GATE - 2002

PHARMACEUTICAL SCIENCE

Time : 3 hours **Maximum Marks : 200**

Read the following instruction carefully.

1. *All answer must be written in ENGLISH.*
2. *This question paper consists of TWO SECTIONS : Section 'A' and 'B'.*
3. *Section A consists of two questions of the multiple choice type. Question 1 consists of TWENTY FIVE sub-questions of ONE mark each and Questions 2 consists of TWENTY FIVE sub-question of TWO marks each.*
4. *Answer Section A only ont he special machine-gradable OBJECTIVE RESPONSE SHEET (ORS). Questions in Section A will not be gradeed if answered elsewhere.*
5. *Write your name, registration number and the name of the center at the specified locations on the right half of the ORS for Section A .*
6. *Using a HB pencil, darken the appropriate bubble under each digit of your registration number. .*
7. *Questions in Section A are to be answered by darkening the appropriate bubble (marked A, B, C or D) using a HB pencil against the question number on the left hand side of the ORS. In case, you wish to change an answer, erase the old answer completely using a good sort eraser.*
8. *The ORS will be collected after 120 minutes from the start of the examination. In case you finish Section A before the expiry of 120 minutes, you may start answering Section B.*
9. *There will be NEGATIVE marking in Section A. for each wrong answer to 1-and 2- mark sub-questions, 0.25 and 0.5 marks will be deducted respectively. More than one answer marked against a question will be deemed as an incorrect response and will be negatively marked.*
10. *Answer questions in Section B in the answer book. Section B consists of TWENTY questions FIVE marks each. ANY FIFTEN out of them have to answered. If more number of questions are attempted, score off the answers not to be evaluated, else only the first fifteen unscored answered will be considered.*
11. *Answer for each question in Section B should be started on a fresh page. Question numbers must be written legibly and correctly in the answer book.*
12. *In all 5 mark questions questions (Section B), clearly show the important steps in your answers. These intermediate steps will carry partial credit.*

SECTION - A

PY-1. *The question contains of Twenty Five sub question(1.1-1.25) of ONE mark each. For each of these sub-question, four possible answers(A,B,C and D) are given, out of which one is correct. Answer each sub question by darkening the appropriate bubble on the OBJECTIVE RESPONSE SHEET(ORS) using a soft HB pencil. Do not use the ORS for any rough work. You may like to use the Answer Book for any rough work, if needed.*

1.1 Volatile oil from Lemon peels contains d- limonine which is

(a) Phenyl propane derivative
(b) Bicyclic Monoterpene derivative
(c) Monocyclic Monoterpene derivative
(d) Acyclic Sesquiterpene derivative

1.2 In case of *Digitalis purpurea*, the cardiac activity is maximum with

(a) Odoroside-H (b) Digoxin (c) Digitoxin (d) Purpurea glycoside-A

1.3 Dragendorff's reagent does not give positive test with

(a) Emetine (b) Morphine (c) Caffeine (d) Codeine

1.4 The instrument used to measure particle volume is

(a) Coulter Counter
(b) Microscope
(c) Hempel Burette
(d) Helium Densitometer

1.5 The purpose of seal coating in sugar coating process for tablets is

(a) To prevent moisture penetration into the tablet core
(b) To round the edges and build up the tablet weight
(c) To impart the desired color to the tablet
(d) To give lusture to the tablet

1.6 The phenomenon of increasing the solubility of weak electrolytes and non polar molecules by the addition of water miscible solvent in which the drug has good solubility is called

(a) Complexation (b) Cosolvancy (c) Solubilization (d) Hydrotrophy

1.7 HLB system is used to classify

(a) Surfactants (b) Preservatives (c) Antioxidants (d) Sequestering agents

1.8 The statement "Store in a cool place" as per IP, means

(a) Store at room temperature
(b) Store between 2° to 8° C
(c) Store at any temperature between 8° to 25° C
(d) Store at 0° C

1.9 Durability of a tablet to combined effects of shock and abrasion is evaluated by using

(a) Hardness tester
(b) Disintegration test apparatus
(c) Friabilator
(d) Screw Gauge

1.10 Ion exchange capacity of a resin is dependent on

(a) The total molecular weight of the resin
(b) The total number of ion active groups
(c) Length of ion exchange resin
(d) Solubility of the ion exchange resins

1.11 In mass spectra, the most intense peak is the

(a) Base peak
(b) Metastable ion peak
(c) Fragment ion peak
(d) Rearrangement ion peak

1.12 Chemical shift is expressed in one of the following units

(a) cm^{-1} (b) Amperes (c) Parts per million (d) mm/ml

1.13 Xenon arc lamp is the source of light in

(a) Spectroflurimeter
(b) IR Spectrophotometer
(c) Flame photometer
(d) Calorimeter

1.14 Which of the following pairs has an interaction beneficial for routine clinical use

(a) Pseudoephedrine & Aluminium hydroxide gel
(b) Tetracyclines and Milk of magnesia
(c) MAO inhibitors and Tyramine
(d) Choramphenicol and Tolbutamide

1.15 Measurement of which of the following two of the constituents of human plasma is of great value in the differential diagnosis of rheumatoid diseases

(a) Rheumatoid factor and immunoglobulin G
(b) Rheumatoid factor and C-reactive Protein
(c) HL-A antigen and C-reactive protein
(d) Immunoglobulin and bradykinin

1.16 Which of the following is valid comparison of live attenuated vaccines versus killed inactivated vaccines

(a) Hypersensitivity reactions are uncommon among inactivated vaccines
(b) Live attenuated vaccines are more effective in children
(c) Live attenuated vaccines are not suitable for pediatrics use
(d) Replication of the organisms in a live attenuated vaccine increases the stimulation of the immune system there by requiring a lower dose

1.17 An antineoplastic agent acting by folate antagonism and having a pteridine ring is

(a) Trimethoprim (b) Mercaptopurine (c) Methotraxate (d) Folic acid

1.18 One of the following drugs has 1,4-dihydropyridine structure, tertiary amino group in the side chain and Ca^{++} channel antagonist action

(a) Nitrodipine (b) Nicardipine (c) Verapamil (d) Captopril

1.19 IUPAC name for one of the steroidal anti-inflammatory agent is 9-α-Fluoro-11β, 16α, 17α, 21-tetrahydroxy-1,4-Pregnadiene-3,20-dione

(a) Predenisolone (b) Betamethasone (c) Triamicinolone (d) Dexamethasone

1.20 CLOFAZIMINE belongs to a class of

(a) Rhiminophenazines (b) Aryl piperazines
(c) Phenothiazones (d) Benzyl piperazines

1.21 One of the drug is odd one in terms of its biological action

(a) Diethyl Stilbesterol (b) Tamoxifen
(c) Ethynyl Estradiol (d) Mestranol

1.22 The key intermediates for the synthesis of TIMOLOL are

(a) 3,4-dichloro-1,2,5-thiadiazole and morpholine (b) 3,4-dichloro-1,2,5-thiadiazole and piperazine
(c) 3,4-dibromo-1,2,5-thiadiazole and piperazine (d) 3-chloro-1,2,5-thiadiazole and morpholine

1.23 One of the following drug interrupts the synthesis of thyroid hormones bypreventing iodine incorporation into the tyrosyl residue of thyroglobulin

(a) Levothyroxine (b) Liothyronine
(c) Propyl thiouracil (d) Triodo thyronine

1.24 Macrolide antibiotics exert their action by

(a) Inhibiting transcription (b) Altering the genetic code
(c) Terminating protein synthesis prematurely (d) Post-translational modification

1.25 One of the following is selective β_2-stimulant

(a) Caffeine (b) Salbutamol (c) Propranolol (d) Betahistine

PY-2. ***The question contains of Twenty Five sub question(2.1-2.25) of TWO mark each. For each of these sub-question, four possible answers(A,B,C and D) are given, out of which one is correct. Answer each sub-question by darkening the appropriate bubble on the OBJECTIVE RESPONSE SHEET(ORS) using a soft HB pencil. Do not use the ORS for any rough work. You may like to use the Answer Book for any rough work,if needed.***

2.1 Cascaroside A is an example of

(a) O-Glycoside (b) C-Glycoside
(c) N-and-S-Glycoside (d) O-and-C-Glycoside

2.2 Precursor of the biosynthesis of Tropane group of alkaloids is

(a) Leucine (b) Lysine (c) Ornithine (d) Tyrosine

2.3 The extraction of steroidal saponins on commercial scale is from

(a) Dioscorea (b) Digitails (c) Datura (d) Trigonella

2.4 *Rauwalfia sepentina* Benth., can be distinguished from other adulterants/ substitutes of Rauwolfia spp. by

(a) Presence of starch grains (b) Presence of calcium oxalate crystals
(c) Presence of trichomes (d) Presence of sclereids

2.5 Schedule FF contains the list of the following

(a) Drug which can be marketed under generic names only

(b) Drug which are habit forming

(c) Standards for ophthalmic preparation

(d) Drug which are exempt from certain provisions applicable to manufacturing

2.6 One of the following equations is used to predict the stability of a drug product at room temperature from experiments at accelerated temperature

(a) Stokes equation (b) Arrheniuns equation

(c) Yong equation (d) Michaelis-Menten equation

2.7 One of the following apparatus is used to determine the particle size by the gravity sedimentation method

(a) Pkynometer (b) Ostwald viscometer

(c) Andreasen apparatus (d) Friabilator

2.8 One of the following mills works on both the principles of attrition and impact

(a) Cutter mill (b) Hammer mill (c) Roller mill (d) Fluid energy mill

2.9 A commonly used antioxidant for oil system is

(a) Butylated hydroxyl toluene (b) Ascorbic acid

(c) Sodium metabisulfite (d) Thioglycol

2.10 In Digitalis glycoside C_{17} position of the steroidal ring is substituted by

(a) α-β unsaturated five membered lactone ring (b) α-β unsaturated six membered lactone ring

(c) α-β unsaturated six membered ring (d) α-β unsaturated five membered lactam ring

2.11 Metoprolol is sometimes preferred to Propranolol because

(a) It has both α and β adrenergic blockade

(b) It has both vasodilator properties and betaadrenergic blocker

(c) It is a β_1 selective antagonist and it does not enter the brain

(d) It is a β_2 selective antagonist

2.12 The major product formed by the condensation of 2-trifluorl methyl phenothiazine with sodamide and 1-(3chlororopy1-4-methyl piperazine)

(a) Trifluoperidol (b) Trifluoperazine

(c) Trifluopromazine (d) Trifluophenothiazine

2.13 One of the following statements is characteristic for natural estrogens

(a) Aromatic ring with phenolic group and an estrange nucleus

(b) Aromatic ring with an alcoholic group and a pregnant nucleus

(c) Reduced ring system belonging to the class estrange

(d) Reduced ring system belonging to the class pregnane

2.14 One of the following opioid peptides is released from pro-opio melanocortin (POMC)

(a) Somatostatin (b) Beta-endorphin (c) Leu-enkephalin (d) Dynorphin

2.15 The ultra short-acting barbiturates have brief duration of action due to

(a) High degree of binding to plasma protein

(b) Low lipid solubility resulting in a minimal concentration in the brain

(c) Metabolism is slow in the liver

(d) Rapid rate of redistribution from the brain due to its high liposolubility

2.16 Derivasation is done in GC

(a) To convert a less polar compound to a more polar compound

(b) To make the compound non-volatile

(c) To convert a polar compound to a more polar compound

(d) To liquefy a solid

2.17 Qualitative analysis by polarography is based on

(a) Electrode potential (b) Half wave potential

(c) Migration current (d) Limiting current

2.18 The stationary phase used in gel permeation chromatography is

(a) Alumina (b) Charcoal

(c) Squalene (d) Styrene divinyl benzyl co-polymer

2.19 A conductivity cell consists of

(a) Two platinised-platinum electrode system (b) A platinum-calomel electrode system

(c) A platinum-tungsten electrode system (d) A glass-calomel electrode system

2.20 A typical example of exotoxin is

(a) Lipid-A (b) Cytokine (c) Tetanospasmin (d) Tuberculin

2.21 A specimen isolated form a patient suffering from septicemia was found to be a strict aerobe. Its culture vial had a characteristic grape like odour and it was susceptible to carbenicillin. Identify the organism

(a) *Pseudomonas fluorescens* (b) *Salmonella typhi*

(c) *Staphylococcus* (d) *Pseudomonas aeruginosa*

2.22 The pKa of lidocaine is 7.9. if the pH of the infected is 8.9, the fraction of the drug in the ionized form will be

(a) 1% (b) 10% (c) 90% (d) 99%

2.23 The drug regimen useful in the treatment of both intestinal and extra-intestinal symptoms of amoebiasis orally is

(a) Diloxanide and Iodoquinol (b) Paramomycin

(c) Metronidazole and Diloxanide (d) Chloroquine alone

2.24 The drug NIFEDIPINE can be synthesized from

(a) O-nitro benzaldehyde methyl acetoacetate and ammonia

(b) P-nitro benzaldehyde methyl acetoacetate and ammonia

(c) O-nitro benzaldehyde ethyl acetoacetate and methylamine

(d) P-nitro benzaldehyde methyl acetoacetate and methylamine

2.25 Methyl malonyl CoA mutase which catalyzes the conversion of propionyl CoA to succinyl utilizes the prosthetic group derived from

(a) Cynocobalamine (b) Pyridoxine (c) Thiamine (d) Nicotinamide

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. (Answers to all parts of a question must appear together).

PY-3 Write your inferences in one or two words only

(a) Two different samples of aloes are dissolved separately in water. 2 ml of the above solutions are treated separately with 2 ml Bromine water

(i) A pale yellow precipitate with violet supernatant liquid is seen

(ii) A pale yellow precipitate with no violet supernatant liquid is seen

(b) Acrude drug sample consisting of dried leaflets gave a positive Borntrager's test

(c) When an-air dried latex is dissolved in water and treated with chloride solution-a red color develops

(d) Draw the structural formula of RESERPINE

PY-4 In a comparative chemical study of Morphine, Codeine and Thebaine, the following observation are noted. Give your inferences

(a) Morphine forms dibenzoate, Codeine forms a monobenzoate

(b) Morphine gives a positive ferric chloride test and other do not

(c) Codeine give one molecule of CH_3 I when heated with HI where as Thebaine gives two molecule of CH_3I

(d) Morphine of treatment with halogen acid gives a monohalogen derivative

(e) All the three alkaloids combine with CH_3I to form methiiodide

PY-5 With respect to Ceylon Cinnamon, Give

(a) Botanical source with family

(b) Main active constituent with its chemical nature

(c) Chemical structure of the main active constituent

PY-6 Assign the bands in the IR spectrum for appropriate groups given below:

>C=O, Aromatic compound, -OH, >C=<, -C=C-

(a) 3700-3500cm^{-1} (b) 1740-1720cm^{-1}

(c) 1667-1640cm^{-1} (d) 2260-2100cm^{-1}

(e) 900-675cm^{-1}

PY-7 In the microbiological assay of ERYTROMYCIN, IP

(a) Name the organism used (b) Name the solvent used

(c) What is the buffer used (d) In what pH is the experiment done

(e) What is the incubation temperature?

PY-8 (a) 0.25g of a compound $C_{10}H_{15}$ NO.HCI was titrated with 0.1 M $HClO_4$. It consumed 12.5 ml of the titrant

(i) What is the stoichiometric factor used for the calculation of percentage purity?

(ii) Calculate the percentage purity

(b) Write the formula used and calculate the absorbance of a solution of a compound having an $\in_{max}$ 6200 when 0.05 mM solution is measured in a 1cm cell.

PY-9 (a) Complete the following reaction giving appropriate structures

O-toluidine is treated with 2-Bromo propionyl bromide, the resulting product is treated with propylamine to get the drug

(b) To which therapeutic category does not drug belong?

PY-10 $2-\text{amino}-4,5\ \text{dimethoxy benzoic acid} \xrightarrow{NaOCN} A \xrightarrow{PCI_3/PCI_5} B \xrightarrow{NH_3} C \xrightarrow{1\text{-(2-Furoyl piperazine)}} D$

(a) Write the products at A, B, C, D

(d) To which therapeutic category does the drug D belong

PY-11 2H-1, 2, 4,-Benzothiadiazine-7-sulfonamide-6-chloro-1, 1-dioxide, can be modified to change biological properties. Comment on the effected of the following modifications to the structure

(a) Saturation of-3-4-double bond

(b) Substitution of 6-chloro by-CF_3

(c) Insertion of a benzyl group at position 3

(d) Insertion of a methyl group at position 2

(e) Saturation of 3, 4-double bond, insertion of a benzyl at position 3, and substitution of 6-Cl byCF_3

PY-12 Draw the structures of the following

(a) Dimethyl-[3-phenyl-3-(pyridyl)-propyl]-amine

(b) 4-amino-N-(-2diethyl-aminoethyl) benzamide

(c) N^1-(5-methyl is oxazol-3-yl)-sulfanilamide

(d) 2-(2-fluoro biphenyl-1-4-yl) propionic acid

(e) (E)-2-(3-pyrrolidin-1-yl-1-(-4-tolyl)prop-1-enyl) pyridine

PY-13 Draw the structures of the major first phase metabolic products of the following drugs by the given route

(a) Phenobarbitone-by aromatic hydroxylation

(b) Procaine –by hydrolysis

(c) Imipramine –by N-mono dealkylation

(d) Nor- epinephrine-by oxidative deamination

(e) 6-mercaptopurine- by oxidation

PY-14 Name the enzyme that catalyze the following reactions

(a) Acetoacetyl CoA	Acetyl CoA
(b) Oxaloacetate	Malate
(c) Riboflavin	Flavin mononucleotide
(d) HMG-CoA	Mevalonate
(e) Glutamate	GABA

PY-15 For the following drugs, name the type of interaction and the molecule involved in exerting their pharmacological response

(a) Captopril

(b) Diltiazem

(c) Diazepam

(d) Rifampicin

(d) Haloperidol

PY-16 Name five components of an aerosol package

PY-17 A drug solution has an initial potency of 125 mg/5ml. after storing for 30 days in a refrigerator, the potency is found to be 100mg/5ml. What is the half-life of the drug solution under these conditions? The drug undergoes first order kinetics. Give the equations and step involved

PY-18 Name the five force that can act between solid particles in Tablet manufacture.

PY-19 (a) Give four reasons for pH adjustment in parenteral preparation

(b) In which year was the pharmacy Council of India first constituted by the Central Government

PY-20 In five different patients, deficiencies of Vitamins were diagnosed. The diagnosis were

(a) Scurvy

(b) Wet or dry beriberi

(c) Inflamed tongue, glossitis

(d) Pernicious anemia

(e) Osteomalacia in adults

PY-21 (a) Define Schick Test Toxin, IP (b) What is it's dose
(c) What is it's pH? (d) Give it' storage conditions
(e) Define Schick Control

PY-22 The antibiotics VANCOMYCIN, CEFALEXIN, FUSIDIC ACID, ERYTHROMYCIN and BICYCLPMYCIN belong to one of the following classes. Include them in the appropriate class Cyclic dipeptide, β-lactam, Macrolide, Tetracyclic triterpene, Glycopeptide.

End of paper

ANSWER KEY GATE 2002

Section – A

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

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