

# GPAT QUESTION PAPER 1998 WITH ANSWER KEY

## PHARMACEUTICAL SCIENCE

Time : 3 hours

Maximum Marks : 200

Read the following instruction carefully.

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

### SECTION - I

- R1.** (1) Answer all questions in this section.  
(2) Answer question No.1 and 2 in the specific columns provide in the answer book.
- 1.1. The opium alkaloids in *Papaver somniferum* is present as one of the following. Identify.
- |                             |                             |
|-----------------------------|-----------------------------|
| (a) Free alkaloids          | (b) As salts of citric acid |
| (c) As salt of meconic acid | (d) None of these           |
- 1.2. In expressing vitamin A activity one of the following is true. Identify.
- |                                                                                     |
|-------------------------------------------------------------------------------------|
| (a) One RE represents the biological activity in 1 $\mu$ g of all trans retinol     |
| (b) One RE represents the biological activity of 30 mg of all trans retinol         |
| (c) One RE represents the biological activity of 0.334 $\mu$ g of all trans retinol |
| (d) None of the above                                                               |
- 1.3. Which of the antineoplastic agent is metabolised by xanthine oxidase?
- |                      |                   |
|----------------------|-------------------|
| (a) 6-Mercaptopurine | (b) Vincristine   |
| (c) Chlorambucil     | (d) 6-Thioguanine |

- 1.5. The energy of a photon is given by the relationship  $E = hv$ , where
- (a) E is energy of photon in kilo-calories (b) E is energy of photon in cycles/sec  
(c) E is the energy of photon in joules (d) E is the energy of photon in ergs
- 1.6. Gas chromatographic technique can be used for
- (a) Qualitative analysis only (b) Quantitative analysis only  
(c) Both (d) None of these
- 1.7. Reference compound widely used in NMR spectroscopy for proton spectra in non-aqueous medium is:
- (a) Silane (b) Tetramethyl Silane  
(c) Dpph (d) Peroxylamide Di Sulphonate
- 1.8. Liposomes are
- (a) Uni or multilayered vesicles of phospholipids (b) Type of enzymes  
(c) Fibrinopeptides (d) Red blood cells
- 1.9. The gonadal hormones like Estrogens, Androgens and Progestins bind with
- (a) Receptors located in the cytoplasm (b) Receptors located in the nucleus of the cell  
(c) Receptors located in the contractile vacuoles (d) None of the above
- 1.10 A highly sensitive semi quantitative method of detecting microbial antigens in biological fluid is:
- (a) Counter immune electrophoresis (b) Nitroblue tetrazolium dye assay  
(c) The Coomb's test (d) Radio-immune electrophoresis
- 1.11 Polyene antibiotics such as Amphotericin - B are most likely to
- (a) Inhibit bacterial DNA synthesis (b) Bind to prokaryotic ribosomes  
(c) Act as antimetabolites (d) React with sterols in the membrane
- 1.12 Among the following statements one of them is most appropriate for  $\gamma$  - Interferon. Identify.
- (a) They are virus specific substances and not host specific, naturally occurring glycol-proteins.  
(b) They are not virus specific substances, however, they are naturally occurring glycol-proteins.  
(c) They are not virus specific substances, however they are not host specific either. They are naturally occurring glycol-proteins.  
(d) They are virus specific and host specific naturally occurring glycoproteins.
- 1.13 The tear secretion contains an antibacterial enzyme known as
- (a) Zymase (b) Diastase (c) Lysozyme (d) Lipase
- 1.14 A list of ACE inhibition is given below. One of them is not a Prodrug. Identify.
- (a) Benzepiril (b) Captopril (c) Quinapril (d) Ramipril
- 1.15 Which one of the following is not a pharmacological effect of MORPHINE?
- (a) Constriction of the pupil (b) C.N.S. depression  
(c) Diarrhoea (d) Respiratory
- 1.16 Half life equation for First order reaction is:
- (a)  $\frac{t}{2} = \frac{a}{2K}$  (b)  $\frac{t}{2} = \frac{0.693}{K}$  (c)  $\frac{t}{2} = \frac{1}{aK}$  (d)  $\frac{t}{2} = \frac{3}{2} \frac{1}{a^2K}$



1.17 Which one of the following is true for alkaloidal bases?

- (a) Water solubility and organic solvent insolubility.
- (b) Water insolubility and organic solvent insolubility.
- (c) Water solubility and organic solvent solubility
- (d) Water insolubility and organic solvent solubility

1.18 The conductivity of the solution of an electrolysis is:

- (a) Non temperature dependent
- (b) Temperature dependent
- (c) Pressure dependent
- (d) None of these

1.19. One of the materials listed below is most commonly used in film coating of tablets. Identify.

- (a) Hydroxypropyl Methyl Cellulose
- (b) Acacia
- (c) Simple Syrup
- (d) Bees Wax

1.20. Lamination is:

- (a) Separation of a tablet into two or more distinct layers
- (b) Partial and complete separation of the top and bottom crowns of a tablet from the main body of the tablet <http://www.xamstudy.com>
- (c) Process of sub-coating of tablets
- (d) None of the above

1.21. Among the four OPIOIDS given below one of them is equipotent on  $\mu$ ,  $\delta$ ,  $k_1$  and  $k_3$  receptor types. Identify.

- (a) Fentanyl
- (b) Methadone
- (c) Morphine
- (d) Etorphine

1.22. An amperometric titration in which one of the following is kept constant?

- (a) Current
- (b) Resistance
- (c) Voltage Applied
- (d) Conductance

1.23. Disposable syringes are made up of

- (a) Polypropylene
- (b) Transparent Polystyrene
- (c) Glass
- (d) Poly Tetra Chloro Ethylene

1.24. Typhoid vaccine IP is a sterile suspension or a freeze dried solid prepared from

- (a) *Salmonella Typhi* Murium
- (b) *Salmonella Para Typhi*
- (c) *Salmonella Typhi*
- (d) *Salmonella Enteritidis*

1.25 In the microbiological assay of bacitracin  $\alpha$  IP the test organism used is

- (a) *Staphylococcus Aureus*
- (b) *Staphylococcus Epidermidis*
- (c) *Micrococcus Luteus*
- (d) *Bacillus Pumilus*

1.26. In the general formula R-X-C-C-N : X= Nitrogen, or Carbon, R = Different groups. This formula represents

- (a) Antitussive
- (b) Antipyretics
- (c) Analgesics
- (d) Antihistamines

1.27. The biological source of cinnamon bark is:

- (a) Dried inner bark of the shoot of coppiced trees of *Cinnomomum zeylanicum* Family – Lauraceae
- (b) Dried inner bark of the shoot of coppiced trees of *Cinnomomum indicum* Family – Lauraceae
- (c) Dried wood bark of *Cinnomomum Camphora* Family – Lauraceae
- (d) Dried inner bark of the shoot of coppiced trees of *Cinnomomum loureirii* Family – Lauraceae



1.28. Identify the correct Geneva name for CORTISONE.

- (a) 4 - Pregnene 17 $\alpha$ , 21 - diol - 3, 11, 20 - trione
- (b) 3 - Pregnene 17 $\alpha$ , 21 - diol - 3, 11, 20 - trione
- (c) 4 - Pregnene 11 $\beta$ , 17 $\alpha$ , 21-triol - 3, 11, 20 - dione
- (d) 4 - Pregnene 12 $\beta$ , 17 $\alpha$ , 21 - triol - 3, 20 - dione

1.29. Identify one of the carbonic anhydrase inhibitor that inhibit only luminal carbonic anhydrase enzyme?

- (a) Methazolamide
- (b) Acetazolamide
- (c) Dichlorphenamide
- (d) Benzolamide

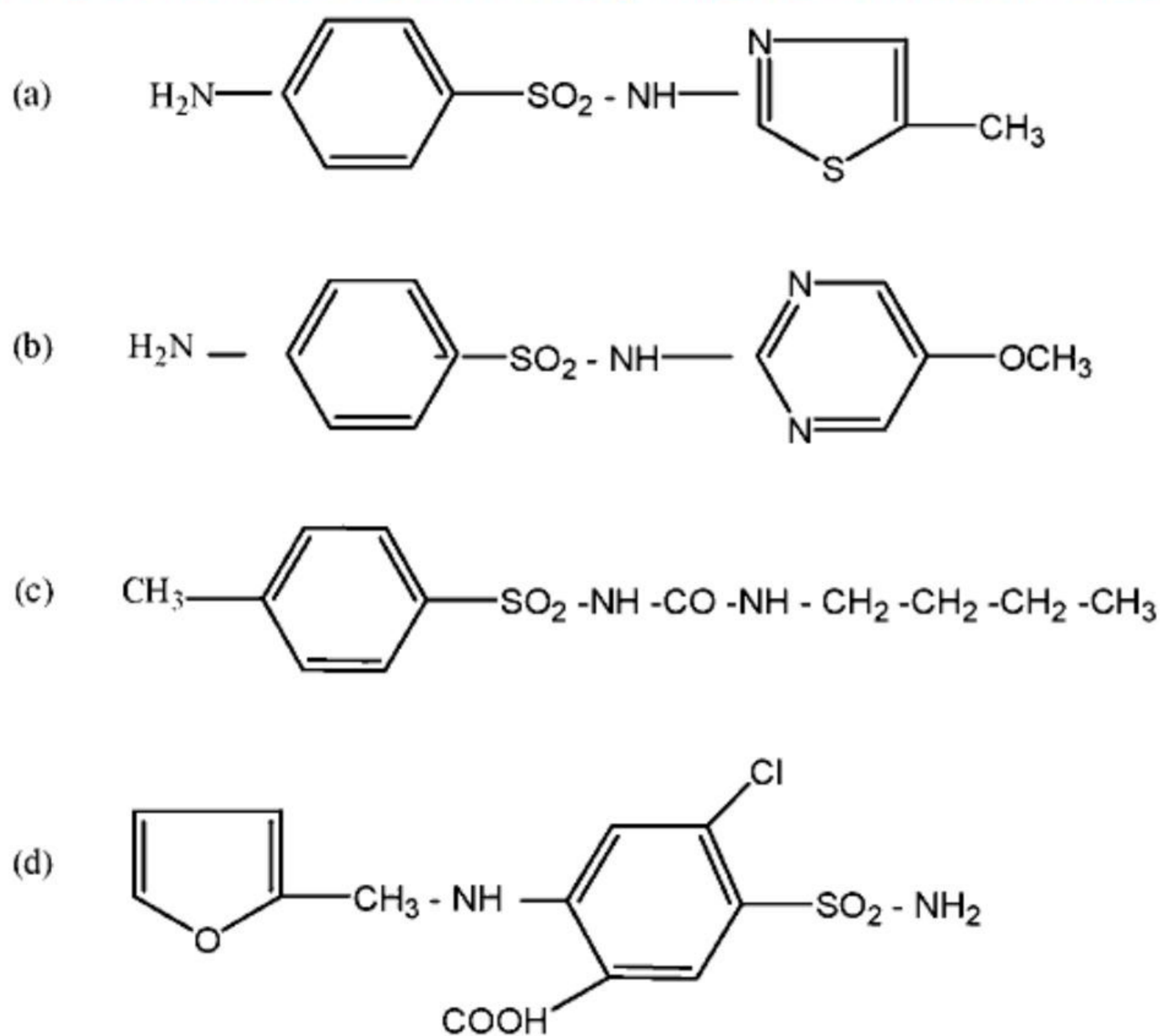
1.30. Testosterone is rapidly converted to one of the following metabolic products in many tissues, which is the active androgen?

- (a) 5- $\beta$ -Dihydro Testosterone
- (b) 5-OH-Testosterone
- (c) 5- $\alpha$ -Dihydro Testosterone
- (d) 5 $\alpha$ , 6 $\beta$ -OH-Testosterone

1.31. One of the following drugs is an alkylating agent. Identify.

- (a) Cyclophosphamide
- (b) Methotrexate
- (c) Allopurinol
- (d) Rifampicin

1.32. Listed below are structures of sulphonamides. Which one of them is used as an anti-diabetic drug?



1.33. Four sets of intermediates are listed below. Choose the correct set for the synthesis of BUPIVACAINE IP.

- (a)  $\alpha$  -Picolinic Acid Chloride with 2, 6-Diethyl Aniline.
- (b)  $\beta$  -Picolinic Acid Chloride with 2, 6-Diethyl Aniline.
- (c)  $\alpha$  -Picolinic Acid Chloride with Aniline Hydrochloride.
- (d)  $\alpha$  -Picolinic Acid Chloride with 2, 6-Di Methyl Aniline.

1.34. Among the immunizing agents listed below one of them is orally administered. Identify.

- (a) Tetanus Toxoid (b) Rabies Vaccine  
(c) Poliomyelitis Vaccine (d) Mumps Virus Vaccine

1.35. In vitro dissolution rate studies on drug product are useful in bioavailability evaluations if they are correlated with

- (a) Disintegration rate  
(b) In-vivo studies in at least three species of animals  
(c) The chemical stability of the drug  
(d) In-vivo studies in human

## SECTION - II

2. In the following sub-questions match each of the items 1 and 2 on the left with an appropriate item on the right [A, B, C, D] and write in the specific space provided in the answer book.

2.1 The mechanism of action of antiviral drugs is given. Match with closely associated drugs given in (A) to (D).

- (1) Inhibit an early step in viral replication viral uni-coating (A) Amantadine  
(2) Irreversible inactivation of DNA Polymerase (B) Methisazone  
(C) Rifampin  
(D) Acyclovir

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

2.2. Given below are the etiologic agents. Match with common name of the infection listed in (A) to (D):

- (1) Enterobius vermicularis (A) Tape worm  
(2) Taenia saginata (B) Pin worm  
(C) Round worm  
(D) Hook worm

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

2.3. The substance mentioned below elicit the therapeutic effect given in (A) to (D):

- (1) Hepatitis B. Immuno globulin antibodies (A) Induce active long term immunity in host cells  
(2) Tetanus Toxoid (B) Induce functional differentiation  
(C) Provide transfer of passive immunity  
(D) Provide short term non-specific bactericidal effect

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



2.4. The following glycosides of Digitalis Purpurea give on hydrolysis the genus and sugars listed in (A) to (D). Match them.

- |                          |                                                                                        |
|--------------------------|----------------------------------------------------------------------------------------|
| (1) Purpurea Glycoside-A | (A) 1, 3, 5 - 11 $\alpha$ 19-hexahydroxy cardenolide + Glucose + Digitoxose            |
| (2) Purpurea Glycoside-B | (B) 3 $\beta$ , 14 $\beta$ - dihydroxy cardenolide + Glucose + Digitoxose              |
|                          | (C) 3 $\beta$ , 14 $\beta$ , 16 $\beta$ - trihydroxycardenolide + Glucose + Digitoxose |
|                          | (D) 3 $\beta$ , 12 $\beta$ , 14 $\beta$ - trihydroxycardenolide + Glucose + Digitoxose |

(a) 1-A, 2-C

(b) 1-B, 2-C

(c) 1-A, 2-D

(d) 1-B, 2-D

2.5. Listed are some important antibiotics (A) to (D). match them.

- |                  |                                      |
|------------------|--------------------------------------|
| (1) Bacitracin   | (A) From several amino acids         |
| (2) Erythromycin | (B) From single amino acids          |
|                  | (C) From acetate or propionate units |
|                  | (D) From sugars                      |

(a) 1-A, 2-C

(b) 1-B, 2-C

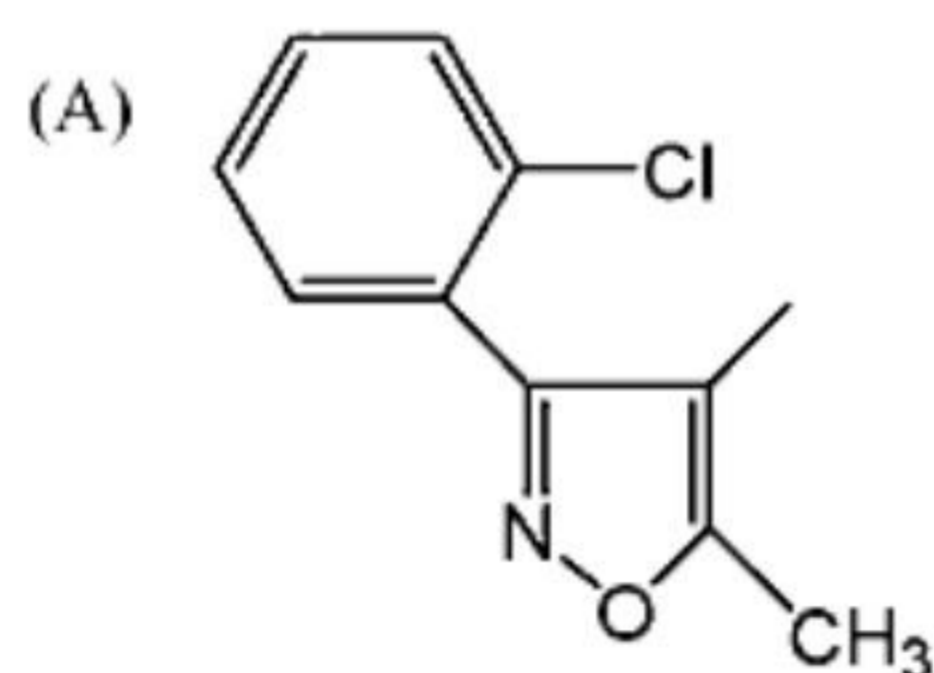
(c) 1-A, 2-D

(d) 1-B, 2-D

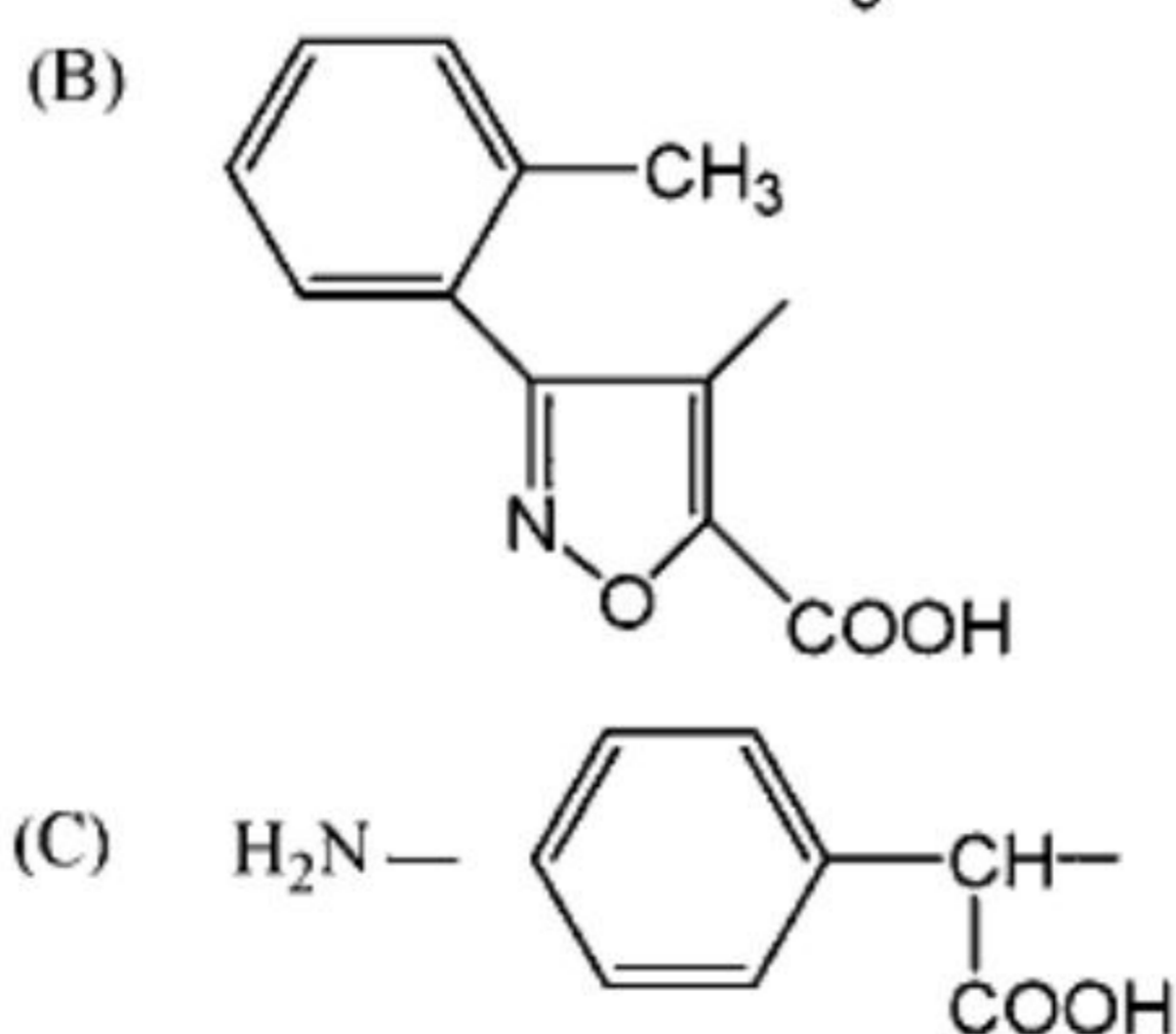


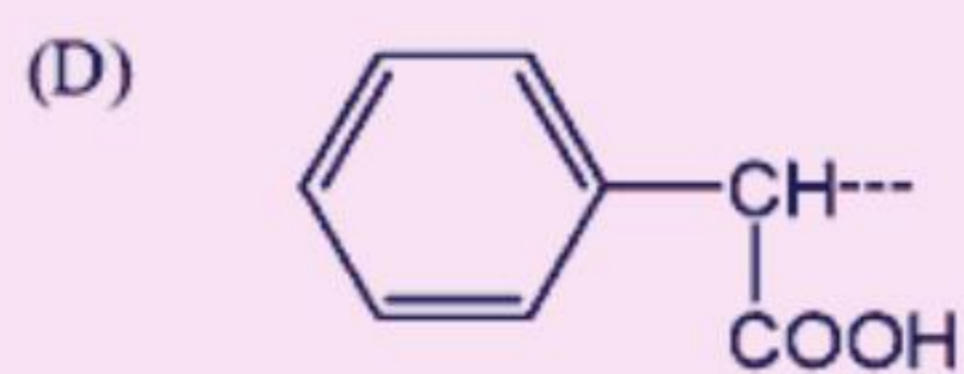
is listed in A to D for the following antibiotics. Match Them:

(1) CLOXACILLIN



(2) CARBENICILLIN





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

2.7. Some of the vitamins listed below are associated with co-enzyme given in (A) to (D). Match them.

- |                    |                |
|--------------------|----------------|
| (1) Nicotinic Acid | (A) Coenzyme A |
| (2) Riboflavin     | (B) Coenzyme I |
|                    | (C) TPP        |
|                    | (D) FAD        |

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

2.8. Listed are some tablets additives. Match them with their correct use given in (A) to (D).

- |             |               |
|-------------|---------------|
| (1) Acacia  | (A) Binder    |
| (2) Lactose | (B) Glidant   |
|             | (C) Diluent   |
|             | (D) Lubricant |

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

2.9. The compounds listed are assayed by method given (A) to (D). Match them.

- |                                  |                           |
|----------------------------------|---------------------------|
| (1) Pyridoxine Hydrochloride I.P | (A) Colorimetry           |
| (2) Ranitidine Hydrochloride     | (B) H P L C               |
|                                  | (C) Fluorimetry           |
|                                  | (D) Non aqueous titration |

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

2.10. The following techniques are associated with the support materials used in the column which are given in (A) to (D). Match them.

- |                                   |                                                          |
|-----------------------------------|----------------------------------------------------------|
| (1) Size exclusion chromatography | (A) Octadecyl silane chemically bounded to Porous silica |
| (2) H P L C                       | (B) Cellulose acetate                                    |
|                                   | (C) Diatomaceous support                                 |
|                                   | (D) Agarose F.C.                                         |

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

2.11. For the following potentiometric titrations indicator electrode used is given from (A) to (D). Match them.

- |                   |                               |
|-------------------|-------------------------------|
| (1) Acid base     | (A) Silver electrode          |
| (2) Complexometry | (B) Glass electrode           |
|                   | (C) Platinum electrode        |
|                   | (D) Mercury-Mercury electrode |

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

2.12. Following ring systems are present in the alkaloids listed (A) to (D). Match them.

- |                  |                 |              |              |
|------------------|-----------------|--------------|--------------|
| (1) Imidazole    | (A) PELLETERINE |              |              |
| (2) Isoquinoline | (B) Nicotine    |              |              |
|                  | (C) Papaverine  |              |              |
|                  | (D) Pilocarpine |              |              |
| (a) 1-D, 2-C     | (b) 1-B, 2-C    | (c) 1-A, 2-D | (d) 1-B, 2-D |

2.13. Following constituents are present in drugs listed in (A) to (D). Match them.

- |                |                         |              |              |
|----------------|-------------------------|--------------|--------------|
| (1) D-Linalool | (A) Opium               |              |              |
| (2) Panaxadiol | (B) Coriandrum sativium |              |              |
|                | (C) Ginseng             |              |              |
|                | (D) Brahmi              |              |              |
| (a) 1-A, 2-C   | (b) 1-B, 2-C            | (c) 1-A, 2-D | (d) 1-B, 2-D |

2.14. Systematic name of the following biologically important purines are given in (A) to (D). Match them correctly.

- |              |                                       |              |              |
|--------------|---------------------------------------|--------------|--------------|
| (1) Adenine  | (A) 2-amino-6-oxo purine              |              |              |
| (2) Guanine  | (B) 6-amino purine                    |              |              |
|              | (C) 1, 3, 7-dimethyl 6-hydroxy purine |              |              |
|              | (D) 6-hydroxy purine                  |              |              |
| (a) 1-D, 2-A | (b) 1-B, 2-C                          | (c) 1-A, 2-D | (d) 1-B, 2-D |

2.15. The drugs mentioned below are synthesized from intermediates listed in (A) to (D). Match them.

- |                 |                                                       |              |              |
|-----------------|-------------------------------------------------------|--------------|--------------|
| (1) Meprobamate | (A) 2-chloro-5-amino benzophenone and glycine         |              |              |
| (2) Diazepam    | (B) 2-amino-5-chloro-benzophenone and ethyl glycinate |              |              |
|                 | (C) 2-ethyl benzaldehyde and formaldehyde             |              |              |
|                 | (D) 2-methyl valeraldehyde and formaldehyde           |              |              |
| (a) 1-A, 2-C    | (b) 1-B, 2-C                                          | (c) 1-A, 2-D | (d) 1-D, 2-B |

2.16. Some of the drugs listed below from (A) to (D) are having specific mechanism of action. Match them.

- |                                                                                         |                 |              |              |
|-----------------------------------------------------------------------------------------|-----------------|--------------|--------------|
| (1) Interferes with the renin-angiotensin system                                        | (A) Hydralazine |              |              |
| (2) Directly relaxes arteriolar smooth muscles and thus decreases peripheral resistance | (B) Methyl Dopa |              |              |
|                                                                                         | (C) Enalapril   |              |              |
|                                                                                         | (D) Clonidine   |              |              |
| (a) 1-C, 2-A                                                                            | (b) 1-B, 2-C    | (c) 1-A, 2-D | (d) 1-B, 2-D |

2.17. Given below from (A) to (D) are application forms for the specific purpose listed as per (D) and (C). Act. Match them.

- |                                                        |                   |              |              |
|--------------------------------------------------------|-------------------|--------------|--------------|
| (1) Manufacture of cosmetics                           | (A) Form No. 31   |              |              |
| (2) Retail sale of schedule C and C <sub>1</sub> drugs | (B) Form NO. 20 C |              |              |
|                                                        | (C) Form No. 20   |              |              |
|                                                        | (D) Form No. 21   |              |              |
| (a) 1-A, 2-C                                           | (b) 1-B, 2-C      | (c) 1-A, 2-D | (d) 1-B, 2-D |



2.18. For many drugs in the I.P. exact solubility limits are not listed. Instead, descriptive terminology is employed.

Match the numbered solubility limits with the correct lettered solubility expression (gm/ml).

- |                       |                      |              |              |
|-----------------------|----------------------|--------------|--------------|
| (1) Very soluble      | (A) Less than 1      |              |              |
| (2) Sparingly soluble | (B) From 1 to 10     |              |              |
|                       | (C) From 30 to 100   |              |              |
|                       | (D) From 100 to 1000 |              |              |
| (a) 1-A, 2-C          | (b) 1-B, 2-C         | (c) 1-A, 2-D | (d) 1-B, 2-D |

2.19. It is often desirable to formulate a dosage form so that its pH is approximately equivalent to that of the area of which it is administered. Match them.

- |              |              |              |              |
|--------------|--------------|--------------|--------------|
| (1) Blood    | (A) pH 7.4   |              |              |
| (2) Skin     | (B) pH 6.4   |              |              |
|              | (C) pH 5.5   |              |              |
|              | (D) pH 6.8   |              |              |
| (a) 1-A, 2-C | (b) 1-B, 2-C | (c) 1-A, 2-D | (d) 1-B, 2-D |

2.20. The following microscopical characteristic is associated with the drugs mentioned in (A) to (D). Match them.

- |                                            |                               |              |              |
|--------------------------------------------|-------------------------------|--------------|--------------|
| (1) Rubiaceous type of stomata (Paracytic) | (A) Atropa belladonna leaves  |              |              |
| (2) Ranunculaceous type of stomata         | (B) Cassia acutifolia leaves  |              |              |
|                                            | (C) Cassia auriculata leaves  |              |              |
|                                            | (D) Digitalis purpurea leaves |              |              |
| (a) 1-D, 2-B                               | (b) 1-B, 2-C                  | (c) 1-A, 2-D | (d) 1-B, 2-D |

- Give the five steps involved in the absorption of Transdermal dosage forms.
- (A) Give the structural formula of the important phenolic constituent of clove oil.  
(B) Give its name.  
(C) What happens when a transverse section of the clove bud is treated with strong potassium hydroxide solution and examined under microscope?  
(D) What are [answer in one sentence each]  
(i) Mother clove  
(ii) Blown clove
- (A) Three types of electrons are involved in the absorption of energy in the UV region. What are they?  
(B) In fluorimetry how the emitted radiation is separated from incident radiation.  
(C) Why IR radiations cannot bring about electronic changes?
- Show how you would convert to the following? Choose any other reagents if need be. Answer by giving equations only.  
(A) Pyridine to Diodone I.P.  
(B) 2-Amino Benzophenone and Ethyl Glycinate to Nitrazepam  
(C) Methyl Acetoacetate and 2-Nitro-Benzaldehyde to Nifedipine.

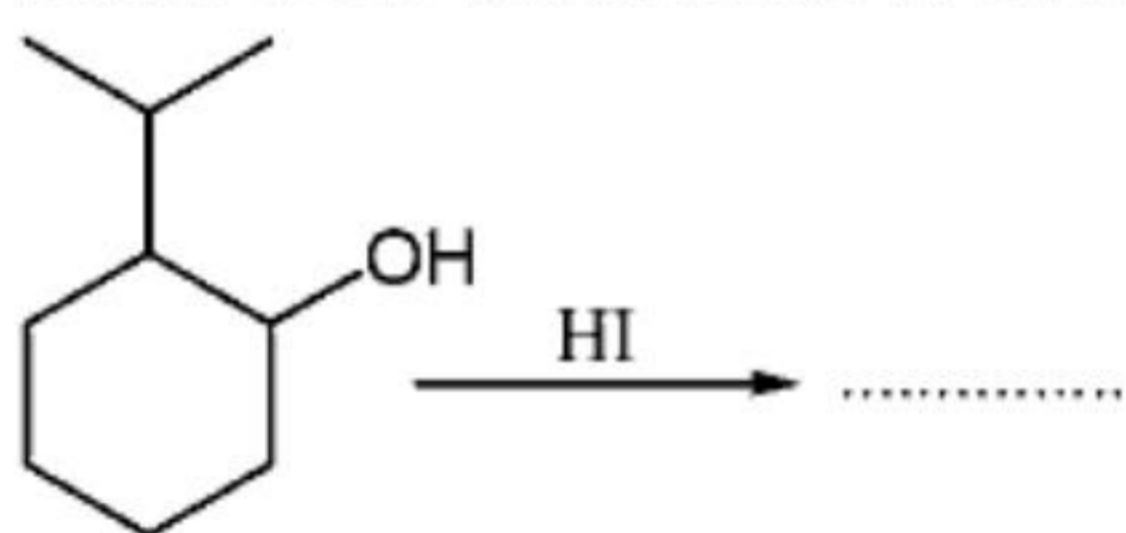
7. (A) Draw the structure of Allopurinol  
 (B) How does it act? (answer in one sentence)  
 (C) What is its interaction with Probenecid? (Answer in 2 sentences)  
 (D) What is its major clinical use? (Answer in 2 sentences)

**PART - B**

**Answer any TEN questions.**

8. Compound A with molecular formula  $C_{18}H_{22}O_2$  gave  
 (A) Chrysene on zinc dust distillation  
 (B) Oxime on treatment with  $NH_2 - NH_2$ .  
 (C) Methyl ether with  $CH_3I$ .  
 (D) On catalytic hydrogenation it is converted to  $C_{18}H_{30}O_2$ , a dihydroxy derivative.  
 (E) It undergoes a coupling reaction with benzene diazonium chloride.  
 What inferences you can draw from reaction - (A) to (E). Answer each in one sentence only.

9. (A) Mention the difference between the optical activity of Limonene and Dipentene.  
 (B) Show how Limonene is converted to Carvone.



- (C) Complete the following reaction:
10. (A) List four basic principles of HPLC.  
 (B) Name the technique used to handle solids as a thin paste in IR-spectrophotometry.
11. (A) What is the source of Belladonna Herb. I.P.?  
 (B) Give the microscopical characteristics of Belladonna leaf under the following headings. Answer each in one or two sentence only.  
 (i) Eipdermal cells  
 (ii) Stomata  
 (iii) Cakium oxalate crystals  
 (iv) Trichomes
12. Calculate the concentration of Dextrose required to make a 0.24% solution of sodium chloride iso osmotic with blood plasma. Molecular weights of NaCl = 58.5 and Dextrose -180.
13. Mention five advantages of Membrane filter method over other methods of sterilization.

14. Name the specific type of antagonism for the following combination:
- Dimercaprol and Mercury
  - Acetyl Choline and Epinephrine
  - Morphine and Naloxone
  - Nor Adrenaline and Phenoxy Benzamine
  - Adrenaline and Diazoxide
15. Write equation only for the chemical reactions involved in the following assays:
- Diphenhydramine Hydrochloride. I.P.
  - Benzocaine. I.P.
  - Ascorbic Acid I.P.
  - Di-iodo Hydroxy Quinoline. I.P.
16. (A) What is half wave potential?  
 (B) Give its application  
 (C) Oxygen dissolved in the solution for polarographic analysis produces two waves in a polarogram. Write the chemical reactions involved in the production of these waves in acid solution.
17. (A) What is Streptokinase. I.P.?  
 (B) Mention its important action.  
 (C) What are Zymogens?
18. (A) Tetracycline hydrochloride shows three acidity constants in aqueous solutions. Which particular functional groups are responsible for this? <http://www.xamstudy.com>  
 (B) "Salt of Phenoxy Methyl Penicillin with N.N'- bis-(dihydroabietyl)-ethylene diamine-provides very long acting liquid oral dosage form" - Give reason in one sentence only.  
 (C) Which group is Penicillin is responsible in determining the extent to which it is plasma protein bound?
19. Mention the nature and name of primary metabolites and the resulting change in the activity profile of the following drugs:
- Procaine
  - Imipramine
  - Enalapril
  - Chlorpromazine
  - 6-Mercaptopurine
20. (A) Metabolism of Lidocaine in the liver produces products A, B and C in a stepwise manner. Draw the structure of Lidocaine and the metabolic products A, B and C.  
 (B) The anti-inflammatory effect of NSAID's are explained on the basis of one important observation. Mention in one sentence.
21. (A) Give the structural formula of a Diuretic which contains a Pyrazine ring.  
 (B) It has a pK of 8.7. Which group is responsible for this?  
 (C) Why the above compound is very poorly and erratically absorbed from the G.I. tract?  
 (D) What happens when Benzhydryl bromide is treated with 4-hydroxy-1-methyl piperidine? [give equation only]  
 (E) Indicate the pharmacological category of the compound obtained in (D).



