BTCESS802 B Environmental Remediation of Contaminated Sites

Question Bank

MODULE 1

1. Explain the different causes for site contamination.
2. What are the different parameters need to check for site contamination?
3. Define hazardous waste. Write down the names of different hazardous waste.
4. What are the rules and regulations should follow during the handling, transporting of hazardous waste?
5. How the hazardous waste is different from municipal solid waste?
6. Explain the characteristics of hazardous waste.
7. What do you mean by risk assessment? Write down the objective of risk analysis.
8. How we can classify wastes as a hazardous?
9. Explain TCLP test.
10. The groundwater of a particular area is contaminated with leachate from a landfill having Arsenic, with the reference dose ($3*10^{-4}$ mg/kg-day) and a daily intake (DI) (0.3 mg/kg-day). Find out the hazard quotient (HQ)?
11. A landfill site contaminated the soil beneath with Benzene (a Carcinogen). The worker's intake due to the soil ingestion at the site is estimated as 1×10^{-7} mg/kg-day. The slope factor is observed to be 1×10^{-2} kg-day/mg. Calculate the risk for benzene.
12. A solid contaminant is dissolved in an aquifer. The aquifer has a porosity of 0.4. The dissolved volume of contaminant in GW is 500 L. The pumping out of an extraction well is performed at a flow rate of 2 L/day. Calculate the remediation time required for the contaminated site.

MODULE 2

1. A ground water contaminant that transports through PRB has a retention time of 48 hrs. The discharge rate is observed as 0.05 m^3/hr. The aquifer has a porosity of 0.4. The c/s area through which the flow is occurring is 150 m^2. Evaluate the thickness of PRB?
2. Explain plume containment?
3. Write down the steps in Human Health Risk Assessment.
4. What do you mean by toxicity assessment?
5. Explain Risk Management.
6. What is the Risk-based Corrective Action?
7. What do you mean by risk characterization?
8. Write down problems of unscientific disposal of hazardous and other waste.
9. Explain shortly waste management hierarchy.
10. What do you mean by ecological risk assessment?

MODULE 3

1. A contaminant is detected in both adsorbed and dissolved phases at a particular site. The partitioning coefficient of adsorbed contaminant is estimated as 3 L/kg. The porosity and dry density of contaminated soil are 0.4 and 1.6 kg/L respectively. Calculate the retardation coefficient of the considered contaminant.

2. A plume of groundwater contaminated by chloroform is to be treated by a permeable reactive barrier zero valent iron. The reaction for the removal of the contaminant is given as,

    ZVI + Chloroform ………………………Product

    Assuming that the reaction obeys pseudo-first-order kinetics. The reaction rate for the reaction is 2×10^{-3} g / (L-hr.). The maximum chloroform concentration 8 mg/L. The kinetics of the reaction was observed in the laboratory and found rate constant k= 0.02 hr^{-1}. A system assumes to behave as a batch reactor, and zero-valent iron added was 200 g/L. Calculate the specific surface area available for the reaction.

3. A plume contaminated with chlorobenzene is to be remediated using nanoscale zero-valent iron. Initially, batch tests were performed before designing actual PRB. It is found that the system behaves as a pseudo-first-order system. The remediation goal for chlorobenzene is 3 μg/L. The maximum chlorobenzene concentration was 6mg/L. The rate of constant for PRB was 0.13 hr^{-1}. Calculate the retention time in hours.

4. A plume contaminated with dichloroethane is 100 m long, 20 m wide, and 6 m deep is to be treated by PRB. The aquifer has porosity 0.35. the kinetics of dichloroethane degradation was observed with first-order constant k = 0.023 hr^{-1} in the batch reactor, where 200 μg/L of ZVI added. The PRB is designed mixture of 40% ZVI and 60 % sand with porosity 0.4 and bulk density of 3 kg/L. What will be the value of the rate constant for PRB?

5. In above Q.4, the maximum dichloroethane concentration was 8 mg/L and the remediation goal is 3 μg/L of chloroethene. Calculate the required thickness of PRB if the actual velocity is 20 m/year. Assume that it is rapidly converted to chloroethene

MODULE 4

1. Explain the landfill procedure for hazardous waste.
2. Write down the characteristics of barrier materials.
3. Explain Solidification/Stabilization.
4. What is single-component and multi-component in leaching?
5. What are non-redox reactions?
6. What are Reductive processes?
7. What are Oxidative processes (ISCO)?
8. Explain Soil Vapor Extraction process.

MODULE 5

1. Explain bioremediation process.
2. Write down the examples of bioremediation process.
3. Write down advantages and limitations of bioremediation process.
4. Explain mechanism of phytoremediation.
5. Explain Incineration.
6. What is the application of incineration?
7. Write down advantages and limitations of incineration.
8. Explain Soil washing.