

BOARD SOLVED QUESTION
WITH ANSWER

Year : 2023

Subject : Pharmaceutical chemistry

Subject Code : ER20-12T

Subject In-Charge : Kiranmayee Bhatra
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ODISHA STATE BOARD OF PHARMACY
E. R. 2020

01/02/2024
2023(I) Examination

D. Pharm Part - I

DO NOT WRITE ANYTHING ON YOUR QUESTION PAPER EXCEPT YOUR ROLL NO.
QUESTION PAPER CONTAINING ANYTHING WOULD BE TREATED AS MALPRACTICE
Answer the questions serially and continuously

Subject: PHARMACHEMISTRY (Theory)

Full Mark -80

Time -3 hrs

1. Answer any six questions :

(6x5)

- Define and classify anti-malarial agents. Write down the structure, chemical name, and to popular brand names of Chloroquine.
- Define impurities and describe the various sources of impurity.
- Define and classify diuretics. Write down the structure, chemical name and popular brand names of Furosemide.
- Define and classify Antacids. Discuss why the combination of antacids is so popular Now-a-days.
- Classify Non Steriodal Anti-inflammatory Drugs (NSAIDs) with suitable example. Write the structure, chemical name & popular brand names of IBUPROFEN & ASPIRIN.
- Classify sympathomimetic agents with examples. Write the structure, chemical name and uses of (a) Dopamine (b) Naphazoline.
- Define Acid-Base indicators and describe in details about the Indicator theory with suitable examples.

2. Answer any ten questions out of eleven:

(10x3)

- Write the Principle involved in Limit test for Arsenic.
- Distinguish between Accuracy & Precision.
- Mention the structure, IUPAC name & popular brand name of INH & Ketoconazole.
- Define Antibiotics. Write the structure, use & popular brand name of Amoxycillin.
- What do you mean by Anticonvulsants ? Write the structure, use & brand name of Valproic acid.
- Write down the stage of anaesthesia.
- Write in brief about preparation & standardization of Potassium Permanganate Solution ?
- Define Cathartics, mention its examples and attached a small note on Osmotic Purgatives ?
- Define Sedative & Hypnotics. Mention the chemical structure & chemical name of diazepam and phenobarbital.
- How raw materials contribute impurities to the finished product. Explain.
- What are the advantages of BaSO₄ reagent over BaCl₂ in the limit test for sulphate.

3. (A) Write down the structure and uses of the following compounds

(1x10)

- | | | | |
|-------------------|-----------------|------------------|----------------------|
| i) Paracetamol | ii) Pheniramine | iii) Haloperidol | iv) Dapsone |
| v) Acyclovir | vi) Phenytoin | vii) Propranolol | viii) Chlorpromazine |
| ix) Glibenclamide | x) Metformin | | |

(B) Define the following (within twenty words) :

(1x10)

- | | | | |
|----------------------|----------------------|--------------------|----------------------|
| i) Self indicator | ii) Quality control | iii) Hemosiderosis | iv) Aprotic solvent |
| v) Laxative | vi) Dental fluorosis | vii) Reductant | viii) Fajan's method |
| ix) Complexing agent | x) Antidepressant | | |

Pharmaceutical Chemistry 2023

1a. Antimalaria Agents are the drugs used to prevent or treat malaria, a disease caused by Plasmodium parasites transmit through mosquito bites.

Classification :- 4 aminoquinolines, Pyrimidines, cinchona alkaloids, Miscellaneous.

Chloroquine

Chemical Name - 7-chloro 4-(4-diethylamino-1-methyl butylamino) quinoline

Brand Name - Acalon, Arloclo, Diraquine

b. Impurities is the any materials that affects the purities of materials of interests.

- it may produce toxic effects.
- it may decrease the strength of pharmaceutical substances.

Sources of Impurities :-

- Raw materials - Atmosphere Condition
- Reagents - Storage condⁿ
- Solvents - Adulteration.

c. Diuretics are the drugs which increase rate of urine excretion by kidney and inhibit tubular reabsorption of sodium and amount of water.

Furosemide

Chemical Name - 4-chloro-N-furfuryl-5-sulphamoyl anthranic acid

Brand - Diural, Lasix, Salinex

d. Antacids are medications or substances that neutral stomach acids, relief heartburns, indigestion, etc.

The combⁿ of antacids are so popular these days because as follows as :-

- Long lasting relief
- Broad spectrum protection
- Improved digestive health
- Acid Neutralizer
- Increase prevalence of acid related disorders.

e. NSAIDs are the drugs which reduces inflammation and give relief of pain. It doesn't contain steroidal nucleus.

Classification :-

1. Salicylic Acid Derivative - Aspirin
- ii. Para amino phenol Derivative - Paracetamol
- iii. Pyrazolones - Aminopyrine
- iv. COX - II inhibitor - Celecoxib; Efecoxib

Ibuprofen

Chemical Name - α -4 isobutylphenyl propanoic acid

Chemical Structure $C_{13}H_{18}O_2$

Brand - Advil, Motrin

Aspirin

Chemical Name - α -acetoxy benzoic acid

Chemical Structure - $C_9H_8O_4$

Brand - Aspirin, Anacin

f. Sympathomimetic agents also known as adrenergic agents, mimic the effect of sympathetic nervous agents.

They are classified into :-

1. Direct Acting Agents - Stimulate adrenergic receptor directly.
Ex - Epinephrine

ii. Indirect Acting Agents - Increase the neurotransmitter release or inhibit

Example - Amphetamine

iii. Mixed Acting Agents - Combine direct and indirect actions
Ex - Ephedrine

Dopamine

Chemical Structure - $C_8H_{11}NO_2$

Chemical Name - 4-(2-Aminoethyl)benzene-1,2-diol

Brand - Ephedrine, Endrine

Naphazoline

Chemical Structure - $C_{14}H_{14}N_2$

Chemical Name - 2-(1-Naphthylmethyl)-2-imidazoline

Brand - Carpine, Andre Carpine

9. An acid-base indicator is a chemical substance that changes color in response to changes in pH, allow us to visual determine the acidity or basicity of a solⁿ.
The indicator theory states that:-

- In acidic solⁿ (pH < 7) indicator exist in its acidic form.
- In basic solⁿ (pH > 7) indicator exist in its basic form.

Examples:-

Litmus:-

Acid form: Red

Basic form: Blue

Transition pH: 4.5 - 8.3

Phenolphthalein:-

Acid form: Colorless

Basic form: Pink

Transition pH: 8.3 - 10

Methyl Red:-

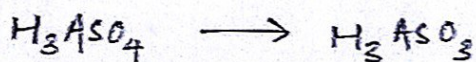
Acid form: Red

Basic form: Yellow

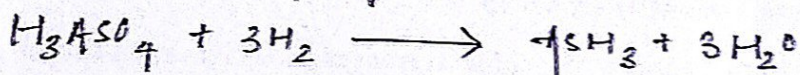
Transition pH: 4.4 - 6.1

a. Limit Test for Arsenic

The solⁿ is treated with reducing agent to convert the Pentavalent arsenic acid into the trivalent arsenious acid.



The arsenic acid is then converted into gaseous arsenious hydride with the help of H_2 .



Arsenic gas is carried through the tube by stream of H_2 and out through mercuric chloride paper.



b. Accuracy

- Refers to how close a measurement or result is to true value.
- Concerned with systematic error.
- focuses on hitting the target.

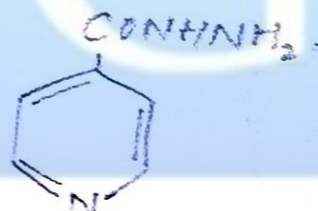
Precision

- Refers to the consistency or repeated of measurement.
- Concerned with random error.
- focuses on spreads.

c. INH or Isoniazid

IUPAC Name: isonicotinic acid hydrazide

Brand: Isoniazid, Nydrazid



Ketoconazole

IUPAC Name: 1-(2-(2,4-dichlorophenyl)-2H-imidazol-1-yl)methyl-1,3-dioxolan-4-yl methanol

Brand: Extina, Ketozole, Nigoral

d. Antibiotics are the medicines that inhibit the growth or destroy microorganisms, particularly bacteria, fungi, protozoa. They are used to treat infection caused by these microorganisms.

Amoxicillin

Structure: $C_{16}H_{19}N_3O_5S$

IUPAC Name: D- α -amino-p-hydroxybenzyl penicillin

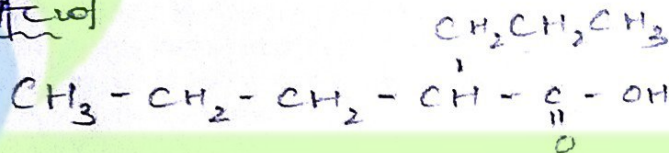
Use: Respiratory tract infection

- Skin & soft tissue
- Dental infection

Brand: Amoxil

e. Anticonvulsants also known as antiepileptics are medication used to treat and prevent seizures in individual with epilepsy or other seizure disorders.

Valproic acid



Chemical Name: 2-propylpentonic acid

Uses: treat & prevent seizures, bipolar disorder, chronic pain

Brand: Epival, Valproate, Depakene

f. Anesthesia means loss of sensation. Local anaesthesia abolish pain sensation in a localised area while general anaesthesia bring about loss of all sensation particularly pain with reversible loss of consciousness.

Stages of Anaesthesia are:-

Analgesia, Delirium, Surgical anaesthesia, Respiratory arrest

Analgesia - Pain relief begins

- Respiratory rate & blood pressure is stable.

Delirium - Increased heart rate & blood pressure

- Muscle tone increases

Surgical Anaesthesia - patient is unconscious, relaxed

- muscle relaxation, Amnesia

g. Preparation of $KMnO_4$ solⁿ :-

Molecular weight of $KMnO_4 = 158 \text{ g/mol}$

- weigh accurately 1.0 g of $KMnO_4$ crystals.

- Dissolve in 100 ml of distilled water.

- Stir completely dissolved

- Transfer to a 100 ml volumetric flask

- Dilute to mark with distilled water.

Standardization of $KMnO_4$ solⁿ :-

- Prepare 0.1N $Na_2S_2O_3$ solⁿ

- Pipette 10 ml of $KMnO_4$ solⁿ into a conical flask.

- Add 10 ml of 1M H_2SO_4

- Titrate with $Na_2S_2O_3$ until the colour fades.

- Calculate the normality.

$$N = \frac{Na_2S_2O_3 \text{ (ml)} \times Na_2S_2O_3 \text{ (N)}}{KMnO_4 \text{ (ml)}}$$

h. Cathartics: are the medical agents used to stimulate bowel movement promoting the evacuation of intestinal contents. They are commonly used to relieve constipation or to clear bowels.

Ex - Magnesium Sulfate.

Osmotic Laxative: are a type of cathartics that act by drawing water into the intestine through osmosis. It increases in water softer and enlarges the stool, easing its passage through intestine.

Ex - Lactulose

Both are the effective for rapid bowel evacuation, which makes them suitable for bowel clearance, it is used for short term relief of constipation to prevent dehydration and electrolyte imbalance.

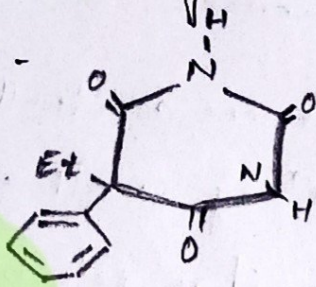
i. Hypnotics and Sedatives :-

Sedative are drugs used to allay excitement and reduce motor activity without induce sleep, while hypnotics help in prodⁿ of sleep.

Barbitals :-

Chem. Name - 5-Ethyl-5-phenyl barbituric acid.

Chem. Struct -



Diazepam :-

Chem. Name - 7-Chloro-1,3-dihydro-5-phenyl-2H-1,4-benzodiazepin-2-one

Chem. Struct - $C_6H_5-C_7H_5ClN_2O$

-2-one

3. Few materials contribute impurities to a finished product in a number of ways, includes:

Natural Contaminants: it introduces inorganic elements like iron, copper or zinc.

Unreacted starting materials: it can survive the synthetic and purification process and appear in final product.

Reagents: it is used in the manufacture process may not be completely removed by wash and can end up in final product.

Solvents: it is used in synthesis may contain impurities that can react with other chemicals to produce impurities.

Q. In the limit test for sulfates, BaSO_4 has specific advantages over BaCl_2 as the reagent?

Insolubility: BaSO_4 is highly insoluble in water which is essential for forming a stable and visible precipitate when sulfates are present in the test solⁿ. It allows for a clear & precise observation of any turbidity or ppt indicate sulfate impurities.

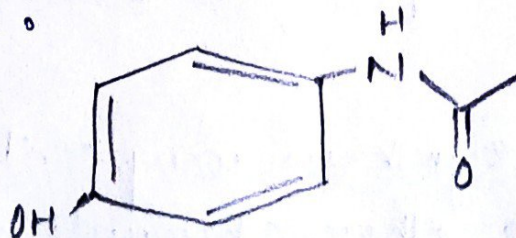
Sensitivity: BaSO_4 provides a more controlled and consistent rxⁿ, ensure accurate detectⁿ of small amounts of sulfate ions. BaCl_2 in contrast is soluble in water and may introduce interference in the test due to its ionic dissociation.

Stability: The ppt formed with BaSO_4 is stable and doesn't dissolve back into the solⁿ easily which makes the endpoint of the rxⁿ easier to observe & measure.

Specificity: BaSO_4 reacts specifically with sulfate ions without being affected by other ions without being affected by other ions present in the solⁿ, which enhances selectivity of the limit test for sulfate.

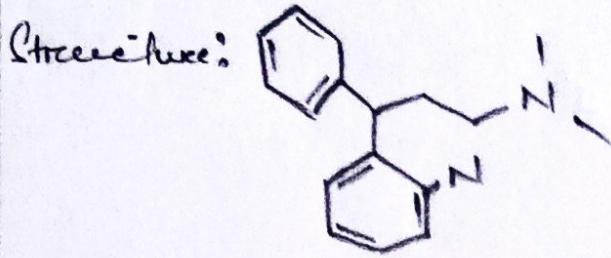
3A. Paracetamol:

ii. Structure:



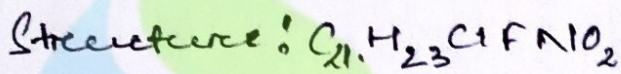
Uses: To treat mild to moderate pain.

ii. Benicarminine :



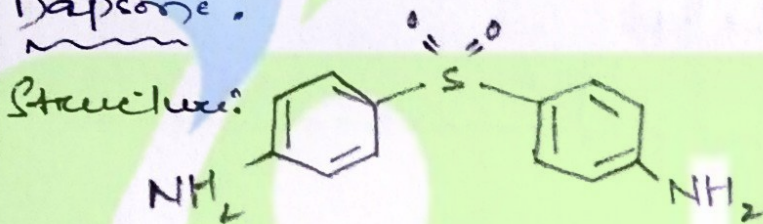
Uses: Treat allergic rhinitis and proctitis

iii. Haloperidol :



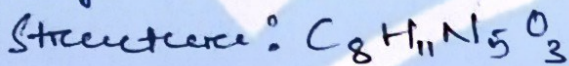
Uses: Treat nervous, mental con?

iv. Dapsone :



Uses: Treat leprosy & skin problems.

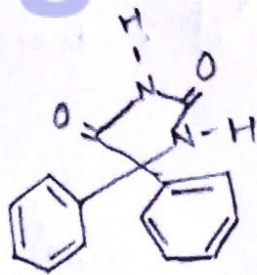
v. Acyclovir :



Uses: Treat chickenpox, shingles

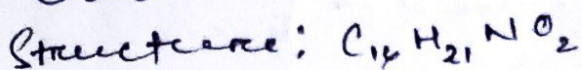
vi. Phenytoin :

Structure:



Uses: Treat & prevent seizures.

vii. Propranolol :



Uses: Treat chest pain, headaches

viii. Chlorpromazine :
Structure : $C_{17}H_{19}ClN_2S$
Uses : Treat mental health condⁿ

ix. Glibenclamide :
Structure : $C_{23}H_{28}ClN_3O_5S$
Uses : To lower blood sugar level to normal

x. Metformin :
Structure : $C_4H_{11}N_5 \cdot HCl$
Uses : Treat -type 2 diabetes

B. Self Indicator :

A chemical substance that can indicate the endpoint of a chemical reaction and also participate in the reaction.

ii. Quality Control :

A process that focuses on identify and correct issue that arises in a product after it released to consume.

iii. Hemosiderosis :

A condition characterized by the accumⁿ of hemosiderin, a protein that stores iron, in various tissues & organs. This lead to iron overload & potential harmful effects.

iv. Aprotic Solvent:

The solvents in which no H-bond takes place or they neither donate nor accept the proton.

'a' means "without" & 'protic' means "proton or H-atom".

v. Laxative:

The medication or substances that help stimulate bowel movements, relieve constipation & promote regularity.

vii. Dental fluorosis:

A condⁿ caused by excessive exposure to fluoride during tooth development, resulting in discoloration and damage to tooth enamel.

viii. Reductant:

A reducing agent is a substance that donate one or more electrons to another substance, typically in a chemical rxⁿ, resulting in the redⁿ of the oxidized species.

ix. Complexing Agent:

A complexing agent i.e., chelating agent is a molecule that binds to a central metal ion, forming a stable complex.

8. Antidepressant :

A medication used to treat depression, anxiety, and other mood disorders by altering neurotransmitter level in the brain.

