



UNIVERSITY OF RUHUNA
FACULTY OF FISHERIES AND MARINE SCIENCES &
TECHNOLOGY

Academic Year 2023/2024

Bachelor of Science Honours in Marine and Freshwater Sciences Degree

Level II Semester II Examinations – April/ May 2025

LIM 2222: Aquatic Toxicology and Human Health Risk

Time: 1 hour and 30 minutes

Answer all (03) questions

1.
 - 1.1 Describe the mechanisms for preventing oxidative damage of enzymes in fish tissues.
 - 1.2 Explain reasons for the improper detoxification processes that occur in fish.

(30 minutes, 25 marks)
2. Human health risk associated with consumption of contaminated drinking water was evaluated using heavy metal concentrations in drinking water. Using the data given below, estimate the human health risk of drinking water in the city.
Arsenic, Lead and Cadmium concentrations in drinking water were 0.82, 0.53 and 0.77 mg/L respectively.
Water ingestion rates (IR): 2.5 L/day
Exposure durations (ED): 50 years
Exposure frequency (EF): 365 days/year
Age: 70-years
Body weight: 60 kg
The reference dosage (RfD) for arsenic, lead and cadmium were 0.0003, 1.4 and 0.5 mg/kg/day, respectively.

(25 minutes, 25 Marks)
3. In an exposure assessment, the concentration of a pesticide in a reservoir was recorded as $0.04 \pm 0.001 \mu\text{g/L}$ (Mean \pm SD). A six-day toxicity test was carried out using *Lymnaea stagnalis* as the target organism in six glass tanks filled with 5L of different concentrations of the pesticide. Twenty similar-weight *Lymnaea stagnalis* were introduced into each concentration. The observations were made for each day, starting from the second day, and were recorded in Table 1. Using the information in Table 1,
 - i) Evaluate the toxicity of the pesticide on *Lymnaea stagnalis*.
 - ii) Estimate the environmental risk of the pesticide.

- iii) Describe the factors to be considered for the environmental bioavailability of the pesticide for the target animal.

Table 1: Observations made for different concentrations in the experiment

Concentration (mg/L)	Number of <i>Lymnaea</i> with degenerated foot in the experimental tanks					Number of <i>Lymnaea</i> without any movements in the experimental tanks				
	Day 2	Day 3	Day 4	Day 5	Day 6	Day 2	Day 3	Day 4	Day 5	Day 6
0.000	00	00	00	00	00	00	00	00	00	00
0.200	00	00	00	02	02	00	00	00	00	00
0.250	00	01	01	02	03	01	01	02	02	04
0.300	01	02	02	03	05	02	03	03	05	05
0.350	02	02	04	03	07	02	03	03	04	06
0.400	02	02	03	03	08	02	02	03	03	08

*Note: The following table would be useful for answering the question.

%	0	1	2	3	4	5	6	7	8	9
0		2.67	2.95	3.12	3.25	3.36	3.45	3.52	3.59	3.66
10	3.72	3.77	3.82	3.87	3.92	3.96	4.01	4.05	4.08	4.12
20	4.16	4.19	4.23	4.26	4.29	4.33	4.36	4.39	4.42	4.45
30	4.48	4.50	4.53	4.56	4.59	4.61	4.64	4.67	4.69	4.72
40	4.75	4.77	4.80	4.82	4.85	4.87	4.90	4.92	4.95	4.97
50	5.00	5.03	5.05	5.08	5.10	5.13	5.15	5.18	5.20	5.23
60	5.25	5.28	5.31	5.33	5.36	5.39	5.41	5.44	5.47	5.50
70	5.52	5.55	5.58	5.61	5.64	5.67	5.71	5.74	5.77	5.81
80	5.84	5.88	5.92	5.95	5.99	6.04	6.08	6.13	6.18	6.23
90	6.28	6.34	6.41	6.48	6.55	6.64	6.75	6.88	7.05	7.33
	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
99	7.33	7.37	7.41	7.46	7.51	7.58	7.65	7.75	7.88	8.09

Probit regression according to EP17-A2

(35 minutes, 35 Marks)

Continuous Assessment: 15 Marks