**Q.1 Classify routes of drug administration.**

Ans 1) Enteral

2) Parenteral

3) Local applications

**1) Enteral - Drug placed directly in the GI tract:**

1. Sublingual – Drug placed under the tongue
2. Oral – swallowing with water or milk
3. Rectum - Absorption through the rectum (enema)

**2 ) Parenteral: Injections & Inhalations**

1. Injections: Intravascular, Intramuscular ,Intradermal, Subcutaneous ,

Intrathecal , Intraperitoneal , Intramedullary , Intraarticular

1. Inhalation -

3) **Local Applications**

**OR**

**R.A**

**Enteral Parenteral Local applications**

**Oral Injections Inhalations**

Sublingual Intravenous

Enema Intraarterial

Retention Intramuscular

Evacuant Subcutaneous

Intraperitoneal

Intrathecal

Intramedulllary

Intraarticular

Advantages

**Q.2. Give advantages and disadvantages of oral route.**

**Ans:- Advantages**

* Common route of administration
* Economic
* Convenient
* No special procedure required
* Self medication possible

**Disadvantages**

* Not Useful in case of Emergencies
* Not useful for Unconscious or uncooperative patients
* Not useful in case of Emergencies
* Not useful in case of Vomiting, diarrhoea
* Slow onset of action
* Certain drugs degraded in GIT. Eg Insulin

**Q.3 Which is the commonest route of administration and why?**

Ans:- Oral route is most common route of administration because

* Economic
* Convenient
* No special procedure required
* Self medication possible

**Q.4. State the advantages and disadvantages of parenteral routes of administration.**

**Ans:- Advantages**

* Useful in case of Emergencies
* Useful for Unconscious or uncooperative patients
* Useful in case of Emergencies
* Useful in case of Vomiting, diarrhoea
* Accuracy of dosage schedule is possible
* Rapid onset of action

**Disadvantages**

* It is costly route
* It is inconvenient
* Self-medication is not possible
* Difficult to reverse the drug effect.
* Skilled person required

**Q.5. State the advantages and disadvantages of Intravenous routes of administration.**

**Ans:- Advantages**

* Useful in case of Emergencies
* Useful for Unconscious or uncooperative patients
* Useful in case of Vomiting, diarrhoea
* Accuracy of dosage schedule is possible
* Rapid onset of action
* Large volume of drug can be administered

**Disadvantages**

* It is costly route
* It is inconvenient
* Self-medication is not possible
* May cause abscess formation
* Difficult to reverse the drug effect.
* Skilled person required

**Q.5. State the advantages and disadvantages of Intramuscular routes of administration.**

**Ans:- Advantages**

* Rapid onset of action
* Mild irritants, suspension, colloids can be administered
* Uniform action

**Disadvantages**

* May cause injury to nerve
* Produces local pain and abscess
* Self-medication is not possible
* Only small volume of drug up to 10 ml can be administered

Q.6 **Give advantages and disadvantages of sublingual route of administration.**

**Ans:- Advantages**

* Useful in case of Emergencies like angina pectoris
* Onset of action is fast
* Inactivation in stomach is avoided
* Inactivation in liver is avoided

**Disadvantages**

* Toxic effect on heart.

**Absorption:**

Entry of drug from site of administration to blood stream and passage across cell membrane.

**Types**

* Simple Diffusion
* Active Transport
* Pinocytosis

1. **Simple Diffusion**

* Also called Passive Diffusion
* No energy Required
* Bi directional process
* Rate of transfer of drug directly proportional to gradient concentration of cell membrane
* Cell membrane is lipidious in nature
* Lipid soluble substances move across cell membrane by passive diffusion

1. **Active Transport**

* This is specialized process requiring energy
* Carrier molecule combines with drug molecule to form a complex on one side of membrane
* This complex then diffuse through the membrane and dissociate into carrier and drug molecule when reaches to other side

1. **Pinocytosis**

* Cell takes up fluid or macromolecules from its surrounding.

**Q.1 Mention factors affecting drug absorption. Explain physiological factors**

Ans. Factors influencing absorption of drugs

• Physical state of drug

• Particle size

• Concentration

• Absorbing surface

• Functional integrity of GIT

• pH of drug and pH of GIT

• Formulation

1. **Physical state of drug:** Liquids are better absorbed than solids
2. **Particle size:** Smaller particle size provides larger surface area & gives better absorption.
3. **Concentration:** High Concentration of drug shows better Absorption
4. **Absorbing surface:** Larger the surface area better is the absorption. Drugs better absorbed from small intestine than stomach.
5. **Functional integrity of gastrointestinal tract:** Increase in peristalsis (increase GI motility) reduces residence time of drug in GIT so reduced absorption, as in case of diarrhea.
6. **pH of the drug and pH of the GIT**; Weakly acidic drugs are better absorbed in the stomach. Weakly basic drugs better absorbed from the intestine.

**Q.2** **Enlist & describe the channels of drug elimination**

Ans. Channels of drug elimination

1. Kidneys II) Lungs III) Intestines IV) Skin

V) Saliva milk VI) Bile

**Kidneys:**

Most of the drugs excreted in urine

Weak acids quickly excreted in alkaline urine & vice versa.

**Lungs:**

• Excretion of gaseous inhalants.

• Volatile general anesthetics, alcohol, paraldehyde.

• Easily detected by breath smell

**Intestines:**

• Purgatives like senna are partly excreted in intestine

• Heavy metals also through faeces.

**Skin:**

• Metalloids like arsenic, lead

**Saliva & milk:**

• Antibiotics, sulphonamides, morphine excreted in milk.

**Bile:**

• Erythromycin, novobiocin eliminated in bile & reabsorbed in intestine. So prolong action.

**Q.3 What do you mean drug distribution? What are the factors affects drug**

**distribution?**

Ans. Distribution is define as reversible transfer of a drug between blood and extra vascular

fluid.

**Factors affecting distribution:**

1. **Molecular weight:** Very large molecules stay in the plasma. Large molecules remain in the extracellular space.
2. **Binding to plasma proteins:** restricts distribution
3. **Solubility:** Hydrophilic, ionized drugs – may distribute in the extracellular space. Lipophilic compounds readily diffuse into tissues.
4. **Adipose tissue:** Stores highly lipid soluble drugs
5. **Disease state**
6. **Drug interaction**

**Q.4 What is biotransformation how it takes place in body.**

Ans Biotransformation(Metabolism): Alteration of a drug in living organism is called biotransformation. **Or** Alteration of drug structure in body.

* Major site of metabolism is liver.
* Other sites are kidney, plasma, placenta and testis
* Microsomal enzymes are responsible for metabolism in liver.
* Converts lipid soluble drug into water soluble
* Methods

1. Non synthetic reactions
2. Synthetic reactions

**Q.4 Define.**

1 **Pharmacology:** Are science deal with the effects of the drugs on living body. **Or**

The branch of medicine concerned with the uses, effects, and modes of action of drugs.

1. **Toxicology:** Which deals with poisonous effects of drugs.
2. **Pharmacokinetics:** which deal with absorption, distribution, metabolism and excretion of drug (What happens to drug in the body)
3. **Pharmacodynamics:** which deals with biochemical, physiological effects of drug and their mechanism of action. (What happens to body due to drug)

**Q.1 Enumerate the various factors which modify drug action.**

Ans. 1. Body weight

2 Age

1. Sex
2. Route of administration
3. Genetic factor
4. Emotional factor
5. Presence of disease
6. Cumulation
7. Additive effect
8. Synergism
9. Antagonism
10. Drug Tolerance
11. Drug Dependence

**Q.2 Explain the following terms with example**

**Drug interactions:**  Drug interaction is defined as interaction between one drug with another drug, or with food or environmental chemicals.

Eg: Interaction between Tetracycline antibiotics and antacids, calcium supplements, milk products etc

**Cumulation:**

Accumulation of the drug in the body following its repeated administration is termed as cumulation.

e.g Heavy metals like lead, Arsenic, Merury or anti-malarial like chloroquine can lead to cumulative toxicity.

**Synergism:**

Synergism is the phenomenon where interaction between two or more drugs produces an effect greater than the sum of their individual effects.

Eg: Codeine & aspirin as analgesics, Aminophylline & mersalyl as diuretics, Sulphamethoxazole & trimethoprim as antibacterials, Reserpine & hydrochlorthiazide as antihypertensives

**Q.3 Define antagonism and explain the types of antagonism.**

Phenomenon of opposing actions of two drugs on the same physiological system.

1. Chemical
2. Competitive / Reversible
3. Noncompetitive
4. Physiological Antagonism

**Chemical Antagonism:**

Biological activity of a drug can be reduced or abolished by inducing a chemical reaction with other agents. Eg: Between acid &alkali.

1. **Competitive Antagonism:**

Agonist & antagonist compete for the same receptors & the extent to which the antagonist opposes the pharmacological action of the agonist is decided by relative no. of receptors occupied by two compounds.

It can be overcome by increasing concentration of the agonist at the receptor site. Eg: Acetylcholine& atropine antagonize at muscarinic receptors.

1. **Noncompetitive Antagonism:**

Antagonist inactivates the receptor so that the effective complex with the agonist cannot be formed irrespective of the concentration of the agonist.

Eg: Acetylcholine & papaverine on smooth muscles.

Physiological Antagonism: A drug when administered reverses the effects of another drug by acting on different receptors. Eg; Adrenaline in histamine reaction.

**Q.4 What is drug tolerance? Describe different types of drug tolerance.**

Drug Tolerance- On repeated administration of some drugs, they may prove ineffective in usual therapeutic dose.

Types of tolerance:-

I) Natural or Congential:-It is by birth.

**a)** Species tolerance:- eg. Belladona alkaloids like atropine is toxic to human beings when given in high dose but rabbits can tolerate high amount of atropine

**b) Racial Tolerance**:- eg. After administration of drug Ephedrine, Mydriasis is not produced in Negros

**II) Acquired tolerance:-** Repeated administration of some drugs leads to acquired tolerance.

**a)** **Tissue Tolerance:** In case of tissue tolerance, tolerance is developed to certain effects of the drugs. e.g Morphine is unable to produce its euphoria effect after repeated administration and thus requires higher dose, but the pupil & gastrointestinal tract effects never develop tolerance.

**b)** **Cross tolerance:** This tolerance is developed to a drug belonging to particular group, and then there could be tolerance to all other drugs in the same group. Eg. When tolerance is developed to alcohol, patient may develop tolerance for use of general anesthetic and other CNS depressants.

**c)** **Pseudo tolerance:** Observed only in oral route. When small dose of poison is taken repeatedly, tolerance to it is developed by the gastrointestinal tract. But if other route is chosen, poisoning will occur.

**d)** **Tachyphylaxis:** It is also known as acute tolerance, observed with certain drugs such as Ephedrine when administered repeatedly at very short intervals & the pharmacological response to that drug decreases.

**Q.5 Differentiate between drug addiction & Drug habituation**

|  |  |
| --- | --- |
| **Drug Addiction** | **Drug Habituation** |
| It is a state of periodic or chronic intoxication produced by repeated consumption of a drug. | It is a condition resulting from repeated administration of a drug |
| There is physical need for the drug | Actual physical need for the drug is minimal |
| There will be overpowering desire to continue taking the drug and obtain it by any means. | There will be desire but not compulsion to continue taking the drug for the sense of well-being. |
| There is a tendency to increase the dose | Little or no tendency to increase the dose |
| Removal of drug leads to withdrawal symptoms | Removal of drug does not lead to withdrawal symptoms |
| The effect is detrimental to the individual  and to the society | If any detrimental effect it is on the individual |

**General Anesthetics**

**Q1. Define and classify general anesthetics.**

Ans. General anaesthetics are agents which produce reversible loss of consciousness, and sensation. Ex. Chloroform, Halothane

Classification:

1. Inhalation anaesthetics
   1. Volatile Liquids: Ether, Chloroform, Halothane, Enflurane
   2. Gases: Nitrous Oxide

2. Intravenous anaesthetics: Thiopentone, Ketamine, Etomidate.

**Q.2 Describe the stages of anaesthesia.**

Ans.

1. **Stage of Analgesia:** From inhalation of drug to loss of consciousness. Minor surgeries can be carried out. Depression of cortical centers.
2. **Stage of Delirium:-** loss of consciousness and marked excitement. During this stage, respirations and heart rate may become irregular, uncontrolled movements, vomiting, breath holding, and pupil dilation.
3. **Stage of surgical anaesthesia:** During this stage,

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Respiration** | **BP** | **Reflex activity** | **Muscle Relaxation** | **Pupils** |
| Plane 1 | Rate of respn | HR: Normal  BP: | Pharyngeal reflex lost | Incomplete | Roving eye ball |
| Plane 2 | further | HR: Normal  BP: further | Laryngeal reflex lost  Skin reflex lost | adequate | Fixed eye ball |
| Plane 3 | Further | Hypotension | --do-- | Complete | dilated |
| Plane 4 | Paralysis of respiration | Severe hypotension | --do--- | complete | More dilated |

1. **Stage of respiratory paralysis:** Overdose of anaesthetic agent shows medullary depression. This results in respiratory paralysis.

**Q.3 What are Preanesthetic Medication(1 mark)?explain with example.(2 marks).**

Ans. These are the medications given before the administration of the anesthetic agents. These agents help in smooth induction, smooth recovery and make anesthesia more safe and pleasant.

Preanesthetic medications are used for:

1) Relief of anxiety and to produce sedation: Example: Diazepam

2) To relieve pre and post-operative pain: Example: Morphine and pethidine

3) To counteract some of the adverse effects of anaesthetic agent:

Example: Atropine or hyoscine (anticholinergic) reduces body secretions.

Antiemetic effect extending to the postoperative period: Example: Promethazine.

**Q.4 Give ideal properties of General anaesthetic agents.**

**Ans.**

1. High potency
2. Ease of administration
3. Induction and recovery fast
4. Analgesic property
5. Stable
6. Non inflammable
7. Non toxic

**Q.5 Give reasons**

**1. Atropine is used as preanaesthetic medication:**

**Or**

**Atropine used as general anaesthesia with ether**

**Or**

**Combination of ether and atropine used for general anaesthesia**

**Ans.** When ether is used as general anaesthetic, it irritates respiratory passage & causes excessive secretion of mucus in the bronchi, lachrymal glands & nasopharynx. These secretions are likely to interfere with normal respiration & thereby anesthetic procedure. Atropine being parasympatholytic (anticholinergic) blocks all secretions and acts as anti secretory agent. Preanaesthetic medication helps in preparing patient for safer & better use of anaesthetic agent.

Atropine thus helps in anaesthesia.

1. **Halothane and cyclopropane are costly anaesthetics.**

**Ans:**

Poor analgesic and poor muscle relaxant.

Require pre-anaesthetic medication.

Require special apparatus for administration.

Hence these are costly anaesthetics.

**Narcotic Analgesics**

**Q.1 Define Narcotic analgesics with two examples.**

**Ans.** Naturally occurring synthetic, semi-synthetic drugs which have morphine like action

i.e relive pain and depression of CNS. Ex. Morphine, Codeine, Pethidine.

**Q.2 Classify Narcotic analgesics (1 mark). Give pharmacological actions of morphine on CNS and GIT (1 mark each)**

**Ans.** CLASSIFICATION:

a) Natural opium alkaloids: morphine codeine

b) Semi synthetic opiates: heroin, pholcodeine

c) Synthetic Opoids: pethidine , methadone, tramadol

**Morphine**

I. CNS: CNS depression leads to sedation, euphoria, respiratory depression.

II. GIT: It decreases peristalsis, so causes constipation.

**Q.3 Describe sign, symptoms and treatment of Morphine poisoning.**

**Ans.** **Sign and symptoms:**

* Respiratory depression, pin point pupil, reduced body temperature
* Hypotension, shock, coma
* Tolerance and drug dependence
* Depression of foetal respiration

**Treatment:**

* Gastric lavage
* Antidote Naloxone 0.4 mg IV every 2-3 minutes
* Artificial respiration
* IV fluid administration

**Q.4 Tincture of opium is used in diarrhoea.**

**OR**

**Morphine causes constipation.**

**Ans;** Tincture of opium contains morphine, morphine has spasmogenic action on smooth muscles of GIT.

It causes constriction of sphincters and decrease in the peristaltic movements of GIT.

This action of morphine results in stagnation of intestinal contents causing maximum absorption of water and drying of faecal matter.

The above actions of morphine cause constipation

Morphine which possesses constipating action so it is used in diarrhoea.

**Q.5 In biliary colic morphine is used.**

Ans

* Biliary colic means pain due to spasm of biliary tract.
* Morphine used to relieve pain.
* Morphine has spasmogenic action due to which aggravate the pain
* Atropine is antispasmodic so it is used with morphine in treatment of biliary colic.

**Q.6 Naloxone is used in morphine poisoning.**

**Ans:**

* Naloxone reverse symptoms like respiratory depression, hypotension, sedation effects
* Naloxone acts as antagonist to morphine.
* Hence used in treatment of morphine poisoning

**Q.7 Morphine is contraindicated in head injury.**

**Ans:**

* Morphine increases intracranial pressure
* Causes respiratory depression, mental clouding
* Mask the diagnosis
* Hence morphine is contraindicated in head injury

**Analgesic and Antipyretic**

**Q.1 Give classification of analgesic and antipyretics**

Ans. ***A} Non Selective COX inhibitors***

1. ***Salicylates:***  Aspirin, salicylic acid, Sodium Salicylates, Methyl Salicylates
2. ***Para-aminophenol derivative:*** Ex Paracetamol
3. ***Pyrazolon derivative:*** Phenylbutazone, Oxyphenbutazone
4. Miscellaneous: Indomethacin, Ibuprofen, Mefanemic acid, Diclofenac, Nimesulide

***B} Selective COX-2 inhibitors:*** Celecoxib, refocoxib, Valdecoxib

**Q.2 What are the symptoms and treatment for salicylism? (1+2) Symptoms ( any 4)**

Ans. **Symptoms:**

Headache, ringing in ear (tinnitus), deafness, vomiting, diarrhoea, mental confusion, hyperthermia, dizziness, sweating

**Treatment:**

* Stop consumption of salicylate
* Gastric lavage
* Artificial respiration
* IV fluid administration
* Administration of alkalinising agents & fluids- 2% sodium bicarbonate to prevent metabolic acidosis & to increase excretion of salicylates

**Q.3 Aspirin is not used in peptic ulcer (1 Mark for each point )**

Ans:

* Aspirin causes irritation of stomach, gastric erosion, gastritis, gastric ulcer and GI

bleeding

* It also cause decrease in prostaglandin level leading to increased secretion of HCl

and ulceration

* Aspirin stimulate the CTZ in brain causing epigastric distress, nausea and vomiting
* Thus, aspirin will aggravate the condition of peptic ulcer. Hence it is not used in

patients with peptic ulcer

***Hypnotic and Sedative***

***Q.1 Define and classify Hypnotic and Sedative with examples.***

***Ans; Hypnotic:*** Produce sleep resembling natural sleep

***Sedative:*** Reduce excitement

***Classification:***

**1] Barbiturates**

a. Long acting Barbiturates: Barbitone, Phenobarbitone

b. Intermediate acting Barbiturates: Amylobarbitone, Cyclobarbitone

c. Short acting Barbiturates: Hexobarbitone, Secobarbitone

d. Ultra short acting Barbiturates: Thiopentone

**2] Benzodiazepine:** Diazepam, Nitrazepam

**3] Newer non benzodiazepines:** Zopiclone

***Q.1 State the symptoms and treatment for barbiturate poisoning. (symptoms- 2 mark, treatment- 1.5 marks)***

Ans: ***Symptoms*** – marked excitement, renal failure, pulmonary oedema, cardiac irregularities, cold skin, paralytic dilation of pupil, weak but rapid pulse, respiratory failure.

***Treatment –***

1. Gastric lavage is performed.
2. If respiration is slightly affected, oxygen can be given by nasal catheter. If respiration is depressed considerably, endotracheal intubation is done.
3. Forced diuresis- diuretics like mannitol or Frusemide is given to increase urinary excretion of barbiturates.
4. Alkalinization of urine – Sodium bicarbonate is used for alkalinization of urine which helps in excretion of barbiturates.
5. Prophylactic antibiotics – To prevent infection, antibiotics are used
6. Administration of IV fluids

**Anticonvulsant / Antiepilepic Drugs**

***Q.1 Define and classify anticonvulsant drugs with examples.***

Ans; Anticonvulsants (Antiepileptic): Are the agents used in the treatment of convulsions (Epilepsy).

1. Hydantoins - Phenytoin

2. Barbiturates - Phenobarbitone

3. Succinimides - Ethosuximide

4. Benzodiazepines - Diazepam

5. Aliphatic carboxylic acid: Sodium Valporate

6. Miscellaneous agents: carbemazepine, primidone, Gabapentine

***Q.2 Give pharmacological action of Phenytoin***

Ans: Pharmacological actions of phenytoin

* CNS depression
* It abolishes tonic phase of epilepsy
* It causes enlargements of gums (hyperplasia of gums)
* It increases hair growth , especially facial hairs in female (hirsutism)
* It causes osteomalacia
* Foetal abnormality (teratogenicity)
* It also has anti-arrhythmic action

***Q.3 Antiepileptics should not be withdrawn abruptly.***

***OR***

***During the treatment of epilepsy, drugs should be withdrawn gradually.***

Ans: Epilepsy is a neurological disorder characterized by paroxysmal short recurrent periodic attacks of motor, sensory or psychological mal function.

The drugs used for the treatment of epilepsy require long term administration in order to prevent epileptic attacks.

Since the antiepileptics mainly act by depressing the CNS, they may lead to recurrence of epileptic attack if withdrawn suddenly.

So, during the treatment of epilepsy, drugs should be withdrawn gradually

**Psychopharmacological Agents**

**Q.1 Define and classify Anti –psychotic with examples (Defn 1.5 marks, classification 1.5)**

Ans: An antipsychotic (or neuroleptic) is a psychiatric medication primarily used to manage psychosis (including delusions, hallucinations, or disordered thought), particularly in schizophrenia .They can also be called as Major tranquilisers.

Examples: Phenothiazines, Meprobamate, Haloperidol.

**Classification:**

I] Tranquilizers

a. Major Tranquilizers: ex Phenothiazine, Reserpine, Haloperidol

b. Minor Tranquilizers or anti anxiety agents: Benzodiazepines

II] Antidepressant or Psychoanaleptics: MAO inhibitors, Tricyclic compounds

III] Psychomimetics: L.S.D,

**Q.2 Give mechanism of action of MAO inhibitors (3.5 M)**

Enzyme MAO oxidises (metabolises) active biogenic amines like 5 HT, Nor adrenaline and

dopamine to inactive compounds. MAO inhibitors prevents the oxidative deamination of

catecholamines and serotonin thereby increasing the functional availability of these monoamines in the brain. This accumulation is associated with excitement and enhanced motor activity. Thereby act as antidepressants or psycho analeptics ( MAO A and MAO B inhibitors act differently) (2.5 marks)

MAO-A preferentially deaminates serotonin, melatonin, epinephrine, and norepinephrine. MAOB preferentially deaminates phenylethylamine and trace amines. Dopamine is equally

deaminated by both types. (1 mark)

**Q.3 Reserpine is never prescribed for immediate quietening of maniac patient.**

Ans:

* Reserpine is an antipsychotic drug.
* It causes depletion of serotonin and catecholamines from the brain and peripheral sites which results in tranquilizing action.
* Reserpine stimulates the CNS excessively leading to firing of all central neurons synchronously developing epilepsy.
* This is followed by severe mental depression resulting in suicidal tendencies.

**Q.4 Eating of cheese is forbidden while on MAO inhibitor therapy.**

Ans:

* Cheese contains tyramine which is metabolized in the liver by the enzyme monoamino oxidase.
* If an individual is on MAO inhibitor therapy, then MAO inhibitors inhibit the detoxification or metabolism of tyramine.
* Thus, tyramine gets accumulated in the body.
* This tyramine causes release of noradrenaline from its binding sites.
* Increased level of noradrenaline causes hypertensive crisis.
* Therefore, eating of cheese is forbidden while on MAO inhibitor therapy.

**Q.5 Chlorpromazine is called as largactil.**

**Ans;**

* In psychosis it produces psychomotor slowing, emotional quietening and reduce anxiety
* Depress CTZ and act as antiemetic
* Anti hypertensive
* Antihistaminic action
* Anticholinergic action
* Skeletal muscle relaxation
* As it produces large number of pharmacological actions.
* Hence called largactil(large acting)

**Centrally Acting Muscle Relaxant and Antiparkinsonian Drugs**

**Q.1 Define and classify antiparkinsonian drugs with example.**

**Ans:**

**Antiparkinsonian Drugs:**

Drugs used in the treatment of Parkinsonism disease are called Antiparkinsonian Drugs

Classification:

1. Drugs acting Dopaminergic system
2. Dopamine precursor: eg. Levodopa
3. Decarboxylase Inhibitors: eg. Carbidopa
4. Dopaminergic antagonist: eg.Bromocryptine
5. MAO-B inhibitors: eg. Selegelline
6. Dopamine Facilitator: eg. Amantadine
7. Drugs affecting brain cholinergic system:
8. Central anticholinergic: eg. Benztropine
9. Antihistaminics: eg. Promethazine

**Q.2 Mention uses (one correct use) and side effects (one correct side effect) of**

**(1/2+1/2)**

1. Levodopa

Use: Parkinson’s disease

Side effects: cardiac arrhythmia, epigastric distress, mental depression, postural

Hypotension

1. Chlorsoxazone:

Use; As Muscle relaxant

Side effects: Epigastric distress

**Q3. Benztropine is used in treatment of Parkinsonism**

Parkinsonism is imbalance of excess of acetyl choline and a deficiency of dopamine. Thus

anticholinergic agents are useful in correcting this imbalance. Benztropine is anticholinergic drug so it is used in the treatment of Parkinsonism

**Q.4 Parkinsonism - Levodopa, Levodopa carbidopa combination**

L dopa is given in combination with carbidopa.

I. L dopa is the precursor of dopamine. And is used in treatment of parkinsonism.

II. L dopa can cross the blood brain barrier but dopamine cannot.

III. In brain, L-dopa is metabolized to dopamine thereby replenishing the deficient neurotransmitter.

IV. The metabolism takes place in the presence of DOPA decarboxylase .

V. Large amount of L-Dopa gets peripherally converted to dopamine and thus small amount reaches the brain. To overcome this problem, higher dose of L

Dopa is required to increase the clinically effective level of dopamine in the brain which results in toxicity.

VI. Carbidopa does not cross the blood brain barrier but it inhibits peripherally dopa decarboxylase. Thus Carbidopa does not interfere with the conversion of L-dopa to dopamine in the CNS but prevents the conversion of l- dopa to dopamine peripherally.

**Q.1 Dfine parasympathomimetics. Classify with examples. (1+2)**

**Ans.** Parasympathomimetics- These are the drugs which produce the actions similar to

those seen by the stimulation of parasympathetic nervous system.

**Classification:**

* Esters of choline- Methacoline, carbachol, Acetylcholine
* Cholinomimetic alkaloids- Piolcarpine, Muscarine
* Cholinestrase inhibitors- Neostigmine, physostigmine
* Synthetic compounds- Futretonium

(iii)Atropine- Physostigmine

**Q.2 Acetylcholine is not used clinically.**

**Ans.**

I. Ach acts on all cholinergic sites throughout the body.

II. It has short duration of action because it is susceptible to hydrolysis by cholinesterases.

III. When given orally it is rapidly hydrolyzed in GIT.

IV. On IV administration it has no appreciable actions because considerable amount is

destroyed by pseudo cholinesterase at the site of action Thus Ach has very short

duration of action.

**Q.3 State the symptoms and treatment for organophosphorous poisoning.**

**(symptoms- 2 mark, treatment- 1.5 marks)**

**Ans.**

**Symptoms:**

Miosis, spasm of accommodation, headach, bronchospasm, tightness in chest, anorexia, nausea, vomiting, diarrhoea, laryngospasm and respiratory failure.

**Treatment:**

1. Gastric lavage
2. Indotrachreal intubation
3. Injection of Atropine 2mg IV
4. Pralidoxime 1G IV
5. IV fluids
6. Moist oxygen inhalation
7. General nursing care

**Q.4 Name antidote used in**

1. Organo phosphorus poisoning - Atropine sulphate inj ,pralidoxime, diacetylmonooxime

**Q.5 Name the drug used in following conditions**

**Mysthenia gravis:** Neostigmine

**Paralytic ileus:** Neostigmine

**Q.6 Define parasympatholytic. Classify with examples**

**Ans.** Parasympatholytics: These are the drugs which block the cholinergic receptors in the

effector organs supplied by cholinergic nerves. Examples: Atropine, Hyoscine.

**Classification:**

1. **Belladonna alkaloids:** Atropine, Scopolamine
2. **Semi synthetic substitutes of Belladonna alkaloids:** Atropine methylnitrate, Homatropine
3. **Synthetic substitutes of Belladonna alkaloids:** Methantheline, Methantheline

**Q.7 Atropine is given with neostigmine in Myasthenia gravis**

1. Myasthenia gravis is a skeletal muscle disorder causing muscle weakness and muscle

fatigue.

2. Nicotinic receptors are present in skeletal muscles and muscarinic receptors are present

in heart blood vessels and eye balls.

1. Neostigmine acts on both the receptors.
2. In myasthenia gravis, only nicotinic action of neostigmine is required.
3. Hence to mask the muscarinic actions of neostigmine, and thus to avoid the side effects, the muscarinic blocker atropine is given in combination.

**Sympathomimetic or Adrenergic Drugs**

**Q.1 Define and classify Sympathetic(Sympathomimetic or adrenergic) drugs with**

**examples.**

Ans. Sympathetic drugs (Adrenergic drugs) - these are the drugs which mimic the effect of

sympathetic nervous stimulation of organs and structure that contain adrenergic receptors.

**Or**

Sympathomimetics are agents which produce an action similar to the stimulation of

postganglionic sympathetic nerves (definition 1& ½, classification 2M)

**Classification(based on mechanism of action**)

i) Directly acting amines: Adrenaline , Nor adrenaline, dopamine, dobutamine

ii) Indirectly acting amines: Amphetamine, Ephedrine.

**Or**

**Chemical Classification:**

Catecholamines: Adrenaline, dopamine, nor-adrenaline, isoprenaline etc

Non-catecholamines: Phenylephrine, ephedrine

**Q.2 Explain Dale’s Vasomotor Reversal.(Explanation 1.5 ,Diagram 1.5 marks)**

**Ans.** In low doses, Adrenaline causes peripheral vasoconstriction, increase in resistance, output,

and thereby rise in peripheral and systolic BP. In high doses, Adrenaline activates both alpha and beta receptors. It causes peripheral vasoconstriction and leads to rise in systolic BP. This is followed by skeletal muscle dilation of blood vessels, decrease in resistance and output, fall in diastolic BP. This response of Adrenaline is known as biphasic response. Its vasoconstriction action is blocked by alpha blocker like ergotoxin, Adrenaline causes only fall in BP thus converting biphasic response to monophasic response.This reversal action of Adrenaline is called as Dale’s vasomotor reversal.

Diagram





**Q.3 Adrenaline is always present in the emergency kit of the physician (any 4**

**points,1 mark each point)**

**or**

**Give uses of adrenaline.**

**Ans.** It is because adrenaline is a life saving drug. It is the drug of choice in following clinical

conditions:

1. Anaphylactic shock- Anaphylactic shock is due to release of histamine which causes

bronchospasm and adrenaline acts as bronchodilator by antagonising histamine.

1. Cardiac arrest- As it is a positive inotropic and positive chronotropic agent, it helps to

reverse the heart in arrest condition.

1. Asthama- the bronchodilator action of adrenaline relieves the asthma due to bronchospasm.
2. Haemostatic- The peripheral vasoconstrictor property of adrenaline is used to stop nasal and dental bleeding by using nasal or dental packs soaked in adrenaline solution.
3. Adrernaline- It is frequently administered along with local anaesthetic agent to prolong

the duration of anaesthesia

1. Used as nasal decongestant.

**Sympatholytics or Adrenergic blockers**

**Q.1 Define Sympatholytics(1& ½mark). Classify with suitable example (2 mark)**

**Or**

**Define Sympatholytics(1 mark). Classify with suitable example (1 mark).**

**Discuss beta adrenergic blockers(1.5 marks).**

**Ans:** These are the agents which produce sympathetic blocking and antagonize the action of

adrenaline and noradrenaline.

**Classification:**

1) Catecholamine depleters- Reserpine

2) Drug which interfere with synthesis of adrenergic transmitters- methyl dopa

3) Drugs which interferes with transmission of impulses across post ganglionic

neuronguanethidine

4) Alpha and beta blockers-Tolazoline and sotolol

**Beta blockers-they block actions of catecholamine They are classified as follows:**

I. Specific beta blockers- sotolol, timolol.

II. Beta blockers with memberane stabilizing activity and intrinsic symathomimetic activity-

Dichloroisopernalin(DCI)

III. Beta blockers with memberane stabilizing activity: Propranalol

IV. Beta blockers with additional alpha blocking activity: labetolol.

Adverse effects: Propranalol may cause sudden hypotension and cardiac asystole in patients

with asthma may cause bronchospasm.

**Therapeutic uses:**

In treatment of Angina pectoris, cardiac arrhythmia, Hypertension, Pheochromocytoma

**Q.2 What are β-blockers? (1 mark) Give their classification with examples.(2.5**

**marks)**

**Ans:** These drugs inhibit adrenergic responses mediated through the β-receptors.

They are competitive antagonists.

Therapeutic uses: They are used in the treatment of angina pectoris, cardiac arrhythmias,

hypertension, migraine etc.

**CLASSIFICATION:**

(1)Specific β-blockers- Sotalol, Timolol

(2) β-blockers with membrane stabilizing activity and intrinsic sympathomimetic activity-

Dichloroisoprenalin

(3) β-blockers with membrane stabilizing activity - Propranalol

(4) β-blockers with additional α-blocking activity- Labetalol.

**Q.3 Drug used in**

Pheochromocytoma: Propranolol, Phentolamine

**Name drug contra indicated in**

Pheochromocytoma: Adrenaline

**Name drug Produces following effect**

Amnesia: Scopalmine

Photophobia - Atropine , Homatropine

Cycloplegia - Atropine

Constipation - Morphine, Atropine

Dryness of mouth: atropine

**Drug acting on Blood and blood Forming Organ**

**Q.1 Define Anticoagulants with example**

**Anticoagulants:**

Anticoagulants are the drugs used to prevent extension of intravascular clotting & to reduce chances of embolism. They are also used to prevent in vitro clotting to preserve blood for transfusion or laboratory examination.

OR

Are the agents which will prevent the clotting of blood.

e.g. Oxalic acid, sodium citrate, sodium edetate, heparin, coumarins warfarin, acenocoumarol , Indanediones (Phenindione)

**Q.2** **Define haematinics (1.5 mark) and classify them with suitable examples (2 marks).**

Haematinics are the pharmacological agents which raise the no. of RBCs and the amount of Hb to normal level when it is below normal, used in treatment of anemia.

**Classification**-There is no specific classification. Various haematinics used clinically are as

follows:

**i) Vitamins-**

• Vitamin B 12

• Folic acid

**ii) Iron-**

***• Oral iron preparationsferrous***

Sulphate tablets IP

Ferrous fumarate tablets IP

Ferrous gluconate tablets IP

***• Parenteral preparations***

Iron dextran injection

Iron sorbitol injection

Saccharated iron oxide

Colloidal ferric hydroxide

**Q.3 Iron plays an important role as haematinic. Give reason.**

* A decrease in oxygen carrying capacity of blood is called anemia.
* The oxygen carrying capacity of blood depends on Hb content of RBCs.
* Anemia occurs due to various reasons like deficiency of dietary factors responsible for blood formation eg- iron, folic acid, vit B12 etc.
* Haematinics are the drugs which raise the no. of RBCs. Iron is required for the formation of haem part of Hb.
* In hypochromic and microcytic anemia, treatment with iron is specific. Iron is used for the treatment of dimorphic anemia along with other vit.

**Q.4 Define Plasma Expanders with two example.**

**Ans:**

These are the agents with high molecular weight when administered parenterally remain in

blood stream & increase circulatory fluid volume by exerting an osmotic pressure.

Eg. Dextan 6% , Dextran 60,Dextran 40, Gelatin 6% solution, Polyvinyl pyrrolidone,

Physiological saline, Gum acacia 6% in normal saline,

**Q.5 Explain the term anemia. Mention different classes of anemia and their**

**treatment.**

**Ans:** **Anaemia:(1 mark)**

* Decrease in oxygen carrying capacity of blood
* Reduction in blood haemoglobin level & number of circulating erythrocytes indicate anemia

**Classes & treatment (2.5marks)**

1. **Microcytic, hypochromic anemia:** Size of RBCs is smaller & Hb is less than normal

Treatment: Iron can be administered

1. **Macrocytic anaemia (Megaloblastic Anemia):** RBCs larger than normal

Treatment: Vit B12 , Folic acid can be administered

1. **Pernicious anemia**

Treatment: Vit B12

1. **Sickle cell anemia:** Cells are sickle shaped.

**Q.6 Give major use, side effect of**

**Ans:**

1. **Heparin**

Use: In treatment of Embolism, Thrombosis

Side Effect: Cerebral Hemorrhage, Alopecia

R.A: I.V.

1. **Warfarin sodium**

Use: In treatment of Embolism, Thrombosis

Side Effect: Cerebral Hemorrhage

R.A: Oral

**Q.7** a) **Name antidote in Iron Poisoning :** Desferrioxamine

b) **Drug of Choice in**

**Thrombosis:** Heparin, Streptokinase, Urokinase,

**Pernicious anemia;** Vit B12

**Megaloblastic anemia:** B12, folic acid, or both

1. Name the drug contraindicated in

**GIT bleeding:** Heparin, warfarin Sodium

**Q.8 Dextran is given by I.V drip. Give reason.  
Ans:**

* Dextran is polysaccharide elaborated by micro-organism seeded in a solution of cane sugar with yeast.
* Dextran absorbed very solwliy. Takes a week to be absorbed.
* When it is administered by I.V route it remains in blood stream and increases the volume of blood.
* So to maintain blood volume dextran is given by I.V. drip.

**Drug Acting On Respiratory System**

Q.1 Define following terms with two examples.

**1) Bronchodialators:**

Drugs that expand bronchiolar airways, helpful in treating asthma. **OR**

Drugs that dilates the narrowed bronchi, helpful in treating asthma.

Eg. Adrenaline HCl, Isoprenaline, Orciprenaline, Salbutamol,Aminophylline, Ephedrine HCl

**2) Antitussives:** The drugs which are used in symptomatic treatment of cough are called

antitussives. Eg. Codeine, Bromohexine, Ambroxol, Dextromethorphan.

**3) Expectorant:** Drugs which increases respiratory tract secretions. This help in their easy   
 expulsion. Ex Guaiphensin, Bromohexine, Ambroxol

**4) Nasal Decongestant:** Drugs which produces vasoconstriction and shrinking of the nasal

mucosa. Ex. Oxymetazoline, Xylometazoline, Pseudoephedrine

**Q.2** **Define bronchial asthma(1 mark).Give the treatment for status asthmaticus (2 marks).**

Ans: **Definition:** It is a clinical syndrome characterized by paroxysmal dyspnoea and wheeze due

to increased airway resistance in narrowed bronchi.

**Treatment for status asthmaticus:**

It is a medical emergency and prompt hospitalization is essential in case of status asthmaticus (0.5 Marks)

**Any 3 of the following points (1.5 Marks)**

1. Bronchodilators like Adrenaline or aminophylline by parenteral administration

2. Hydrocortisone 100 mg i. v.

3. Oxygen therapy

4. Antibiotic if any infection

**Q.3 Define bronchial asthma(1.5 marks). Mention the drugs used in asthma (2 marks).**

**Definition:** It is a clinical syndrome characterized by paroxysmal dyspnoea and wheeze due to increased airway resistance in narrowed bronchi.

**Drugs used in asthma:**

Adrenaline, Isoprenaline,orciprenaline, salbutamol, Aminophylline, theophyline, steroids etc.

**Q.4 What is bronchial asthma?(1 mark) Explain therapy for it.(2.5 marks)**

**Ans:** **Definition:** It is a clinical syndrome characterized by paroxysmal dyspnoea and wheeze

due to increased airway resistance in narrowed bronchi.

Therapy –

i) Elimination of trigger factors eg. allergens.

ii) Avoiding respiratory irritants as tobacco, smoke , chemicals

iii) Psychological treatment

iv) Drug therapy eg-

a) bronchodilators like salbutamol, adrenaline

b) bronchodilator, steroids and maintenance therapy for chronic persistent asthama

c) corticosteroids for status asthamaticus

v) Supportive therapy

**Q.4 Name the drug of choice in following condition.( ½ mark each)**

1. Status epilepticus- Diazepam, Phenytoin

2. Bronchial Asthma: Adrenaline, Isoprenaline,orciprenaline, salbutamol, Aminophylline,

***Local Anaesthetics***

***Q.1 Define local anaesthetics(1 mark) . Classify with suitable examples (2 mark)***

**Ans:** Local anesthetics are pharmacological agents which when applied or injected, block the conduction as well as generation of impulses in localized area and bring reversible loss of sensation without affecting degree of consciousness.

**OR**

They are the compounds that when applied in appropriate concentration, block nerve conduction in the area of application.

**Classification:**

1. **Injectable**
2. Low potency: Procaine, chlorprocaine
3. Intermediate potency: Lignocaine, Prilocaine
4. High potency: Tetracaine, Ropivacaine
5. **Surface anaesthetics:** Cocaine, Lignocaine, Benzocaine

***Q.2 Define local anaesthetics(1 mark) . Why adrenaline added to local anaesthetics?(2***

***mark)***

**Ans:** Local anesthetics are pharmacological agents which when applied or injected, block the conduction as well as generation of impulses in localized area and bring reversible loss of sensation without affecting degree of consciousness.

**OR**

They are the compounds that when applied in appropriate concentration, blocknerve conduction in the area of application.

Adrenaline acts as a vasoconstrictor and constricts the blood vessels which prolongs the duration of action of local anesthetic by reducing the systemic absorption of local anesthetics. It also reduces systemic toxicity of local anesthetic. Therefore, adrenaline is combined with local anesthetics

***Q.3 Define local anesthetic (1M). Give ideal properties any 5 (2.5M)***

**Ans:** As given above

**Ideal Properties:-**

1. It should be soluble in both water and lipids. Thus, these are the water soluble salts of lipid soluble substances.

2. It should be nontoxic, non-irritant and produce anesthesia quickly.

3. The action should be reversible and persists long enough to complete desired operative

procedure.

4. It should not decompose on standing

5. It should not be habit forming.

6. It should be non –antigenic.

***Q.4 What are local anaesthetics?(1.5 marks) Explain various methods of producing local***

***anaesthesia.( 2 marks)***

**Ans:** Local anaesthetics are pharmacological agents which when applied or injected, block the conduction as well as generation of impulses in localized area and bring loss of sensation without affecting degree of consciousness.

**OR**

They are the compounds that when applied in appropriate concentration, block nerve conduction in the area of application. Examples: cocaine, xylocaine, benzocaine etc.

**Methods**

**A) By paralyzing of nerve endings:**

1) Application to mucus surface, skin, wounds (surface anaesthesia): In this case the LA is

just applied on the skin or mucus membrane.

2) By hypodermic injection: LA is injected under the skin layer.

3) By infiltration: Here LA is injected first intradermally, then subcutaneously and then into

deeper tissues.

**B) By blocking the sensory impulse:**

1) Block anaesthesia: Here the LA is injected close to nerve trunk

2) By spinal anaesthesia: The LA is introduced after lumbar puncture

3) By caudal anaesthesia: The LA is injected into epidural space.

***Drug acting on Eye***

**Q.1 Define with two examples.**

**Ans:**

**Miotics:**

These are the agents that produce miosis or constriction of pupil.

Eg. Parasympathomimetics like physostigmin, pilocarpine

**Mydriatics:**

These are the agents that produce mydriasis or dilation of pupil.

Eg. Atropine, Adrenaline, Phenylephrine

**Q.2 a) Mention drug used in following condition:**

Glaucoma: physostigmin, Pilocarpine

1. **Name the contraindicated in**

Glaucoma: Atropine

**c)Name of drug which produce following effects**

Cycloplegia – Atropine, Hyoscine

Mydriasis: Atropine, Adrenaline, Phenylephrine

Miosis: physostigmin, pilocarpine

**Autocoids**

**Q.1 Define autocoids. What is triple response? (1+2)**

**Ans:** Autocoids are the local hormones with high biological activity & are naturally found in body in active or inactive form eg. Histamine, bradykinin, prostaglandins

**TRIPLE RESPONSE**

When histamine is applied locally or injected intradermally on skin histamine produces a

typical response known as “triple response” which is characterised by three distinguish sign:

i. Reddening on the site of injection described as **flush**

ii. Patch formation beyond flush occurs due to vasodilation & this is called as **flare.**

iii. Development of localized edema i.e **wheal**

**Q.2 Define Autocoids. (2 marks) Classify antihistaminic drugs with example. (1.5 marks)**

**Ans:** Autocoids are local hormones with high biological activity and naturally found in body as

active or inactive forms.

**Classification of antihistaminics**:-

1. **H1 receptor antagonist**- Eg- diphenhydramine, chlorpheniramine, mepyramine, Promethazine, Chlorcyclizines
2. **H2 receptor antagonist**- Eg- ranitidine, cimetidine

**Q.3 What are autocoids? Give pharmacological actions of histamine on smooth muscles**

**and gastric glands.**

**Definition and examples (1.5 M)**

Autocoids are the local hormones with high biological activity & are naturally found in body in active or inactive form eg. Histamine, bradykinin, prostaglandins

**Pharmacological Actions: (1 M EACH)**

1. Smooth muscles: It causes bronchoconstriction and causes contraction of intestine and

uterus.

1. Gastric glands – It increases acid secretion.

**Q.4 Mention the drug used in**

1. Migraine: Ergotamine, Paracetamol
2. Motion Sickness: Diphenhydramine

**Drugs acting on digestive system:**

**Q.1 Define and classify Purgatives with examples. Or**

**What are laxatives? Classify them with suitable examples.**

**Ans:** Drugs which promotes defecation & used in the treatment of constipation are called purgatives.

***Classification:***

1. ***Stimulant or irritant purgatives***
2. Anthraquinones: Senna, Cascara sagrada
3. Resinous compounds: Jalap
4. Irritant oils: Castor oil
5. Miscellaneous: Phenopthalein, Bisacodyl
6. ***Osmotic purgatives:*** Magnesium sulphate, Magnesium citrate, Lactulose
7. ***Bulk purgatives:*** Methyl Cellulose, Plantago seeds
8. ***Lubricant purgatives:*** Liquid paraffin

**Q.2 Define and classify antidiarrhoeal drugs. Mention their mechanism of action.**

**Ans:** Drugs used in the treatment of diarrhoea.

***Classification:***

1. Protective and adsorbent: Light kaolin, Activated charcoal, Pectin
2. Astringent: Tannic acid, Bismuth salt
3. Miscellaneous: Opium alkaloid, Loeperamide

**Q.3 Give the mechanism of action of castor oil with its therapeutic use. ( 1.5 mark for**

**mechanism, ½ mark for use)**

**Ans:** When taken orally, castor oil is hydrolyzed in the intestine by pancreatic lipase to

glycerol and ricinoleic acid. The ricinoleic acid stimulates the peristaltic movement of

small intestine thus acting as irritant purgative. Full dose of castor oil produces purgation

in 2-6 hrs.

Therapeutic uses – used as cathartic

**Drug Acting on CVS**

**Q.1 Give mechanism of action of digitalis glycoside as cardiotonic.**

**Ans:** Digitalis directly acts on myocardium & increases conductivity, automaticity, rhythmicity &

causes forceful contraction of heart. Digitalis derivatives block Na+--K+ ATPase enzymes &

improve levels of Na+ & acts as shown below:

Digitalis blocks Na+ -- K+ ATPase enzyme

Increases Na+ level

Activates sarcoplasmic reticulum, also stimulates Na-Ca exchange

Releases Ca++

Increase intracellular calcium

Combines with cardiac muscles

Causes forceful contraction

Leads to complete emptying of heart Thus relieves congestion

It restores myocardial function. Thus heart can do work with less energy expenditure.

Enlist the pharmacological action of digitalis and justify its use in CCF.

**Q.2 List out pharmacological actions of digitalis: (Enlist 1.5 M, explanation 2 )**

**Ans:**

1. Positive inotropic action, cardiotonic action (action on heart)
2. Diuretic action (secondary to cardiac action) (action on kidney)
3. Vomiting ,Nausea (action on GIT)

**Explanation (2 M)**

**CCF:** Its Congestive Cardiac failure characterized by decreased cardiac function , weak ventricular muscles, cardiac congestion, increase heart size, edema, weakness.

Digitalis improves cardiac functions in CCF by following ways

1. It increases the force of cardiac contraction, positive inotropic action
2. It decreases heart rate,
3. Increases cardiac output, which decreases residual blood in heart, end diastolic pressure

and diastolic size of the heart.

1. Decreases venous congestion
2. Increase renal blood flow and perfusion.
3. Relieves edema by producing diuresis.

**Q.3 Classify Antihypertensive drugs with examples.(3.5 marks)**

**Ans:** Antihypertensive are the drugs used in treatment of hypertension to reduce the level of elevated blood pressure. They are classified as according to site of action:

1) Drugs acting centrally : clonidine, methyl DOPA

2) Drugs acting on adrenergic nervous system:

a) Drugs which are beta blockers: Propranalol,metoprolol

b) Drugs acting on alpha blockers: Phenoxybenzamine,Prazocin

c) Adrenergic blocking neuron blockers: e.g Guanethedine

d) Catecholamine depletors: E.g Reserpine

3) Drugs acting directly on vascular smooth muscles: Vasodilators such as

Hydralazine,Diazoxide,Minoxidil

4) Drugs acting reflexly by stimulating baroreceptors: Veratrum

5) Drugs which block rennin angiotensin aldosterone axis

e.g Enalapril,losartan,captopril

6) Oral diuretics: e.g Frusemide,Hydrohlorothiazide

7) Miscellaneous: E.g MAO Inhibitors e.g Pargylin

**Q.4 Define and classify antiarrythmic with examples.**

**Ans:** Agents used to correct cardiac arrhythmia.

**Classification:**

1. Myocardial depressants: Quinidine, Procainamide, Lignocaine

2. Sympathetic blockers: Propranolol

3. Calcium channel blockers: Verapamil

4. Miscellaneous: Potassium, Amiodorone

**Q.4 Explain the cardiac actions of Quinidine. (0.5 Marks each)**

**OR**

**Discuss the pharmacological action of Quinidine**

**Ans:** Quinidine is used as antiarrythmic drug

1) **Automaticity:** Quinidine depresses the entry of Na+ in cell and decreases the diastolic depolarization and thus decreases the automaticity.

2) **Excitability:** it decreases the excitability

3) **Refractory period**: It decreases the K+ efflux. Prolongs Refractory period in atria and decreases the Refractory period in ASV node,

4) **Conduction velocity**: It slows down the rate of rise in action potential and thus decreases the conduction velocity of all cardiac tissue.

5) **AV conduction**: It decreases the conduction in atria and in His purkinje system and enhances conduction in AV node.

6) **Contractility**: It shows negative ionotropic effect on heart by decreasing entry of Ca++ into

cardiac muscle cells.

7) **B.P.** : In normal subject upon IV and oral administration there is fall in B.P

**Q.5 Antihypertensives are given along with diuretics.**

**Ans:** One of the causes of hypertension is presence of excess plasma sodium and calcium level.

To eliminate these in the form of salts, diuretics are used.

Diuretics inhibit reabsorption of sodium and its equivalent osmotic amount of water.

This causes decrease in plasma fluid which decreases BP.

Diuretics also cause vasodilation and decreases BP.

Therefore, antihypertensives are given with diuretics.

**Q.6 Toxicity of digitalis is increased by chlorthiazide.**

* Chlorthiazide is a diuretic.
* Thiazides depress sodium transport in the cortical dilating segment of nephron just proximal to Na-K exchange.
* Thiazides also increase potassium excretion to a considerable extent
* In the treatment of congestive cardiac failure with digitalis, there is already excess potassium loss ie hypokalemia
* Hence if chlorthiazides are administered in patients on digitalis therapy then these increase the toxicity of digitalis.

**Q.7 Digitalis is called as cardiotonic.**

Ans:

* Digitalis has direct action on myocardium.
* It increases the force of cardiac contraction
* This lead to complete ventricular emptying.
* The duration of systole is decreased allowing greater time to ventricular filling and heart rest
* Diastolic size of heart is reduced. Hence oxygen expenditure is reduced
* Digitalis improve energy utilization
* Thus digitalized heart do same work with less energy
* Therefore digitalis is called as cardiotonic.

**Diuretics**

**Q.1 Define and classify Diuretics (1+2)**

**Ans:** Diuretics- These are the agents that increase rate and flow of urine formation

**Classification:**

***1.Weak diuretics***

i) Osmotic diuretics

A. Electrolytes-Sodium and Potassium salts

B. Non electrolytes- Mannitol

ii) Acidifying salts-Ammonium chloride

iii) Xanthine derivatives- Theophyline

iv) Carbonic anhydrase inhibitors- Acetazolamide

***2. Moderately potent diuretics***-Thiazides like: benzothiazide ,Hydrochlorothiazide

***3. Very potent diuretic***- Frusemide, ethacrynic acid

***4. Potassium sparing diuretics***- spironolactone, aldosterone antagonist

**Q.2 Define diuretics with examples. Describe mechanism of action of any one diuretic.**

**Ans:** Diuretics- These are the agents that increase rate and flow of urine formation

(Definition 1 M, example. 1M , MOA- 1& ½. Any one.)

Examples: Mannitol, Theophylline, Acetazolamide, Frusemide, Spiranlactone, Chlorothiazide.

***MOA :*** Thiazide diuretics- these act by inhibiting the NA+ /CL- co-transporter in the distal

convoluted tubule and block the active reabsorption of sodium and chloride with water in the

distal tubule. These thus excrete sodium, chloride, water.

***LOOP DIURETICS:*** Act on thick ascending limb of loop of Henle and cause a profound

increase in the urinary excretion of sodium and chloride ion by blocking sodium potassium

chloride reabsorption.

Carbonic anhydrase inhibitors inhibit the carbonic anhydrase and prevent the reabsorption of

sodium causing its excretion along with bicarbonate ions and water;

**Q.3 Give dose, R.A., Use and side effect of**

***1. Mannitol:***

Use: prophylaxis of acute renal failure (Diuretic)

Side effect; Headache, Nausea

Dose, R.A: 50-100g (15-20 % solution IV)

1. ***Acetazolamide:***

Use: Diuretic

Side effect; Drowsiness, renal calculi

Dose, R.A: 250-500mg (I.V)

1. ***Frusemide:***

Use: Diuretic

Side effect; Hypokalemia

Dose, R.A: 20-80mg (Oral, I.V)

**Hormones and Hormone Antagonist**

**Q.1 What are oral hypoglycemics? What is the difference between biguanides & sulphonyl ureas? (1+2 for ANY FOUR POINTS**)

**Q. 2 Differences between sulphonyl urea derivatives & biguanides**

**Q.3 Write a note on Oral Hypoglycemic compounds.**

**Ans:**

Oral hypoglycemics are the pharmacological agents when administered orally decrease elevated blood glucose level.

1. Sulphonyl ureas stimulate beta cells of islets of Langerhans in pancreas to secrete insulin.

Biguanides don’t stimulate beta cells, they act on liver

2. Sulphonyl ureas are effective in patients who have residual insulin.

Biguanides are effective in absence of functioning pancreatic beta cells or residual insulin

3. Sulphonyl ureas don’t accelerate peripheral utilization of glucose.

Biguanides inhibit glucose absorption & accelerate peripheral utilization of glucose & inhibit

gluconeogenesis

4. Sulphonyl ureas may stimulate appétite. Biguanides are anorexiants

5. Sulfonylureas can cause hypoglycemia as side effect. Biguanides don’t cause such side effect

6. Sulphonylureas Eg: Tolbutamide, Chlorpropamide, Glibenclamide

Biguanides Egs; Phenformin, Metformin.

Combination of biguanides & sulphonyl ureas can be used.

**Q.4 Describe pharmacological profile of Oral contraceptives.(0.5+1.5+1+0.5 marks)**

**Ans:**

These are the pharmacological agents which are used orally to prevent conception. They contain

estrogen/ progesterone either alone or in combination.

***Mode of action:***

They decrease the secretion of gonadotropin releasing factor by hypothalamus and the release by the pituitary of both LH and FSH and thus ovulation stops. Endometrium finally become thin,

hypoplastic and unsuitable for implementation. Progesterone affects the cervical mucus to become thick, tough and impermeable by spermatozoa.

***Adverse effects:***

Nausea, vomiting, headache, breast discomfort. Weight gain, acne, increased body hairsetc.

***Contraindications:*** Coronary and cerebro-vascular disease, active liver disease,porphyria etc.

**Q.5 Which type of anti-diabetic drugs can be taken orally? (1.5 marks) Explain its advantages. (2marks)**

**Ans:** Oral hypoglycemics are the pharmacological agents when administered orally decrease elevated blood glucose level. The following anti diabetic drugs can be taken orally- sulphonyl urea derivatives and biguanides.

The advantages of oral anti-diabetics arei)

These are safe

ii) Convenient

iii) Economical

iv) Easy self medication

v) Hypersensitivity due to insulin can be avoided

vi) Occasional resistance to insulin due to antagonizing antibodies can be avoided.

**Q.6 Insulin is not given orally.**

I. Insulin is a polypeptide hormone secreted by beta cells of islets Langerhans of pancreas.

II. Commercially it is extracted from pancreas of cattle or pigs

III. When given orally proteolytic enzymes and gastric juice, HCL causes its degradation and therapeutic effect is lost.

**Sulphonamides**

**Q.1 Explain the mechanism of action of sulphonamides. Give its adverse effects. (2+1)**

**Ans:** Many microorganisms require Para amino benzoic acid (PABA) for the synthesis of folic acid. PABA & sulphonamides are similar in chemical structure such that bacteria are not able to differentiate them. There is also competition between these two substances for same receptor site. Bacteria take up sulphonamide instead of PABA & inhibit formation of folic acid which is required for the bacterial growth and have bacteriostatic action.

**Adverse effects** (any 2) - crystalluria, haematuria, agranulocytosis, renal impairment, allergic reactions etc.

**Q.2 Give dose, R.A, and major side effects of Dapsone (1.5 marks)**

**Ans:**

***Dose-*** 1st week – 100 mg daily

Next 4 weeks- 25 mg twice a week

5th and 6th week- 50 mg twice a week. Thereafter 100 mg thrice a week.

7th and 8th week- 100 mg twice a week. Thereafter 100 mg thrice a week.

0.2 ml of 20% w/v suspension of Dapsone in arachis oil

***Route of administration***- oral, IM injection.

***Major adverse effect-*** agranulocytosis, sulphone allergy, severe haemolytic anaemia, nephritic syndrome, toxic hepatitis.

**Q.3 Why sulfa drugs are inactive in pus?**

**Ans:**

* PABA(p- amino benzoic acid) is required for synthesis of folic acid.
* Due to structural similarity of sulfa drugs, it is a competitive inhibitor of PABA.
* Since pus contains large amount of PABA, sulfonamides are ineffective in therapeutic doses.
* If larger doses of sulfa drugs are used to compete with PABA, it results in renal complications such as crystaluria, haematuria and renal damage.
* To avoid these renal complications, sulfa drugs are not used in large doses. Hence they are

inactive in pus.

**Q.4 Large amount of fluids is taken along with the sulfa drugs.**

**Ans:**

* Sulphonamides cause renal complications.
* In presence of acidic urine the acetylated form of sulphonamides is precipitated in collecting tubules and calyces.
* This causes renal irritation obstruction of urinary flow crystaluria, albuminuria, hematuria, oliguria and anuria.
* The acetylated form is soluble in alkaline urine.
* Alkalinisation of urine also enhances the urinary excretion of sulphonamides.
* Hence large amount of fluid intake is required to make the urine alkaline and

minimise complications.

**Q.5 Sulphamethoxazole is combined trimethoprim.**

**Ans:**

* These two agents acts synergistically by blocking formation and utilization of folic acid
* Sulphamethoxazole is structurally similar to PABA.
* Thus sequential blockade produced by these two drug explains synergistic effect.

**Antibiotics**

**Q.1 Define and classify antibiotics with examples.**

**Ans:** Chemical substance produced by microorganism and having property of inhibiting or destroying the microorganism.

1. **Antibiotics effective against gram +ve bacteria:** e.g. Penicillin, ampicillin, erythromycin
2. **Antibiotics effective against gram -ve bacteria:** e.g. Streptomycin
3. **Antibiotics effective against both gram +ve and gram –ve bacteria:** e.g. Tetracyclin, Chloramphenicol

**Q.2 Give the mechanism of action of Penicillin & its side effects.(1.5m + 2m for any four)**

**Ans:** Mechanism of action- Penicillin is bactericidal; it interferes with the synthesis of cell wall, by inhibiting mucopolypeptide of gram positive bacteria. This makes the cell membrane of microorganisms susceptible to damage by solutes in surrounding medium, i.e. plasma. Penicillins are effective mainly against multiplying organisms.

***Side effects / adverse effects –***

* Anaphylaxis- rare but serious reaction. It can develop with minute quantity of penicillin. It is characterized by cardiovascular collapse, bronchospasm.
* Serum sickness- with skin rash, fever, eosinophilia, asthama
* Renal complications- like haematuria, albuminuria
* Hyperkalemia
* Intolerance which includes idiosyncrasy and allergic conditions

**Q.3 Penicillin is a life saving as well as life threatening drug.(2 Marks for each point)**

* Penicillin is an antibiotic used in different diseases like Syphillis ,Gonorrhea, Diphtheria, Gangrene, Tetatus ,Meningitis etc. Thus it is a life saving drug.
* Penicillin in therapeutic dose if randomly administered by parenteral route to an individual without checking its allergy, then it may produce severe allergic reaction such

as anaphylactic shock. Hence it is a life threatening drug.

**Q.4 Tetracyclines are contraindicated in pregnant women and children. (4 points, one mark for each point)**

* Tetracyclines are teratogenic drugs and crosses the placental barrier when taken by pregnant females.
* It complexes the calcium and makes it unavailable for foetal development which results in bone deformity, staining of teeth etc
* Tetracyclines if taken by children, leads to bone deformity and affect the overall skeletal growth.
* It affects the deciduous and permanent teeth formation in children.
* Hence it is contraindicated in pregnant women and children.

**Q.5 Give the therapeutic uses, side effect and dose of tetracycline**

**Ans:** Tetracyclines are antibiotics and are used in following conditions:

* Cholera
* Pneumonia
* Rickettsial infection
* Chlamydia infection
* Urinary tract infection
* Bacillary infection
* Plague
* Sexually transmitted diseases

**Dose:-** 1-2 g daily in 4 divided doses

**Route of administration**- Oral

**Major adverse effects**:- Anaphylaxis, acute hepatic dysfunction, skin rash, dermatitis, fever,

retardation of bone growth and tooth discolouration.

**Q.6 Lactobacillius is combined with antibiotics.**

* Lactobacillus is a useful bacteria and is normally present in GIT.
* Antibiotics may destroy the normal G.I flora which causes opportunistic pathogens to grow and that can lead to diarrhea.
* Lactobacilli are given to restore the normal G.I flora and to avoid the diarrhea.
* Lactobacillus prevents overgrowth of pathogenic bacteria.
* Lactobacillus improves patient compliance for antibiotics, hence ensures completion of treatment.

**Q.7 Chloramphenicol should not be given to premature babies**.

* In premature babies, the metabolic & excretory systems are not fully developed & hence the body cannot metabolize & excrete the chloramphenicol.
* It causes respiratory depression and circulatory collapse in infants due to cumulative effect.The body becomes gray in colour due to lack of oxygen,called as gray baby syndrome.So chloramphenicol should not be given to premature babies.

**Q.8 Frequent blood cell counting is essential during prolonged Chloramphenicol therapy**

* It causes bone marrow depression, agranulocytosis and aplastic anemia.
* It causes respiratory depression and circulatory collapse in infants due to cumulative effect.
* The body becomes gray in colour due to lack of oxygen,called as gray baby syndrome.
* So to keep the continuous record of R.B.C whether the count is affected by chloramphenicol or not, Frequent blood cell counting is essential during prolonged Chloramphenicol therapy

**Q.9 Chloraphenicol therapy is supplemented with haematinic or iron preparation**

* It causes bone marrow depression, agranulocytosis and aplastic anemia.
* To overcome this effect and to promote erythropoiesis process, haematinic or iron preparations are supplemented with chloramphenicol therapy.

**Q.1 What isTuberculosis? Explain its chemotherapy.**

**Ans:** Tuberculosis is an infectious disease caused by several species of Mycobacteria. It’s a systemic disease & the commonest form is chronic pulmonary tuberculosis. Symptoms include chest pain and a productive, prolonged cough.

**Chemotherapy:(2.5 mark)**

***Agents used for treatment are of 2 types:***

1. Standard drugs used in initial treatment/1st line drugs:

* Streptomycin
* Isoniazide
* Rifampicin
* Para amino salicylic acid(PAS)

1. Reserve drugs used in resistant cases/2nd line drugs:

* Pyrazinamide
* Kanamycin
* Viomycin

***Frequently used combinations are (2 drug & 3 drug regimen):***

* Rifampicin + INH
* Ethambutol + INH
* Rifampicin + INH + Pyrazinamide
* Rifampicin + INH + Pyrazinamide + Ethambutol

***Short course chemotherapy includes***

Rifampicin + INH + Pyrazinamide for 2 months & then Rifampicin + INH for next 4 months.

Ethambutol or Streptomycin may also be added.

**Q.2 Why anti T.B. drugs are given in combination explain.**

**Ans:** Anti TB drugs are given in combination because : ( 3.5 MARKS)

i) Resistance to antiTB drug is developed quickly if used as single drug.

ii) Combination therapy reduces bacterial load effectively and quickly.

iii) Combination therapy gives synergistic effect.

iv) Side effects are lesser with combination than with single drug used in high dose.

**Q.3 What are carcinogens? Classify antineoplastics (Anti cancer)(1+2)**

**Carcinogens**:- The agents which cause cancer are called carcinogens.

**Classification**

1. Alkylating agents:

a) Nitrogen mustards:-Cyclophosphamide, chlorambucil

b) Alkyl sulfonates:- Busulfan

2. Antimetabolites:

a) Folic acid antagonist:- Methotrexate

b) Purine antagonist:- 6 Mercaptopurine

c) Pyrimidine antagonist:- 5 fluorouracil

3. Radioactive isotopes:- Radioiodine, Radiophosphorus

4. Antibiotics:- Mitomycin, Actinomycin D

5. Hormones:- Androgen, Estrogen

6. Enzymes: – L- asparaginase

7. Miscellaneous

a) Vinca alkaloids- Vincristine, vinblastine

b) Others- Cisplatin, hydroxyurea

**Q.4 Define Anthelmintic and Vermifuge.**

**Ans:** **Anthelmintic:** Are the agents used to treat the helminthiasis (worm infestation) Eg: Piperazine, mebendazole, albendazole, pyrantal pamoate etc

**Vermifuge:** These are the pharmacological agents which cause paralysis of intestinal parasitic Worms / heliminths & expel them out in the faeces. E.G Piperazine,tetramisol, pyrantel pamoate

**Q.5 Anthelmintics are administered with purgatives.**

* Anthelmintics are either wormicidal or wormifugal in action.
* Thus after killing or paralyzing these worms by anthelmintic agent, these should be expelled out from the intestine.
* Hence purgatives are advised as supportive treatment with anthelmintics.
* Thus combination acts synergistically.

**Q.6 What is Helminthiasis? Why Piperazine is supplemented with purgatives? (1+2.5)**

* Helminthiasis is the disease caused by the infestation by the worms.
* Piperazine paralysed the worm.
* The paralysed worm should be expelled out from intestine.
* Purgatives are the agents which evacuate the bowel, hence purgatives are advised as supportive treatment with anthelmintics.

**Q.7 Define and classify anti malarials.**

**Ans:** Agents are used in the treatment of malaria.

**Classification:**

1. Cinchona alkaloid: Quinine
2. 4-aminoquinolines: Chloroquine, hydroxylchloroquine
3. 8-aminoquinolines: Pamaquine, Primaquine
4. Acridine: Mepacrine
5. Biguanides: proguanil
6. Diamidopyrimidnes: Pyrimethamine
7. Miscellaneous: Mefloquine

Classification of Antihypertensive drugs (According to site of action):

1. Centrally acting Drugs: Clonidine, Methyl Dopa

2. Drugs acting on autonomic ganglia: Hexamethonium

3. Drugs acting on post ganglionic sympathetic nerve endings

a) Adrenergic neuron blockers; Guanethidine

b) Catecholamine depletors: Reserpine

4. Drugs acting on adrenergic receptors:

a)Alpha adrenergic blockers: Phentolamine

b) Beta adrenergic blockers: Propranolol

5. Vasodilaors: Hydralazine

6. Drugs acting reflexly by stimulating baroreceptors: Veratrum

7. Oral Diuretics: Thazides, Frusemide, spironolactone, amiloride etc

8. Calcium Channel Blockers: Nifedipine, Amlodipine, Felodipine

9. Drugs acting on rennin angiotensin system:

a) ACE inhibitors: Enalapril, ramipril

b) Angiotensin Receptor Blockers: Losartan, Telmisartan

10.Miscellaneous: MAO inhibitors (Pargyline)

**Objective**

1. **Name the drug of choice in the following conditions.(0.5 marks for any one example)**
2. **Gonorrhoea:** Ceftriaxone, Penicillin G, Sulpha drugs
3. **Syphilis**: Penicillin
4. **Typhoid**:- Chloramphenicol, Ampicillin, Ciprofloxacin etc
5. **Leprosy:**- Dapsone (4-4 diamino diphenyl sulphone DDS)
6. **Congestive heart failure(CCF):** Digoxin, amrinone,milrinone,ouabain
7. **Angina pectoris:-** Glyceryltrinitrate
8. **Atherosclerosis:-** Atorvastatin (All statins & other hypolipidemics)
9. **Obesity:-** Amphetamine
10. **Leukemia:**- 6 mercaptopurine / Chlorambucil / Busulphan
11. **Helminthiasis:**- Piperazine, mebendazole,albendazole, pyrantel pamoate etc
12. **Trichomoniasis:**- Metronidazole
13. **Candidiasis**: – Nystatin

**B. Name of drug which produce following effects (0.5 mark each for one correctly written**

**drug)**

1. **Teratogenecity**:- Tetracycline
2. **Anaphylactic shock:-**  Penicillin, Cephalosporins
3. **Gray baby syndrome:-** Chloramphenicol
4. **Bone and teeth deformity:-** Tetracycline
5. **Ototoxicity:-** Streptomycin, Kanamycin
6. **Damage to auditory nerve:** Strptomycin, Kanamycin
7. **Cinchonism:-** Quinine, Quinidine
8. **Tinnitus:-** Quinine, Quinidine
9. **Hypoglycemia:-** Insulin / oral hypoglycemic agents
10. **Alopecia:-** Anticancer drugs, Heparin
11. **Anorexia:-** Amphetamine
12. **Drowsiness:-** Acetazolamide, spirinolactone
13. **Crystallurea:-** Sulfonamides
14. **Emesis:**- Morphine / Apomorphine / Ipecacunha / Sodium chloride

**C. State the important side effect of following drugs: (o.5 marks each)**

1. **Quinine:-** Cinchonism

**2. Penicillin:-** Anaphylactic shock

**3. Propranolol:-** Postural hypotension, bradycardia

**D. Name the Drug contraindicated in the following conditions: (0.5 mark each)**

1. **Pregnancy: -** Tetracycline, Chloramphenicol, Morphine, Thalidomide
2. **Renal failure:** Sulfonamides
3. **Hyperthyroidism:** Adrenaline
4. **Congestive Cardiac Failure:** Quinidine
5. **Intestinal obstruction:** loperamide, Atropine / Morphine
6. **G6PD deficient patient -** Chloroquine, sulpha drugs, dapsone. Quinolones
7. **Hypertension -** Adrenaline, other sympathomimetics
8. **Hypokalemia -** Digitalis, Thiazide Diuretics

**E. Give the dose of each drug (any one correct dose:0.5 marks each)**

1. Tetracycline - 1-2 g daily in 4 divided doses Oral

2. Ranitidine - 150-300mg 1-2 times daily for 4-8 weeks

3. Furosemide - 20-80mg orally/20-4-mg IV

4. Sulfamethaoxazole - 400 mg,800 mg orally

5. Rifampicin: Daily dose of 10mg/kg orally

6. Omeprazole – 20 – 40 mg orally daily before meal

7. Amoxycillin - 250- 500 mg thrice a day orally

8. Mebendazole: 100 mg twice daily for 3 consecutive days (oral)

9. Trinitroglycerine: 0.3- 0.6 mg every 8-12 hrs.(sublingual)

10. Streptomycin: 0.75-1 gm daily (I.M.) / 0.5—2gm daily in divided doses (Oral)

11. Ranitidine - 150-300mg 1-2 times daily for 4-8 weeks

12. Dapsone -first week 100mg daily, next 4 weeks 25mg twice a weekly. 5th and 6th

week 50mg twice a week, thereafter 100mg thrice a week. 7th and 8th

week-100mg twice a week thereafter 100mg thrice a week