

## Environmental Toxicology 2022 STATE EXAM QUESTIONS

1. Basics of environmental toxicology and testorganisms
  - Role and definition of environmental toxicology
  - Definitions: xenobiotic, toxicant, ecosystem, food chain/web, trophic level – role of trophic levels in environmental toxicology
  - Type of testorganisms in environmental toxicology based on their taxonomic rank with examples
  - Test organism requirements
  - Test standardization
2. Functions of environmental toxicology and measurement endpoints
  - Three main functions of environmental toxicology (figure)
  - Interaction of chemicals with the ecosystem and functions needed to be described by environmental toxicology, parameters at each level of interaction (examples)
  - Main measurement endpoints in environmental toxicity testing (examples)
3. 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
4. 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
5. 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 on direct contact tests
  - *Bacillus subtilis* agar diffusion test (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)
6. 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 microscope: description of counting chambers, determination of cell counts (laboratory practice)

## 7. 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)

## 8. 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 closed bottle (applicability and questions to be answered, measurement principle)
- FIFRA test system (aim of application)
- Living machines (aims of application)

## 9. 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)

## 10. 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

## 11. 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

## 12. 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