

Environmental Toxicology 2024

STATE EXAM QUESTIONS

1. Basics of environmental toxicology and testorganisms

- Role and definition of environmental toxicology
- Type of testorganisms in environmental toxicology based on their taxonomic rank with examples
- Main measurement endpoints in environmental toxicity testing (examples)
- Test organism requirements
- Test standardisation

2. Classification of environmental toxicity tests

- Aim of testing
- Tested ecosystem
- The number of species used in the test: single and multispecies tests with examples
- The duration relative to the life span of the organism: acute and chronic toxicity tests with examples
- Exposure scenario

3. Endpoints of test evaluation

- Relationship between concentration/dose and response, differences between dose and concentration, the main steps of the determination of the concentration-response curve (from dilution to measurement and analysis), the description and main parts of the concentration-response curve
- Endpoints of the test evaluation, endpoints of acute and chronic toxicity test

4. Terrestrial ecotoxicology: bacterial, plant and animal tests

- Fate and behaviour of chemical substances in the environment; general characteristics of soil ecotoxicity tests, characteristics and advantages of direct contact tests
- *Bacillus subtilis* agar diffusion test (the aim of the tests and endpoint measurement)
- Plant elongation inhibition test (details, laboratory practice)*
- *Folsomia candida* (Collembola) mortality test (details, laboratory practice)*
- Earthworm ecotoxicity tests (main test types and measurement endpoints)

5. Aquatic ecotoxicity tests: bacterial, algae and protozoon tests

- General characteristics of aquatic ecotoxicity tests
- *Aliivibrio fischeri* bioluminescence inhibition test (details, laboratory practice)*
- Algae and protozoon tests (testorganism characteristics, main description of the test, measurement endpoints, innovative methods)
- Cell counting with counting chambers under a microscope: description of counting chambers, determination of cell counts (laboratory practice)

6. Aquatic ecotoxicity tests: plant and animal tests

- Duckweed test (description and Latin name of the testorganisms, aim of the test, endpoints of measurement)
- Ostracod test (description of the testorganism, aim of the test, endpoints of measurement)
- *Daphnia* acute and chronic tests (details)*, innovative methods
- Fish test (main aim and endpoints of measurement)

7. Multispecies test: microcosms and mesocosms

- Advantages and disadvantages of multispecies tests compared to single-species toxicity tests
- Characteristics of microcosms and mesocosms
- Standardized Aquatic Microcosm (main composition, measurement endpoints)
- Soil respiration measurement in a closed bottle (applicability and questions to be answered, measurement principle)
- FIFRA test system (aim of application)
- Living machines (aims of application)

8. Multispecies test: field studies

- Complexity of environmental toxicology studies (figure)
- Characteristics of field studies
- Passive and active biomonitoring, biodiversity, bioindication, bioaccumulation
- Lichens as bioindicators (description of lichens and their applicability, air pollution maps)
- Early warning systems: musselmonitor (aims and sensitivity to contaminant groups), canary birds (application)

9. Basics of Environmental Risk Assessment, Qualitative ERA

- Definition: contaminant/pollutant, types with examples (e.g. emerging micropollutants, toxic metals)
- Hazard and risk of chemical substances
- Environmental toxicology in risk management and risk assessment (figure)
- Characteristics and aims of the Qualitative Environmental Risk Assessment

10. Quantitative Environmental Risk Assessment

- Characteristics of the Quantitative Environmental Risk Assessment, Integrated Risk Model
- Steps of the Quantitative Environmental Risk Assessment: Exposure Assessment and Effect Assessment
- PEC and PNEC estimation and its refined assessment

11. Human Health Risk Assessment

- Basic steps of the Human Health Risk Assessment
- Exposure pathways, estimation of exposure (calculation of Average Daily Intake, ADI), extrapolation from NOAEL to TDI
- “Three Rs” principle, alternatives to animal tests: EpiSkin test, Isolated Chicken Eye (ICE) test (aims of testing and test principle)

*Details of ecotoxicity tests:

- Characteristics of the testorganism: taxonomic rank, habitat, sensitivity to contaminants
- Description of the test: acute and/or chronic test, type of tested sample, diluting material, main steps of the test, necessary equipment, test duration, standards
- Measurement and evaluation endpoints