

Examination assignments TBI4110, spring 2018. English

Task 1-5 counts equally and in sum 50% of the total grading.

Task 6-13 counts equally and in sum 50% of the total grading.

Task 1

- a. Explain the difference between essential and non-essential elements.
- b. Show in figures relationships between concentrations of essential/non-essential elements and health effects in organisms.
- c. Give some examples of elements from each of the two groups.

Task 2

- a. Explain similarities and differences between the toxic compounds "dioxins", "polychlorinated biphenyls (PCBs)" and "per- and polyfluorinated alkyl substances (PFASs)" with respect to sources and uses/applications, as well as properties related to biomagnification.
- b. Explain similarities and differences between dioxins and PCBs with regard to toxic mechanisms of action, and possible toxicological and ecotoxicological effects.
- c. What characterizes environmental pollutants regulated by the international "Stockholm Convention"?

Task 3

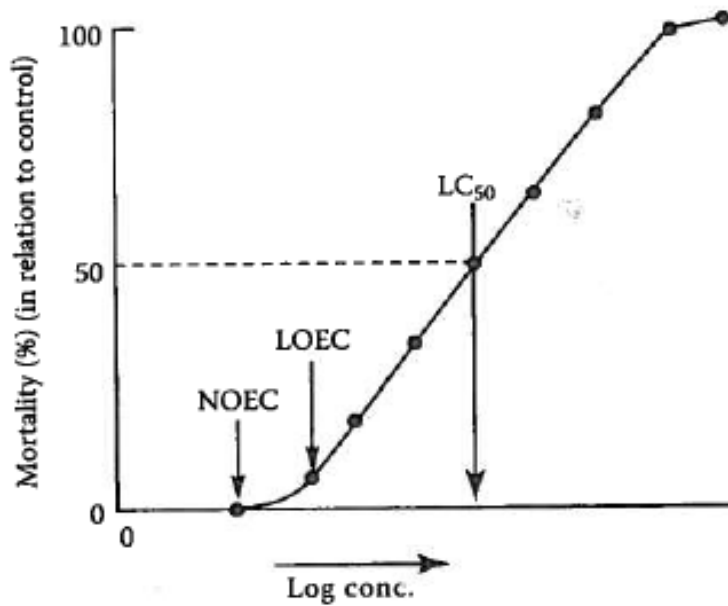
- a. What is a biomarker and what criteria should a good biomarker fulfill?
- b. What can the four biomarkers below provide information on?
 - i. EROD (CYP1A enzyme)?
 - ii. Metallothionein (MT) upregulation?
 - iii. Induction of Zona radiata protein (Zrp) in liver?
 - iv. ALAD (aminolevulinate dehydratase) inhibition?

Task 4

- a. In a mixture of equal amounts of the compounds A and B, what types of interactions can occur between the two compounds. Explain briefly each type of interaction and give an example of each.
- b. Give an example of how a toxic interaction at the molecular level can lead to effects at population level (explain effects at each level of organization).

Task 5

- Briefly describe the four types of biological monitoring (biomonitoring), and give examples of each of the four.
- Explain the figure below (including NOEC, LOEC, LC₅₀).

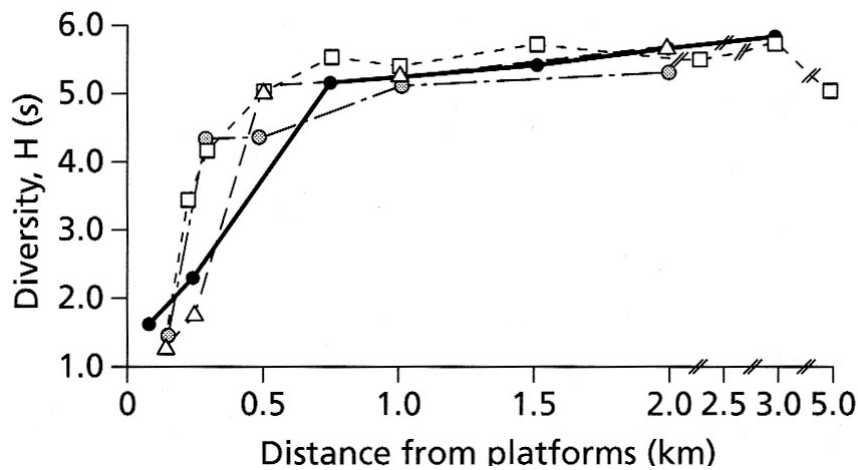


- Describe the "community-level NOEC" concept, including its pros and cons (advantages and disadvantages).

Task 6

- Which environmental toxicant(s) has/have been shown to cause eggshell thinning?
- Which of these birds are most sensitive to eggshell-thinning:
 - Pheasant
 - Duck
 - Cormorant
- Is it correct or wrong that eggshell-thinning causes population effects?

Task 7 (multiple choice, only one of the alternatives A-E is correct)



The figure above illustrates how the Shannon-Wiener species diversity index changes with distance near 4 oil production platforms in the ocean off the California coast. Which of the following statements about the Shannon-Wiener species diversity index in general and about the figure above in particular are NECESSARILY TRUE.

- I. Species diversity is relatively low near the oil production platforms
- II. You'll find the same species in approximately similar densities at 1.0 km distance from any of the oil production platforms.
- III. The Shannon-Wiener species diversity index changes relatively little when a rare species is lost.

Only one of the alternatives A-E is correct:

- A: I
- B: I and II
- C: I and III
- D: II and III
- E: I, II and III

Task 8 (multiple choice, only one of the alternatives A-E is correct)

Some plant species have adapted to thrive in soils contaminated with zinc from mining activities (and thereby evolved into new species). The following examples of tolerance mechanisms have been presented and discussed in the lectures.

- I. An adjustment of flowering time in order to avoid seasonal peak levels of soil zinc.
- II. A reduced capacity to take up zinc via the roots.
- III. An increased capacity to store zinc in vacuoles.
- IV. A decrease in exposure risk through migration.
- V. An increased capacity to excrete zinc salts via the leaves.

Only one of the alternatives A-E is correct:

- A: I, II and III
B: I, II, III and V
C: I, II, III, IV and V
D: II, III and IV
E: II, III and V

Task 9 (multiple choice, only one of the alternatives A-E is best)

Communities and ecosystems can collapse due to an increase in contaminant levels. The worst-case scenario is called (choose the BEST answer):

- A: non-linear tracking, because a small increase in the level of a contaminant in the environment can lead to a large and unforeseen change in the composition of an ecosystem, for instance due to the extinction of a keystone species.
- B: hysteresis, because a small increase in the level of a contaminant in the environment can lead to a large and unforeseen change in the composition of an ecosystem, for instance due to the extinction of a keystone species.
- C: non-linear tracking, because a small increase in the level of a contaminant in the environment can lead to a large and unforeseen change in the composition of an ecosystem. This change cannot be undone by reducing the contaminant level back to the level prior to the small increase.
- D: hysteresis, because a small increase in the level of a contaminant in the environment can lead to a large and unforeseen change in the composition of an ecosystem. This change cannot be undone by reducing the contaminant level back to the level prior to the small increase.
- E: carrying capacity catastrophe, because the system loses the capacity to sustain its species due to contaminant exposure.

Task 10 (multiple choice, only one of the alternatives A-D is correct)

Plastics are:

- A) synthetic oligomers
- B) inorganic polymers
- C) organic monomers
- D) synthetic polymers

Task 11 (multiple choice, only one of the alternatives A-D is correct)

Why are plastics a challenge to study toxicologically?

- A) Because they differ in physico-chemical properties
- B) Because they are so persistent
- C) Because they float on water
- D) Because they do not dissolve in water

Task 12 (multiple choice, only one of the alternatives A-D is correct)

Which taxa are most affected by entanglement in plastic (as number of species)?

- A) Whales
- B) Seals
- C) Turtles
- D) Invertebrates

Task 13 (multiple choice, two of the alternatives A-D are correct)

By which mechanism can microplastics induce toxicity?

- A) physiological
- B) physical
- C) reproductive
- D) chemical