Model Answer of Environmental safety (Z222) time:

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Answer the following questions:

1- Discuss each of the following :- (22 Marks)

a- Cold Heat death and its explanations (8 Marks)

It is the death of the animal when exposed to very low temperature that is far below their thermal tolerance. The cold death vary according to the habitat in which the animal live in. For example those live in tropical habitat 10 C is considered cold death temperature whereas those live in Arctic zone same temperature is a heat death temperature.

Explanations:

-when the animal exposed to low temperature at zero or below, the animal losses temparture to the outside environment . So that the body temparture tend to lower down till it reach zero. This lowering of body temperature cames from the outside to the internal side of the animal, it has been done slowely and gradually. When the body temparure reach zero it causes freezing of the water present in the body fluids with the formation of ice crystals. Ice crystals formation is from water onlu leaving the other solutes as electrolytes and other unfrozen. This process increases the osmotic concentration of the body fluids. So that the osmotic concentration outside the cells became higher than those inside the cells. Due to this process the water oozes out the cells and cause destruction of the cells. This is the primary reason of cold death.

- Cold temperature lower the rate of metabolism and also the heart rate and blood flow.

b- Effects of Turbidity on aquatic organisms (7 Marks)

It is the total suspended matter in the water. It is composed of:

- Settled substances as sand, gravel, stones eggs of fish, phytoplankton, zooplankton, larvae of insects and other crustaceans. The rate of precipitation depend not only for the size particles but also on the density and viscosity of the water
- Non- settled substances as silt and clay, they are fine particles and are in continuous movement .

Effects of turbidity:

High turbidity in the water obstruct the light penetration to deeper level and this reduces the primary production through photosynthesis.

High turbidity damage the fish gills as the particles precipitates over the gills and Clough it and so impedes fish respiration. Also, sand particles cause the abrasion of fish gill with hemorrhage and possible infection.

High turbidity may possible to contain high amount of phytoplankton the increase the rate of oxygen consumption during the night and this can cause death of the fish>

Due to the above mentioned reason the turbidity of the aquatic habitats should be kept in a moderate level not high as

it harm the biota and also not very low or zero as in this case the productivity will be zero and this is not desired.

c- Resistance of insects to pesticides (7 Marks)

One of the major problems with insecticides is that many insects become resistant to these poisons. An insecticide at a certain concentration often becomes less effective after some years of use. In areas where spraying is heavy, strains of insects have evolved which are resistant to a particular chemical.

Resistance to insecticides is an extremely serious problem. By 1945, at least a dozen species had developed resistance to DDT. By 1975, the number had increased to 200 species. About 35 of these resistant species carry diseases and about 80 others are serious agricultural pests Since resistant parents tend pass this character on to succeeding generations, the old pesticides are rendered ineffective. DDT-resistant bed bugs were placed on cloth impregnated with DDT. They lived, mated and the females laid eggs normally. The young born on a coating of DDT, grew up and were healthy. Attempts to change pesticides have produced strains of insects that are resistant to more than one insecticide.

The problem of resistance of insects can be more serious, is the pest becomes resistant and various predators do not. If this happens, the pests can increase greatly in number in the absence of natural predators.

As an example, DDT was used to control pests in an area. Within four years, cotton production rose from 490 to 790

kilograms per hectare. However, one year later, the crop dropped to 390 kg. per hectare. Studies showed that the DDT had destroyed the natural enemies of the pests. Then, the pests develop resistance. With natural enemies eliminated, the pest increased greatly in number. In this case, the pesticide caused a rapid decrease in the pest number, thus cotton production rose greatly. Later on, the pests develop immunity, but the predators not. The increased numbers of pests caused the drop in the crop.

2- Write the details of each of the following:- (14 Marks)
   a- Pollution of inland waters (7 Marks)

The inland waters (as streams, Lakes, pond) may become polluted from a number of sources. Of these are:

1.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.

1. **Industrial wastes**

The wastes of various industries are generally discharged 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.

3.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.

b- Biological effects of radiation (7 Marks)

Radioactive materials may arise from the nuclear plants or from the application of these substance in medicine, industry, agriculture and scientific research. Radioactive pollutants may be concentrated in organisms by passing through a food chain. Some of these radioactive pollutants cause damage to living tissues.

Strontium is the most important radioactive pollutant. Radioactive strontium behaves like calcium in biochemical cycles. It is taken by plants , where it passes to herbivores as cows. Like calcium, it can be deposited in bone, and concentrates in milk. Therefore, milk, vegetables and fruits can be source of radioactive strontium for man. In man, it become a structural part of bone along with calcium. Thus, the cells in bone and marrow become the prime target for radiation.

Radioactive phosphorus can accumulate in plants, animals and man.

DNA is considered as a sensitive target for radiation. DNA contains the genetic information. Radiation may cause changes in DNA, thus producing mutations. These mutation may be the harmful type.

Radiation may cause serious diseases as leukemia, bone tumors, anemia, cancer, etc.

3- Define each of the following: (12 Marks)

- Photochemical smog (2 marks)
- It is the somg formed in the presence of light. Smog= Fog or water vapor + smoke (carbon dioxide vabour). It occurred in sunny cities that is heavily polluted and highly traffic.
- The reaction proceeds as the following
- Hydrocarbon+NO2 Ozone +Perooxyacetyl nitrate(PAN)
- Ozone is hamfull for human skin as it causes irritation and cause eye watering and respiratory stress
- PAN kill the plants through stopping the photosynthesis. So they are extremely toxic to plants.

- **Point source pollution (2 marks)**

It is a type of pollution in which the pollutans reach the environment through pipes or canals. This means that there is a one source of the pollutants. For example, the different discharged wastewaters is

a point source of pollution. Radiation is not a point source pollution.

- **Dead Sea (2 marks)**
  It is the phenomenon that ocuur in river or sea when environmental pollution is high enoygh to kill the biota of that habitat.
- **Bioaccumulation and Bioconcentration (2 marks)**
- Biococnetration is the net result of uptake or assimilation of certain pollutants through all route of exposure , i.e., by water (waterborne exposure) by food or other means. This is happens when fish accumulate pollutants through water and drinking and food.
- Bioconcnetration is the net result of uptake or assimilation of pollutants through water only. In this case the animlas concentrates the pollutants in gretar amount higher than those in the environment. For example bioconcentration happens in sessile animals as sponge and mussels.

- **EC50 & LC50 (2 Marks)**

  EC50:
  It is the concentration of the pollutant that cause an adverse effect of specific end point as heart rate, feeding activity, light emission or even growth of the tested organism.
  LC50:
  It is the concentration that kill 50% of the animals during certain time.
- **Environmental quality standard (2 Marks)**

- We use environmental standards to manage the water envir onment. Environmental standards help us work out

how much water could be abstracted from a body of water, how much of a pollutant could be discharged and how much engineering works could be undertaken without significant risks to the health of the plants and animals that live in the water.

- For example, suppose an environmental standard specifies that the concentration of a particular chemical in the water environment should be less than 20 milligrams per litre. Suppose we monitor the concentration of that particular chemical in a body of water and find that it is currently only 12 milligrams per litre. Our assessment would be that the chemical is not posing a significant risk to the health of the plants and animals in the water body.
- On the other hand, suppose a new discharge is proposed and we predict that it would increase the average concentration of the chemical in the water body by 15 milligrams per litre to 27 milligrams per litre. Such a concentration would pose a significant risk to the health of the plants and animals in the water body. We use such risk assessments as the basis for setting permit limits.

Best of Success

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