UNIVERSITI KUALA LUMPUR
INSTITUTE OF MEDICAL SCIENCE TECHNOLOGY

FINAL EXAMINATION

OCTOBER 2025 SEMESTER

COURSE CODE	:	HGB40303
COURSE TITLE	:	ENVIRONMENTAL HEALTH RISK ASSESSMENT
PROGRAMME NAME	:	BACHELOR OF ENVIRONMENTAL HEALTH (HONS)
DATE	:	29 JANUARY 2026
TIME	:	9:00AM - 12:00PM
DURATION	:	3 HOURS

Universiti Kuala Lumpur
ACADEMIC DEPT
MESTECH

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 15 PAGES OF QUESTIONS INCLUDING THIS PAGE

SECTION A (Total: 40 marks)

Answer ALL questions.

Please use the answer booklet provided.

1. Which route of exposure is most relevant for PM_{10}?

   A. Inhalation

   B. Dermal absorption

   C. Ingestion

   D. Injection

2. Quantitative Health Risk Assessment (HRA) is most suitable for assessing _____.

   A. social stressors

   B. psychological impacts

   C. chemical hazards

   D. communicable diseases

3. Residual health impact refers to _____.

   A. unpredicted health outcomes

   B. impacts that occur only during construction

   C. health impacts before mitigation

   D. remaining health impacts after mitigation measures

4. Health Impact Assessment (HIA) primarily supports decision-making by _____.

   A. replacing environmental monitoring

   B. predicting economic returns

   C. approving development activities

   D. evaluating potential health consequences of a project

5. Hazard identification involves determining whether an agent _____.

   A. requires monitoring

   B. exceeds regulatory standards

   C. causes adverse health effects

   D. can be mitigated

6. Residual health impacts must be addressed because they _____.

   A. may still pose risks to public health

   B. cannot be mitigated

   C. occur only short-term

   D. are always insignificant

7. Which factor most strongly justifies the need for Health Impact Assessment (HIA)?

   A. Project cost

   B. Type of contractor

   C. Project duration

   D. Presence of human receptors

8. The hazard quotient (HQ) is used to assess _____.

   A. non-carcinogenic risk

   B. environmental damage

   C. carcinogenic risk

   D. acute mortality

9. Which factor would most likely reduce the size of the Zone of Impact (ZOI)?

   A. Effective pollution control measures.

   B. Longer project duration.

   C. Presence of vulnerable populations.

   D. Increased emission height.

10. Which factor most influences the size of the Zone of Impact (ZOI)?

   A. Project duration

   B. Land ownership

   C. Project approval status

   D. Dispersion of pollutants

11. Which of the following is a key indicator of public health status related to environmental factors?

   A. Air quality indices.

   B. Average income levels.

   C. Educational attainment.

   D. Employment rates.

12. Volatile agents in exposure assessments are most commonly associated with _____.

A. inhalation routes

B. dermal absorption

C. soil contamination

D. water contamination

13. What does NOAEL stand for?

A. Non-Adverse Effect Level

B. No Obtain Adverse Effect Level

C. Negligible Observable Acute Effect Level

D. No Observable Adverse Effect Level

14. Monitoring is defined as a _____ and systematic process of collecting data.

A. periodic

B. final

C. retrospective

D. continuing

15. The morbidity data in the context of public health status refer to the _____.

A. incidence and prevalence of diseases

B. economic impact of diseases

C. mortality rates

D. behavioral risk factor

16. Which outcome best reflects effective scoping?

A. Approved mitigation measures.

B. Comprehensive assessment of all possible diseases.

C. Prioritised list of relevant health endpoints.

D. Detailed monitoring plan.

17. The key focus areas of mitigation measures should include _____.

I. preventive measures that avoid the occurrence of impacts and thus avoid harm or produce positive outcomes.

II. measures that focus on limiting or lessening the impacts' severity and duration.

III. the identification of compensation mechanisms for those impacts that are unavoidable and cannot be reduced further.

IV. articulated targets and a set of indicators to measure performance.

A. I, II and III only.

B. III and IV only.

C. II only.

D. I only.

18. Lifetime Cancer Risk (LCR) estimates _____.

A. daily exposure

B. environmental contamination

C. acute toxicity

D. probability of developing cancer over a lifetime

19. What is typically used in qualitative risk assessment to categorize the level of risk?

A. Descriptive terms (e.g., low, medium, high).

B. Economic valuations.

C. Numerical scores.

D. Statistical models.

20. What is the objective of performing screening in Health Impact Assessment (HIA)?

A. Propose a mitigation plan.

B. Identify potential health hazards.

C. Identify projects that need to proceed with HIA.

D. Defines an existing public health status associated with the project.

21. Which of the following best describes risk management?

A. Process of estimating the potential impact of a chemical, biological, physical or social agent on a specified human population system under a specific set of conditions and for a certain time frame.

B. Process of determining whether exposure to an agent can cause an increase in the incidence of a health condition.

C. Process of weighing policy alternatives and selecting the most appropriate regulatory action, integrating the results of risk assessment with engineering data, and with social, economic and political concerns to reach a decision.

D. Process of estimating the incidence of a health effect under the various conditions of human exposure described in exposure assessment.

22. Which statement best describes hazard ranking in qualitative risk assessment?

A. It orders hazards based on potential impact and likelihood.

B. It involves calculating exact risk probabilities.

C. It assesses the financial cost of each hazard.

D. It measures statistical significance.

23. Which of the following is not considered as monitoring?

A. Tracking the number of brochures disseminated.

B. Attributing changes in health outcomes to an intervention.

C. Collecting monthly data on clients served in a clinic.

D. Counting the number of people trained.

24. Which risk concepts can be assumed to have no mitigating controls?

A. Current risk.

B. Business risk.

C. Residual risk.

D. Inherent risk.

25. Why do the environmental pathways of chemicals have to be found in exposure assessment?

A. To conduct chemical analysis.

B. To determine affected biota.

C. To predict the source of the discharge.

D. To predict the type of chemicals.

26. Arrange the steps that need to be performed in the Health Impact Assessment (HIA).

I. Scoping
II. Screening
III. Health risk assessment
IV. Description of existing public status

A. IV, III, I, II.

B. I, II, III, IV.

C. II, I, IV, III.

D. I, III, IV, II.

27. Process evaluation focuses on assessing whether _____.

A. risk estimates were accurate

B. health outcomes improved

C. standards were exceeded

D. mitigation measures were implemented as planned

28. Risk characterization integrates information from _____.

A. exposure and mitigation only

B. screening and scoping only

C. hazard identification only

D. hazard, dose-response and exposure

29. The exposure assessment equation considers all except _____.

A. body weight

B. concentration of the contaminant

C. contact rate

D. risk management plan

30. What is an example of a qualitative risk description?

A. 0.05% increase in cancer incidence

B. Risk reduction of 2 cases per 1,000

C. Medium-level risk

D. Statistical odds ratio of 2:1

31. A Community Health Survey is useful for assessing status but is _____.

A. strictly for biological hazards

B. very cheap to conduct

C. only required for small projects

D. labor-intensive and time-consuming

32. Why Health Impact Assessment (HIA) is critical?

A. Damage is reversible.

B. Pre-empt the pollution events.

C. Cure is better than prevention.

D. No legal cost borne by victims.

33. Which of the following activities listed under Prescribed Activities is not mandatory for Health Impact Assessment (HIA)?

A. Construction of dams.

B. Construction of oil refineries.

C. Housing development covering an area of 50 hectares or more.

D. Logging activities in a small rural area.

34. Which of the following categories are the prescribed activities that require Health Impact Assessment (HIA)?

I. Petroleum
II. Mining
III. Road
IV. Quarries

A. I, II and III only.

B. I, II and IV only.

C. II, III and IV only.

D. I, II, III and IV.

35. The severity of toxic exposure on an individual depends on _____.

A. dose and susceptibility

B. age and health

C. genetics

D. diet

36. What is the primary focus of conducting exposure assessment in monitoring environmental health risks?

A. To determine sources of contamination.

B. To quantify the levels of contaminants to which individuals are exposed.

C. To perform statistical analysis.

D. To measure health outcomes.

37. Exposure assessment estimates _____.

A. magnitude, frequency and duration of exposure

B. mitigation effectiveness

C. toxicity values

D. disease incidence

38. What is the primary goal of exposure assessment?

A. To establish legal liabilities for environmental contamination.

B. To evaluate the effectiveness of personal protective equipment in preventing exposure.

C. To determine the sources and routes of human exposure to hazardous substances.

D. To identify potential health risks associated with environmental factors.

39. Which of the following best describes the screening phase?

A. Preliminary identification and prioritization of risks.

B. Implementation of mitigation measures.

C. Conducting epidemiological studies.

D. Detailed evaluation of all potential hazards.

40. Acceptance of residual risk should be based on _____.

A. public pressure only

B. developer preference

C. absence of complaints

D. regulatory benchmarks and health significance

SECTION B (Total: 60 marks)

Answer THREE (3) questions only.

Please use the answer booklet provided.

Question 1

There is overwhelming evidence that development can have a beneficial impact on human health and well-being, through the creation of employment, promotion of economic activities and growth, and improvement of living standards. However, development can also generate adverse impacts. Explain five adverse impacts of development that are commonly addressed.

(20 marks)

Question 2

Risk mitigation strategies in Health Impact Assessment (HIA) are designed to minimize or eliminate the adverse health impacts of a project, policy, or plan. These strategies are critical for ensuring that potential health risks are managed effectively and that benefits are maximized. Outline the FIVE (5) essential steps to develop an effective risk mitigation plan in HIA

(20 marks)

Question 3

Discuss FOUR (4) roles and significance of Health Impact Assessment (HIA) in shaping public health policies and urban planning decisions.

(20 marks)

Question 4

A factory manufacturing nickel-cadmium battery discharges cadmium in its effluent. The effluent discharge enters a river and the concentration of cadmium in the river was found to be 1 mg/L. Children from a nearby village downstream occasionally swim in the river.

Information given

A. Chronic daily intake due to ingestion while swimming (CDI_I)

$= C \times R \times ET \times EF \times ED / W_B \times AT$

Where, CDI_I = Chronic daily intake (mg/kg-day)

C = Concentration of the pollutant in water (mg/L)

R = Water ingestion rate (L/hr) = 0.05 L/hr

ET = Exposure time (hr/event)

EF = Exposure frequency (event/year)

ED = Exposure duration (years)

W_B = Body weight (kg) = 30kg

AT = Averaging time (days):

for chronic non-carcinogenic effects: AT= ED x 365 days/yr;

for carcinogenic effects : AT= 70 yr x 365 days/yr = 25, 550 days

B. Chronic daily intake due to skin absorption while swimming (CDIs)

$= C \times A_s \times R_D \times ET \times EF \times ED \times K_v / W_B \times AT$

Where, CDI_s = Chronic daily intake (mg/kg-day)

C = Concentration of the pollutant in water (mg/L)

A_s = Skin surface area available for contact (cm^2)

= 11, 600 cm^2 for a 9 to 12-year-old boy

R_D = Dermal permeability constant (cm/hr) = 8.4×10^{-4} cm/hr for water

ET = Exposure time (hr/event)

EF = Exposure frequency (event/year)

ED = Exposure duration (years)

K_v = Volumetric conversion factor (0.001 L/cm^3)

W_B = Body weight (kg) = 30kg

AT = Averaging time (days):

for chronic non-carcinogenic effect : AT= ED x 365 days/yr;

for carcinogenic effect : AT= 70 yr x 365 days/yr = 25, 550 days

C. Reference dose (RfD) for cadmium = 5×10^{-4} mg/kg-day

D. Slope factor for cadmium = $6.1\ (mg/kg\text{-}day)^{-1}$

(a) Calculate the chronic daily intake (CDI) of cadmium for swimming activities and the corresponding hazard quotient (HQ) for a boy who swims in the river at 2 hours per swim, twice a week, from the age of 9 to 12 years.

(16 marks)

(b) Estimate the lifetime excess cancer risk from this exposure.

(4 marks)

END OF EXAMINATION PAPER