



## SUMMER– 2023 EXAMINATION

## MODEL ANSWER - ONLY FOR THE USE OF RAC ASSESSORS

Subject Title: PHARMACEUTICAL CHEMISTRY- THEORY

Subject Code: 20112

**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 any equivalent 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.
- 8) As per the policy decision of Maharashtra State Government, teaching in English/Marathi and Bilingual (English + Marathi) medium is introduced at first year of AICTE diploma Programme from academic year 2021-2022. Hence if the students write answers in Marathi or bilingual language (English +Marathi), the Examiner shall consider the same and assess the answer based on matching of concepts with model answer.

Q. No.	Sub No.	Answers	Marking Scheme
1		Answer any <b>SIX</b> of the following:	30M
1	a	Name any 2 of the following:  Marking Scheme:  "Name" – means student should writes name of the drugs from that category.  <b>A. If a student has attempted any two BITS, they will receive 2.5 marks for each category. However, it is required to have at least three examples for each category.</b>  <b>OR</b> <b>B. If a student has attempted all five bits, 1M for each category. Any two examples = 1M (0.5 mark for each example)</b>  Answer:  i. <b>Haematinics</b> - Ferrous sulphate, Ferrous fumarate, Ferric ammonium citrate, Ferrous ascorbate, Carbonyl iron.  ii. <b>Antacids</b> - Aluminium hydroxide gel, Sodium bicarbonate, Calcium carbonate, Magnesium hydroxide, Magaldrate.  iii. <b>Dental Products</b> - Sodium fluoride, Calcium carbonate, Stannous fluoride  iv. <b>Cathartics</b> - Magnesium sulphate, Sodium potassium tartrate, Magnesium hydroxide  v. <b>Antiseptics/Disinfectants</b> - Ionic Silver, Chlorhexidine Gluconate, Hydrogen peroxide, Boric Acid, Bleaching powder, Potassium Permanganate	5M



Q. No.	Sub No.	Answers	Marking Scheme
1	b	<p><b>Define “Volumetric analysis”. List the apparatus needed in volumetric analysis.</b></p> <p><b>Mention the types of volumetric analysis.</b></p> <p><b>Marking Scheme: Definition:1M, List of apparatus (any 4):2M (0.5M for each apparatus), Types of volumetric analysis (any 4): 2M (0.5M for each type)</b></p> <p><b>Answer:</b></p> <p>Volumetric analysis- Volumetric analysis is a quantitative analytical method which is used widely and involves measurement of the volume of a solution whose concentration is known and applied to determine the concentration of the analyte.</p> <p style="text-align: center;"><b><u>OR</u></b></p> <p>Volumetric analysis is often referred to as titration, a laboratory technique in which one substance of known concentration and volume is used to react with another substance of unknown concentration.</p> <p><b>Apparatus needed in volumetric analysis-</b></p> <ol style="list-style-type: none"><li>1. Burette</li><li>2. Pipette (Bulb, Graduated)</li><li>3. Volumetric flask</li><li>4. Conical flask/ Iodine flask/ Stoppered flask</li><li>5. Beaker</li><li>6. Funnel</li><li>7. Burette stands</li><li>8. White tile</li></ol> <p><b>Types of volumetric analysis</b></p> <ol style="list-style-type: none"><li>1. Acid-base Titrations (Aqueous and Non-aqueous)</li><li>2. Redox Titrations (permanganate, iodimetry, iodometry, cerimetry, bromometry)</li><li>3. Precipitation Titrations (argentometry))</li><li>4. Complexometric Titrations.</li></ol>	<p><b>5M</b></p> <p><b>1M</b></p> <p><b>2M</b></p> <p><b>2M</b></p>



## SUMMER– 2023 EXAMINATION

## MODEL ANSWER - ONLY FOR THE USE OF RAC ASSESSORS

Subject Title: PHARMACEUTICAL CHEMISTRY- THEORY

Subject Code: 20112

Q. No.	Sub No.	Answers	Marking Scheme
1	c	<p><b>Define the term “epilepsy”. Classify Anti-epileptic agents with suitable examples.</b></p> <p><b>Marking Scheme: Definition:1M; Classification: 4M (any eight classes)</b></p> <p><b>Answer:</b></p> <p><b>Definition-</b> Epilepsy is also known as a seizure or convulsion disorder, is a brain disorder (neurological condition) that causes recurring seizures.</p> <p><b>Classification</b></p> <ol style="list-style-type: none"><li>1. Aldehydes. e.g. Paraldehyde (1882). One of the earliest anticonvulsants. It is still used to treat status epilepticus, particularly where there are no resuscitation facilities.</li><li>2. Aromatic allylic alcohols. e.g., Stiripentol</li><li>3. Barbiturates e.g. Phenobarbital, Methylphenobarbital</li><li>4. Benzodiazepines e.g. Diazepam, Clobazam, Clonazepam, Lorazepam</li><li>5. Carboxamides e.g. Carbamazepine, Oxcarbazepine, Eslicarbazepine acetate</li><li>6. Fatty acids e.g. valproates: valproic acid, sodium valproate, and divalproex sodium, Vigabatrin, Progabide,</li><li>7. Fructose derivatives e.g. Topiramate</li><li>8. Hydantoin e.g. Ethotoin, Phenytoin, Mephentoin, Fosphenytoin</li><li>9. Oxazolindiones e.g. Paramethadione, Trimethadione, Ethadione</li><li>10. Pyrrolidines e.g. Brivaracetam, Etiracetam, Levetiracetam</li><li>11. Succinimides e.g. Ethosuximide, Phensuximide, Methsuximide</li><li>12. Pyrimidinediones e.g. Primidone</li><li>13. Triazines e.g. Lamotrigine</li><li>14. Sulfonamides e.g. Sultiame</li><li>15. Ureas e.g. Phenacemide</li></ol>	<p><b>5M</b></p> <p><b>1M</b></p> <p><b>4M</b></p>
1	d	<p><b>Draw chemical structure of Dapsone. Give its chemical name, uses, formulations and storage conditions.</b></p> <p><b>Marking Scheme: Structure:1M; Chemical Name:1M; Use:1M (Any two uses); Name of Formulations:1M; Storage condition:1M.</b></p> <p><b>Answer:</b></p>	<p><b>5M</b></p>





Q. No.	Sub No.	Answers	Marking Scheme
		<p style="text-align: center;"><math display="block">\text{As}^{3+} + \text{HCl} \longrightarrow \begin{array}{c} \text{OH} \\   \\ \text{As} \\ / \quad \backslash \\ \text{HO} \quad \text{OH} \end{array}</math><p style="text-align: center;">Trivalent arsenic <span style="margin-left: 150px;"></span> Arsenious acid (trivalent)</p><p style="text-align: center;"><math display="block">\text{As}^{5+} + \text{HCl} \longrightarrow \begin{array}{c} \text{OH} \\   \\ \text{O}=\text{As}-\text{OH} \\   \\ \text{HO} \end{array}</math><p style="text-align: center;">Pentavalent arsenic <span style="margin-left: 150px;"></span> Arsenic acid (pentavalent)</p><p>* When acidic solution of sample treated with reducing agent (stannous chloride) converts pentavalent arsenic acid into trivalent arsenious acid</p><p style="text-align: center;"><math display="block">\begin{array}{c} \text{OH} \\   \\ \text{O}=\text{As}-\text{OH} \\   \\ \text{HO} \end{array} \xrightarrow{\text{SnCl}_2 + \text{HCl}} \begin{array}{c} \text{HO} \\   \\ \text{As}-\text{OH} \\   \\ \text{HO} \end{array} + 3\text{H}_2\text{O}</math><p style="text-align: center;">Arsenic acid (pentavalent) <span style="margin-left: 100px;"></span> Arsenious acid (trivalent)</p><p>* The Arsenious acid is then converted into gaseous hydride (arsine gas) with help of nascent hydrogen (which is produced by zinc and HCl).</p><p style="text-align: center;"><math display="block">\text{H}_3\text{AsO}_3 + 6\text{H} \longrightarrow \text{AsH}_3 \uparrow + 3\text{H}_2\text{O}</math><p style="text-align: center;">Arsenious acid (trivalent) <span style="margin-left: 20px;"></span> Nascent Hydrogen <span style="margin-left: 100px;"></span> ARSINE GAS</p><p>* Arsine gas is carried through the tube by steam of hydrogen and out through the mercuric chloride paper. A reaction occurs between arsine and mercuric chloride which produces yellow colour stain.</p><p style="text-align: center;"><math display="block">\text{AsH}_3 \uparrow + \text{HgCl}_2 \longrightarrow \begin{array}{c} \text{AsH}_2 \\   \\ \text{Hg} \\   \\ \text{AsH}_2 \end{array} + 2\text{HCl}</math><p style="text-align: center;">ARSINE GAS <span style="margin-left: 50px;"></span> Mercuric Chloride Paper <span style="margin-left: 100px;"></span> Mercuric Hydrogen Arsenide (Yellow/ Brown in colour)</p></p></p></p></p></p>	
		<p><b>Diagram of Gutzeit apparatus.</b></p>	

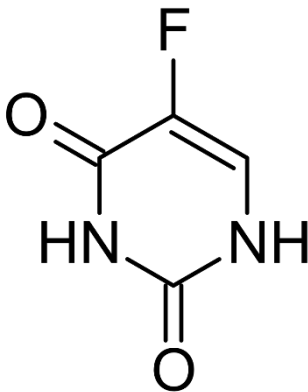


Q. No.	Sub No.	Answers	Marking Scheme
		<p>INTERNAL DIAMETER (5 mm)</p> <p>RUBBER BUNG</p> <p>MERCURIC CHLORIDE PAPER</p> <p>LEAD ACETATE COTTON PLUG</p> <p>GLASS TUBE (20 Cm)</p> <p>RUBBER BUNG</p> <p>LATERAL ORIFICE (2-3 mm)</p> <p>TEST/STANDARD SOLUTION</p> <p>FIG : APPARATUS FOR ARSENIC LIMIT TEST</p>	
1	f	<p><b>What are adrenergic drugs? Classify with examples. Draw the structure of Norepinephrine.</b></p> <p><b>Marking Scheme:</b></p> <p><b>Definition of adrenergic drugs: 1M, Classification:3M, Structure:1M</b></p> <p><b>Answer:</b></p> <p><b>Adrenergic drugs-</b></p> <p>A drug or other substances which has effects like or the same as adrenaline (epinephrine).</p> <p><b>OR</b></p> <p>An adrenergic agent is a drug, or other substance, which has effects similar to, or the same as, epinephrine (adrenaline). <b>OR</b></p>	5M



Q. No.	Sub No.	Answers	Marking Scheme
		<p>Alternatively, it may refer to something which is susceptible to epinephrine, or similar substances, such as a biological receptor (specifically, the adrenergic receptors).</p> <p><b>Classification- (Consider any one method of classification)</b></p> <p><b>I method</b></p> <ol style="list-style-type: none"><li>1. Catecholamines. Eg. Noradrenaline, adrenaline, isoprenaline, dopamine.</li><li>2. Noncatecholamines. E.g. Phenylephrine hydrochloride, Mephentermine sulfate,</li><li>3. Imidazoline: Naphazoline</li></ol> <p><b>II method</b></p> <ol style="list-style-type: none"><li>1. Directly acting (act directly on <math>\alpha</math> or <math>\beta</math> receptors)-e.g. Epinephrine, Norepinephrine,</li><li>2. Indirectly acting (act by providing more norepinephrine to act on <math>\alpha</math> or <math>\beta</math> receptors)- e.g. Amphetamine, hydroxyamphetamine, and proprylhexedrine, pseudoephedrine</li><li>3. Mixed acting (act by both mechanisms)- e.g. ephedrine, Metaraminol</li></ol> <p><b>III method</b></p> <ol style="list-style-type: none"><li>1) alpha-adrenoceptor agonists (<math>\alpha</math>-agonists) e.g. Phenylephrine</li><li>2) beta-adrenoceptor agonists (<math>\beta</math>-agonists) e.g. Terbutaline, Salbutamol</li><li>3) Both alpha and beta agonist- Adrenaline, Noradrenaline</li></ol> <p style="text-align: center;"><b>Adrenergic Agents</b></p> <div style="display: flex; justify-content: space-around;"><div style="border: 1px solid black; padding: 5px; width: 30%;"><p style="text-align: center;"><b>Catecholamines</b></p><p>Adrenaline Nor-adrenaline Isoprenaline Dopamine</p></div><div style="border: 1px solid black; padding: 5px; width: 30%;"><p style="text-align: center;"><b>Noncatecholamines</b></p><p>Amphetamine Ephedrine Pseudoephedrine Phenylephrine Terbutaline Salbutamol</p></div><div style="border: 1px solid black; padding: 5px; width: 30%;"><p style="text-align: center;"><b>Imidazoline</b></p><p>Naphazoline Xylometazoline</p></div></div> <p><b>Structure of norepinephrine</b></p> <chem>Oc1ccc(O)c(C(O)CN)c1</chem>	



Q. No.	Sub No.	Answers	Marking Scheme
1	g	<p><b>Define and classify anti-neoplastic agents. Draw structure of 5-fluorouracil.</b></p> <p><b>Marking Scheme: Definition:1M; Classification:3M; Structure:1M</b></p> <p><b>Answer:</b></p> <p><b>Definition-</b> Antineoplastic drugs are medications used to treat cancer. Other names for antineoplastic drugs are anticancer, chemotherapy, chemo, cytotoxic drugs.</p> <p><b>Classification-</b></p> <ul style="list-style-type: none"><li>• <b>Alkylating agents:</b><ul style="list-style-type: none"><li>✓ Mustine, <b>Cyclophosphamide</b>, Busulfan, Chlorambucil, Thiotepa.</li></ul></li><li>• <b>Antimetabolites:</b><ul style="list-style-type: none"><li>✓ Folic Acid Analogues - Methotrexate,</li><li>✓ Pyrimidine Analogues – <b>Fluorouracil</b>,</li><li>✓ Purine Analogues - 6-mercaptopurine, 6-thioguanine.</li></ul></li><li>• <b>Antibiotics:</b> (Anticancer Antibiotics)<ul style="list-style-type: none"><li>✓ Dactinomycin, Doxorubicin, Mitomycin-C, Daunorubicin.</li></ul></li><li>• <b>Hormones and antagonists:</b> Diethylstilbesterol, tamoxifem.</li><li>• <b>Plant products - Vinca alkaloids:</b> Vincristine, Vinblastine</li><li>• <b>Enzymes:</b> Asparaginase</li><li>• <b>Miscellaneous Agents:</b> <b>Cisplatin</b>, Carboplatin, procarbazine, Hydroxyurea.</li></ul> <p><b>Structure:</b></p>  <p>The chemical structure of 5-fluorouracil is a pyrimidine ring with a fluorine atom at the 5-position, a carbonyl group at the 2-position, and another carbonyl group at the 4-position. The nitrogen atoms are at the 1 and 3 positions.</p>	5M
2		<p><b>Answer any <u>TEN</u> of the following:</b></p>	30 M
2	a	<p><b>Discuss any three different sources of impurities in pharmaceuticals.</b></p> <p><b>Marking Scheme:</b> Explanation of any three sources: 1M for each source</p> <p><b>Sources of Impurities</b></p> <ol style="list-style-type: none"><li>1. Raw materials used in manufacture</li><li>2. Processes used in manufacture</li><li>3. Material of the plant</li></ol>	3M





Q. No.	Sub No.	Answers	Marking Scheme
		<p>4. During storage</p> <p>5. Accidental substitution or deliberate adulteration</p> <p>6. Manufacturing hazards</p> <p><b>1. Raw materials used in manufacture</b></p> <ul style="list-style-type: none"><li>• Traces of impurities in raw materials may be carried to contaminate the final product</li><li>• E.g. common salt (NaCl) prepared from rock salt will almost certainly contain traces of calcium (Ca) and magnesium (Mg) compounds</li><li>• Metallic zinc may be present as an impurity in zinc oxide (ZnO) sample as it is prepared by heating metallic zinc</li></ul> <p><b>2. Processes used in manufacture</b></p> <ul style="list-style-type: none"><li>• Some impurities are incorporated during the manufacturing process. This may occur due to<ul style="list-style-type: none"><li>○ Reagents used in process</li><li>○ Reagents added to remove other impurities</li><li>○ Solvents - water is the cheapest solvent widely available. Tap water contains many ion impurities in small amounts like <math>\text{Cl}^-</math>, <math>\text{Ca}^{++}</math>, <math>\text{Mg}^{++}</math>, <math>\text{Na}^+</math> etc</li><li>○ The intermediate products may come along the process in the final product as impurity</li></ul></li></ul> <p><b>3. Material of the plant</b></p> <ul style="list-style-type: none"><li>• The vessels used in the manufacturing process are generally made up of metals like iron, copper, zinc, nickel, aluminium and stainless steel. Due to the solvent action on the plant material the traces of metals i.e. impurities come in the product.</li><li>• Similarly, glass of an unsatisfactory standard and plastic containers used for handling liquid and semisolid products may yield traces of alkalis and antioxidants respectively.</li></ul> <p><b>4. During storage:</b></p> <ul style="list-style-type: none"><li>• Filth - stored product may become contaminated with dust, insect, or insect excreta.</li><li>• Decomposition of the product during storage - many chemical substances undergo changes or decomposition due to careless storage</li><li>• e.g. ferrous sulphate is slowly converted into insoluble ferric oxide by air and moisture</li><li>• Ether and chloroform decompose in the presence of light and air. Chloroform on decomposition gives carbonyl chloride (phosgene gas) so it should be stored in well filled, well-closed amber coloured bottle.</li></ul> <p><b>5. Accidental substitution or deliberate adulteration</b></p>	



Q. No.	Sub No.	Answers	Marking Scheme
		<ul style="list-style-type: none"><li>Accidental substitution can take place if toxic substances are stocked with other substances or compounds.</li><li>Some pharmaceutical products may be adulterated with cheaper substitutes.</li><li>E.g. Honey may be adulterated with inverted sugar, potassium bromide with sodium bromide.</li></ul> <p><b>6. Manufacturing hazards:</b></p> <ul style="list-style-type: none"><li>Particulate contamination - accidental inclusion of dirt, glass, porcelain, metallic or plastic fragments from sieves, granulating, tableting, and filling machines or even from product containers is possible.</li><li>Process error - gross errors arising from incomplete solution of solute in a liquid preparation must be detected by normal analytical procedures.</li><li>Special care is required for highly potent medicaments of low dose (5 mg or less)</li><li>Cross contamination - the handling of powders, granules and tablets in large quantities creates considerable amount of air-borne dust and may lead to cross-contamination</li><li>Microbial contamination - liquid preparations and creams for topical application are prone to bacterial and fungal contamination.</li><li>Special care should be taken in parenteral and ophthalmic preparations to avoid microbial contamination</li><li>Packing errors - products of similar appearance as tablets of same size, colour and shape packed in similar containers may lead to mislabelling</li></ul>	
2	b	<p><b>Classify Antimalarials. Draw structure of chloroquine phosphate</b></p> <p><b>Marking Scheme: Classification: 2M; Structure:1M</b></p> <p><b>Answer:</b></p> <ol style="list-style-type: none"><li>Quinolines Antimalarials<ol style="list-style-type: none"><li>Cinchona Alkaloids – Quinine, Cinchonine</li><li>4-aminoquinolines – Chloroquine, Amodiaquine</li><li>8-aminoquinolines – Primaquine, Pamaquine</li></ol></li><li>Acridines dye – Quinacrine, Acriquine</li><li>4-quinoline carbinolamines – <b>mefloquine</b></li><li>Diaminopyrimidines – Pyrimethanamine</li><li>Biguanides – Proguanil, Chloroproguanil</li><li>Sulphones – Dapsone</li><li>Misc. – Doxycycline.</li></ol>	3M



Q. No.	Sub No.	Answers	Marking Scheme
		<p><b>Structure of Chloroquine Phosphate</b></p> <p>OR</p>	
2	c	<p><b>Give storage-stability, uses &amp; brand name of drug Penicillin G.</b></p> <p><b>Marking Scheme:</b> Storage-stability: 1M; Uses: 1M (0.5 Mark for each uses), Brand name:1M (0.5 Mark for each brand name)</p> <p><b>Answer:</b></p> <p><b>Storage - Stability:</b> It should be stored in air-tight dry container &amp; kept in a cool place</p> <p><b>Uses:</b></p> <ol style="list-style-type: none"><li>1. It is used as antibiotics to treat wide range of bacterial infections.</li><li>2. It is active against wide range of Gram-positive bacteria and Neissera spp.</li><li>3. It is used to treat abscesses, syphilis, gonorrhoea, pneumonia, meningitis, anthrax, diphtheria, tetanus</li><li>4. It is used prophylactically, before dental &amp; surgical procedures to prevent from developing endocarditis, re-occurrence of rheumatic fever</li></ol> <p><b>Brand name: (Consider any two correct brand names)</b> Novopen, Crystapen G,PAM, Pentids</p>	3M



Q. No.	Sub No.	Answers	Marking Scheme
2	d	<p><b>What are Parasympathomimetic agents? Draw structure of drug acetylcholine. Give its storage &amp; stability conditions</b></p> <p><b>Marking Scheme:</b> Defination:1M; Structure:1M; Storage &amp; stability conditions:1M</p> <p><b>Answer:</b></p> <p><b>Parasympathomimetic agents:</b></p> <p>The agents that mimic the action of acetylcholine or produce the effect of parasympathetic nerve stimulation are called as cholinergic agents or parasympathomimetic agents.</p> <ul style="list-style-type: none"><li>• Substance that stimulates the parasympathetic nervous system.</li><li>• Compounds which mimic the action of acetylcholine.</li><li>• Chemicals that act at the same sites as the neurotransmitter acetylcholine (Ach).</li></ul> <p><b>Classification:</b></p> <div style="text-align: center;"><pre>graph TD; A[Cholinergic drugs] --&gt; B[Direct Acting Cholinergic agonists]; A --&gt; C[Indirect acting Anticholinesterases]; B --&gt; D[Choline Esters]; B --&gt; E[Alkaloids]; C --&gt; F[Reversible]; C --&gt; G[Irreversible]; D --&gt; D1[Acetylcholine]; D --&gt; D2[Methacholine]; D --&gt; D3[Carbachol]; D --&gt; D4[Bethanechol]; E --&gt; E1[Muscarine]; E --&gt; E2[Pilocarpine]; E --&gt; E3[Arecoline]; F --&gt; F1[Carbamates]; F --&gt; F2[Acridine]; F1 --&gt; F1a[Physostigmine]; F1 --&gt; F1b[Neostigmine]; F1 --&gt; F1c[Pyridostigmine]; F2 --&gt; F2a[Tacrine]; G --&gt; G1[Organophosphates]; G --&gt; G2[Carbamates]; G1 --&gt; G1a[Parathion]; G1 --&gt; G1b[Malathion]; G1 --&gt; G1c[DFP]; G2 --&gt; G2a[Carbaryl]; G2 --&gt; G2b[Propoxur];</pre></div> <p><b>Structure Acetylcholine</b></p> <div style="text-align: center;"><math display="block">\text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{CH}_2-\text{CH}_2-\overset{\text{CH}_3}{\underset{\text{CH}_3}{\text{N}^+}}-\text{CH}_3</math></div> <p><b>Storage-stability condition:</b></p> <p>It should be stored in air-tight dry container and keep it in a cool place as it is hygroscopic in nature.</p>	3M



Q. No.	Sub No.	Answers	Marking Scheme
2	e	<p><b>Define and classify sedative and Hypnotics with examples. Draw structure of Phenobarbitone</b></p> <p><b>Marking Scheme: Definition:1M (0.5M for each); Classification: 1M; Structure:1M</b></p> <p><b>Definition-</b></p> <p><b>Hypnotics: (0.5M)</b></p> <p>These are the drugs which depress C.N.S. and produce sleep resembling natural sleep-in normal dose. They are used to overcome insomnia.</p> <p><b>Sedatives: (0.5M)</b></p> <p>A drug that reduces excitement, calms the patient without inducing sleep. They reduce excitement of nerves and hence are used in relief of tension, anxiety and restlessness.</p> <p><b>Classification-</b></p> <p>1. <b>BARBITURATES:</b> Depending upon duration of action</p> <ol style="list-style-type: none"><li>Long-acting barbiturates (6 hrs or more). eg: Barbitone, Phenobarbitone.</li><li>Intermediate acting barbiturate (3-6 hrs).eg: Butobarbitone.</li><li>Short acting Barbiturate (less than 3 hrs) eg: Cyclobarbitone.</li><li>Ultra-short acting (IV) Barbiturates (1/2 to 1 hr).eg: Methohexitone Sodium, Thiopentone Sodium.</li></ol> <p>2. <b>NON-BARBITURATES:</b></p> <ol style="list-style-type: none"><li>Benzodiazepine Hypnotics - Flurazepam, Triazolam</li><li>Urea derivatives: Glutethimide</li><li>Methylprylon</li><li>Alcohols – Chloral hydrate, Ethchlorvynol</li><li>Aldehydes – Paraldehyde</li><li>Ureides – Carbromal</li><li>Miscellaneous. - Phenacemide, Carbamazepines</li></ol> <p><b>Structure of Phenobarbitone:</b></p> <p>The chemical structure of Phenobarbitone is a 5-phenyl-2-ethyl-1,3,5-triazin-2,4,6-trione. It consists of a central six-membered ring with two nitrogen atoms at positions 1 and 3, and three carbonyl groups at positions 2, 4, and 6. A phenyl ring is attached to the carbon at position 5, and an ethyl group (-CH<sub>2</sub>-CH<sub>3</sub>) is attached to the carbon at position 2. A hydrogen atom is attached to the nitrogen at position 6.</p>	5M

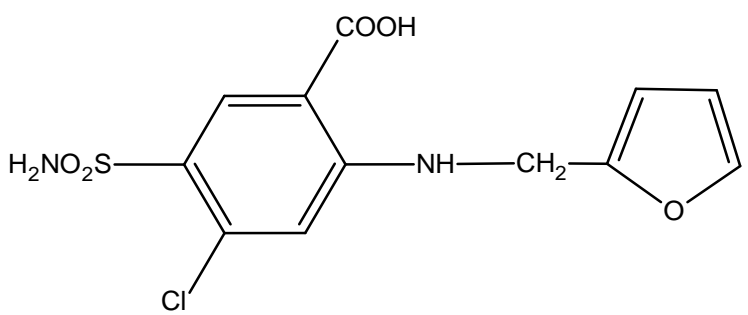
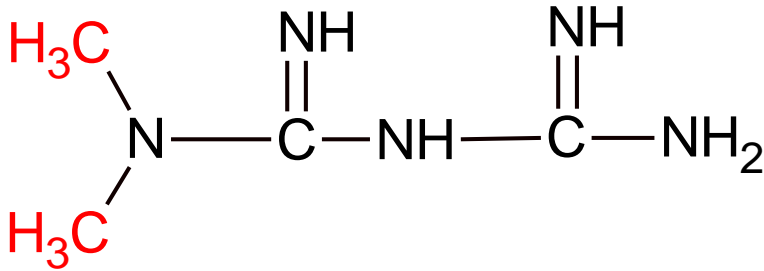


## SUMMER- 2023 EXAMINATION

## MODEL ANSWER - ONLY FOR THE USE OF RAC ASSESSORS

Subject Title: PHARMACEUTICAL CHEMISTRY- THEORY

Subject Code: 20112

Q. No.	Sub No.	Answers	Marking Scheme
2	f	<p>Give structure, chemical name of &amp; uses of Frusemide.</p> <p><b>Marking Scheme:</b> Structure:1M; Chemical name:1M; Uses:1M (0.5 M each any two uses)</p> <p><b>Structure of Frusemide</b></p>  <p><b>Chemical name:</b> 4-chloro-2-((furan-2-ylmethyl)amino)-5-sulfamoylbenzoic acid</p> <p><b>Uses of Furosemide</b></p> <ul style="list-style-type: none"><li>• It is used as a diuretic.</li><li>• It is useful for treatment of oedema associated with CHF, liver cirrhosis and renal diseases.</li><li>• It is used to treat high blood pressure (hypertension).</li></ul>	3M
2	g	<p>Define diabetes mellitus. Draw structure of metformin &amp; give its popular brand names</p> <p><b>Marking Scheme:</b> Definition:1M; Structure: 1M; Brand name: 1M (0.5M for each name)</p> <p><b>Answer:</b></p> <p><b>Diabetes mellitus:</b> A group of diseases that result in too much sugar in the blood (high blood glucose- Hyperglycaemia) due to insulin deficiency.</p> <p><b>Structure :</b></p>  <p><b>Popular brand name: (Consider any two correct brand names)</b> Metformin, Glycomet, Glyciphage, Diabex, Diaformin, DMGG</p>	3M



## SUMMER- 2023 EXAMINATION

## MODEL ANSWER - ONLY FOR THE USE OF RAC ASSESSORS

Subject Title: PHARMACEUTICAL CHEMISTRY- THEORY

Subject Code: 20112

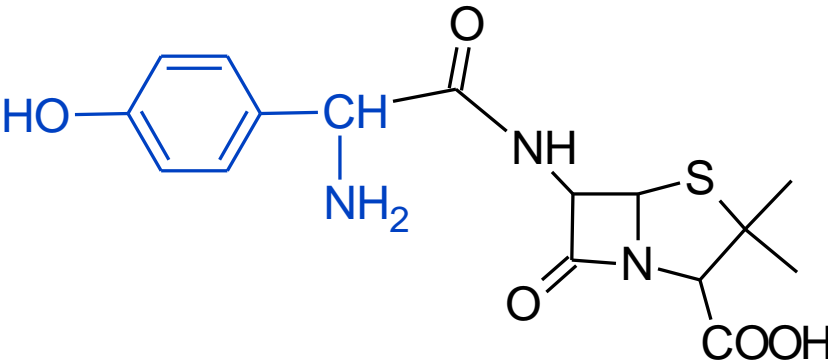
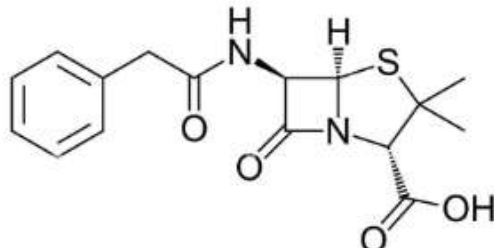
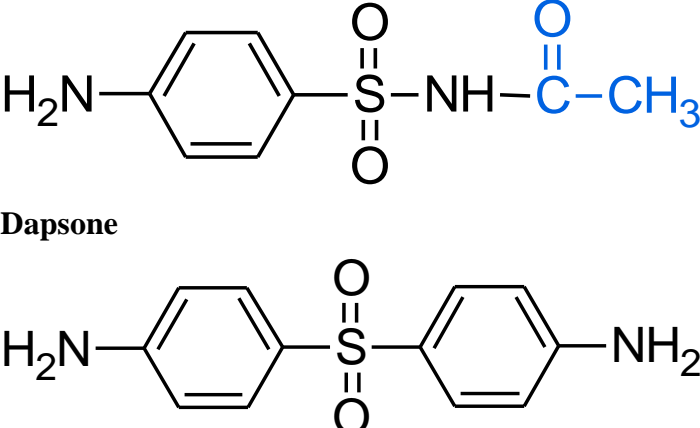
Q. No.	Sub No.	Answers	Marking Scheme
2	h	<p><b>What are narcotic analgesics? Give its classification with examples</b></p> <p><b>Marking Scheme:</b> Definition: 1M, Classification with example: 2M</p> <p><b>Answer:</b></p> <p><b>Narcotic analgesics:</b></p> <p>The drugs used to relief of moderate to severe pain by acting on central nervous system &amp; produce the stupor.</p> <p>OR</p> <p>Narcotic analgesics are the drugs which relieve pain by acting on central nervous system without loss of consciousness.</p> <p><b>Classification:</b></p> <ol style="list-style-type: none"><li>1. Morphine &amp; related compounds: Morphine, codeine</li><li>2. Synthetic compounds<ol style="list-style-type: none"><li>a. Pethidine &amp; related compounds - Pethidine</li><li>b. Morphinan &amp; benzomorphan derivatives - Pentazocine, latorphanol</li><li>c. Methadone &amp; its analogue - Methadone, dextropropoxyphene</li></ol></li></ol>	3M
2	i	<p><b>Give uses for :- i) Chlorpromazine ii) Chloramphenicol iii) Propranolol</b></p> <p><b>Marking Scheme: Uses:1M for each drug (0.5M for any two uses)</b></p> <p><b>Answer:</b></p> <p><b>Chlorpromazine</b></p> <ol style="list-style-type: none"><li>1. It is used ad sedative &amp; tranquilizer</li><li>2. It is used to treat schizophrenia, mania, h ypomania</li><li>3. It is used to control nausea, vomiting</li><li>4. It reduces salivary &amp; gastric secretions</li><li>5. It has local anaesthetic properties</li><li>6. It is used as analgesic &amp; relaxes skeletal muscles</li><li>7. It is used as antiemetic, antipruritic</li></ol> <p><b>Chloramphenicol</b></p> <ol style="list-style-type: none"><li>1. It was used in the treatment of typhoid.</li><li>2. It may be used as a second-line agent in the treatment of tetracycline-resistant cholera.</li><li>3. It is also useful in the treatment of brain abscesses.</li><li>4. It is also applied locally for treatment of ear, eye and skin infection.</li><li>5. It is used in treatment of Rickettsia, Chlamydia and mycoplasma.</li></ol>	3M



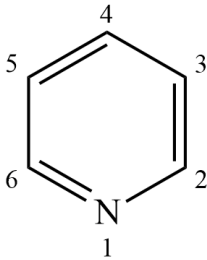
Q. No.	Sub No.	Answers	Marking Scheme
		<p><b>Propranolol:</b></p> <ol style="list-style-type: none"><li>1. It is a typical beta adrenergic receptor blocker used in the treatment of cardiac diseases like :-<ol style="list-style-type: none"><li>a. Angina pectoris</li><li>b. Cardiac arrhythmia</li><li>c. Hypertension</li><li>d. Congestive heart failure</li><li>e. Coronary atherosclerosis</li><li>f. Arterial hypertension</li></ol></li><li>2. Treatment of Pheochromocytoma</li><li>3. Treatment of tachycardia</li></ol>	
2	j	<p><b>Classify Antihypertensive agents with suitable examples.</b></p> <p><b>Marking Scheme: Classification with example: 3M</b></p> <p><b>Classification:</b></p> <ol style="list-style-type: none"><li>1. ACE inhibitors: Captopril, Enalapril, Ramipril</li><li>2. Angiotensin antagonist: Losartan, Candesartan</li><li>3. Calcium channel blockers: Verapamil, Nifedipine,</li><li>4. Diuretics:<ol style="list-style-type: none"><li>a. Thiazides: hydrochlorothiazide</li><li>b. High ceiling: furosemide</li><li>c. Potassium sparing: spironolactone</li></ol></li><li>5. Beta-adrenergic blockers: Propranolol, Metoprolol, Atenolol</li><li>6. Alpha-adrenergic blockers: Prazosin, Terazosin</li><li>7. Alpha + beta adrenergic blockers: Labetalol, Carvedilol</li><li>8. Central sympatholytic: Clonidine, Methyldopa</li><li>9. Vasodilators: Hydralazine, Minoxidil sodium</li></ol>	3M
2	k	<p><b>Draw structure for i) beta lactum antibiotics ii) Sulfa drugs</b></p> <p><b>Marking Scheme: Structure of any one beta lactum antibiotic: 1.5M; Structure of any one sulpha drug: 1.5M.</b></p> <p><b>Answer:</b></p> <p>Structure of beta lactum antibiotic: (Consider structure of any one drug)</p> <p><b>Amoxicillin</b></p>	3M





Q. No.	Sub No.	Answers	Marking Scheme
		 <p><b>Benzylpenicillin:</b></p>  <p>Structure of Sulpha Drug: (Consider structure of any one drug)</p> <p><b>Sulphacetamide</b></p>  <p><b>Dapsone</b></p>	
3		Attempt ALL questions	20 M
		<b>Important Instructions: In case, multiple answer options are observed for the same sub question of question No. 3, the option (Answer) appearing first in the answer book shall be treated as answer and assessed accordingly.</b>	
3	a	Define antibiotics. Definition: 1M Answer:	1M



Q. No.	Sub No.	Answers	Marking Scheme
		Chemical compounds derived from living organism and capable to inhibit the growth of micro-organism or kill the micro-organism are called as antibiotics. OR The substances which <u>produced by micro-organism</u> and have capacity to <b>inhibit the growth</b> or <b>destroy the microorganism</b> are called as antibiotics.	
3	b	<b>Write any 2 uses of Azithromycin.</b>  <b>Marking Scheme: 1M for any two uses.</b> <b>Answer:</b> It is used in the treatment of Acne vulgaris, bronchitis, COPD, Mycobacterial infection, Pneumonia, Sexually transmitted diseases (STD), CoVID-19 infection, ear nose and throat infections.	1M
3	c	<b>Draw structure of acetyl group and chloro group.</b>  <b>Marking Scheme: 0.5 M each</b> <b>Answer:</b> Acetyl Group: $-\text{COCH}_3$ Chloro Group: $-\text{Cl}$	1M
3	d	<b>Draw structure of Pyridine and give its method of numbering</b>  <b>Marking Scheme: Structure - 0.5 M; Numbering - 0.5 M</b> <b>Answer:</b> 	1M
3	e	<b>Chemical formula for bleaching powder is _____</b>  <b>Marking Scheme: 1 M</b> <b>Answer:</b> i. $\text{Ca}(\text{ClO})_2$	1M
3	f	<b>Prazosin drug is used for</b>  <b>Marking Scheme: 1 M for its use</b> <b>Answer:</b> It is used in treatment of hypertension or It is used as antihypertensives	1M



## SUMMER- 2023 EXAMINATION

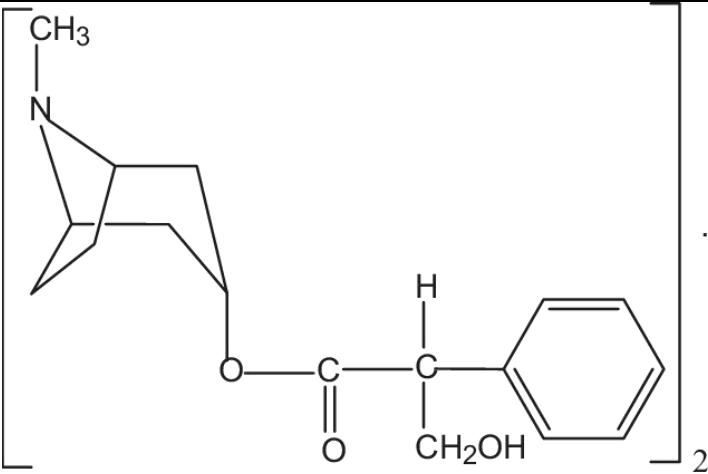
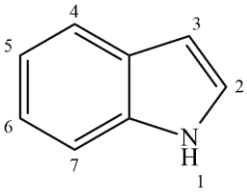
## MODEL ANSWER - ONLY FOR THE USE OF RAC ASSESSORS

Subject Title: PHARMACEUTICAL CHEMISTRY- THEORY

Subject Code: 20112

Q. No.	Sub No.	Answers	Marking Scheme
3	g	<p>Name any 2 indicators used in Acid-base titration.</p> <p><b>Marking Scheme: One indicator name - 0.5 M. Consider any two name for 1M.</b></p> <p><b>Answer:</b></p> <ul style="list-style-type: none"><li>• Phenolphthalein,</li><li>• Bromcresol green,</li><li>• Methyl red,</li><li>• Bromthymol blue,</li><li>• Phenol red,</li><li>• Neutral red,</li><li>• Methyl yellow,</li><li>• Methyl orange.</li></ul>	1M
3	h	<p>The synonym of Calcium Carbonate is _____.</p> <p><b>Marking Scheme: Any one synonym - 1 M</b></p> <p><b>Answer:</b> Limestone, calcite, aragonite, prepared chalk.</p>	1M
3	i	<p>The precipitating agent used in Limit Test for chloride is _____.</p> <p><b>Marking Scheme: 1 M</b></p> <p><b>Answer: Silver Nitrate</b></p>	1M
3	j	<p>Define "Redox Titration"</p> <p><b>Marking Scheme: Definition:1M</b></p> <p><b>Answer:</b></p> <p>It is titration in which oxidation and reduction reaction usually occur simultaneously.</p> <p>OR</p> <p>A redox titration is a titration in which the analyte and titrant react through an oxidation–reduction reaction.</p>	1M
3	k	<p>Draw structure of Atropine sulphate.</p> <p><b>Marking Scheme: 1 M for Structure</b></p> <p><b>Answer:</b></p> <p style="text-align: center;">OR</p>	1M



Q. No.	Sub No.	Answers	Marking Scheme
		 <p>. H<sub>2</sub>SO<sub>4</sub> . H<sub>2</sub>O</p>	
3	1	<p>Doxycycline belongs to the structural class of Antibiotics.</p> <p><b>Marking Scheme: 1 M for correct option</b></p> <p><b>Answer:</b></p> <p>iii) Tetracyclines.</p>	1M
3	m	<p>IUPAC name of Paracetamol is _____.</p> <p><b>Marking Scheme: 1 M for correct name</b></p> <p><b>Answer:</b></p> <p>iii) 4 - hydroxy - Acetanilide</p>	1M
3	n	<p>Full form of NSAID is _____.</p> <p><b>Marking Scheme: 1 M for full form</b></p> <p><b>Answer:</b></p> <p>Non-Steroidal Anti-Inflammatory Drug.</p>	1M
3	o	<p>Structure of Indole ring is _____</p> <p><b>Marking Scheme: 1 M for correct option</b></p> <p><b>Answer:</b></p> <p>i)</p>  <p>1H-Indole</p>	1M



## SUMMER– 2023 EXAMINATION

## MODEL ANSWER - ONLY FOR THE USE OF RAC ASSESSORS

Subject Title: PHARMACEUTICAL CHEMISTRY- THEORY

Subject Code: 20112

Q. No.	Sub No.	Answers	Marking Scheme
3	p	<p>State whether true or false for Antacids are meant for constipation and hypoacidity.</p> <p><b>Marking Scheme: 1 M for correct answer</b></p> <p><b>Answer:</b></p> <p>False</p>	1M
3	q	<p><b>Define “non-aqueous” titration.</b></p> <p><b>Marking Scheme: Definition:1M</b></p> <p><b>Answer:</b></p> <p>A type of titration in which the analyte substance is dissolved in a solvent which does not contain water.</p> <p>OR</p> <p>Non-aqueous titration can be defined as the process in which solute is dissolved in a non-water solvent.</p>	1M
3	r	<p><b>Gravimetry analysis is a semi-quantitative method. True or False.</b></p> <p><b>Marking Scheme: 1 M for correct answer</b></p> <p><b>Answer:</b></p> <p>False</p>	1M
3	s	<p><b>Give two uses of Atenolol.</b></p> <p><b>Marking Scheme: Use:1M (each use – 0.5M)</b></p> <p><b>Answer: (Consider any two correct uses)</b></p> <p>Atenolol is used to treat:</p> <ol style="list-style-type: none"><li>1. Angina pectoris.</li><li>2. Hypertension.</li><li>3. Atrial Fibrillation.</li><li>4. Supraventricular tachycardia.</li><li>5. Cardiac Arrhythmia.</li></ol>	1M
3	t	<p><b>Name any two anti-depressant drugs</b></p> <p><b>Marking Scheme: 1 drug – 0.5 M (Consider any two correct Drug)</b></p> <p><b>Answer:</b></p> <p>Imipramine, Trimipramine, Amitriptyline, Doxepin, Desipramine, Citalopram, Fluoxetine, Paroxetine, Venlafaxine, Phenelzine, Selegiline, Tranylcypromine, Trazodone.</p>	1M