

UNIVERSITY OF RUHUNA

Bachelor of Science Honours Degree in Fisheries and Marine Sciences

Level III, Semester I Examination – 2018 August/September

LIM 3122- Ecological and Human Health Risk of Pollutants

Answer all questions

Time: 2 hours

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1. The Crop Pollution Index (CPI) is determined as the ratio of an element concentration in the crop samples to the relevant National Standard values for food types in China. The heavy metal concentration in the food types and National Standard values are given in the Table 1. Calculate the Crop Pollution Index (CPI) for beans, fruits and tubers

Element	Concentration in food Types (mg/kg)			National Standard values (mg/kg)		
	Beans	Fruits	Tubers	Beans	Fruits	Tubers
Pb	0.09	0.08	0.06	0.8	0.2	0.4
Hg	0.02	0.02	0.01	0.01	0.01	0.01
Cr	0.75	0.44	0.70	1	0.5	0.5
As	0.16	0.05	0.41	0.5	0.5	0.5

2. The heavy metal transfer from soil to plant is determined as the bioaccumulation factor (BAF). The Table 2 gives the mean heavy metal concentrations measured in the soils that the three food types are grown. Calculate the bioaccumulation factor (BAF) for the food types (beans, fruits, tubers)

Element	mean heavy metal concentrations of soils that the three food types are grown (mg/kg)
Pb	42.65
Hg	0.21
Cr	69.64
As	6.38

3. Chronic Daily Intake (CDI, mg/kg/day) is used to evaluate human health risk assessment via three exposure pathways for heavy metals: ingestion of contaminated food types, dermal contact of soil and inhalation of soil dust. Using the following data calculate Hazard Quotient (HQ) and Hazard Index (HI) for the population considered below.

Heavy metal concentrations of airborne particulate matter is assumed to be equal to the concentrations of heavy metals in soil

Exposure time: 4 hours/day

Inhalation rate of air: 1.2 m³/day

Exposure frequency: 300 days/year

Exposure duration: 30 years

Skin surface area for soil contact: 25 cm²/day

Mean body weight: 55 kg

Average age: 45 years

Reference dose: Pb 0.01, Hg 0.001, Cr 0.01, As 0.002 (mg/kg/day)

Food consumption rate: beans 1 kg/year, fruits 1.5kg/year and tubers 2kg/year

4. Write a summary report explaining the answers of the above three questions (1, 2 and 3).

Part II

(Write your answers only within the provided space)

1. What are the three levels of approaches in ecological integrity assessment and state the major importance of each step

i.

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ii.

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iii.

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(3 marks)

2. Why conducting an ecological integrity assessment is necessary?

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(3 marks)

3. Define the term "**condition metrics**" used in ecological integrity assessment

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(3 Marks)

4. What is the importance of conceptual model diagrams in ecosystem assessments?

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(4 Marks)

5. Write three ecosystem services giving a suitable example for each

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ii.
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iii.
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(3 marks)

6. List different forms of reservoirs found in the ancient reservoir systems in Sri Lanka with respect to its function?

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(4 Marks)

7. Indicate two important reasons why international law is required for the conservation and management of water resources

i.
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ii.
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(6 Marks)

8. Name three different types of Product Standards used to regulate products that are manufactured.

i.
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ii.
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iii.
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(6 Marks)

9. Write two legal instruments used to regulate land use

- i.
- ii.

(2 Marks)

10. Write three environmentally critical projects that need Environmental Impact Assessment (EIA) regardless of the location of the project.

- i.
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- ii.
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- iii.
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(6 Marks)

Part III

Answer both questions (50 Marks)

(Write your answers only within the provided space)

1. Describe the process of Adaptive Resources Management (ARM) and briefly explain their importance in aquatic ecosystem management

(25 Marks)

2. Describe techniques that can be applied to obtain public participation at different levels in environmental decision making.

(25 Marks)