

M. Tech. Food Technology and Bio-chemical Engineering 1st Yr 2nd Semester Exam 2025

Hazardous Waste Management

Time: Three Hours

Full Marks: 100

(60 marks for Part I & 40 marks for Part II) Use separate Answer-Scripts for each part

Part-II

Answer Question No. 1 and any Two from the rest. Any relevant data may be assumed, if necessary.

1. Answer following questions very briefly:

- a) Name the current Indian Hazardous Waste (HW) Management Rule.
- b) What is the least preferred option in Hazardous Waste Management Hierarchy?
- c) Give an example to show the difference between risk and hazard?
- d) What is the last step of risk assessment? e) What is fire point?
- f) Why is steel corrosion considered as a primary indicator of a HW?
- g) What is a reactive HW? h) How is toxicity and TCLP correlated?
- i) When is LC_{50} used instead of LD_{50} to identify a waste as toxic?
- j) Why is carcinogenicity not considered as a characteristic in defining HW?
- k) What is the full form of LD_{50} ?
- l) Mention four criteria used by the USEPA to define toxicity of a HW.
- m) Which one should be preferred among reuse, recovery, release & recycle of HW?
- n) Define 'storage' as per Indian HW Rule.
- o) Why is 'Basel Convention' so named? p) What is the threshold value of risk ratio?
- q) By which Ministry was HW Rules promulgated? r) Explain significance of Bio-concentration Factor.
- s) Why is 'potency factor' also called 'slope factor'?
- t) Draw a sketch to show threshold value of a chronic dose-response curve for a carcinogen? 1X20=20

[Turn over

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2. a) When a substance which is not a liquid may be called 'ignitable'?
- b) When a waste may be termed as 'corrosive'?
- c) "TCLP of Arsenic is 5 mg/L"explain.
- d) Name two nephrotoxic metals. Why is benzene a hematotoxin?
- e) How to get LD50 of a chemical through toxicological study. 2 x 5 =10
3. a) Write a brief note on 'DWEL'.
- b) Compute the DWEL for methylene chloride.
- c) An evaluation of records for employees of a vinyl chloride manufacturing plant finds that out of 400 workers, 35 developed liver cancer. A control group consisting of individuals with smoking histories similar to the exposed workers and who were unlikely to have encounter vinyl chloride , had 27 with liver cancers and 505 who did not develop liver cancer. Find the relative risk and attributable risk. Comment on the results.

2+4+4=10

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4. Write short note about any **four** of the followings:

- (i) RfD for non-carcinogenic effects (ii) mutagenesis (iii) contaminant degradation (iv) exposure pathway (v) hazardous air pollutants (vi) risk characterization (vii) Transboundary movement of HW

2.5x4 = 10

Some of the following information may be needed:**i) Table A**

Chemical	PF(oral) (mg/kg-day) ⁻¹	PF(inhalation) (mg/kg-day) ⁻¹	Oral RfD (mg/kg-day)	BCF (L/kg)
Chloroform	6.1x10 ⁻³	8.1x10 ⁻²	0.010	3.75
Trichloroethylene (TCE)	1.1x10 ⁻²	1.3x10 ⁻²	0.0005	10.6
Tetrachloroethylene	5.1x10 ⁻²	1-3.3x10 ⁻³	0.10	31.0
Benzo(a)pyrene (BaP)	11.5	6.11	0.0002	-----
Methylene chloride	7.5x10 ⁻³	1.4x10 ⁻²	0.060	-----

ii) Table B

Exposure pathway	Daily Intake	exposure frequency (days/yr)	exposure Duration (yrs)	body wt. (kg)
Ingestion of potable water	2 L	350	30	70
Inhalation of contaminant	20 m ³	350	30	70
Consumption of fish	54 gm	350	30	70