**Subject Title: Pharmacology and toxicology** Subject Code: 0813

**Important Instructions to examiners:**

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for anyequivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

| Q. No. | Sub Q. N. | | Marking Scheme |
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| **1** | | **Answer any EIGHT of the following:** | **16M** |
| **1** | **a)** | **Explain the terms pharmacokinetics and plasma expanders.**<br><br>**Pharmacokinetics:** It is the study of movement or passage of drug across the body. It is what body does to the drug. It includes study of Absorption, Distribution, Metabolism & Excretion (ADME) of drug.<br><br>**Plasma expanders:** These are pharmacological agents with high molecular weight when administered parenterally remain in blood stream and increase circulatory fluid volume by exerting an osmotic pressure.<br><br>**Examples:** Dextran, gelatin 6% solution, PVP, Physiological saline acts as plasma expanders. | **1M EACH** |
| **1** | **b)** | **Define following:**<br><br>**i) Oral hypoglycaemic agents:** These are the pharmacological agents used in treatment of diabetes mellitus,are given by oral route & help in lowering elevated blood sugar level.<br><br>**Examples**: Tolbutamide, Metformin,glimepiride,gliclazide,pioglitazone etc<br><br>**ii) Antiseptic:** These are the agents which are used to prevent or inhibit the growth of microorganisms and can be applied to living tissues.<br><br>**Examples:** Phenol, Potassium permanganate, Boric acid, Crystal violat,alocohol etc. | **1M EACH** |
| **1** | **c)** | **Mention the drug of choice in the following condition:**<br><br>**i) Pernicious anaemia:** Vitamin B12, Folic acid<br><br>**ii) Leukemia:** 6 mercaptopurine , Chlorambucil , Busulphan<br><br>**iii) Syphilis:** Penicillin, tetracycline, doxycycline<br><br>**iv) Glaucoma:** Pilocarpine, Timolol, Betaxalol, Physostigmine, Acetazolamide, Mannitol. | **0.5 M EACH** |

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| **1** | **d)** | **Mention adverse effect of each of the following drug.**<br>**i) Streptomycin:** Ototoxicity, skin rash, dermatitis, aplastic anaemia, nephrotoxicity,teratogenicity<br>**ii) Diphenhydramine:** Blurred vision, dry mouth, sedation<br>**iii) Phenformin:** Gastrointestinal upset, anorexia<br>**iv) Morphine: Respiratory depression,**Euphoria, Mental clouding,addiction | **0.5 M EACH** |
| **1** | **e)** | **Mention therapeutic use of each of the following drug:**<br>**i) Griseofulvin:** As antifungal (dermatophytic) (Used in fungal infections)<br>**ii) Xylometazoline:** As nasal decongestants (used to treat nasal congestion)<br>**iii) Streptokinase:** Thrombolytic agent (used to treat thromboembolism )<br>**iv) Mebendazole:** As anthelmintic(in treatment of helminthiasis/worm infestation) | **0.5M EACH** |
| **1** | **f)** | **Mention dose of each of the following drug.**<br>**i) Ranitidine:** 150-300mg 1-2 times daily for 4-8 weeks<br>**ii) Ibuprofen:** 200 to 400 mg t.i.d.<br>**iii) Verapamil:** 40 to 80 mg mg t.i.d.<br>**iv) Amphetamine:** 5 mg to 60 mg daily in divided doses | **0.5M EACH** |
| **1** | **g)** | **Mention route of administration of the following drug.**<br>**i) Nitroglycerine:** Sublingually/oral /parenteral /topical<br>**ii) Insulin:** Parenteral (Subcutaneous)<br>**iii) Paraldehyde:** Intramuscular, Rectal (enema), oral<br>**iv) Sulphacetamide:** Opthalmic, Topical, | **0.5M EACH** |
| **1** | **h)** | **Mention the drug which produces following adverse effect:** | **0.5M EACH** |

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| | | **i) Anaphylactic shock: Beta lactam antibiotics like** Penicillin G injection,and<br>**ii ) Black water fever:** Quinine<br>**iii) Methaemoglobinemia:** Aspirin, Paracetamol, Trimethoprim, Dapsone, Benzocaine, Aniline dyes<br>**iv) Postural hypotension:** Propranolol,imipramine like TCAs,nitrates etc | |
| **1** | **i)** | **Explain triple response of histamine**<br><br>When histamine is applied locally or injected intradermally on skin, histamine produces a typical response known as "triple response" which is characterized by three distinct signs:<br>**i. Flush-** it is redness at the site of application because of hyperemia.<br>**ii. Flare-** Patch formation in the vicinity of 1.5 cm of flush occurs due to vasodilation & this is called as flare.<br>**iii. Wheal-** around 1.5cm of flare permeation of fluid occurs, raising the surface and its called as wheal (swelling formation) | **2M** |
| **1** | **j)** | **Mention the drug which is contraindicated in following condition:**<br><br>**i) Oedema:** Estradiol, NSAIDs, All steroids etc.<br>**ii) Insomnia:** Analeptics like Caffeine, Amphetamine etc.<br>**iii) Constipation:** Morphine, Atropine etc.<br>**iv) Photophobia:** Ibuprofen, Methotrexate, Tetracycline etc. | **0.5M EACH** |
| **1** | **k)** | **Explain mechanism of action of acetazolamide**<br><br>Acetazolamide produces diuretic action by carbonic anhydrase inhibition in kidney. Due to carbonic anhydrase inhibition, $H^+$ ions are not produced. This reduces reabsorption of $Na^+$. Bicarbonate ions are also excreted in urine. It acts as self-limiting diuretic. | **2M** |
| **1** | **l)** | **Give reason- In treatment of myasthenia gravis atropine is used along with neostigmine.**<br>• Myasthenia gravis is the disease characterised by skeletal muscle weakness. Skeletal muscles have nicotinic group of receptors<br>• Neostigmine being a parasympathomimetic, acts on both muscarinic as well as nicotinic receptor. | **2M** |

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| | | • When neostigmine is used in treatment of myasthenia, it produces nicotinic action on skeletal muscle, which is desired therapeutic action but at the same time it produces several side effects on heart,smooth muscles,secretions by acting on muscarinic receptors<br>• To mask these unwanted muscarinic actions of neostigmine, an anticholinergic, anti-muscarinic atropine is administered with neostigmine. | |
| **2** | | **Attempt any FOUR of the following** | **12M** |
| **2** | **a)** | **Give symptoms and treatment of belladona poisoning.**<br>**Symptoms:**<br>Dryness of mouth, marked thirst, increase in body temp, weak pulse, Some central effects are restlessness, confusion, hallucination, Convulsions, coma, blurred vision<br>**Treatment:**<br>i) Gastric lavage: - to remove unabsorbed poison should be done if poisoning is through oral route.<br>ii) The patient should be kept in dark quiet room<br>iii) Cold sponging or ice bags are applied for reducing body temperature<br>iv) Physostigmine 1-3mg S.C.or I.V.antagonizes both central and peripheral effects<br>v) Catheterization in case of urine retention<br>vi) IV fluids if necessary, artificial respiration. | **1M Symptom 2M Treat** |
| **2** | **b)** | **State the factors modifying drug absorption and explain any two of them**<br>- Physical state of drug<br>- Particle size<br>- Diffusion rate of drug-<br>- Absorbing surface area<br>- Functional integrity of GIT<br>- pH of drug and pH of GIT<br><br>**Physical state of drug:** Liquid dosage forms absorb faster than solid dosage form.<br>**Particle size:** Smaller the particle size greater is the absorption. | **1M factors 1M Each For any two Expl.** |

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| | | **Diffusion rate of drug-** Diffusion rate is directly proportional to lipid solubility of drug<br>**Absorbing surface area:** Larger the surface area better is the absorption. Drugs better absorbed from small intestine than stomach.<br>**Functional integrity of GIT:** Increase in peristalsis (increase GI motility) reduces residence time of drug in GIT so reduced absorption, as in case of diarrhoea<br>**pH of drug and pH of GIT:** Weakly acidic drugs remain unionized in acidic pH of stomach and are better absorbed in the stomach. Weakly basic drugs remain unionized in alkaline pH of the intestine and are better absorbed from the intestine. Strongly acidic and basic drugs do not get absorbed well from GIT. | |
| **2** | **c)** | **Define excretion. Enlist different routes of excretion of drug with at least two examples of each.**<br>**Definition:**<br>The process of elimination of drugs from the body is called as excretion<br>Important Channels of drug excretion are Kidneys ,Lung, Intestines ,Skin, Bile, Saliva & milk<br>**Kidneys:** Most of the drugs are excreted in urine<br>Weak acids are quickly excreted in alkaline urine & vice versa. Ex. Penicillin, salicylic acid<br>**Lungs:** Excretion of gaseous inhalants.<br>Volatile general anesthetics, alcohol, paraldehyde.<br>Easily detected by breath smell<br>**Intestines**: Purgatives like senna are partly excreted in intestine<br>Heavy metals also through faeces.<br>**Skin:** Metalloids like arsenic, lead<br>**Saliva & milk**: Antibiotics, sulphonamides, morphine excreted in milk.<br>**Bile:** Erythromycin, novobiocin eliminated in bile & reabsorbed in intestine. It prolongs the action. | **1M Def.**<br>**1M Routes**<br>**1M Ex.** |
| **2** | **d)** | **Classify various routes of administration of dug. Give advantages and disadvantages of oral route.**<br>**1.Enteral:**<br>Oral | **1M Routes**<br>**1M for any two adv. & Disadv.** |

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| | | Sublingual<br><br>Rectal<br><br>**2.Parenteral:**<br><br>**Injections:**<br><br>Intravenous,Intraarterial,Intramuscular,Subcutaneous,Intraperitoneal,Intrathecal,<br><br>Intramedullary ,Intraarticular<br><br>**Inhalations**<br><br>**3.Local**<br><br>**Advantages of oral route:**<br>1. It is simple and most convenient.<br>2.Self-medication is possible<br>3.It is cheaper<br>4. No complications<br><br>**Disadvantages of oral route:**<br>1.Slow onset of action<br>2.100% absorption is not possible &bioavailability is variable & get affected by presence of food, other drugs<br>3. The irritant and unpalatable drugs can't be given.<br>4. In case of severe vomiting or in unconsciousness, uncooperative patient ,oral route can't be used.<br>5. Few drugs which cannot be absorbed from GIT are not given by this route.<br>6.Drugs which get degraded in GIT can't be given .e.g Insulin | |
| **2** | **e)** | **Tetracycline is contraindicated in pregnant women and children.**<br><br>• Tetracyclines are teratogenic drugs and cross the placental barrier when taken by pregnant females.<br>• It complexes the calcium and makes it unavailable for foetal development which results in bone deformity, staining of teeth etc | **3M** |

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| | | • Tetracyclines if taken by children, lead to bone deformity and affect the overall skeletal growth.<br>• It affects the deciduous and permanent teeth formation in children.<br>• Hence it is contraindicated in pregnant women and children. | |
| **2.** | **f)** | **Explain how following factors affect drug action:**<br>**i) Sex:**<br>Females require smaller doses of drugs due to their lesser body weight. Drug must be administered with due care in females during menstruation, pregnancy or lactation.<br>**ii) Cumulation:**<br>If excretion rate of particular drug is slow, its repeated administration may built up high concentration in plasma, which is termed as cumulation.<br>Eg: Phenobarbitone in epilepsy treatment, digitalis in CCF<br>**iii) Time of administration:**<br>**Time in relation with food:**<br>Some of the drugs are advised to be taken on empty stomach to get quick action, or to avoid interference of food or to prevent destruction of drugs by digestive enzymes eg: antibiotics like penicillin, tetracycline<br>Most of the drugs are advised to be taken after meal so as to reduce risk of gastric irritation, nausea and vomiting eg salicylates and derivatives<br>**Time in relation with side effects:**<br>Diuretic like drugs should be taken in morning and should not be taken at night as it can cause frequent urination during night | **1M EACH** |
| **3** | | **Attempt any FOUR of the following** | **12M** |
| **3** | **a)** | **What is absorption? Explain active transport process of absorption.**<br>Absorption of drugs means entry of drug in the blood circulation.<br>**ii) Active transport-** it is the transfer of drug against concentration gradient and needs energy. It is carried by specific carrier protein. Compound binds to a specific carrier on one side of the membrane and moves across the cell. The complex then dissociates and the carrier moves back to transport another molecule.<br>Ex. Iron, Sugars , Amino acid , Levodopa etc. | **1M define**<br>**2M Expl.** |
| **3** | **b)** | **What is drug antagonism? Explain pharmacological antagonism with suitable** | **1M Def.** |

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| | | **examples.**<br>The opposite action of two drugs on the same physiological system is called as Antagonism.<br>**1) Antagonism at receptor level:-**<br>a) Reversible/ competitive antagonism – the agonist and antagonist compete for Same receptors. By increasing the concentration of agonist the antagonism can be overcome. It is reversible<br>Eg – Acetylcholine and atropine compete with each other at receptor site.<br>b) Irreversible antagonism – Antagonist bids by covalent bonds to the receptor and it dissociates very slowly or not at all. So it blocks action of agonist and blockade cannot be overcome by increasing the dose of agonist so irreversible.<br>Ex. Adrenaline and Phenoxybenzamine at alpha adrenergic receptors.<br>**2) Noncompetitive antagonism:**<br>The antagonist block at the level of receptor effector linkage that is at a different site beyond the receptor and not on the receptor.<br>Ex. Verapamil blocks cardiac calcium channels and inhibits entry of calcium during depolarization so antagonizes effect of Isoprenaline and Adrenaline. | **2M Expl.** |
| **3** | **c)** | **Define analgesics and antipyretics. Explain why aspirin is not used in patient with peptic ulcer.**<br>**a)Analgesics:-**<br>These are the drugs which are used for suppression of pain.<br>**b)Antipyretics:-**<br>These are the agents which reduce the elevated body temperature.<br><br>**Aspirin is not given in peptic ulcer.**<br>1. In peptic ulcer, there are lesions in the stomach, associated bleeding and pain.<br>2. Aspirin causes irritation to stomach, gastric erosion, gastritis, gastric ulcer and G.I bleeding.<br>3. Thus aspirin can worsen the condition of peptic ulcer and hence should not be given. | **1M EACH** |
| **3** | **d)** | **Define local anaesthetics. Discuss various methods of producing local anaesthesia.**<br>Definition: Local anaesthetics are pharmacological agents which when applied or | **1M Def. 2M Methods** |

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| | | injected, block the conduction as well as generation of impulses in localized area and bring loss of sensation without affecting degree of consciousness.<br>OR<br>They are the compounds that when applied in appropriate concentration, block nerve conduction in the area of application.<br>Examples: cocaine, lignocaine, benzocaine etc.<br>**Methods of producing local anaesthesia**-<br>**(I) By paralyzing of nerve endings:**<br>i) Application to mucus surface, skin, wounds ( surface anaesthesia): In this case the LA is just applied on the skin or mucus membrane.<br>ii) By hypodermic injection: LA is injected under the skin layer.<br>iii) By infiltration: Here LA is injected first intradermally, then subcutaneously and then into deeper tissues.<br>**(II) By blocking the sensory impulse:**<br>i) Block anaesthesia: Here the LA is injected close to nerve trunk<br>ii) By spinal anaesthesia: The LA is introduced after lumbar puncture<br>iii) By caudal anaesthesia: The LA is injected into epidural space. | |
| **3** | **e)** | **Define anti-parkinsonian drugs. Write the mechanism of action of Levodopa.**<br>**Anti-parkinsonian drugs**:- The dopaminergic or central antimuscarinic drugs which restore balance between excitatory cholinergic and inhibitory dopaminergic nerve impulses at basal ganglia to reduce muscle rigidity and used in parkinsons disease.<br>**Mechanism of Levodopa**:<br>Dopamine is stored and released as a neurotransmitter in dopaminergic neurons. But cannot cross blood brain barrier. Levodopa is precursor of dopamine. Levodopa crosses blood brain barrier and is converted to dopamine by action of DOPA Decarboxylase. Hence it improves the symptoms of Parkinson's disease. | **1M Def.**<br>**2M MOA** |

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| **3** | **f)** | **Give the differences between Drug habituation and Drug addiction.** | **3M** |

| Drug habituation | Drug addiction |
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| It is a condition resulting from repeated administration of a drug | It is a state of periodic or chronic intoxication produced by repeated consumption of a drug. |
| There will be desire but not compulsion to continue taking the drug for the sense of well-being. | There will be overpowering desire to continue taking the drug and obtain it by any means. |
| Little or no tendency to increase the dose. | There is a tendency to increase the dose. |
| Some degree of psychic dependence but absence of physical dependence and hence of an abstinence syndrome | A psychological and generally a physical dependence on the effect of the drug |
| If any detrimental effect, it is on the individual. Ex. Tea, Coffee. | The effect is detrimental to the individual and to the society. Ex. Alcohol, Narcotics, Nicotine. |

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| **4** | | **Attempt any FOUR of the following:** | **12M** |
| **4** | **a)** | **Write symptoms and treatment of Acute barbiturate poisoning.** | **1M Sym. 2M Treat.** |

**Symptoms** –

Marked excitement, renal failure, pulmonary oedema, cardiac irregularities, cold skin, paralytic dilation of pupil, weak but rapid pulse, respiratory failure.

**Treatment –**

1) If patient is conscious and within 4 hrs. of ingestion, patient can be induced vomiting with concentrated salt solution or syrup of ipecac. If patient is unconscious, simple stomach wash i.e. 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

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| | | excretion of barbiturates.<br>4) Alkalinization of urine – Sodium bicarbonate is used for alkalinization of urine which helps in excretion of barbiturates.<br>5) Prophylactic antibiotics – To prevent infection, antibiotics are used in case of catheterization or tracheostomy<br>6) Administration of IV fluids –Forced diuresis may result in dehydration. So, administration of fluids is advised. | |
| **4** | **b)** | **Classify purgatives with examples. Give mechanism of action of castor oil as purgative.**<br>**Classification:**<br>**I) Stimulant or Irritant purgative**<br>(a) Anthracene group-e.g. Rhubarb, Senna. Aloe. Cascara<br>**(b)** Castor oil<br>(c) Bisacodyl can be given by mouth or as suppository<br>**II) Bulk Purgative:**<br>(a) Saline Laxatives-e.g .Magnesium sulphate, Sodium potassium tartarate, Potassium phosphate,<br>(b) Methyl cellulose, Sodium carboxy methyl cellulose, Plantago , Agar Agar<br>**III) Lubricant / Emollient Purgative:** e.g Liquid paraffin , Dioctyl sodium sulphosuccinate<br>**Mechanism:-**<br>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. | **2M Class. 1M MOA** |
| **4** | **c)** | **d) What is status asthmaticus? Give its treatment.**<br>• Serious medical emergency due to severe persistent asthmatic attack associated with respiratory failure or insufficiency. It is a medical emergency and needs hospitalization.<br>**Treatment:**<br>• Careful administration of oxygen, salbutamol nebulizer, oral corticosteroids. | **1M Def. 2M Treat.** |

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| | | • If poor response patient is hospitalized. Repeat salbutamol nebulizer every 30 minutes. IV corticosteroids, IV aminophylline or salbutamol, antibiotics are used. If still serious shift to I.C.U.<br>• In case of chronic persistent asthma the drugs should be taken in rotation. Salbutamol & orciprenaline during acute attacks & then corticosteroids. | |
| **4** | **d)** | **Define and give two examples of Anthelmintic. Why purgatives are administered with Anthelmintic.**<br>**Anthelmintic:** These are the agents used in treatment of helminthiasis, infestation of worms.<br>Ex. Piperazine,Pyrantel pamoate, Albendazole , Mebendazole,etc.<br>**Why purgatives are administered with Anthelmintic.**<br>Anthelmintics are either wormicidal or wormifugal in action.<br>Thus after killing or paralyzing these worms, worms should be expelled out from intestine. Purgatives are the agents which evacuate the bowel; hence purgatives are advised as supportive treatment with anthelmintics. | **1M Def.**<br>**1M**<br>**Any two**<br>**Ex.**<br>**1M GR** |
| **4** | **e)** | **Define anti-arrhythmic drugs. Patients of atrial fibrillation are digitalized before giving quinidine, Why?**<br>**Antiarrhythmic agents:-**<br>These are the agents used to correct cardiac arrhythmia i.e. disturbance in cardiac rhythm.<br>Eg: Quinidine, Procainamide, Propranolol, Lignocaine, Phenytoin, etc.<br><br>Digitalis corrects heart failure associated with fibrillation. Quinidine therapy alone may lead to rapid ventricular rate during conversion of fibrillation of normal sinus rhythm. In atrial fibrillation where many ventricular premature beats are present, digitalis helps to slow ventricular rate while quinidine abolishes premature beats.<br>(Digitalis and Quinidine both can cause conduction block) | **1M def.**<br>**2M GR.** |
| **4** | **f)** | **Define Diuretics. Why diuretics are used along with anti-hypertensive drugs.**<br>**Diuretics:** These are the pharmacological agents which when administered, increase rate of formation of urine as well as excretion of urine.<br>**Antihypertensives are given along with diuretics**.<br>Excess plasma sodium and fluids are present in hypertension. Diuretics inhibit reabsorption of sodium and its equivalent osmotic amount of water and causes its excretion.. This causes decrease in plasma fluid which decreases BP. Diuretics also cause | **1M Def.**<br>**2M GR.** |

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| | | vasodilation and decreases BP.<br>Therefore, antihypertensives are given with diuretics. | |
| **5** | | **Attempt any FOUR of the following:** | **12M** |
| **5** | **a)** | **Describe mechanism of action & give therapeutic uses of Digitalis.**<br>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:<br>Digitalis blocks Na+ -- K+ ATPase enzyme<br>↓<br>Increases Na+ level<br>↓<br>Activates sarcoplasmic reticulum, also stimulates Na-Ca exchange<br>↓<br>Releases Ca++<br>↓<br>Increase intracellular calcium<br>↓<br>Combines with cardiac muscles<br>↓<br>Causes forceful contraction<br>↓<br>Leads to complete emptying of heart.<br>Thus relieves congestion It restores myocardial function. Thus heart can do work with less energy expenditure.<br>**Therapeutic Uses Of digitalis**:<br>It is useful in<br>Congestive cardiac failure<br>Left ventricular failure<br>Paroxysmal supraventricular tachycardia<br>Atrial fibrillation<br>Atrial flutter | **2M**<br>**MOA**<br>**1M**<br>**Uses** |
| **5** | **b)** | **Define oral contraceptives. Explain different types of oral contraceptives.**<br>**Oral contraceptives**: Are the orally administered agents used for reversible suppression of fertility or agents used for preventing conception.<br>**Types: - Pills are hormonal or non-hormonal.**<br>1.Combined Pills :Regular contraceptive pill, which contain estrogen and progestin and | **1M Def.**<br>**2M Expl.** |

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| | | commonly used pills are taken from 5th day of menstruation for 21 days<br>2. Mini Pills: Which contain only progestin<br>3. ECPs (Emergency Contraceptive pills):contains Levonorgestrel .,to be taken only as an emergency, within 72 hours of unprotected sex.<br>4. Centchroman: Non-hormonal pill, to be taken initially twice a week followed by once in a n week | |
| **5** | **c)** | **Define & classify antineoplastic drugs with examples.**<br>**Definition:** Antineoplastic drugs describe a group of medicines that contain chemicals which are toxic to cells, preventing their replication or growth, and so are used to treat cancer.<br>**Classification with examples:**<br>**I. Alkylating agents:**<br>• Nitrogen mustards:E.g.: Chlorambucil, Mechlorethamine<br>• Ethylenimines:E.g.: Triethylenemelamine, Triethylenethiophosphamide<br>• Alkylsulphones:E.g. : Busulphan<br>**II. Antimetabolites:**<br>• Folic acid antagonists:E.g.: Methotrexate<br>• Purine Antagonist:E.g.: 6-mercaptopurine<br>• Pyrimidine Antagonist:E.g.: 5-Flurouracil, Cytosine<br>**III. Radioactive Isotopes:** E.g.: Radioiodine, Radiophosphorous<br>**IV. Antibiotics:** E.g.: Actinomycin-D, Mitomycin<br>**V. Hormones:** E.g.: Androgens, Estrogens, Corticosteroids<br>**VI. Enzymes:**E.g.: L-asparginase<br>**VII. Vinca alkaloids:** E.g.: Vincristine, Vinblastin<br>**Miscellaneous Agents:**E.g.: Hydroxyurea, Cis-platin | **1M Def.**<br>**2M Class.** |
| **5** | **d)** | **Give primary goals & different regimens used in treatment of tuberculosis.**<br>**Goals of TB Treatment**<br>1.To treat M. tuberculosis infection to cure the patient | **1M Goals**<br>**2M Regimens** |

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| | | 2.Prevention of the development of drug resistance<br>3..Preventing relapse of disease<br>4.Prevention of M. tuberculosis transmission<br>**Different regimens used:**<br>**Frequently used combinations are:**<br>Rifampicin + INH<br>Ethambutol + INH<br>Rifampicin + INH + Pyrazinamide<br>Rifampicin + INH + Pyrazinamide + Ethambutol<br>**Short course chemotherapy includes**<br>Rifampicin + INH + Pyrazinamide for 2 months & then Rifampicin + INH for next 4 months. Ethambutol or Streptomycin may also be added. | |
| **5** | **e)** | **Write mechanism of action & therapeutic uses of penicillin**.<br>**Mechanism of action:** Penicillin act by interfering with cell wall mucopeptide synthesis so that organisms explode from internal pressure. Thus it is bactericidal in nature.<br>It is effective against multiplying organisms as resting organisms are not making new cell wall. It doesn't interfere with tissue cell wall synthesis in humans.<br>**Therapeutic Uses:**<br>Useful in streptococcal, pneumococcal, staphylococcal infections.<br>Useful in treatment of respiratory tract infections Pneumonia, Pharyngitis, Diphtheria etc.<br>Useful in treatment of venereal diseases like Syphilis, Gonorrhoea.<br>Used in Meningitis, endocarditis ,rheumatic heart condition | **1.5 M EACH** |
| **5** | **f)** | **What are anticoagulants? Classify them. Give mechanism of action of Warfarin Sodium**<br>Anticoagulants are the chemical substances that prevent or reduce coagulation of blood, prolonging the clotting time.<br>**Classification:**<br>**In Vitro anticoagulants**: Oxalic acid, Sodium citrate, Sodium Edetate, Heparin<br>**In Vivo anticoagulants:**<br>**Oral:**<br>Coumarin derivatives: Warfarin,acenocoumarol<br>Indanedione Derivatives: Phenindione | **1M EACH** |

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| | | **Parenteral:**<br>Heparin, Heparin derivatives, Hirudin etc<br>**Mechanism of action of Warfarin Sodium:**<br>It acts by interfering with synthesis of vitamin K dependent clotting factors in the liver. | |
| **6** | | **Attempt any FOUR of the following:** | **16M** |
| **6** | **a)** | **Mention different stages of general anaesthesia. Explain Surgical anaesthesia in details.**<br>Stages of anaesthesia<br>i. Stage of analgesia<br>ii. Stage of delirium or excitement<br>iii. Stage of surgical anaesthesia<br>iv. Stage of respiratory paralysis<br>**The Surgical anaesthesia** can be divided into 4 planes. Surgical procedure is done in this stage.<br>**Plane i** - reflexes controlling voluntary muscles begin to go, pupil diameter return to initial size<br>**Plane ii** - respiration becomes more regular and the eyelid reflexes are abolished.<br>**Plane iii**- there is an incomplete intercostal paralysis. thoracic movement is reduced and lags behind abdominal movement. surgery is normally carried out at this stage.<br>**Plane iv** - there is a complete intercostal paralysis. the purely abdominal breathing is rapid and shallow, pupil dilate, the cough and vomiting centres in the medulla are depressed | **1M Stages 3M Expl.** |
| **6** | **b)** | **Explain Dale's vasomotor reversal phenomenon in detail.**<br>In low doses, Adrenaline causes peripheral vasoconstriction, increase in resistance, output, and thereby rise in peripheral and systolic BP.<br>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 | **4M** |

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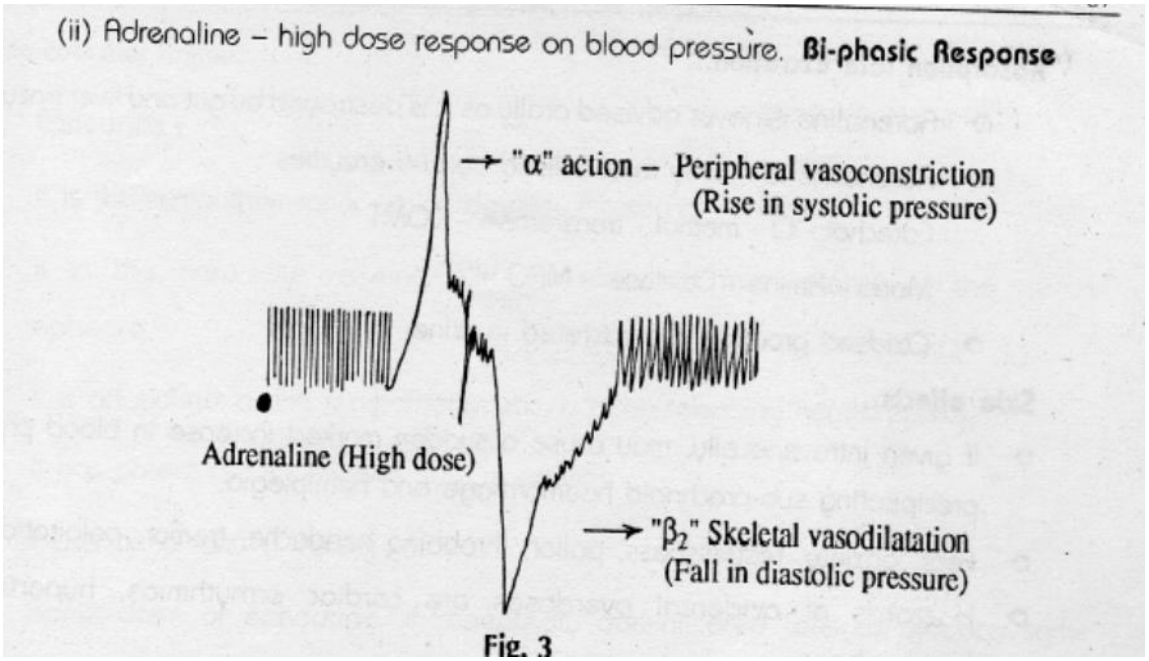
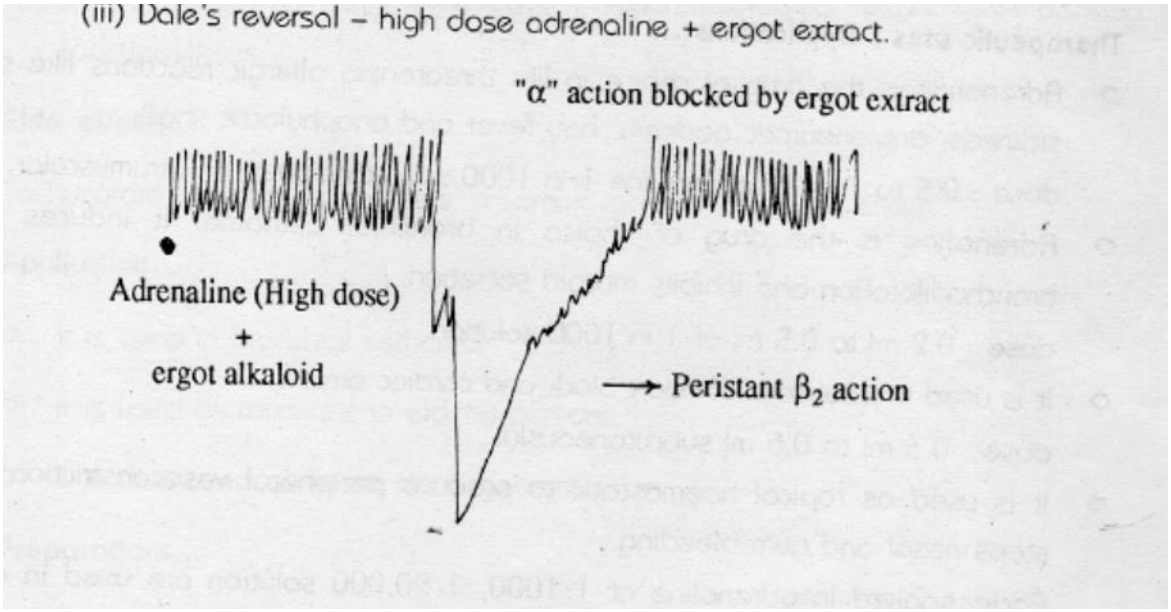
| | | response of Adrenaline is known as biphasic response.<br>Its vasoconstriction action is blocked by alpha blocker like ergotoxin, Adrenaline causes only fall in BP. This reversal action of conversion of biphasic to monphasic response on Blood pressure is called as Dale's vasomotor reversal.<br>Diagram:<br>  <br><br>Fig. 3<br>  <br> | |
| **6** | **c)** | **Give the significance of plasma protein binding in detail.**<br>On reaching the circulation most drugs bind to plasma proteins.<br>1. Only free fraction is available for action, metabolism & excretion. Protein binding may delay the drug reaching the site of action. | **4M**<br>**For any four** |

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| | | 2. Protein binding serves as reservoir of the drug& drug is released when free drug levels fall.<br>3. It prolongs the half-life & so duration of action<br>4. Many drugs may compete for the same binding sites, so drug having higher affinity may displace another from the binding sites& result in drug interactions which may lead to toxicity of the displaced drug.<br>5. Chronic renal failure & chronic liver disease result in hypoalbuminaemia with reduced protein binding leading to raised levels of free drug. | |
| **6** | **d)** | **Define & classify anti-hypertensive drugs with examples. Give the uses of propranolol.**<br>**Definition:** Antihypertensive drugs are the agents used in treatment of hypertension.<br>**Classification (According to site of action):**<br>1. Centrally acting Drugs: Clonidine, Methyl Dopa<br>2. Drugs acting on autonomic ganglia: Hexamethonium<br>3. Drugs acting on post ganglionic sympathetic nerve endings<br>a) Adrenergic neuron blockers; Guanethidine<br>b) Catecholamine depletors: Reserpine<br>4. Drugs acting on adrenergic receptors:<br>a)Alpha adrenergic blockers: Phentolamine<br>b) Beta adrenergic blockers: Propranolol<br>5. Vasodilators: Hydralazine<br>6. Drugs acting reflexly by stimulating baroreceptors: Veratrum<br>7. Oral Diuretics: Thiazides, Frusemide, spironolactone, amilorideetc<br>8. Calcium Channel Blockers: Nifedipine, Amlodipine, Felodipine<br>9. Drugs acting on rennin angiotensin system:<br>a) ACE inhibitors: Enalapril, Ramipril<br>b) Angiotensin Receptor Blockers: Losartan, Telmisartan<br>10.Miscellaneous: MAO inhibitors (Pargyline)<br>**Propranolol is used**<br>To treat tremors, angina (chest pain), hypertension (high blood pressure), heart rhythm disorders, and other heart or circulatory conditions. It is also used to treat or prevent heart attack, to reduce the severity and frequency of migraine headaches**,** and in thyrotoxicosis | **1M Def.**<br>**2M Class.**<br>**1M uses** |
| **6** | **e)** | **Classify sulphonamides. Explain by what mechanism Trimethoprim potentiates the** | **2M** |

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| | | **effects of sulphonamides.**<br>Sulphonamides can be classified as:<br>Short acting: Eg Sulphadiazine,Sulphixazole<br>Intermediate acting: Eg.Sulphamethoxazole<br>Long acting: Eg. Sulphadoxine<br>Poorly absorbed: Eg.Sulphasalazine<br>Topical: Sulphacetamide,Silver sulphadiazine<br><br>Trimethoprim has high degree of selective affinity for bacterial Dihydrofolate reductase. Sulphonamides inhibit conversion of PABA to dihydrofolic acid & Trimethoprim inhibits dihydrofolate reductase & thus prevents reduction of DHF to Tetra hydro folic acid. The two drugs thus block sequential steps in folic acid synthesis & the combination is synergistic & acts as bactericidal. The ratio of trimethoprim: sulphamethoxazole used is 1:5 to attain right plasma concentration. | **EACH** |
| **6** | **f)** | **Explain muscarinic actions of acetylcholine in detail.**<br><br>**CVS:** Acetylcholine slows down heart rate & may produce cardiac arrest.<br><br>**Blood vessels**: Ach dilates blood vessels & drops B.P.<br><br>**Other smooth muscles: Causes contraction of smooth muscles**<br><br>Gastrointestinal tract-Ach increases peristalsis<br><br>Urinary Bladder-promotes voiding of urine<br><br>Bronchial smooth muscles- contracted & may cause bronchoconstriction, apnoea.<br><br>**Glands & secretions**: Ach increases various exocrine secretions such as salivary, respiratory ,gastric secretions etc.<br><br>**Eyes**:<br><br>Causes constriction of pupil or miosis by contracting circular muscles of iris | **4M** |