



# TECHNICAL UNIVERSITY OF MOMBASA

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FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF MEDICAL SCIENCES

**UNIVERSITY EXAMINATION FOR:**

DIPLOMA IN PHARMACEUTICAL TECHNOLOGY

APM 2225: ORGANIC AND INORGANIC PHARMACEUTICAL CHEMISTRY

SPECIAL/ SUPPLEMENTARY EXAMINATIONS

**SERIES:** SEPTEMBER 2018

**TIME:** 2HOURS

**DATE:** Pick Date Sep 2018

## Instructions to Candidates

You should have the following for this examination

*-Answer Booklet, examination pass and student ID*

This paper consists of **THREE**Section(s). AttemptAll questions in section A and B and any two questions in section C.

**Do not write on the question paper.**

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## SECTION A (40 MARKS)

Answer ALL the questions in this section

1. Which of the following statements is true about Azo-reduction?
  - a) It is a phase II metabolic reaction
  - b) The product of Azo-reductions are mines
  - c) It is a hydrolytic reaction
  - d) It is a microsomal reaction
2. The products of conjugation are usually
  - a) Biologically inactive
  - b) Non toxic
  - c) Readily eliminated from the body
  - d) All of the above.
3. Enzyme induction can result in
  - a) Reduced plasma levels of concomitantly administered substrate drugs.
  - b) Increased plasma levels of concomitantly administered substrate drugs.
  - c) Failure of oral contraception in patients taking certain anticonvulsants.
  - d) Choice A and C
4. Disulfiram has been used as a treatment for chronic alcoholism. It works by blocking which enzyme.
  - a) Liver Alcohol Dehydrogenase (LAD)
  - b) Liver Aldehyde Dehydrogenase (LAD)
  - c) Liver Albumin Dehydrogenase (LAD)
  - d) Liver Alcohol Demethylase (LAD)
5. In management of methanol poisoning, ethanol is administered since it is preferentially metabolized to:
  - a) Acetone and acetic acid
  - b) Acetic acid and Chloroform
  - c) Acetylaldehyde and acetic acid
  - d) Acetylaldehyde and acetone
6. Which of the following statements about pro-drugs is not true?
  - a) Facilitates absorption and distribution of drugs with poor lipid solubility
  - b) Increases the duration of action of drugs that are rapidly eliminated
  - c) Promotes site specific delivery of drugs
  - d) Improves palatability of in drug formulation

7. The following endogenous substances are used as conjugation substances in phase II drug metabolic reactions except;

- a) Glucuronic acid
- b) Acetyl- CoA
- c) Glycine
- d) Alanine

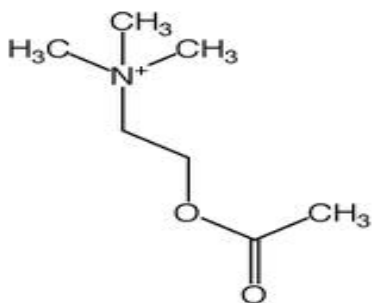
8. Which of the following is NOT TRUE for drugs that are excreted largely unchanged in urine following administration?

- a) Are drugs that are resistant to drug metabolizing enzymes
- b) Are drugs that are lipophilic
- c) Are drugs that are hydrophilic
- d) Are pro drugs

9. The following are drug- receptor interactions except:

- a) Covalent bonding
- b) Ionic bonding
- c) Van -der Waal forces
- d) Hybrid bonding

Use the structure given below figure to respond to the three questions that follow.



10. The compound shown above can be described as an:

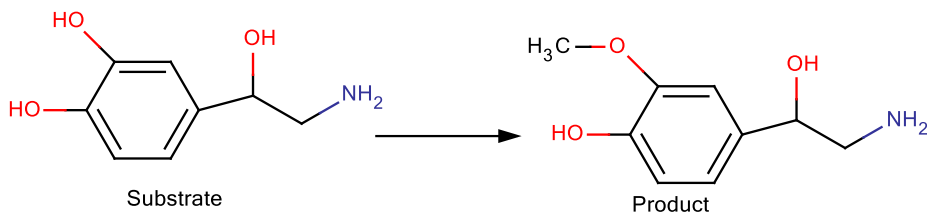
- a) Adrenergic agonist
- b) Cholinergic agonist
- c) Adrenergic antagonist
- d) Cholinergic antagonist

11. The oxygen atoms in the above compound affect the activity in the following ways except:

- a) Duration of action of the compound
- b) Metabolism of the compound
- c) Optical activity of the compound

- d) Degree of action
12. In the structure of  $\beta_1$  receptors antagonists, maximum selectivity is attained when:
- a) The aromatic ring system is substituted in the para position
  - b) The aromatic ring system is substituted in the meta position
  - c) The aromatic ring system is substituted in the ortho position
  - d) The aromatic ring system is unsubstituted
13. The following are phase TWO metabolic reactions except
- a) Sulphate formation
  - b) Purine oxidation
  - c) Uric acid formation
  - d) Mercapturic acid formation
14. Which of the following drug metabolic reactions is not a phase I metabolic reaction?
- a) Oxidation
  - b) Conjugation
  - c) Hydrolysis
  - d) Reduction
15. Which of the following drug induces Cytochrome P450 enzyme and drug metabolism?
- a) Phenobarbitone
  - b) Chlordiazepoxide
  - c) Fluoxetine
  - d) Fluvoxamine
16. The following statement is false regarding Pro-drugs:
- a) A prodrug is an inactive derivative that will be converted to the active drug in vivo
  - b) They are designed to overcome barriers to drug function through chemical approach rather than formulation approach
  - c) The choice of promoiety should be considered with respect to the dose and the duration of therapy
  - d) The promoeities should be toxic
17. Hydrogen bonding is important in drug action in several ways except;
- a) Solubility
  - b) Plasma binding
  - c) Binding on receptors
  - d) Metabolism

18. The following endogenous substances are used as conjugation substances in phase II drug metabolic reactions except;
- Glucuronic acid
  - Acetyl- CoA
  - Glycine
  - Alanine
19. Considering that the major consequence of drug metabolism is inactivation of drugs, which of the following would not be the likely effect of enzyme induction?
- Increased drug activity of the substrate drug
  - Failure of the substrate drug to produce expected pharmacological effects
  - Increased metabolism of the substrate drug
  - Reduced side effects of the substrate drug
20. The following is an illustration of a phase II metabolic reaction.



What is the name of the above metabolic pathway?

- Amino acid conjugation
  - Methylation
  - Acetylation
  - Glutathione conjugation
21. Water for injection fulfills the following characteristics except:
- It is packaged in a single dose container not larger than one liter
  - It is used in the extemporaneous prescription compounding
  - It is used in hydrolysis of drugs
  - It is used in dissolving preparations for parenteral administration
22. Which of the following bonding characteristic results in compounds that have poor aqueous solubility?
- Electrovalent bonding
  - Covalent bonding
  - Polar bonds
  - Dipole moments

23. Which of the following is statement is NOT true of water for parenteral use;
- It must be sterile and pyrogen free
  - One or more distillation stages are required
  - Bacteria and pyrogens are removed by adsorption on reactive surface of the filter
  - Water for injection may have no added bacteriostatic agents
24. Which of the following compounds is used as a proton source in effervescent mixtures;
- Sodium bicarbonate
  - Sodium carbonate
  - Tartaric acid
  - Carbonic acid
25. Which of the following statements is true regarding acetate buffers?
- $pK_a$  of acetic acid is such that best buffer action is in weak alkaline range
  - Mould growth is not a problem with acetate buffers
  - It is a good buffer for silver containing ophthalmic preparations
  - Freshly prepared solutions may have a big variation in pH
26. The following are the advantages of demineralization over distillation as methods for water purification. Which one is NOT?
- it is economical
  - It effectively removes weak electrolytes
  - It effectively removes non electrolytes
  - None of the above
27. Which of the following is NOT correctly defined?
- Disinfection - Keeping safe from injury/harm and make lasting
  - Solvation - Process of attraction and association of molecules a of solvent with molecules of a solute
  - Sterilization - Process of elimination of all forms of microbial life including spores.
  - Stabilization - Process of preventing undesirable physical and chemical changes.

28. According to the Bronsted-Lowry Theory an acid is:
- A proton donor
  - A proton acceptor
  - Both True
  - None of the above.
29. Buffers are used in the following areas of pharmacy EXCEPT;
- In stability of medicinal
  - In providing patient comfort
  - In control work like pH meters and indicators.
  - In the disposal of pharmaceuticals.
- 30 The dissociation constant of water ( $k_w$ ) at 25°C is
- $10^{-14}$  moles<sup>2</sup>/L
  - $10^{14}$  moles<sup>2</sup>/L
  - $10^{-7}$  moles<sup>2</sup>/L
  - $10^7$  moles<sup>2</sup>/L
31. Water frequently assumes the role as a ligand in complex substances because of its
- Small size
  - Strong permanent dipole
  - Hydrogen bonding
  - Dielectric constant
32. Which one of the following is acidic in nature?
- Sodium dihydrogen phosphate
  - Quick lime
  - Sodium carbonate
  - Calcium chloride
33. Why is water considered to be a polar molecule?
- The molecule has a net positive charge
  - The molecule has a net negative charge
  - The molecule has a net zero charge

d) The ends of the molecules have partial negative and positive charges

34. The following methods are used to prepare purified water except:

- a) Filtration
- b) Distillation
- c) Ion exchange
- d) Evaporation

35. Which of the following statements is true in regard to water for parenteral use

- a) It must be sterile and apyrogenic
- b) It contains dissolved salts
- c) It may contain a limited number of microorganisms
- d) It can be prepared by distillation process

36. Neutralization reactions are used in the following except:

- a) Preparation of suitable salts
- b) Conversion of salts into more suitable forms
- c) In analytical procedures involving acid-base titration
- d) Preparation of effervescent mixtures

37. The type of water used for dissolving substances or preparations for parenteral administration before use is

- a) Purified water.
- b) Sterile water for injection.
- c) Potable water
- d) Mineral water

38. What is the pH of 1 M solution of HCl?

- a) 1
- b) 0
- c) 2
- d) 5

39. Which of the following alkali metals shows the largest deviation from the group properties?

- a) Lithium



- b) Sodium
- c) Potassium
- d) Caesium

40. Borate buffers can be used in

- a) Parenteral preparations
- b) Injections
- c) Ophthalmic solutions
- d) Blood products

### SECTION B (40 MARKS)

**Answer all the questions in this section**

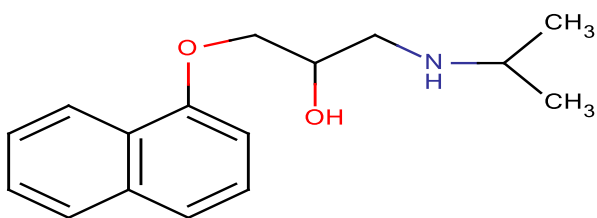
*Discuss with examples, the effects of addition of a methyl (CH<sub>3</sub>) group to a molecule in respect to*

41. Lipophilicity (4 marks)

42. Electronic effect (4 marks)

43 Steric effect (4 marks)

Study the structure of a beta-blocker given below use it to answer question 44 and 45



44. State two structural requirements for beta antagonism (4 marks)

45. Outline the SARs of the terminal amino group (4 marks)

46. Water for parenteral use should be sterile and pyrogen free.

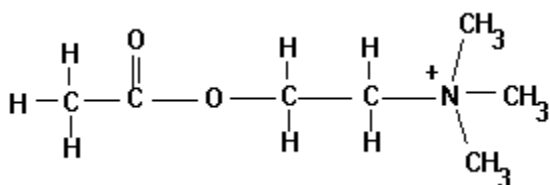
- a) State two techniques that are used for removing pyrogens from purified water (2 marks)
- b) Briefly explain why parenteral water supplied in small glass vials may have a high total solid content (2 marks)

47. Outline the use of acid-base reactions in pharmacy **(4 marks)**
48. Lithium deviates from other members of Group 1 family of elements in terms of physical and chemical properties
- Briefly explain the cause of this deviation **(2 marks)**
  - State two reasons why lithium is eliminated for use in place of Na<sup>+</sup> and K<sup>+</sup> in salt substitutes **(2 marks)**
- 49.a) briefly explain why strongly alkaline buffers cannot be stored for a long time in glass containers **(1 mark)**
- List three disadvantages of phosphate buffers **(3 marks)**
50. FeSO<sub>4</sub> is a coagulating material used for removing suspended particles in the pre-treatment stage of portable water preparation.
- Write the equation for reactions illustrating the action of FeSO<sub>4</sub> as a coagulating agent **(3 marks)**
  - What is the main purpose of water fluoridation during the pre-treatment stage of portable water preparation **(1 mark)**

**SECTION C (questions from this section 40 MARKS)**

**Answer ANY TWO**

51. Below is the structure of a cholinergic agonist



- Discuss its structure activity relationship (SAR) **(20 marks)**
52. a) Define **(4 marks)**
- Buffer action
  - Buffer capacity
- b) Discuss the role of buffers in the pharmacy **(16 marks)**
53. Discuss with illustrations the preparation of portable water from raw water **(20 marks)**