Benha University
Faculty of Science
Department of Zoology

Environmental Health (222 Z)

Semester / year: first 2014/2015 **Level:** second level

Exam time: 1:00 hours **Sepc**: Zoology & chemistry

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A- Compare between each of the following: (28 marks)

1) Lentic and lotic habitats. **(10 marks)**
   a) Current: The whole volume of water flows in one direction in streams. In lentic habitat a certain amount of movement may occur, as internal currents and wave action.
   b) Land-water interchanges: The streams are intimately associated with the surrounding land, than are most standing bodies of water. For example, some of the biota of the streams is dependent on food from the surrounding land.
   c) Oxygen: Streams have higher oxygen content on account of the constant motion and higher oxygen content on account of the constant motion and small depth.
   d) Turbidity: In general, the streams maintain a greater turbidity than standing water.

2) Organochloride and organophosphate insecticides. **(10 marks)**

Organochloride insecticides: are chlorinated hydrocarbons, and include DDT, aldrin, endrin, toxaphene, etc. The insecticidal properties of DDT were first discovered and thenaldrin, endrin, toxaphene, etc. These insecticides were received with great enthusiasm, because they are cheap, easy to use, fast-acting and effective against a wide range of pests. The organochloride insecticides are characterized by their chemical stability, and they resist degradation for many years. Therefore, these insecticides accumulate and often move along the biogeochemical cycles and the food chains from plants to herbivores to carnivores. Organochloride insecticides accumulate and persist in bodies of many animals. These animals become harmfully affected by these persistent insecticides accumulated in their bodies. Also it is impossible for man to avoid exposure to pesticides in food (plants and animals) air and drinking water. Now, we all carry or quantities of pesticides in our bodies. These may cause cancer or other diseases.

Organophosphates insecticides: These compounds are degradable and much less persistent in the environment than are the organochlorides. They decompose after few months, and thus, they do not accumulate in

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the bodies of organisms. The organophosphates are now replacing the organochlorides, as they have much less harmful effects on non-target organisms. The following are some exapmles of organophosphorous pesticides: malathion, parathion, methyl parathion, etc.

3) LC_{50} and EC_{50}. **(8 marks)**

LC50 (Lethal concentration for 50 %): It is defined as the concentration that kills 50% of the animals after 24 or 48 h.

EC50 (Effective concentration for 50 %): It is defined as the concentration that effect 50% of specific function (as feeding rate, respiratory rate, heart rate, luminescence, egg production and growth) of the animals after 24 or 48 h.

B- Discuss two of the followings: (20 marks)

1) Freshwater acute toxicity test.

The test organisms:

-Daphnia (water flea, *Daphnia* sp.) survival and reproduction test. The daphnia is a model organism for toxicological studies.

-Fish model as fathead minnow (larval growth and survival) and zebra fish (Survival and egg production).

- Bacteria, *Vibrio sp* (Lumniscence bacteria) that can emit light. They are present in sea water and live symbiotically with some fishes as well as some invertebrates.

Procedure:

- In case of wastewaters, Make a serial dilutions of the test substances (0, 5, 10, 20, 40, 60, 80, 100%) from the stock waste water.
- In case of chemical substances make a stock solution (10%) and then make serial dilutions to give serial concentration depend upon the toxicity of the substance.
- In triplicate order, expose the test organism to every serial dilution or concentration.

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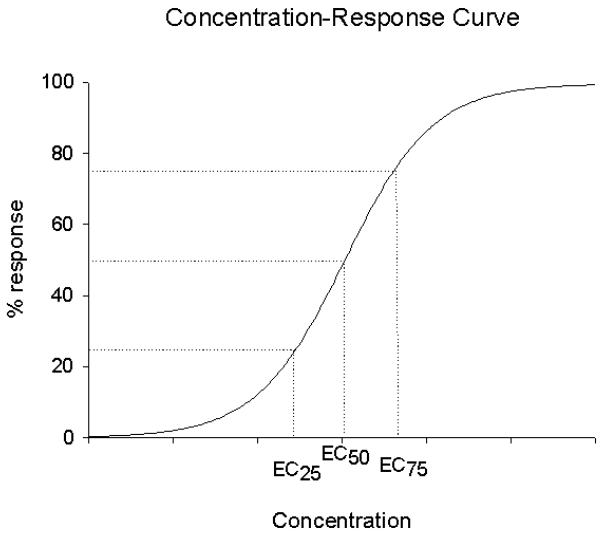
- In case of Daphnia, small petri dishes are used and currently micro-plate are used to conduct the test. It is placed in incubator for 24 and 48 h.
- In case of fish model, aerated glass aquaria are used for 24 and 48 h.
- At the end of 24 and 48 h the dead animals are counted for each serial dilution or concentrations.
- Depict a graph between % Mortaliy at Y axis versus dilution or concentration at X axis, this is termed Toxicity Curve. From this curve LC50 can be estimated.
- Currently, the probit analysis used to depict the toxicity curve. In it the Probit of % of response is expressed in Y axis and logconcentration of the substance is expressed in X axis. The probit analysis also called Finney's method (Finney 1952).
- The probit analysis is used when the relation between responses X Concentration is linear.



2) Effect of air pollution on human health.

Air pollutants may be either suspended particles or gaseous. The particles present in the sir may be carried through the air passages into the alveoli of the lung, and may be absorbed into the blood stream. These particles may cause asthma, cough and other diseases of lungs and throat. Lead

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particles may damage the brain of children, and may affect the normal functioning of the nervous system in adults. Cadmium particles are a respiratory poison, and cause high blood pressure and heart diseases.

As for pollutant gases, a water soluble SO_2 will rapidly dissolve in the soft tissues of mouth, nose, throat, bronchi and eyes. This will produce the characteristic dry mouth, scratchy throat and smarting ryes that most city dwellers have sometimes experienced.

NO_2, which is relatively insoluble in water, may pass to the alveoli of the lungs, and may affect the lung function.

Carbon monoxide is one the most poisonous pollutants in the city atmosphere. When this gas enters the blood stream, it replaces the oxygen in oxyhaemoglobin.

The smog characteristic of city atmosphere causes eye watering, respiratory stress and irritation in man.

Accumulation of radioactive materials in our bodies may cause serious diseases as leukemia, cancer, etc.

Pesticides may be present at low concentrations in our bodies. Yet, over the years, these chemicals may concentrate to a lethal level.

3) Sources of inland water pollution and methods used to treat them.

Sources of inland water pollution

a) **Domestic sewage:** It consists of human and animal wastes. The sewage is mostly discharged into rivers and drains. Small quantities of organic sewage may increase the productivity of the streams, acting as fertilizers. But the limit of sewage load that a stream can carry without harm is low and soon reached. The organic sewage oxidizes and CO_2 and toxic gases get in the water. This leads to a heavy reduction in O_2 content of water, which will affect the aquatic organisms.

b) **Industrial wastes**: The wastes of various industries are generallydischarged into nearby streams. These wastes may contain salts of heavy metals, and most of them are very toxic to fishes, and other aquatic organisms. Some industrial wastes have high organic

loading which rapidly reduce O_2 content of water. Some of the industrial wastes react with chlorine in water, producing chlorinated organic compounds that smell and taste very badly.

c) **Pesticides:** These compounds when sprayed on plants to kill pests are washed down to streams and lakes. They may accumulate in the bodies of aquatic organisms causing harmful effects.

Methods used in treatment of water pollution:

1. High Heavy metals levels treated by the addition of chelating agent as Ethylenediamine tetra acetic acid (EDTA) that chelate the heavy metals from the water resulting clean water.
2. Polymer compounds also clear water from the heavy metals.
3. In the artificial water habitat as fish farm, it can be done by making gradual water replacement with unpolluted water.
4. There are some plants as well as microorganisms are able to make bioconcentrtion of the metals from the surrounding water.

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