(*University of Choice*)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS
2019/2020 ACADEMIC YEAR

FOURTH YEAR FIRST SEMESTER EXAMINATIONS

FOR THE DEGREE
OF
BACHELOR OF SCIENCE MEDICAL LABORATORY SCIENCES
MAIN EXAM

COURSE CODE: **BMB 412**

COURSE TITLE: **THERAPEUTIC DRUG MONITORING AND TOXICOLOGY**

DATE: 8TH DECEMBER 2020 **TIME: 8.00 -10.00AM**

INSTRUCTIONS TO CANDIDATES

SECTION A: multiple choice questions (MCQs)

1. The process where drugs are generally converted to more polar, water soluble molecules through enzymatic reaction is called?
    a. protein-binding
    b. theraputic range
    c. intravenously
    d. biotransformation

2. In monitoring drug therapy, a clinician should be aware that a synergistic drug effect is?

    a. an effect greater than the sum of the separate actions of two or more drugs
    b. an increase in the action of one of the two drugs being given
    c. a neutralizing drug effect
    d. a comprehensive drug effect

3. Which of the following statements is true concerning the renal excretion of drugs?

    a. drugs that are ionized in the renal tubule are more likely to undergo passive reabsorption than those that are unionized
    b. low-molecular-weight drugs are much more likely to be actively secreted than filtered
    c. only drug that is not bound to plasma proteins is filtered by the glomerulus.
    d. decreasing renal tubular fluid ph will increase elimination of weakly acidic drugs

4. A neonate is given drug A, a compound with a high affinity for plasma proteins, in a dose that does not exceed the binding capacity of albumin. Later, a second drug, B that also binds strongly to albumin, is given in amounts that greatly exceed albumin's binding capacity. Which of the following statements is true?

    a. The free plasma concentration of drug A is decreased
    b. The relative free drug concentration of both compounds is unchanged
    c. The concentration of drug A in tissues is likely to be increased
    d. The concentration of drug A in tissues is likely to be decreased

5. If a patient takes a drug on an empty stomach, the drug will be:
    a. absorbed more slowly
    b. neutralized by pancreatic enzymes
    c. affected by enzymes in the colon
    d. absorbed more rapidly

6. Which route of drug administration is most likely to subject a drug to first pass effect?
    a. intravenous
    b. inhalational

c. oral
d. sublingual

7. The half-life of drug F is 40 hours and is being given to a patient once daily; steady state will be reached shortly following which DOSE?
    a. 1st dose
    b. 3rd dose
    c. 5th dose
    d. 8th dose

8. If a drug is highly bound to plasma proteins, it:
    a. has a large volume of distribution
    b. has a high renal clearance
    c. is a likely candidate for drug interactions
    d. is most likely carried by alpha-glycoprotein

9. Most drugs gain entry to cells by:
    a. passive diffusion with zero-order kinetics
    b. passive diffusion with first-order kinetics
    c. active transport with zero-order kinetics
    d. active transport with first-order kinetics

10. Which of the following is an agent useful in the treatment of severe poisoning by organophosphorus insecticides, such as parathion?
    a. ethylenediaminotetraacetic acid (edta)
    b. pralidoxime (2-pam)
    c. *n*-acetyl-l-cysteine
    d. carbachol

11. Of the following, which is not a manifestation of chronic poisoning with zinc?
    a. anemia
    b. encephalopathy
    c. fever
    d. decreased amylase secretion

12. The mobile phase in high performance liquid chromatography should:
    a. have high viscosity
    b. react with column material
    c. chemically inert
    d. insoluble

13. In HPLC analysis the retention volume (tr) is:
    a. distance between each side of a peak
    b. time elapsed between the injection point and the dead point
    c. is the highest point of the peak
    d. volume of mobile phase passed through the column between the injection point and the peak maximum

14. The following are limitations of colorimetric assays except:

a. compounds with similar functional groups will produce similar colours
b. colour description is very subjective even in people with normal colour
c. colour produced usually vary in intensity or hue with concentration and may be unstable
d. colorimetric assays are relatively easy and cheap to perform

15. Unbound blood drug concentration refers to:
    a. minimum effective concentration
    b. peak concentration
    c. the concentration of drug in serum and plasma that is free and not bound to proteins
    d. total drug concentration

16. Therapeutic drug monitoring is indicated if:
    a. drug efficacy is difficult to establish clinically
    b. toxicity is suspected
    c. inadequate therapeutic response
    d. therapeutic effects can be measured using functional laboratory tests

17. The therapeutic range of carbamezipine is
    a. 4-10µg/ml
    b. 40-100µg/ml
    c. 50-100µg/ml
    d. 4-10mg/ml

18. The therapeutic range of digoxin is:
    a. 4-10µg/ml
    b. 0.9-2ng/ml
    c. 0.9-2µg/ml
    d. 2.5-20µg/ml

19. The therapeutic range of procainamide is:
    a. 4-12µg/ml
    b. 0.9-2ng/ml
    c. 0.9-2µg/ml
    d. 2.5-20µg/ml
20. The therapeutic range of lidocaine is:
    a. 4-12µg/ml
    b. 0.9-2ng/ml
    c. 1.5-5µg/ml
    d. 2.5-20µg/ml

<u>SECTION B</u>: SAQs: 40 marks; answer all

1. Describe three mechanisms via which drug and toxic substance permeate membranes **(6 marks)**

2. Describe the two phases drug/toxin metabolism **(8 marks)**

3. Illustrate the general algorithm used in analysis of samples from suspected poisoning cases **(8marks)**

4. List **FIVE** main biological samples collected for toxicological and therapeutic drug analysis **(5 marks)**

5. Explain how physical examination of patient's urine and stomach contents can provide leads for confirmatory analysis and identification of poisons **(6marks)**

6. Give **FOUR** limitations of colorimetric tests in analysis and identification of toxic substances **(4marks)**

7. Define the following terms: **(4 marks)**
    a. Loading dose
    b. Steady state concentration
    c. Trough concentration
    d. Area under the curve (AUC)

SECTION C: LAQs: Answer all (60 marks)

1. Describe the standard steps followed during analysis of therapeutic monitoring analysis **(20marks)**

2. Describe the following methods and their applications in therapeutic drug monitoring **(20 marks)**
    a. Particle Enhanced Turbidimetric Inhibition Immunoassay (PETINIA)
    b. Radioimmunometric assay (RIA)
    c. Enzyme Multiplied Immunoassay Technique (EMIT)
    d. Fluorescence Polarization Immunoassay (FPIA)
    e. Cloned Enzyme Donor Immunoassay (CEDIA)

3. Using five specific examples discuss the therapeutic drug monitoring of **antiarrhythmic drugs**, under the following headings: goals, sample type, sample timing, analytical method, therapeutic ranges (**20 marks)**