



UNIVERSITI KUALA LUMPUR
INSTITUTE OF MEDICAL SCIENCE TECHNOLOGY

FINAL EXAMINATION
MARCH 2025 SEMESTER

COURSE CODE : HGB30903
COURSE TITLE : ENVIRONMENTAL TOXICOLOGY
PROGRAMME NAME : BACHELOR OF ENVIRONMENTAL HEALTH (HONS)
DATE : 26 JUNE 2025
TIME : 2:00PM - 5:00PM
DURATION : 3 HOURS



INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. This question paper consist of TWO sections.
4. Answer ALL questions for Section A.
5. Section B consist of four questions. Answer THREE (3) questions only.
6. Please write your answer on the answer booklet provided.
7. Please answer all questions in English only.
8. Please answer MCQ/EMQ questions using OMR sheet. *Tick if applicable*
9. Refer to the attached Formula/ Appendies. *Tick if applicable*

THERE ARE 13 PAGES OF QUESTIONS INCLUDING THIS PAGE

SECTION A (Total: 40 marks)

Answer ALL questions.

Please use the answer booklet provided.

1. A basic principle of toxicology states that _____.
 - A. animal studies cannot determine potency
 - B. all compounds are poisons
 - C. toxicity is independent of dose
 - D. environmental chemicals act via unique biological processes

2. A toxic substance produced by a biological system is referred to as a _____.
 - A. poison
 - B. toxicant
 - C. xenobiotic
 - D. toxin

3. Which of the following best describes a risk from a public health perspective?
 - A. A possibility of a bad outcome.
 - B. The undesirable endpoint is reached.
 - C. Likelihood of an unwanted outcome combined with uncertainty of when it will occur.
 - D. A bad outcome is assured and its mechanism is well understood.

4. Dose is defined as the amount of substance that _____.
- A. reaches the target site in the body
 - B. is converted into active metabolite to exert a toxic effect
 - C. enters the body
 - D. is released into the environment
5. Which of the following played an important role in the history of toxicology?
- A. Rachel Carson
 - B. Hippocrates
 - C. Atropa belladonna
 - D. Paracelsus
6. The correct sequence of toxicokinetic phases a xenobiotic may pass through is _____.
- A. absorption, distribution, metabolism and excretion
 - B. formulation, absorption, metabolism and excretion
 - C. disintegration, absorption, elimination and expiration
 - D. administration, inhalation, absorption and excretion
7. Toxicology is the study of _____.
- A. prevalence of disease and death in a population
 - B. adverse effects of chemicals on living organisms
 - C. word origins
 - D. the appearance of symptoms produced by infectious agents

8. The definition that best describes toxicodynamics is the _____.
- A. dose range between desired biological effects and adverse health effects
 - B. linkage between dose and response
 - C. dynamic nature of toxic effects among various species
 - D. linkage between exposure and dose
9. What is meant by active transport?
- A. Transport without energy consumption.
 - B. Engulf of toxin substances by a cell membrane with a new vesicle formation.
 - C. Transport against the concentration gradient.
 - D. Transport of toxin substances through a membrane using diffusion.
10. Which of the following routes is the most likely to be subjected to the first-pass metabolism?
- A. Rectal
 - B. Oral
 - C. Subcutaneous
 - D. Sublingual
11. What is angiogenesis in cancer?
- A. Spread of cancer to blood
 - B. Death of tumor tissue
 - C. Formation of new blood vessels to supply tumors
 - D. Mutation of blood cells

12. The organs least involved in systemic toxicity are _____.
- A. muscle and bone
 - B. brain and peripheral nerves
 - C. liver and kidney
 - D. hematopoietic system and lungs
13. Which of the following statements is true regarding phase II biotransformation (conjugation) reaction?
- A. Increased phase II reactions result in increased xenobiotic storage in adipocytes.
 - B. Carboxyl groups are very common additions of phase II reactions.
 - C. Phase II reactions greatly increase the hydrophilicity of the xenobiotic.
 - D. Phase II reactions are usually the rate-determining step in the biotransformation and excretion of xenobiotic.
14. The hydroxylated products of phase 1 are converted to soluble metabolites by coupling with polar agents in phase 2 of detoxification reactions by conjugation. Which of the following is not a conjugating agent?
- A. Active bicarbonate
 - B. Active acetate
 - C. Active sulfate
 - D. Active methionine
15. Administration by oral gavage of a test compound that is highly metabolized by the liver will most likely result in _____.
- A. more systemic toxicity
 - B. lower levels of metabolites in the systemic circulation
 - C. less parent compound present in the systemic circulation
 - D. more local irritation at the site of administration caused by the compound

16. The main mechanism of most xenobiotics absorption in the gastrointestinal tract is _____.
- A. endocytosis and exocytosis
 - B. active transport (carrier-mediated diffusion)
 - C. filtration
 - D. passive diffusion (lipid diffusion)
17. Which of the following statements regarding receptors is INCORRECT?
- A. They are all present on the cell surface.
 - B. They are proteins.
 - C. Each receptor will only bind with ligands of a particular structure.
 - D. They received chemical signals from outside the cell.
18. Toxicants acting through receptors exhibit the following features EXCEPT
- A. competitive antagonism.
 - B. structural specificity.
 - C. high potency.
 - D. dependence of action on lipophilicity.
19. Agonists affect the receptor molecule by _____.
- A. altering its folding or alignment of subunit
 - B. inducing covalent bond formation
 - C. denaturing the receptor protein
 - D. altering its amino acid sequence

20. Which of the following is not a primary target of toxicant action?
- A. Enzymes
 - B. Hormones
 - C. Receptors
 - D. Carriers
21. What is the first step in the development of the dose-response relationship curve?
- A. Intermediate point.
 - B. Start point.
 - C. Identify the outcome.
 - D. Toxicological endpoint.
22. Which of the following elements is not specifically involved in assessing non-carcinogenic effects?
- A. Reference concentration.
 - B. Weight of evidence.
 - C. Threshold limit value.
 - D. Reference dose.
23. Which of the following terms is used to describe the dose of a toxicant required to kill 50% of a group of animals?
- A. ED_{99}
 - B. ED_{50}
 - C. LD_{50}
 - D. ED_{99}

24. Quantal dose-response curves are obtained when studying _____.
- A. bimodal responses
 - B. partial agonists
 - C. all-or-nothing responses
 - D. submaximal responses
25. In the cell cycle, cell division is arrested at _____.
- A. G
 - B. G₁
 - C. G₂
 - D. S
26. Rubella may cause blindness, deafness, and mental impairments. This condition is referred to a/an _____.
- A. susceptibility
 - B. equifinality
 - C. multifinality
 - D. detectability
27. The ability of cancer to invade other cells is known as _____.
- A. acute
 - B. malignant
 - C. benign
 - D. metastasis

28. Mutagen refers to a/an _____.
- A. substances that can induce the formation of abnormal tissue growths
 - B. agents that can lead to DNA damage
 - C. substance that can cause cancer
 - D. chemical substance that can promote mitosis
29. A point mutation is _____.
- A. entire gene deletion
 - B. loss of a chromosome
 - C. duplication of a chromosome
 - D. replacement of one nucleotide with another
30. Which of the following is the defect led by heavy drinking of alcoholic beverages?
- A. Fetal Alcohol Effects
 - B. Klinefelter Syndrome
 - C. Fetal Alcohol Syndrome
 - D. Down's Syndrome
31. Which of the following is the characteristic of cancer?
- A. Stochastic
 - B. Deterministic
 - C. Benign
 - D. Acute

32. Failure of DNA repair is mainly caused by _____.
- I. carcinogen-induced mutational inactivation of DNA repair enzymes
 - II. failure of the DNA repair mechanisms to recognize carcinogen-induced mutation
 - III. low doses of mutagen that cause minimum changes
 - IV. stage of cancer that has invaded other cells
- A. I, II, III only.
 - B. III only.
 - C. I, II, III and IV.
 - D. I and II only.
33. Mercury is a toxic substance, and its toxicity varies based on its chemical structure. Which of the following mercury compounds is the most harmful?
- A. C_2H_5HgCl
 - B. Hg_2Cl_2
 - C. $HgCl_2$
 - D. HgO
34. Organic solvents are _____.
- A. donors of hydrogen ions
 - B. non-polar solvents
 - C. polar solvents
 - D. formed through sigma bonds
35. Which exposure route does smog most negatively affect a person's body?
- A. Skin contact
 - B. Drinking
 - C. Breathing
 - D. Eating

36. The reaction between nitrogen oxides (NO_x) and volatile organic compounds (VOCs) in the presence of sunlight causes the formation of _____.
- A. global warming
 - B. acid rain
 - C. ozone hole in the atmosphere
 - D. smog
37. _____ assessment is one of the assessments involved in risk assessment.
- A. Hazard
 - B. Hierarchy
 - C. Alert
 - D. Detection
38. Which of the following groups is considered the most susceptible to air pollution?
- A. Middle-aged men and women.
 - B. Young children and older adults.
 - C. Healthy people.
 - D. Teenagers.
39. Which of the following entry routes for volatile chemicals that exist as water droplets at room temperature?
- A. Skin absorption
 - B. Ingestion
 - C. Inhalation
 - D. Exhalation

40. Greenhouse gases include _____.
- A. argon and carbon monoxide
 - B. hydrogen and ozone
 - C. oxygen and nitrogen
 - D. methane and carbon dioxide

SECTION B (Total: 60 marks)

Answer **THREE (3)** questions only.

Please use the answer booklet provided.

Question 1

In environmental toxicology, understanding dose-response relationships is crucial for assessing the effects of contaminants on human and ecological health. Distinguish between graded and quantal dose-response relationships.

(20 marks)

Question 2

Compare and contrast mutagens and carcinogens in terms of their definitions, sources, mechanisms of action, examples, and effects on human health.

(20 marks)

Question 3

The Water Treatment Plant (WTP) is a crucial infrastructure for ensuring human health and protecting the environment. During its development, it is essential to address aspects of environmental safety and health. As a consultant for the appointed company, describe the four steps involved in conducting a health risk assessment to develop this WTP.

(20 marks)

Question 4

Gene mutations can be categorized as point mutations and frameshift mutations. Analyze these two types of gene mutations by comparing their characteristics, mechanisms, possible causes, examples, and effects on proteins.

(20 marks)

END OF EXAMINATION PAPER

