

## SECTION - A

1. (i) This question consists of 25 (Twenty five) multiple choice questions each carrying one mark.  
(ii) Choose the correct answer.  
(iii) Enter (a) or (b), (c) or (d) as the case may be in the boxes corresponding to the questions in the first page of the answer book.
- 1.1 One of the following statements for adenylyl cyclase is wrong. Identify.  
(a) is a membrane bound enzyme  
(b) inactivated by Phosphodiesterase  
(c) catalyses the A.M.P. formation  
(d) active only when associated with G. Protein
- 1.2 Which one of the following device is used to increase the efficiency of drug delivery via aerosols?  
(a) Tube spacers  
(b) Metered valve  
(c) Actuator  
(d) Pressure valve
- 1.3 One of the uses given below for ~~topiramide~~ is not correct. Indicate  
(a) Antitussive  
(b) Analgesic  
(c) Anti-inflammatory  
(d) antidiarrhoeal
- 1.4 Which one of the following is used as a preservative in ophthalmic preparations?  
(a) Benzalkonium Chloride  
(b) Phenol  
(c) Benzoic acid  
(d) Chlorocresol
- 1.5 The activity of one of the following drugs is dependent on Pheny-N-alkyl piperidine moiety?  
(a) Meperidine  
(b) Impipramine  
(c) Diazepam  
(d) Chlorpromazine
- 1.6 One of the organism mentioned below is used as a biological indicator in I.P. for ethylene oxide sterilization. Choose the correct one.  
(a) Bacillus stearothermophilus  
(b) Spores of Bacillus subtilis  
(c) Bacillus pumilus  
(d) Spores of Bacillus cereus
- 1.7 The most common causative agent of Bacterial Pneumonia is:  
(a) Staphylococcus aureus  
(b) Escherichia coli  
(c) Streptococcus pneumoniae  
(d) Mycoplasma pneumoniae

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- 1.8 Creatinine clearance is used as a measurement for  
(a) Glomerular filtration rate (b) Renal excretion rate  
(c) Drug metabolism rate (d) Passive renal excretion
- 1.9 Choose the correct starting material for the synthesis of Ethacrynic Acid  
(a) 2, 3-Dichloro phenoxy acetic acid  
(b) 2, 3-Dibromo phenoxy acetic acid  
(c) 2, 3-Dichloro phenoxy propionic acid  
(d) 2, 3-Dichloro phenoxy butyric acid
- 1.10 Choose the correct metabolic process for Phenobarbitone  
(a) p-Hydroxylation followed by reduction  
(b) p-Hydroxylation followed by Glucuronidation  
(c) p-Hydroxylation followed by acetylation  
(d) p-Hydroxylation followed by oxidation
- 1.11 Which one of the following antihistaminic is a basic ether?  
(a) Pheniramine Maleate (b) Triprolidine hydrochloride  
(c) Diphenhydramine hydrochloride (d) Promethazine hydrochloride
- 1.12 Conductivity cells are made up of  
(a) two silver rods (b) two parallel sheets of platinum  
(c) glass membrane with Ag/AgCl (d) Sb-Sb<sub>2</sub>O<sub>3</sub>
- 1.13 The chemical shift value is  
(a) proportional to field strength (b) not proportional to field strength  
(c) ratio of the number of Protons in each group  
(d) proportional to the total number of protons
- 1.14 Select the equation that gives the rate of drug dissolution from a tablet  
(a) Fick's law (b) Henderson Hasselbatch equation  
(c) Noyes Whitney equation (d) Michelis Menten equation
- 1.15 Energy absorbed in U.V. region produces changes in  
(a) the rotational energy of the molecule  
(b) the vibrational energy of the molecule  
(c) the electronic energy of the molecule  
(d) all the three energy levels of the molecule

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- 1.16 Dose dumping is a problem in the formulation of  
(a) compressed tablets (b) suppositories  
(c) soft gelatin capsules (d) controlled release drug products
- 1.17 The initial distribution of a drug into the tissue is determined chiefly by  
(a) rate of blood flow to the tissue  
(b) plasma protein binding of the drug  
(c) affinity for the tissue (d) stomach emptying time
- 1.18 Choose the correct characteristic of the epidermal cells and cuticle of *Atropa belladonna* leaf  
(a) Pitted walls with striated cuticle (b) Wavy walls with striated cuticle  
(c) Algal cell walls with smooth cuticle (d) Straight walls with wavy cuticle
- 1.19. Meclizine hydrochloride is prepared from which one of the following?  
(a) 1-(4-chloro benzhydryl)-Pyridine and 3-methyl benzaldehyde  
(b) 1-(2-chloro benzhydryl)-Piperazine and 3-methyl benzaldehyde  
(c) 1-(4-chloro benzhydryl)- Piperazine and 3-methyl benzaldehyde  
(d) 1-(4-chloro benzhydryl)- Piperazine and 2-methyl benzaldehyde
- 1.20. Which one of the following is an Ex-Officio member of the State Pharmacy Council?  
(a) Chief Pharmacist of Government hospital  
(b) Chief Administrative Medical Officer of the state  
(c) Registered Pharmacist  
(d) Assistant Drug Controller
- 1.21. Phloroglucinol and Hydrochloric acid produces pink or red colour with  
(a) Cellulose cell walls (b) Lignified cell walls  
(c) Cutinized cell walls (d) Mucilaginous cell walls
- 1.22. One of the forms mentioned below is used to issue licence for wholesale of drugs other than specified in schedule C, C<sub>1</sub> and X. Choose the correct one.  
(a) 20.B (b) 20 B.B (c) 21 B (d) 20 A
- 1.23. Choose the correct chemical name for Chlorpromazine hydrochloride  
(a) [3-(2-chlorophenothiazin-10-yl) propyl] diethylamine hydrochloride  
(b) [2-(3-chlorophenothiazin-10-yl) propyl] diethylamine hydrochloride  
(c) [3-(2-chlorophenothiazin-10-yl) propyl] diethylamine hydrochloride  
(d) [3-(3-chlorophenothiazin-10-yl) propyl] diethylamine hydrochloride

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- 1.24. Wavelength of a radiation is  $5.0 \mu$ . Wave number corresponding to that is:  
(a)  $4000 \text{ cm}^{-1}$       (b)  $2000 \text{ cm}^{-1}$       (c)  $3000 \text{ cm}^{-1}$       (d)  $1000 \text{ cm}^{-1}$
- 1.25 Choose the synthetic adrenocortical steroid, which do not occur in nature.  
(a)  $11\beta, 17\alpha, 21$ -Trihydroxy-1, 4-pregnadiene-3, 20-dione  
(b)  $17\alpha, 21$ -Dihydroxy pregna-4-ene-3, 11, 20-trione  
(c)  $11\beta, 17\alpha, 21$ -Trihydroxy pregna-4-ene-3, 20-dione  
(d) 3-oxo- $17\beta$ -Hydroxy androst-4-ene.
- 2. Match each of the items 1 and 2 on the left with an appropriate item on the right [a, b, c, d] and answer in the specific space provided in the answer book.**
- 2.1 Match the correct heterocyclic system present in the medicinal agents given in (a) to (d).
- |   |                    |
|---|--------------------|
| (1) 5H Dibenzo (b - f) azepine            | (a) Nitrazepam     |
| (2) 1, 4-Dihydro-1, 8-Naphthyridine-4-one | (b) Carbamazepine  |
|   | (c) Imipramine     |
|   | (d) Nalidixic acid |
- 2.2. Match the titrants used for the following:
- |                         |                                    |
|-------------------------|------------------------------------|
| (1) Paracetamol I.P.    | (a) Perchloric Acid                |
| (2) Phenytoin sold-I.P. | (b) EDTA                           |
|                         | (c) Ceric ammonium sulphate        |
|                         | (d) Tetra butyl ammonium hydroxide |
- 2.3. Starting material for the synthesis of medicinal agents are listed below. Match them with the correct ones from (a) to (d).
- |                                      |                       |
|--------------------------------------|-----------------------|
| (1) 2-Amino-5-chloro-benzophenone    | (a) Ethosuximide      |
| (2) Butanone and ethyl cyano acetate | (b) Diazepam          |
|                                      | (c) Prochloroperazine |
|                                      | (d) Propranolol       |

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2.4. The ring structures present in the alkaloids listed below are given in (a) – (d). Match them.

- |                |                   |
|----------------|-------------------|
| (1) Codeine    | (a) Phenanthrene  |
| (2) Ergotamine | (b) Indole        |
|                | (c) Quinoline     |
|                | (d) Iso-quinoline |

2.5. The following terms are used to describe the parts of certain plants listed in (a) – (d). Match them.

- |                |                                   |
|----------------|-----------------------------------|
| (1) Hypanthium | (a) Prunus communis               |
| (2) Rhytidoma  | (b) Cinnamon bark                 |
|                | (c) Roots of Rauwolfia serpentine |
|                | (d) Eugenia caryophyllus          |

2.6. The chief active constituents of some umbrelliferous fruits are listed in (a) – (d). Match them with the correct source.

- |                            |              |
|----------------------------|--------------|
| (1) Foeniculum capillaceum | (a) Anethol  |
| (2) Anethum graveolens     | (b) Carvone  |
|                            | (c) Khellin  |
|                            | (d) Linalool |

2.7. Some substances used in tablet coating process are given. Match them with their correct use mentioned in (a) to (d).

- |                                     |                  |
|-------------------------------------|------------------|
| (1) Shellac                         | (a) Polishing    |
| (2) Hydroxy propyl methyl cellulose | (b) Seal coating |
|                                     | (c) Film former  |
|                                     | (d) Sub-coating  |

2.8. Some materials used in the manufacture of pharmaceutical dosage forms are given. Match them with correct use mentioned in (a) – (d).

- |                      |  |
|----------------------|--|
| (1) Sorbitol         | (a) Preservative for capsules            |
| (2) Titanium dioxide | (b) Plasticizer in soft gelatin capsules |
|                      | (c) Lubricant for tablets                |
|                      | (d) Opacifier for gelatin mass           |

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2.9. Given below are the aerosol systems. Match them with their correct propellants given in (a) - (d).

- |                             |                                  |
|-----------------------------|----------------------------------|
| (1) Aerosol for oral use    | (a) Propane                      |
| (2) Aerosol for topical use | (b) Oxygen                       |
|                             | (c) Methane                      |
|                             | (d) Trichloro-monofluoro methane |

2.10. Some of the applications for immobilized enzyme systems are given below. Match with the process listed in (a) - (d).

- |                          |   |
|--------------------------|---|
| (1) Amino cyclase        | (a) N-oxidation of drugs containing Hydrazine |
| (2) Flavoprotein oxidase | (b) Resolution of DL-amino acid               |
|                          | (c) D-amino acid production                   |
|                          | (d) Nucleotide production from RNA            |

2.11. Systematic chemical names of the medicinal agents are given in (a) - (d). Match them.

- |                    |   |
|--------------------|---|
| (1) Indomethacin   | (a) 13 $\beta$ -ethyl-17 $\beta$ hydroxyl-18 19 dinor-17 $\alpha$ -Pregn-4-4n-20 yn-3-one |
| (2) Levonorgestrol | (b) 13 $\beta$ -methyl-17 $\alpha$ hydroxyl-18 nor-17- $\alpha$ -Pregn-4-en-20 yn-3-one   |
|                    | (c) 1-(2-chloro benzyl)-5-ethoxy-2-methyl indoyl-3-yl, acetic acid                        |
|                    | (d) 1-(4 chloro benzoyl)-5-methoxy 2-methyl indol-3-yl, acetic acid                       |

2.12. Storage conditions as per I.P. for different preparations are given. Match them with the correct temperature prescribed.

- |          |   |
|----------|---|
| (1) Cold | (a) Between 20°C and 8°C                  |
| (2) Warm | (b) Below 20°C                            |
|          | (c) Any temperature between 30°C and 40°C |
|          | (d) Above 40°C                            |

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2.13. The wave lengths of two different regions of the electromagnetic spectrum are given from (a) to (d). Match them.

- |                         |                               |
|-------------------------|-------------------------------|
| (1) Finger print region | (a) 2.5 to 8.0 $\mu\text{m}$  |
| (2) Visible region      | (b) 8.0 to 15.0 $\mu\text{m}$ |
|                         | (c) 0.2 to 0.35 $\mu\text{m}$ |
|                         | (d) 0.4 to 0.8 $\mu\text{m}$  |

2.14. Match the correct applications mentioned in (a) – (d) with the two equations.

- |                      |                       |
|----------------------|-----------------------|
| (1) Nernst equation  | (a) Potential         |
| (2) Ilkovic equation | (b) Migration current |
|                      | (c) Diffusion current |
|                      | (d) Conductance       |

2.15. Certain drug combinations are given below. Match them with the correct drug interaction given in (a) to (d).

- |                                    |  |
|------------------------------------|--|
| (1) Phenobarbitone and Digitoxin A | (a) Induction of Hepatic Microsomal enzyme under digitalization            |
| (2) Aspirin and Methotrexate       | (b) Potentiation of the activity of Digitalis                              |
|                                    | (c) Less absorption of Methotrexate  |
|                                    | (d) Displacement of Protein Binding site-increase toxicity of Methotrexate |

2.16. Mechanism of action of drugs listed below are given (a) to (d). Match them.

- |                           |   |
|---------------------------|---|
| (1) $\alpha$ -Methyl Dopa | (a) Multiple sites including $\alpha_2$ agonism |
| (2) Minoxidil             | (b) Catecholamine release                       |
|                           | (c) Sympathetic neuronal block                  |
|                           | (d) Non-selective vasodilation                  |

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2.17. Listed below are some important metabolic products of the drugs given in (a) to (d). Match them.

- |   |                        |
|---|------------------------|
| (1) p-Fluro phenyl acetic acid glycine conjugate      | (a) Paracetamol        |
| (2) Diphenyl methoxy acetic acid glutamibne conjugate | (b) Diloxanide furoate |
|   | (c) Halaperidol        |
|   | (d) Diphenhydramine    |

2.18. Listed below is the percentage of Protein binding of some drugs given in (a) to (d). Match them.

- |           |                     |
|-----------|---------------------|
| (1) 0% A  | (a) Oxyphenbutazone |
| (2) 99% D | (b) Lisinopril      |
|           | (c) Hexobarbital    |
|           | (d) Morphine        |

2.19. The items listed from (a) to (d) can be identified by the tests given below.

- |                    |   |
|--------------------|---|
| (1) Coomb's test   | (a) <i>Candida albicans</i>               |
| (2) Coagulase test | (b) Virulent <i>Staphylococcus aureus</i> |
|                    | (c) <i>Mycobacterium tuberculosis</i>     |
|                    | (d) Non agglutinating antibodies          |

2.20. For the following drugs, specific mechanism of action is given in (a) to (d). Match them.

- |                    |  |
|--------------------|--|
| (1) Spiranolactone | (a) Non competitively inhibit the enzyme carbonic anhydrase                                |
| (2) Acetazolamide  | (b) Inhibit the contransport of $\text{Na}^+$ and $\text{Cl}^-$ in loop of Henle           |
|                    | (c) Competitive inhibitor of aldosterone at the receptors in the distal tubule             |
|                    | (d) Direct inhibition of $\text{Na}^+$ and $\text{Cl}^-$ re-absorption at proximal portion |

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2.21. Given below are different schedules as per the (d) and (c) Act. Match them with items mentioned in (a) to (d).

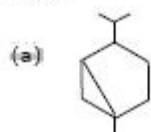
- |                 |  |
|-----------------|--|
| (1) Schedule FF | (a) Standards for ophthalmic preparations                                |
| (2) Schedule M  | (b) Diseases or ailments which a drug may not purport to prevent or cure |
|                 | (c) Life period of drugs   |
|                 | (d) Requirements of factory premises                                     |

2.22. Two types of detectors are given below. Match them with the instrument given in (a) to (d).

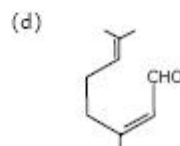
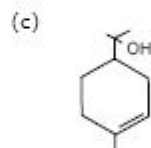
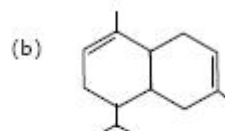
- |                               |                          |
|-------------------------------|--------------------------|
| (1) Flame ionization detector | (a) IR Spectrophotometer |
| (2) Golay pneumatic detector  | (b) UV Spectrophotometer |
|                               | (c) Flame photometer     |
|                               | (d) Gas chromatograph    |

2.23. Appropriate structural formulae for Monocyclic monoterpene and Bicyclic monoterpene are given in (a) to (d). Match them.

(1) Monocyclic monoterpene



(2) Bicyclic monoterpene



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2.24. Two methods of sterilization are given for the materials listed from (a) to (d). Match them correctly.

- |                          |                           |
|--------------------------|---------------------------|
| (1) Dry heat             | (a) Rooms                 |
| (2) $\gamma$ - radiation | (b) Plastic syringes      |
|                          | (c) Talcum powder         |
|                          | (d) Intravenous admixture |

2.25. Listed are some of the microscopical characters of bark powder obtained from the plants mentioned in (a) to (d). Match them.

- |   |                               |
|---|-------------------------------|
| (1) Narrow slender lignified phloem fibres occur singly or tangential rows of 2-5. Lignified, colourless Narrow sub rectangular parenchyma with small starch grains. Less amount of cork. | (a) Cinchona succirubra       |
| (2) Wider phloem fibres, Larger-Starch grains Longer fibres abundant cork   | (b) Cinnamomum zeylanicum     |
|   | (c) Cinnamomum cassia         |
|   | (d) Holarrhena antidysentrica |

#### SECTION - B

This section consists of TWENTY questions of FIVE marks each. Attempt ANY FIFTEEN questions. Answers must be given in the answer book provided. Answer for each question must start on a fresh page and must appear at one place only.

3. Draw the structures of Anthraquinone, Oxanthrone, Anthranol Anthrone and Dianthrone.
4. Starting from m-chloroaniline, draw a scheme for the preparations of chlorothiazide and then to hydrochlorothiazide. Give the structural formulae of all reactants, reagents and products.
5. (a) Write complete equations for the following reaction:  
 1-(4 hydroxy phenyl)-2-amino propanol + 1-phenoxy-2-propyl bromide  $\rightarrow$   
 (b) What is the common name of the medicinal agent formed?  
 (c) To which pharmacological category it can be included.
6. (a) Complete the following synthesis by writing the full equation:  
 Ethyl- $\alpha$ -hydroxy- $\alpha$ -methyl Propionate + Urea  
 $\xrightarrow{C_6H_5ONa}$  (2)  $\xrightarrow{(CH_3O)_2SO_2}$  (3).....

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- (b) Streptomycin acts as a triacidic base – which groups are responsible for this.
7. Draw the structural formulae of the products obtained at 1, 2, 3, 4 and 5.
- Phthalic anhydride  $\xrightarrow{\text{Zn}}$  (1).....  $\xrightarrow[\text{H}_2\text{O}]{\text{O}_2}$  (2).....  $\xrightarrow{\text{H}_2\text{N}-\text{NH}_2, \text{H}_2\text{O}}$  (3).....  
 $\xrightarrow{\text{POCl}_3}$  (4).....  $\xrightarrow{\text{H}_2\text{N}-\text{NH}_2, \text{H}_2\text{O}}$  (5).....
8. (a) What is cell constant? How is it determined?  
 (b) Give the reason for the following:  
 (i) In conductometric titration the titrant should be at least ten times as concentrated as the solution being titrated.  
 (ii) Temperature control is important in conductometric titrations.
9. (a) Define [Answer each in one or two sentences only]  
 (a) Palisade ratio (b) Stomatal number (c) Stomatal index  
 (d) Vein islet number (e) Vein islet termination number
10. (a) Name the types of Stomata present in the following medicinal plants:  
 (i) Digitalis purpurea leaves (ii) Datura stramonium leaves  
 (iii) Cassia acutifolia leaves (iv) Mentha piperita  
 (b) Give the murexide test for detecting purine derivatives.
11. (a) How Benzodiazepines produce claming effect?  
 (b) How anxiolytic activity can be correlated?  
 (c) Why presence of 3(-OH) group confers shorter duration of action?  
 (d) Why intravenous solution of diazepam cause precipitation when mixed with aqueous solution?  
 (e) What is the clinical use of Adenosine?
12. List the quality control tests specified in I.P. for injections.
13. A solution of a drug contained 1000 units/milliliter when prepared. It was analysed after a period of 40 days and was found to contain 600 units/milliliter. Assuming the decomposition is of first order, at what time will the drug have decomposed to one half of its original concentration?
14. What are the five basic components present in tablet compressing machine? Give their specific uses. (Answer each point in one sentence only).
15. (a) Name the principle on which freeze drying works.  
 (b) Name the four basic components of freeze drier.

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16. Define the following in or two sentences only:
- (i) Diploid                      (ii) Erythropoietin                      (iii) Genome  
(iv) Plasmid                      (v) Virion
17. Name five important components of a gas chromatograph.
18. (a) Given below are the names of common microorganisms and starting materials used for bio-conversion. Name the probable compounds formed or changes effected:
- (i) *Acetobacter suboxydans*/D Sorbitol  
(ii) *Rhizopus arrhizus*/progesterone  
(iii) *Curvularia lunata*/Progesterone
- (b) Name the enzymes present in the following microbes:
- (i) *asperigillus oryzae*  
(ii) *Clostridium histolyticum*
19. Some of the anticancer drugs act at the following specific sites in a manner exclusive for them:
- (a) Converted to fraudulent nucleotide and inhibits purine biosynthesis  
(b) Converted to fraudulent nucleotide and inhibits thymidylate synthetase  
(c) Intercalates in DNA and stabilizes the DNA topo isomerase II complex  
(d) Binds tubulin and inhibits microtubule formation  
(e) Inhibits proliferation of lymphocytes
- Name the class of compounds accordingly.
20. (a) Give the mechanism of action of:
- (i) Nystatin                      (ii) Griseofulvin                      (iii) Omeprazole  
(b)  
(i) Give the names of the immediate precursor of catecholamines.  
(ii) Which is the rate limiting enzyme in catecholamine biosynthesis?
21. In the microbiological assay of Bacitracin I.P., mention:
- (i) Method adopted                      (ii) Organism used  
(iii) pH of the media                      (iv) Incubation time  
(v) Incubation temperature
22. (a) Give three methods of record the IR spectra of solids.  
(b) Name two ways (phases) by which partition chromatography can be conducted.

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**ANSWER Key –GATE-1999 Pharmaceutical Sciences**

1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10
B	B	C	A	A	B	C	A	A	A
1.11	1.12	1.13	1.14	1.15	1.16	1.17	1.18	1.19	1.20
C	B	A	C	C	D	A	B	C	B
1.21	1.22	1.23	1.24	1.25	2.1	2.2	2.3	2.4	2.5
B	B	C	B	D	1-b,2-d	1-c,2-a	1-b,2-a	1-a,2-b	1-d,2-b
2.6	2.7	2.8	2.9	2.10	2.11	2.12	2.13	2.14	2.15
1-a,2-b	1-b,2-c	1-b,2-d	1-d,2-a	1-b,2-a	1-d,2-a	1-a,2-c	1-b,2-d	1-a,2-c	1-a,2-d
2.16	2.17	2.18	2.19	2.20	2.21	2.22	2.23	2.24	2.25
1-c,2-d	1-c,2-a	1-b,2-a	1-d,2-b	1-c,2-b	1-a,2-d	1-d,2-a	1-a,2-c	1-c,2-b	1-b,2-c

Remaining question are long answer type questions.