-dMYZB-c>
- Structure, Synthesis and uses of Paracetamol - <https://youtu.be/hBtdYkaoi40>
- Acetaminophen/Paracetamol (Tylenol) - <https://youtu.be/VHgCEvckitM>

**Smt. Radhabai Sarda Arts, Commerce and Science College,
Anjangaon Surji**

**Department of Chemistry
Session 2023-24
Class- B. Sc III Semester VI (CBZ)**

**A project report
On**

Industrially Important Molecules

Submitted by

- 1) Jaweriya Firdous**
 - 2) Absar Khan**
 - 3) Ayesha Humera**
-

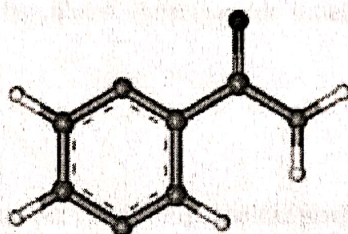
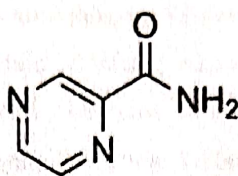
Guided by

Prof: Pavan Vijay Raut



Pyrazinamide:

Pyrazinamide



Pyrazinamide is a medication used to treat tuberculosis. For active tuberculosis, it is often used with rifampicin, isoniazid, and either streptomycin or ethambutol. It is not generally recommended for the treatment of latent tuberculosis. It is taken by mouth.

Physical properties:

It occurs as a white crystalline powder. It is odourless and has slightly bitter taste. It is sparingly soluble in water but soluble in ether and in chloroform.

Composition:

Each pyrazinamide tablet for oral administration contains 500 mg of pyrazinamide and the following inactive ingredients: colloidal silicon dioxide, croscarmellose sodium, dibasic calcium phosphate (dihydrate), microcrystalline cellulose, and stearic acid.

Uses of Pyrazinamide:

Pyrazinamide is indicated for the initial treatment of active tuberculosis in adults and children when combined with other antituberculous agents. (The current recommendation of the CDC for drug-susceptible disease is to use a six-month regimen for initial treatment of active tuberculosis, consisting of isoniazid, rifampin and pyrazinamide given for 2 months, followed by isoniazid and rifampin for 4 months.

*4)(Patients with drug-resistant disease should be treated with regimens individualized to their situation. Pyrazinamide frequently will be an important component of such therapy.)(In patients with concomitant HIV infection, the physician should be aware of current recommendation of CDC. It is possible these patients may require a longer course of treatment. It is also indicated after treatment failure with other primary drugs in any form of active tuberculosis. Pyrazinamide should only be used in conjunction with other effective antituberculous agents.

Medical Uses:

Pyrazinamide is only used in combination with other drugs such as isoniazid and rifampicin in the treatment of *Mycobacterium tuberculosis* and as directly observed therapy (DOT).[4] It is never used on its own. It has no other indicated medical uses. In particular, it is not used to treat other mycobacteria; *Mycobacterium bovis* and *Mycobacterium leprae* are innately resistant to pyrazinamide. Pyrazinamide is used in the first 2 months of treatment to reduce the duration of treatment required. Regimens not containing pyrazinamide must be taken for 9 months or more. Pyrazinamide is a potent antiuricosuric drug and consequently has an off-label use in the diagnosis of causes of hypouricemia and hyperuricosuria.

Dosage for Pyrazinamide:

Pyrazinamide should always be administered with other effective antituberculous drugs. It is administered for the initial 2 months of a 6-month or longer treatment regimen for drug-susceptible patients. Patients who are known or suspected to have drug-resistant disease should be treated with regimens individualized to their situation. Pyrazinamide frequently will be an important component of such therapy. Patients with concomitant HIV infection may require longer courses of therapy. Physicians treating such patients should be alert to any revised recommendations from CDC for this group of patients. Usual dose: (side heading) Pyrazinamide is administered orally, 15 to 30 mg/kg once daily.

Older regimens employed 3 or 4 divided doses daily, but most current recommendations are for once a day. Three grams per day should not be exceeded. The CDC recommendations do not exceed 2 g per day when given as a daily regimen (see table). Alternatively, a twice weekly dosing regimen (50 to 75 mg/kg twice

weekly based on lean body weight) has been developed to promote patient compliance with a regimen on an outpatient basis. In studies evaluating the twice weekly regimen, doses of pyrazinamide in excess of 3 g twice weekly have been administered. This exceeds the recommended maximum 3 g/daily dose. However, an increased incidence of adverse reactions has not been reported.

Missed Dose:

It is important to take each dose of this medication as scheduled. If you are taking this medication daily and miss a dose, take it as soon as you remember. If it is near the time of the next dose, skip the missed dose. Take your next dose at the regular time. Do not double the dose to catch up. If you are taking this drug on a weekly schedule and miss a dose, take it as soon as you remember. If you don't remember until the next day or later, ask your doctor or pharmacist right away for a new dosing schedule. Do not double the dose to catch up.

Side Effects:

Nausea, vomiting, loss of appetite, or mild muscle/joint pain may occur. If any of these effects last or get worse, tell your doctor or pharmacist promptly. Remember that this medication has been prescribed because your doctor has judged that the benefit to you is greater than the risk of side effects. Many people using this medication do not have serious side effects. Tell your doctor right away if you have any serious side effects, including: symptoms of liver disease (such as nausea/vomiting that doesn't stop, unusual tiredness/weakness, severe stomach/abdominal pain, yellowing eyes/skin, dark urine), painful/swollen joints, signs of kidney problems (such as change in the amount of urine), easy bleeding/bruising, fast heartbeat. A very serious allergic reaction to this drug is rare. However, get medical help right away if you notice any symptoms of a serious allergic reaction, including: fever that doesn't go away, new or worsening lymph node swelling, rash, itching/swelling (especially of the face/tongue/throat), severe dizziness, trouble breathing. This is not a complete list of possible side effects. If you notice other effects not listed above, contact your doctor or pharmacist.

Contraindications for Pyrazinamide:

Pyrazinamide is contraindicated in persons: with severe hepatic damage; who have shown hypersensitivity to it; with acute gout.

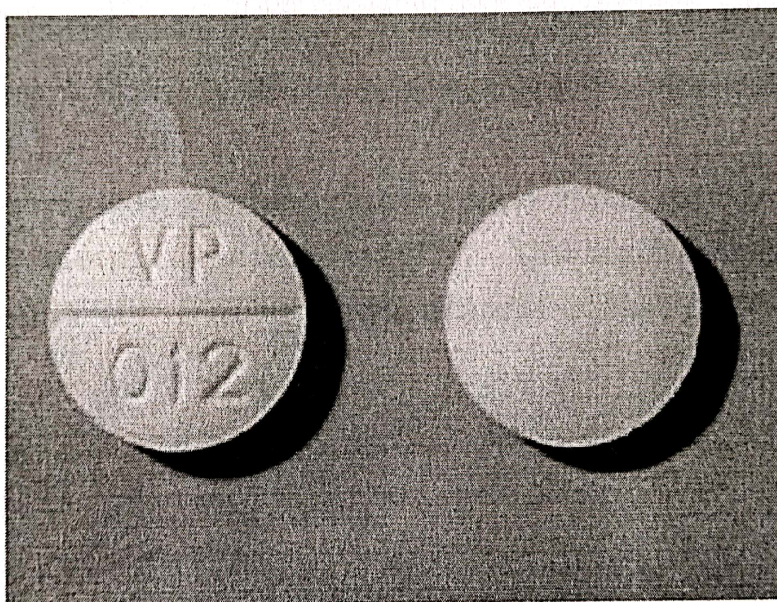
Pyrazinamide tablet:

Brand Name:

Zinamidr, pyride , pyrina-500 ,pyzina ,Atzide -750

Industrially important of Pyrazinamide:

Pyrazinamide is industrially important primarily for its use in the pharmaceutical industry. It is a key component in the treatment of tuberculosis (TB) and is included in various anti-TB drug formulations. Additionally, it may have applications in the synthesis of other pharmaceutical compounds due to its structural properties and reactivity.



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- 1) Treatment of tuberculosis and tuberculosis infection in adults and children. *Am Rev Respir Dis.* 1986 ; 134 : 363-368.
- 2) Reynolds JEF, Parfitt K, Parsons AV, Sweetman SC. *Martindale The Extra Pharmacopoeia*, ed 29. London, The Pharmaceutical Press. 1989; 569-570.
- 3) Bioassay of pyrazinamide for possible carcinogenicity. National Cancer Institute Carcinogenesis Technical Report Series No. 48, 1978.
- 4) Zerger E, Anderson B, Haworth S, Lawlor T, Mortelmans K, Speck W. *Salmonella mutagenicity tests: III. Results from the testing of 255 chemicals.* *Environ Mutagen.* 1987; 9 (Suppl 9) : 1-109.
- 5) Roman IC, Georgian L. Cytogenetic effects of some antituberculosis drugs in vitro. *Mutation Research.* 1977; 48: 215-224.
- 6) Holdiness M. Antituberculosis drugs and breast-feeding. *Arch Intern Med.* 1984 ; 144 : 1888.
- 7) Turcios N, Evans H. Preventing and managing tuberculosis in children. *J Resp Dis.* 1989 ; 10 (6) (Jun): 23.
- 8) Starke JR. Multidrug therapy for tuberculosis in children. *Pediatr Infec Dis J.* 1990 ; 9: 785-793.
- 9) Specific requirements on content and format of labeling for human prescription drugs; proposed addition of "geriatric use" subsection in the labeling. *Federal Register.* 1990 ; 55 (212) (Nov 1)

Imipramine:

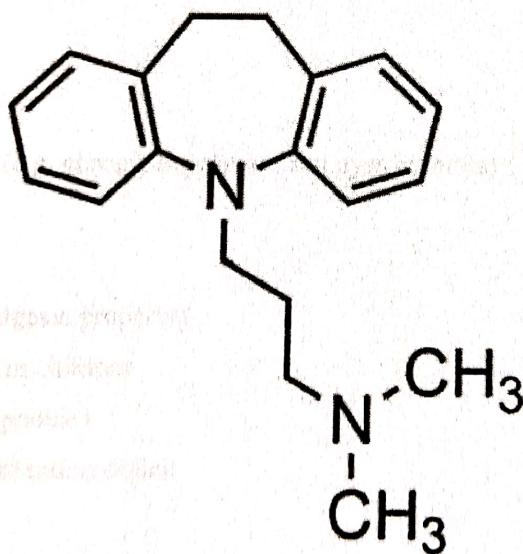
Chemical Name: 10, 11-dihydro-5-(3-dimethyl aminopropyl) 5-H dibenzo (b, f) azepine.

Physical Properties:

It is official as its hydrochloride salt which is white or slightly yellow crystalline powder. It is odourless and has bitter taste followed by sensation of numbness. It is soluble in water.

Composition:

Imipramine is comprised of a tricyclic nucleus (including two phenyl rings and a central cycloheptadien ring). A short side chain and a terminal amine group are additional structural features characterizing imipramine and related members of the same chemical series.



Medical Uses:

Imipramine is primarily used for the treatment of depression and certain anxiety disorders, including acute post-traumatic stress reactions. A significant amount of research regarding its efficacy on acute post-traumatic stress in children and adolescents has focused on trauma resulting from burn-injuries. Although evidence for its efficacy in the treatment of chronic post-traumatic stress disorder appears to be less robust,[10] it remains a viable treatment. Here, it may act fairly similarly to monoamine oxidase inhibitor phenelzine. Caution is needed in prescribing imipramine (and its commercially-available metabolite, desipramine) in children and youth/adolescents (whether they suffer with, e.g., bed-wetting, panic attacks, acute trauma or, in the case of desipramine,[12][13] ADHD), owing to possibility of certain side-effects which may be of particular concern in those under a certain age. In the treatment of depression, it has demonstrated similar efficacy to the MAOI moclobemide.[16] It has also been used to treat nocturnal enuresis because of its ability to shorten the time of delta wave stage sleep, where wetting occurs. In veterinary medicine, imipramine is used with xylazine to induce pharmacologic ejaculation in stallions. Blood levels between 150 and 250 ng/mL of imipramine plus its metabolite desipramine generally correspond to antidepressant efficacy.

Uses:

It is used to treat:

- 1) Depressive illness (e.g. chronic depression and dysrhythmia)
- 2) Anxiety disorders
- 3) Anorexia nervosa
- 4) Pain (due to its analgesic property)
- 5) Nocturnal enuresis in children
- 6) Phobias (e.g. agoraphobia)
- 7) Hyperactivity and attention deficit
- 8) Catalepsy
- 9) Allergic conjunctivitis (due to topical antihistaminic property)

Mechanism Of Action:

Imipramine works by inhibiting the neuronal reuptake of the neurotransmitters norepinephrine and serotonin 5,10. It binds the sodium-dependent serotonin transporter and sodium-dependent norepinephrine transporter reducing the reuptake of norepinephrine and serotonin by neurons. Depression has been linked to a lack of stimulation of the post-synaptic neuron by norepinephrine and serotonin 7. Slowing the reuptake of these neurotransmitters increases their concentration in the synaptic cleft, producing knock-on effects in protein kinase signalling which is thought to contribute to changes in neurotransmission and brain physiology which relieves symptoms of depression 9.

Dosage:

The amount of medicine that you take depends on the strength of the medicine. Also, the number of doses you take each day, the time allowed between doses, and the length of time you take the medicine depend on the medical problem for which you are using the medicine.

For oral dosage form (capsules):

For depression:

Adults—At first, 75 milligrams (mg) once a day. Your doctor may adjust your dose as needed. However, the dose is usually not more than 200 mg per day, unless you are in the hospital. Some hospitalized patients may need higher doses. Teenagers and older adults—At first, 25 to 50 mg per day using the tablets. Your doctor may adjust your dose as needed and switch you to the capsule form. However, the dose is usually not more than 100 mg per day. Children—Use and dose must be determined by your doctor.

Missed Dose:

If you miss a dose, take it as soon as you remember. If it is near the time of the next dose, skip the missed dose. Take your next dose at the regular time. Do not double the dose to catch up. If you miss a dose, take it as soon as you remember. If it is near the time of the next dose, skip the missed dose. Take your next dose at the regular time. Do not double the dose to catch up.

Side Effects:

These side effects can be contributed to the multiple receptors that imipramine targets such as serotonin, norepinephrine, dopamine, acetylcholine, epinephrine, histamine. Those listed in italics below denote common side effects, separated by the organ systems that are affected. Central nervous system: dizziness, drowsiness, confusion, seizures, headache, anxiety, tremors, stimulation, weakness, insomnia, nightmares, extrapyramidal symptoms in geriatric patients, increased psychiatric symptoms, paresthesia Cardiovascular: orthostatic hypotension, ECG changes, tachycardia, hypertension, palpitations, dysrhythmias Eyes, ears, nose and throat: blurred vision, tinnitus, mydriasis Gastrointestinal: dry mouth, nausea, vomiting, paralytic ileus, increased appetite, cramps, epigastric distress, jaundice, hepatitis, stomatitis, constipation, taste change Genitourinary: urinary retention Hematological: agranulocytosis, thrombocytopenia, eosinophilia, leukopenia Skin: rash, urticaria, diaphoresis, pruritus, photosensitivity

Contraindications:

Combining it with alcohol consumption may cause more drowsiness, necessitating greater caution when drinking. It may be unsafe during pregnancy.

Stability And Storage:

It is affected by moist air and light. Hence, it is stored in tightly-closed, light, resistant containers

Pharmaceutical formulations:

- 1) Imipramine tablets
- 2) Imipramine capsule
- 3) Imipramine injection
- 4) Imipramine mixture

Brand Names:

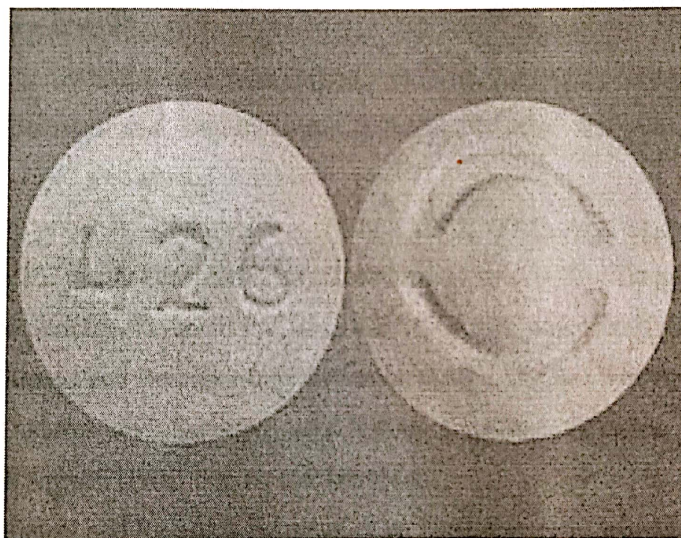
Impratab, Depsonil, tofranil

Generic Name:

Imipramine

Industrially important of imipramine:

Imipramine tablets are primarily used as a tricyclic antidepressant in the treatment of major depressive disorder. While their industrial importance may not be as significant as in other sectors, they play a crucial role in pharmaceutical manufacturing and healthcare, contributing to mental health management and well-being on a societal level.



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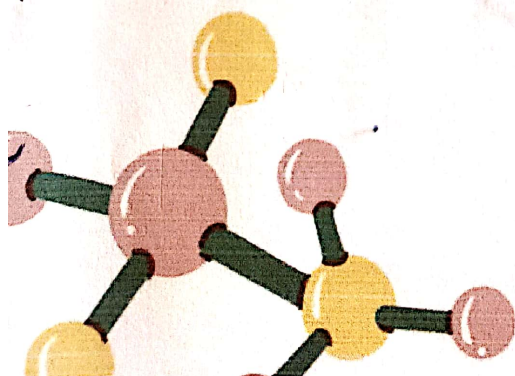
**SMT RADHABAI SARDA ARTS,
COMMERCE AND SCIENCE
COLLEGE**

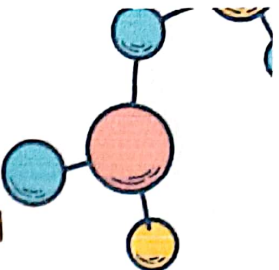
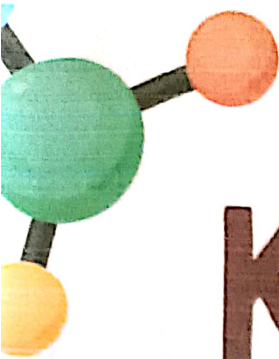
Anjangaon Surji
BSC III

2023-2024

**CHEMISTRY
PROJECT**

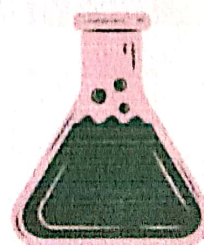
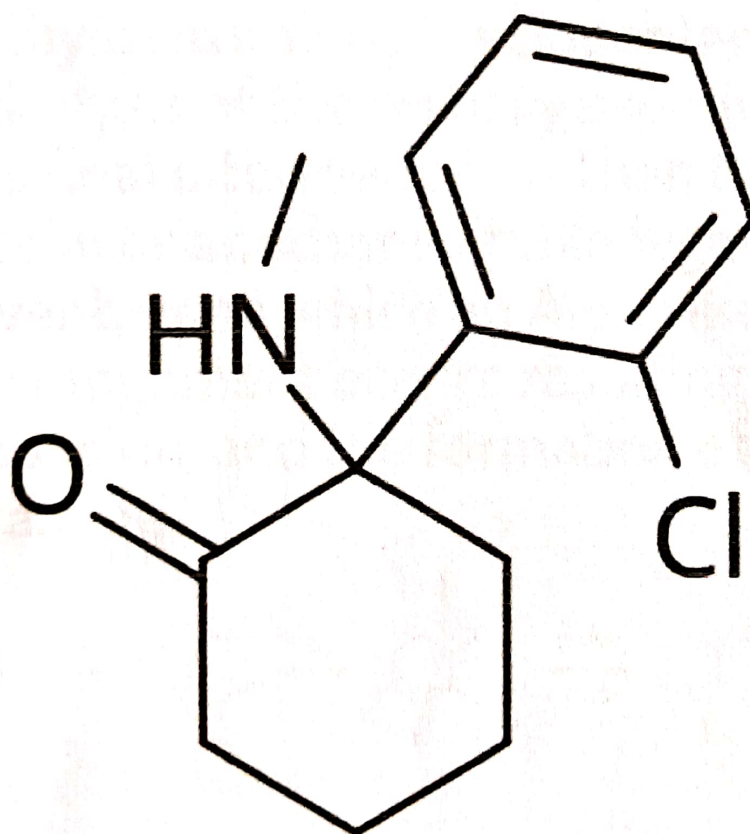
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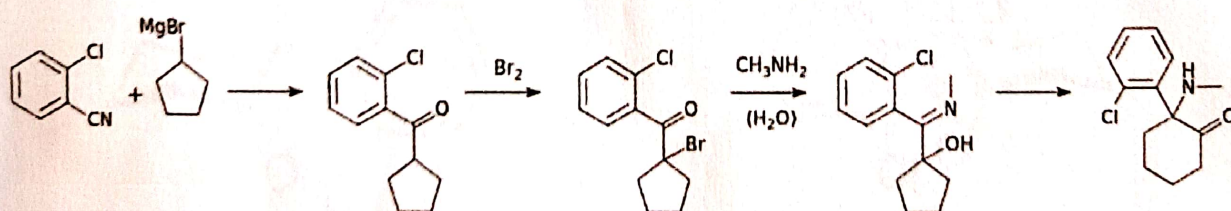
KETAMINE

- Ketamine is a dissociative anesthetic used medically for induction and maintenance of anesthesia.
- It is also used as a treatment for depression and pain management.
- It is a novel compound that was derived from phencyclidine in 1962 in pursuit of a safer anesthetic with fewer hallucinogenic effects.



SYNTHESIS

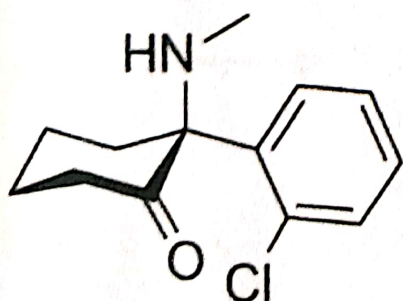
- 2-chlorobenzonitrile is reacted with the Grignard reagent cyclopentylmagnesium bromide to give (2-chlorophenyl) (cyclopentyl)methanone.
- This is then brominated using bromine to form the corresponding bromoketone, which is then reacted with methylamine in an aqueous solution to form the methylimino derivative, 1-(2-Chloro-N-methylbenzimidoyl)cyclopentanol, with hydrolysis of the tertiary bromine atom.
- This final intermediate is then heated in decalin or another suitable high-boiling solvent, upon which an Alpha-ketol rearrangement occurs resulting in a ring-expansion, and the formation of racemic ketamine.



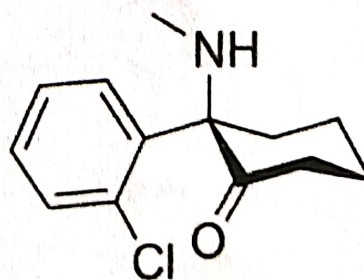
Preparation of ketamine

STRUCTURE

- In chemical structure, ketamine is an arylcyclohexylamine derivative. Ketamine is a chiral compound.
- The more active enantiomer, esketamine (S-ketamine), is also available for medical use under the brand name Ketanest S, while the less active enantiomer, arketamine (R-ketamine), has never been marketed as an enantiopure drug for clinical use.
- While S-ketamine is more effective as an analgesic and anesthetic through NMDA receptor antagonism, R-ketamine produces longer-lasting effects as an antidepressant.
- The optical rotation of a given enantiomer of ketamine can vary between its salts and free base form.
- The free base form of (S)-ketamine exhibits dextrorotation and is therefore labelled (S)-(+)-ketamine. However, its hydrochloride salt shows levorotation and is thus labelled (S)-(-)-ketamine hydrochloride.



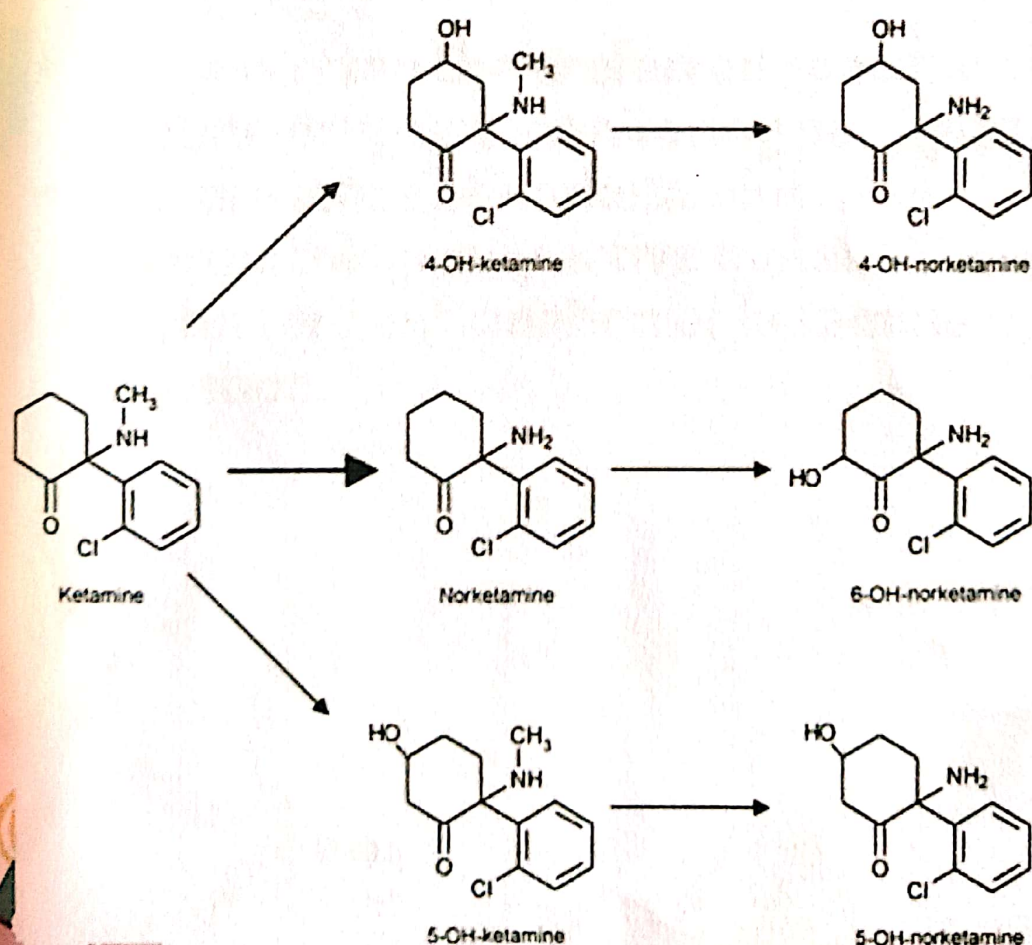
(S)-ketamine



(R)-ketamine

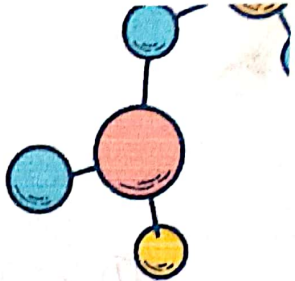
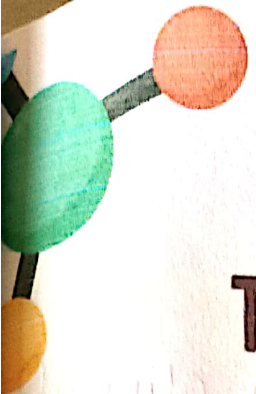
PHYSICOCHEMICAL CHARACTERISTICS

- Ketamine is a hydrosoluble aryl-cyclo-alkylamine with a molecular mass of 238 g/mol and a pKa 7.5.
- Used as a chlorhydrate in a slightly acid (pH 3.5–5.5) aqueous solution, ketamine sometimes includes benzethonium chloride or chlorobutanol as preservatives.
- The second carbon of the cyclohexanone radical is asymmetrical.
- Ketalar is the racemic mixture (optically inactive) of 2 enantiomers of equal quantity (isomers that diverge light in opposite ways).
- The active enantiomer is S(+)-ketamine ("S" spatial structure, light diverged to the right), two times stronger than the racemic form, and four times than the R(–)-ketamine isomer.
- S(+)-Ketamine is available (Ketanesth) in some European countries (Germany, Austria, Italy, and the Netherlands).

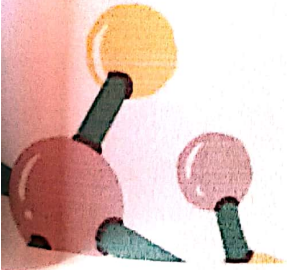


DETECTION

- Ketamine may be quantitated in blood or plasma to confirm a diagnosis of poisoning in hospitalized people, provide evidence in an impaired driving arrest, or to assist in a medicolegal death investigation.
- Blood or plasma ketamine concentrations are usually in a range of 0.5–5.0 mg/L in persons receiving the drug therapeutically (during general anesthesia), 1–2 mg/L in those arrested for impaired driving and 3–20 mg/L in victims of acute fatal overdose.
- Urine is often the preferred specimen for routine drug use monitoring during ingestion.
- The presence of norketamine, a pharmacologically active metabolite, is useful for confirmation of ketamine ingestion.



THERAPEUTIC USES

1. Inducing general anesthesia
 2. Treating pain
 3. Treating status epilepticus
 4. Treating depression
 5. Treating anxiety
- 

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