Technical University of Mombasa

Faculty of Applied and Health Sciences

DEPARTMENT OF **MEDICAL SCIENCES**

DIPLOMA IN PHARMACEUTICAL TECHNOLOGY
(DPT 12J)

APM 2217 : PHARMACEUTICAL CHEMISTRY I

SPECIAL/SUPPLEMENTARY: EXAMINATIONS

SERIES: February 2013

TIME: 2 HOURS

INSTRUCTIONS:

You should have the following for this examination

- *Answer booklet*

This paper consists of THREE sections A, B and C.
Answer all questions in section A and B and choose THREE out of FIVE questions in section C.

This paper consists of 9 PRINTED pages

SECTION A (40MARKS)

1. A hydrophilic medicinal agent has the following property:
   a) Low ability to penetrate cell membranes
   b) High ability to undergo extensive metabolism
   c) High ability to penetrate blood brain barrier
   d) Low ability to undergo renal elimination

2. Biotransformation of drugs is to render them
   a) Less ionizable
   b) More pharmacologically active
   c) More lipid soluble
   d) Less lipid soluble

3. Select the drug type for which microsomal oxidation is the most prominent
   a) Lipid soluble
   b) Water soluble
   c) Low molecular weight
   d) High molecular weight

4. Which of the following processes proceeds in the second phase of biotransformation
   a) Acetylation
   b) Reduction
   c) Oxidation
   d) Hydrolysis

5. Irrepressible interaction between an antagonist and receptor is due to
   a) Ionic bonds
   b) Hydrogen bonds
   c) Covalent bonds
   d) All of the above

6. Which of the following functional groups is most likely to participate in dipole- dipole interations
   a) Aromatic ring
   b) Ketone
   c) Alcohol
   d) Alkene

7. Which of the following underlined actions is likely to be the strongest hydrogen bond acceptor
   a) Amide nitrogen (R<u>N</u>HCOR)
   b) Aniline nitrogen (Ar<u>N</u>H_2)
   c) Amine nitrogen (R<u>N</u>H_2)
   d) CArboxylate oxygen (RC<u>O_2^-</u>)

8. Which of the following shows electron withdrawing groups
   a) Phenyl
   b) Ethers
   c) Amines
   d) Alkyl groups

9. Which of the following shows electron donating group
   a) Amides
   b) Esters
   c) Ketones
   d) Amines

10. Hendersen – Hasselbalch equation is represented by
   a) Ka = [A] [H^+] / [HA]
   b) pKa + pKb = 14
   c) pKa = pH + 10g[HA] /[A^-]
   d) both (a) and (c)

11. The physical properties of alkali metal compounds are usually determined by
   a) Anion present
   b) Cation present
   c) Both anion & cation present
   d) None of the above

12. Tetra substituted amine salts
   a) Are acids
   b) Are bases
   c) Form highly polar compounds
   d) B and C are correct

13. The most effective method of removing microbial contamination from water is
   a) Distillation
   b) Demineralization
   c) Micro-porous filtration
   d) Photo-oxidation

14. Which of the following best explains why pH of potable water will vary from 5 to 7
    a) Source of raw water
    b) Demineralization
    c) Aeration
    d) Chlorination

15. The acid of choice in neutralization procedures when resultant – solution are to be used as medicine is
    a) Phosphoric acid
    b) HCl
    c) H_2SO_4
    d) Sodium dihydrogen phosphate

16. Effervescent formulations are usually packed in single dose sachets to
    a) Minimise cost
    b) Easen handling
    c) Prevent mature contamination
    d) All the above

17. The following properties constitute to excellent solvent action of water except
    a) Small size of water molecule
    b) Ability to form H – bonds
    c) Strong dipole moment
    d) Low surface tention

18. The compound used for pH adjustment of commercial sample of sodium hypochlorite is
    a) Phasphoric acid
    b) HCl
    c) Sodium carbonate
    d) Sodium dihydrogen phosphate

19. The main advantages of $NaHCO_3$ over NaOH is that :
    a) It is more heat stable
    b) It has stronger neutralizing action
    c) It is not sensitive to moisture and CO_2
    d) It is cheaper

20. The following sulphur IV compound may be used as an anti-oxidant for alkaline solutions
    a) Sulphur dioxide
    b) Sodium sulphite
    c) Sulphurous acid
    d) Hydrogen

21. The following are classified as long acting barbiturates except
    a) Mephorbarbitone
    b) Barbitone
    c) Phenobarbitone
    d) Thiopental

22. Which of the following is true about benzodiazepines
    a) Are unstable to light
    b) Most are hydrophilic
    c) Are CNS stimulants
    d) Are drugs of choice in grandma epilepsy

23. The following benzodiazepines has no anticonvulsant activity
    a) Diazepam
    b) Chlordiazepoxide
    c) Carbamazepine
    d) Acetazolamide

24. The most important physical chemical properties of drugs include the following except
    a) Water and lipid solubility
    b) Interaction with receptors
    c) Partition co-efficient
    d) Stereo – chemistry

25. The following class of drugs is not included in the chemical classification of antipsychotic agents
    a) Butyrophenones
    b) Thioxanthenes
    c) Oxazolidine diones
    d) Benzazepines

26. Which of the following ios not a tricyclic antidepressant?
    a) PRotryptilline
    b) Phenelzine
    c) Amitryptilline
    d) Imipramine

27. Formulation of a drug as a prodrug is aimed at achieving the following except
    a) Improved oral solubility
    b) Prolonged duration of action
    c) Improved H_2O solubility
    d) Increased bio transformation

28. An example of a drug that undergoes amino acid conjugation is
    a) Isoniazid
    b) Salicylic acid
    c) Paracetamol
    d) Sulphanilamide

29. A show acetylator administered a drug metabolized this way may warrant
    a) An increase in drug dosage
    b) A decrease in drug dosage
    c) No special considerations in their case
    d) More frequent dosage

30. Mercapturic acid derivatives in phase II metabolism can result from reactions of
    a) Alutathion conjugates
    b) Glucoronide conjugates
    c) Glycine conjugates
    d) Glutamate conjugates

31. All optically active compounds
    a) Decompose in strong light
    b) Undergo photo-chemical reactions
    c) Contain a centre of plane reactions
    d) Contain a double bond

32. Which of the following enzymes is not involved in catalyzing a phase I metabolic reaction
    a) Flavin containing mono-oxygenases
    b) Mon-amine oxidases
    c) Glucoronyl transferases
    d) Esterases

33. Which type of infection could be orally treated by a highly polar antibacterial agent
    a) Brain infection
    b) Gut infection
    c) Kideney infection
    d) Lung infection

34. Water frequently assumes the role as a ligand in complex substances because of it's
    a) Small size
    b) Strong dipole moment
    c) Hydrogen dipole bonding
    d) Dielectric constant

35. An excessive acidity resulting from high chlorination may be reduced to acceptable level by addition of
    a) Sodium bicarbonate
    b) Sodium hydroxide
    c) Ammonia
    d) Calcium carbonate

36. Algae control in the swimming pool water requires the use of
    a) Soda Ash
    b) Quartenary ammonium salts
    c) Copper sulphate
    d) All choices above

37. The following are the bases of choice except
    a) Sodium carbonate
    b) Calcium hydroxide
    c) Sodium hydroxide
    d) Potassium hydroxide

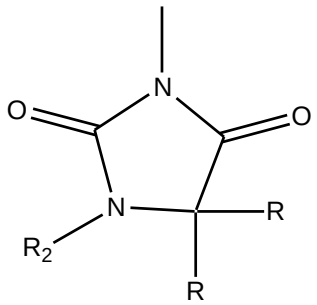
38. Role of buffers in pharmacy practice include the following except
    a) Stabilization of medicines
    b) Patient comfort provision
    c) Optimum medium of medicinal activity
    d) Increase product shelf life

39. Disadvantages of borate buffers include the following except
    a) Toxicity
    b) Buffering capacity is in mild alkaline range
    c) Sensitivity to carbon dioxide
    d) Prone to mould growth

40. Micro-organism contamination is no problem in acid buffers below a ph of about 3 because of
    a) Dissolving action of strong acid on protein
    b) Strong acidic solutions are germicidal
    c) Mecrotic reactions that take place
    d) Destructive reactions in the system

SECTION B (Answer ALL questions)

1. List four factors that need to be considered in the selection of sodium verses potassium compounds for use in pharmacy **(4marks)**
2. Define the following terms
   a) Preservation
   b) Steralization **(4marks)**
3. What are the two main advantages of $NaHCO_3$ over NaOH as the base of choice **(4marks)**
4. Briefly explain NH3is a base while NH^{4+} is a weak acid **(4marks)**
5. List FOUR examples of compounds used as drying agents **(4marks)**
6. Briefly describe oxidative deamination metabolic pathway using relevant examples **(4marks)**
7. Briefly differentiate between structurally specific and structurally non –specific drugs. Provide relevant examples. **(4marks)**
8. The figure below is the general structure of hydantuin class of anticonvulsants



   Give TWO examples of hydantoins giving the values for R, R_1 and R_2 **(4marks)**

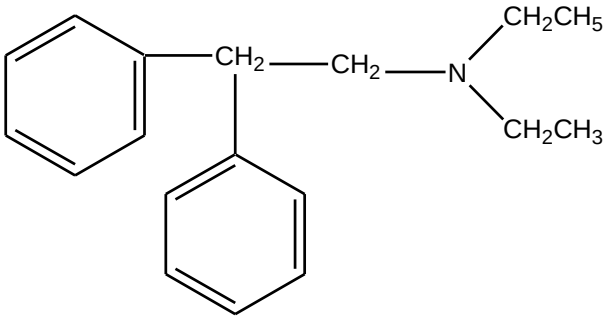
9. Name the donor of the conjugate in the following phase II metabolic reactions
   a) Acetylation
   b) Glucoronidation
   c) Sulphate formation
   d) N-Methylation **(4marks)**

10. Briefly describe how ionization of a drug molecule affect
    i) Its solubility
    ii) Its portioning across biological membranes **(4marks)**

SECTION C

1. (i) Using relevant examples discuss the therapeutic implications of drug inhibition and drug induction **(10marks)**

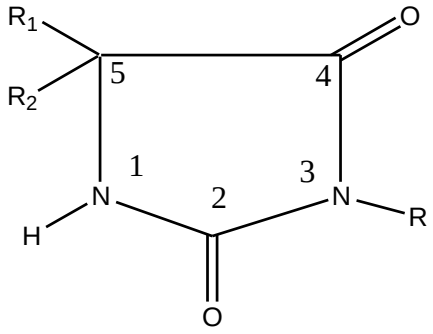
   (ii) Study the structure of the compound given below



   Discuss various metabolic pathways for the above compound and its immediate metabolites **(10marks)**

2. Discuss the factors that should be taken into consideration in the selection of water for a given pharmaceutical procedure. **(20marks)**

3. Study the structure of phenytoin given below



   i) Using structures , illustrate the keto-enol tautomerism exhibited by this drug in immediate and acidic pH **(4marks)**

   ii) Outline the structure activity relationship of the above compound **(10marks)**

   iii) List three metabolic pathways than phenytoin could undergo stating the enzymes involved in each pathway **(6marks)**

4. Using a schematic diagram , discuss the process of preparation of potable water from natural water. **(20marks)**