GATE - 1997

PHARMACEUTICAL SCIENCES

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

Read the following instructions carefully

1. *Write all the answer in the answer book.*
2. *This question paper consist of TWO SECTION : A and B.*
3. ***Section A** has **Seven** questions. Answer ALL questions in this section.*
4. ***Section B** has Twenty questions. Anawer any **TEN questions**. Strike off the answers which are not to be evaluated; else only the first ten answer will be considered.*
5. *Answer to **Section B** should start on a fresh page and should not be mixed with answers to **Section A** .*
6. *Answer to questions and answers to parts of a question should appear together and should not be separated.*
7. *In all questions of 5 marks, write clearly the important steps in your answer. These steps carry partial credit.*
8. *There will be no negative marking.*
9. *Read specific instruction given if any, in the individual section.*

SECTION - I

CHOOSE THE CORRECT ANSWER

1. For each question given below, four alternatives are provided, out of which only one is correct. Write the correct answer on the answer script by writing (a), (b), (c) or (d) against the respective sub-questions number.

1.1 The first hydrolytic product of STREPTOMYCIN with methanolic hydrochloric acid is given below. Identify the correct one.

(a) Streptidine + Streptose + N-methyl glucosamine

(b) Streptidine + methyl strepto-biosaminide dimethyl acetal

(c) Streptamine + Streptose + N-methyl glucosamine

(d) Streptamine + Steptose dimethyl acental + N-methyl glucosamine

1.2 One of the following drugs interferes with cellular metabolism, especially the synthesis of Mycolic acid. Identify.

(a) Chloramphenicol
(b) Pyrazinamide
(c) Isonicotinic acid hydrazide
(d) Nicotinamide

1.3 A synthetic sweetening agent which is approximately 200 times sweeter than sucrose and has no after taste is:

(a) Saccharin
(b) Aspartame
(c) Cyclamate
(d) Sorbitol

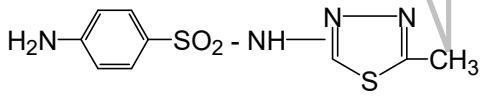
1.4 In capsules ROTOSORT is used for

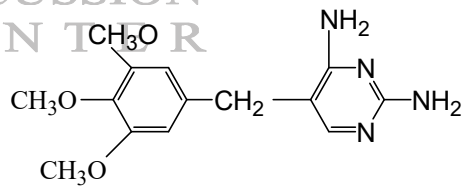
(a) Filling Powder into capsules
(b) Filling liquids into capsules
(c) Filling pellets into capsules
(d) Sorting the filled capsules

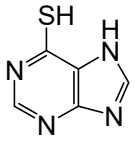
1.5 Shellac is used for the purpose of coating of tablets as

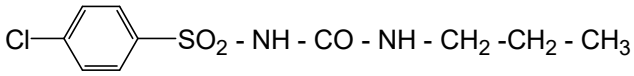
(a) Polishing agent
(b) Film coating agent
(c) Enteric coating agent
(d) Sub-Coating agent for sugar coating

1.6 Listed below are structures of some drugs. One of them prevents the incorporation of PABA into Folic acid. Identify

(a) 

(b) 

(c) 

(d) 

1.7 In Quantitative T.L.C. radioactive material can be studied by

(a) Visual comparison
(b) Densito meter
(c) Gravimetry
(d) Geiger counter

1.8 One of the following ingredients which improves the flow property of granules is:

(a) Glidant (b) Emollient (c) Lubricant (d) Surfactant

1.9 The wavelength source in N.M.R. spectrometer is

(a) Goniometer
(b) Radiofrequency oscillator
(c) High voltage generator
(d) Klystron oscillator

1.10 One of the following materials is used for the preparation of master grating. Identify

(a) Glass (b) Iron (c) Aluminium (d) Teflon

1.11 Benzathine penicillin is

(a) An equimolecular composition of Amoxicillin + N.N dibenzyl ethylene diamine

(b) A molecular complexation of Benzyl penicillin+ N.N dibenzyl ethylene diamine

(c) A molecular complexation of Cloxacillin + ethylene diamine

(d) Equimolecular proportion of Amoxicillin + ethylene diamine

1.12 Schick test is performed to ascertain susceptibility to

(a) Tetanus (b) Diphtheria (c) Mumps (d) Syphilis

1.13 Which of the following commonly available large volume dextrose solution for intravenous use is isotonic?

(a) 2.5% W/V (b) 5.0% W/V

(c) 10% W/V (d) 20% W/V

1.14 The term bioavailability refers to the

(a) Relationship between the physical and chemical properties of a drug and the systemic absorption of the drug

(b) Measurement of the rat and amount of therapeutically active drug that reaches the systemic circulation

(c) Movement of drug into the body tissues over time

(d) Dissolution of a drug in the gastrointestinal tract

1.15 Among the propellants used in aerosols one of the following is used for topical pharmaceutical aerosols.

(a) Trichloro monofluoro methane (b) Dichloro difluoro methane

(c) Dichloro tetra fluoro ethane (d) Propane

1.16 The principal structural component of the cell wall in bacteria is made up of

(a) Simple protein (b) Peptidoglycan polymer

(c) Complex polysaccharides (d) Glycoprotein

1.17 Which of the following has the highest degree of ionization in an aqueous solution?

(a) Aspirin pKa = 3.5 (b) Indomethacin pKa = 4.5

(c) Warfarin pKa = 5.1 (d) Ibuprofen pKa = 5.2

1.18 Tetracyclines are avoided during pregnancy because

(a) It is teratogenic (b) It may affect the bone growth of foetus

(c) It causes discolouration of mothers teeth (d) It May cause abortion

1.19. The Xenobiotics that does not cause nephrotoxicity is

(a) Streptozocin (b) Cisplatin

(c) Gentamycin (d) Isoniazid

1.20. Which of the following function of OPIOID receptors?

(a) Decrease Nor adrenaline release
(b) Decrease Dopamine release
(c) Decrease Serotinin release
(d) Decrease Acetyl choline release

1.21. Assume that a typical type of Cancer is susceptible to an individual drug. Listed below are some therapeutic combination of anti-cancer drugs which are rationale except one. Identify.

(a) Thiotepa and Prednisone
(b) Cyclophosphamide and 6-Mercaptopurine
(c) Doxorubicin and Methotrexate
(d) Chlorambucil and Melphalan

1.22. One of the following emissions from the decay of Radio nuclides is commonly used in sterilization. Identify

(a) Gamma (b) X-ray (c) Alpha (d) Positron

1.23. Clinically available anticancer agents have one of the underlying mechanism of action, they act by

(a) Improving body defense mechanism
(b) Inhibition of cell wall synthesis
(c) Receptor site blockade of cancer cell content
(d) Cell Growth inhibitor

1.24. Listed below are some of the common Radio nuclides used in Nuclear Pharmacy which one is generator produced?

(a) 201 Tl (b) 67 Ga (c) 133 Xe (d) 99^{m} Tc

1.25. Smallpox Vaccine contains

(a) Living Virus Vaccinia
(b) Living culture of B.C.G.
(c) Attenuated staphylococcus
(d) Living Virus of Hepatitis

1.26. The solution strength of Ca^{++} in terms of mg/L for a Calcium injection which contains 5m Eq. Calcium (Ca^{++}) per 100 ml is given below. Identify the correct one. [At 40 wt - Ca^{++} = 40].

(a) 150 (b) 500 (c) 750 (d) 1000

1.27. Listed below are some of the drug intermediates. Choose the correct one for the synthesis of Procainamide.

(a) p-nitro benzyl chloride and Diethyl amino ethylamine
(b) p-nitro benzyl chloride and ethyl amino ethylamine
(c) p-nitro cinnamoyl chloride and Diethyl amino ethylamine
(d) p-nitro benzene and Diethyl amino ethylamine

1.28. Choose the correct name for Digitoxigenin.

(a) 3β , 14β , 16β trihydroxy cardenolide
(b) 3β , 12β , 14β trihydroxy cardenolide
(c) 3β , 14β dihydroxy cardenolide
(d) 1, 3, 5, 11α , 14, 19 β -hexahydroxy cardenolide

1.29. 2, 6-dimethyl aniline and chloro acetyl chloride are the starting compounds for the synthesis of one of the following drugs. Choose the correct one.

(a) Lidocaine (b) Prilocaine (c) Bupivacaine (d) Cinchocaine

1.30. Choose the correct geneva name for TRANYL CYPROMINE.

(a) (-) trans-2-Phenyl Cyclopropylamine (b) (+) trans-2-Phenyl Cyclopropylamine
(c) ± cis-2-Phenyl Cyclopropylamine (d) ± trans-2-Phenyl Cyclopropylamine

1.31. In take of which of the following should be avoided by a patient taking on oral anticoagulant?

(a) Cyanocobalamin (b) Thiamine (c) Menadione (d) Tocopherol

1.32. Ellipsoidal schizolysigenous oil glands are important diagnostic of

(a) Ergot (b) Ginseng (c) Cinnamon (d) Clove

1.33. Catecholamines act by

(a) Decrease the amount of glucose released into the blood
(b) Increase the utilization of glucose by muscle
(c) Increase the amount of glucose released into the blood
(d) Decrease the amount of glucose in the muscle.

1.34. Hyoscyamine an alkaloid obtained from Atropa belladonna

(a) Readily racemises to atropine with ethanolic alkali. Atropine is (±) Hyoscyamine
(b) Readily disintegrates into atropine with acid solution. Atropine is (-) Hyoscyamine
(c) Readily rearranges into atropine with acid solution. Atropine is (+) Hyoscyamine
(d) Readily racemise to atropine with ethanolic alkali. Atropine.

1.35. Identify the correct molecule which controls the biosynthesis of proteins in living organisms

(a) DNA (b) RNA (c) Purines (d) Pyrimidines

SECTION - II

MATCH THE FOLLOWING

2. In the following sub questions match each of the items 1, 2, 3 and 4 on the left with an appropriate item on the right and indicate the answer.

2.1 Listed below are substances which are assayed by methods mentioned in (A) to (F). Match them.

(1) Ascorbic Acid Tablets I.P. (A) Fluorimetry
(2) Thiamine Hydrochloride I.P. (B) Spectrophotometry
(3) Calcium Pantothenate I.P. (C) Ceric ammonium sulphate oxidation
(4) Pyridoxine Hydrochloride I.P. (D) Complexometry
(E) Non-aqueous (F) Gravimetry

(a) 1-C, 2-D, 3-A, 4-E (b) 1-A, 2-C, 3-D, 4-E
(c) 1-C, 2-E, 3-E, 4-B (d) 1-A, 2-B, 3-C, 4-F

2.2 The diagnostic features of crude drugs are given in 1-4. Their descriptions are given in (A) to (F). Match them.

(1) Trichome
(2) Cicatrix
(3) Stomata
(4) Mesophyll

(A) Two similar cells placed with their long axis parallel and having smaller intercellular space.
(B) Epidermal cells which do not have any definite function
(C) An elongated tubular outgrowth of an epidermal cell
(D) Trichomes having fallen or been rubbed off leaving a scar
(E) The whole of the parenchymatous ground tissue between two epidermises
(F) Flat and has one or more rows of Palisade cells.

(a) 1-C, 2-D, 3-A, 4-E
(b) 1-A, 2-C, 3-D, 4-E
(c) 1-A, 2-C, 3-E, 4-D
(d) 1-A, 2-B, 3-C, 4-F

2.3 Some types of drugs are listed below, the specific examples are given in (A) to (F). Match them.

(1) Anti folate
(2) Purine analogues
(3) Pyrimidine analogues
(4) Antimitotic

(A) Vinblastine
(B) Thioguanine
(C) 5-Fluorouracil
(D) Methotrexate
(E) Actinomycin
(F) Cytarabine

(a) 1-D, 2-B, 3-C, 4-A
(b) 1-A, 2-C, 3-D, 4-E
(c) 1-A, 2-C, 3-E, 4-D
(d) 1-A, 2-B, 3-C, 4-F

2.4 Heterocyclic system (1-4) and the natural products in which they are present is given in (A) to (F). Match them.

(1) Imidazole
(2) B Carboline
(3) Hetrosteroidal
(4) Isoquinoline

(A) Reserpine
(B) Pilocarpine
(C) Conessine
(D) Ergotamine
(E) Papaverine
(F) Scopolamine

(a) 1-C, 2-D, 3-A, 4-E
(b) 1-B, 2-A, 3-C, 4-E
(c) 1-A, 2-C, 3-E, 4-D
(d) 1-A, 2-B, 3-C, 4-F

2.5. Starting materials used for the synthesis of the following drugs are given (A) to (F). Match them.

(1) Mepyramine Maleate
(2) GuanethidineSulphate
(3) Isoxsuprine
(4) Imipramine Hydrochloride

(A) Azocine and Chloromethyl cyanide
(B) 10-11 Dihydro-5-H. dibenz.[b-f] azepine
(C) 5-Oxo 10-11 dihydro 5-H dibenz [a-d] cycloheptene
(D) 4-hydroxy nor-ephedrine
(E) Benzaldehyde and 2-chlopro pyridine
(F) 4-methyl benzaldehyde and 2-amino pyridine

(a) 1-C, 2-D, 3-A, 4-E
(b) 1-A, 2-C, 3-D, 4-E
(c) 1-F, 2-A, 3-D, 4-B
(d) 1-A, 2-B, 3-C, 4-F

2.6. Listed below are some tests carried out to identify the constituents given in (A) to (F). Match them correctly.

(1) Benedict's test
(2) Hay's test
(3) Gimelin's test
(4) Salkowski test

(A) Bile salt
(B) Calcium
(C) Bile pigments
(D) Urea
(E) Ketone bodies
(F) Glucose

(a) 1-F, 2-A, 3-C, 4-B
(b) 1-A, 2-C, 3-D, 4-E
(c) 1-A, 2-C, 3-E, 4-D
(d) 1-A, 2-B, 3-C, 4-F

2.7. Antibiotics and their biochemical origins are given below. Match them.

(1) Cycloserine
(2) Cephalosporin
(3) Neomycin
(4) Erythromycin

(A) Two amino acid units
(B) Single amino acid
(C) Sugars
(D) Polypeptides
(E) Acetate or Propionate
(F) Polycyclic units

(a) 1-C, 2-D, 3-A, 4-E
(b) 1-B, 2-F, 3-C, 4-E
(c) 1-A, 2-C, 3-E, 4-D
(d) 1-A, 2-B, 3-C, 4-F

2.8. Match the following relationship correctly.

(1) Hypokalemia
(2) Spironolactone
(3) Rhodopsin in Retina
(4) Prodrug

(A) Biotransformation prior to eliciting pharmacological response
(B) Competitive antagonist of Aldosterone
(C) Reduction of Serum K^+ level
(D) Vitamin A

(E) Biotin
(F) Competitive antagonist of cortisone

(a) 1-C, 2-D, 3-A, 4-E
(b) 1-A, 2-C, 3-D, 4-E
(c) 1-A, 2-C, 3-E, 4-D
(d) 1-C, 2-B, 3-A, 4-A

2.9. In parenteral products, listed below are some ingredients. Their main functions are given in (A) to (F). Match them.

(1) Thiomersal
(2) Ascorbic Acid
(3) EDTA-salt
(4) Sodium Chloride

(A) Chelating agent
(B) Buffer
(C) Anti-oxidant
(D) Anti microbial agent
(E) Vehicle
(F) Tonicity adjusting agent

(a) 1-C, 2-D, 3-A, 4-E
(b) 1-A, 2-C, 3-D, 4-E
(c) 1-D, 2-C, 3-A, 4-F
(d) 1-A, 2-B, 3-C, 4-F

2.10. Size, shape and Mode of arrangements is typical of certain Micro-organisms. Match them correctly.

(1) Streptococci
(2) Sarcina
(3) Bacillus Anthracis
(4) Vibrios and Spirilla

(A) Comma and S shaped form
(B) Gram positive arranged in chains
(C) Multiples of eight
(D) Large bacilli, rectangular and gram positive
(E) Gram negative cocci
(F) Rod shaped-Acid fast

(a) 1-B, 2-C, 3-F, 4-A
(b) 1-A, 2-C, 3-D, 4-E
(c) 1-A, 2-C, 3-E, 4-D
(d) 1-A, 2-B, 3-C, 4-F

3. Give the names of the equipments used for the following:

(A) To determine the Flash point in aerosols.
(B) To determine the particle size distribution in aerosols.
(C) To determine the Hardness of the tablets
(D) To determine the particle size in a suspension
(E) To measure the volume of particles in powers

4. (i) Mention 2 gaseous materials used for sterilization.
(ii) Name a filter used for sterilization
(iii) Name the method used for sterilization of plastic syringes.
(iv) Name an equipment which can give limited asceptic area.

5. (A) Give four important side effects of MAO inhibitors.

   (B) Name a drug which is a presynaptic receptor stimulant.

6. (A) Define the following terms:

   (i) Molar absorptivity

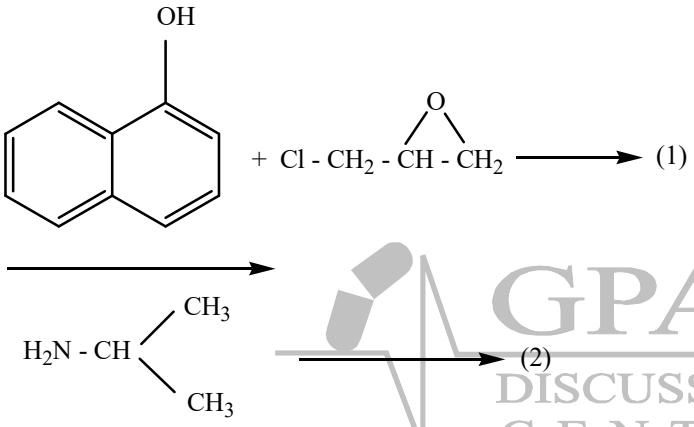
   (ii) Frequency

   (iii) Equivalent conductance

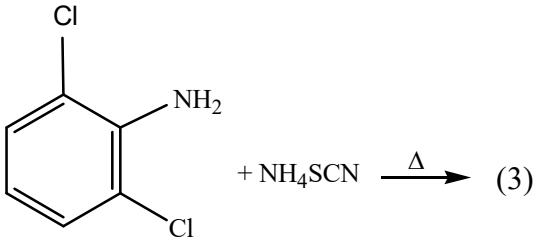
   (B) Give only the equations for the reactions involved in the assay (IP-1985) of I.N.H.

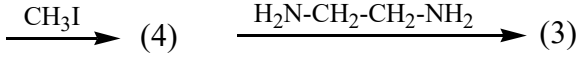
7. Complete the following reactions by inserting the appropriate products:

(a)



(b)





PART - B

Answer any TEN questions. **(50 Marks)**

8. Define mottling. Give three reasons for mottling.

9. (a) Name the causative organisms of the following infections:
   (i) Intestinal and extraintestinal amoebiasis
   (ii) Schistosomiasis
   (iii) Filariasis
   (b) Name a Macrolide antibiotic containing a lactone ring and one or more deoxy sugars which inhibits protein synthesis.
   (c) A derivative of TETRACYCLINE which has greater acid and alkaline stability and slower rate of excretion. It produces higher and more prolonged blood levels. Name it.

10. Give one typical identification test each for
   (a) Eugenol in clove oil
   (b) Cardenolides of Digitalis
   (c) Alkaloids of Belladonna
   (d) Alkaloids of Ergot
   (e) Gycosides of Senna

11. Laboratory report of the blood analysis of a patient showed RBC count = 440000/cu mm. Hb content 11.2 gm/100 ml. Calculate the % age of Haemoglobin, % of Red cell and colour index. Comment on the condition of the patient. Normal value. RBC count = 500000/cu mm Hb content = 14.8 gm/100 ml.

12. Complete the following equations showing the structure of reactants and products:
   (a) Pyrazine-2-Carboxylic acid is treated with CH_3OH and the resulting compound is treated with ammonia.
   (b) 5-Chloro salicylic acid is treated with 2 chloro-4-nitro aniline in presence of PCl_3.
   (c) 2-methyl-5-nitro imidazole is treated with 2-chloro ethanol, resulting compound is benzoylated.

13. Categorize the following drugs pharmacologically and draw the heterocyclic system present in them:
   (i) Imipramine
   (ii) Diazepam
   (iii) Cimetidine
   (iv) Dipyridamole
   (v) Thiotepa

14. (a) Name four specific tests in the investigation of a suspected case of AIDS.
   (b) Name the organism which is used in the microbiological assay of GENTAMICIN.

15. (a) Calculate the half life for a drug formulation which is most stable at pH 2.5 at which pH, the rate constant is 5×10^{-7} s^{-1} at 25°C. The drug obeys first order kinetics.
    (b) Give the Henderson-Hasselbalch equation for a weak base.
    (c) Define the term area under the curve.

16. (a) The UV spectrum of Benzaldehyde contains different absorption bands. What are the electronic transition taking place to form these bands? Name them.
    (b) Define auxochrome. Give two examples.

17. Outline the synthesis of CAFFEINE from Dimethyl urea and ethyl cyanoacetate. Give complete steps showing the reactants and products.

18. Give a specimen lable of GENTAMICIN INJECTION [I.P.1985] as per D and C act.

19. Show how you would convert the following. Choose any other reagents if need be. Give equations.
    (a) 2-4 dichloro benzoic acid to FUROSEMIDE
    (b) 4-chloro benzyl cyanide and 2-chloropyridine to an antihistaminic
    (c) Benzhydryl bromide to DIPHENDYDRAMINE

20. Write the reaction sequence catalyzed by the enzymes for the transfer of acyl Co-A across inner mitochondrial membrane and degradation of fatty acids.

21. (a) Give an equation and show how it can be used to measure the solubility of a sparingly soluble salt by conductometry.
    (b) Give three important requirements to prepare a normal Hydrogen electrode.

22. Name the metabolic reaction and give the structure of the major metabolite formed from the following medicinal agents:
    (a) Chlorpromazine
    (b) 6-mercapatopurine
    (c) Meperidine
    (d) Sulphamethoxazole
    (e) Nicotinamide

23. Write the characteristic I.R. absorption bands fro the following functional groups:
    (a) > C = 0 group in aldehydes
    (b) Free-OH group
    (c) Primary amino group
    (d) C-Cl-stretching
    (e) C-NO_2 Aromatic

24. Write in one or two sentences the mechanism of action of the following:
    (a) Isosorbide mononitrate
    (b) Sulphamethoxazole and Trimethoprim
    (c) Cisplatin
    (d) Chloramphenicol

25. Following Phytoconstituents are present in specific part of a crude drug. Give the botanical name and the part in which they are present.
    (a) Morphine
    (b) Eugenol
    (c) Deserpidine
    (d) Dihydroxy Anthracene derivatives
    (e) Ergotoxine

26. Give the drug interactions for the following combination-answer in 2 sentences each.
    (a) Acetazolamide and Quinidine
    (b) Methyl Dopa and Chlorothiazide
    (c) Amphotericin-B and Digitalis glycosides
    (d) Ascorbic Acid and PAS
    (e) Haloperidol and Rifampicin

27. Name and draw the structural formulae of a
    (a) Vitamin which participates in the metabolic reaction as coenzyme-A
    (b) Water soluble vitamin which is derived from sugar
    (c) Vitamin which contains Pteridine ring system and is used as an antianemic factor
    (d) Vitamin which as coenzyme takes part in the decarboxylation of -keto acid
    (e) Vitamin which forms part of NAD^+ and NADH.

End of paper

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ANSWER KEY GPAT 1997

Section -I

1.1	a	1.11	b	1.21	a	1.31	d
1.2	c	1.12	b	1.22	a	1.32	d
1.3	b	1.13	b	1.23	d	1.33	c
1.4	d	1.14	b	1.24	d	1.34	a
1.5	d	1.15	d	1.25	a	1.35	b
1.6	a	1.16	b	1.26	d		
1.7	d	1.17	a	1.27	a		
1.8	a	1.18	b	1.28	c		
1.9	b	1.19	d	1.29	a		
1.10	c	1.20	c	1.30	d		

Section –II

2.1	c	2.2	a	2.3	a	2.4	b
2.5	c	2.6	a	2.7	b	2.8	d
2.9	c	2.10	a				

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