

Dr. Casey
Exam 1
Fall 2009
CHEM 480/580

Name: _____

Signature: _____

Honor Statement: By signing this exam, you indicate that you have neither given nor received aid from any unauthorized source.

Each numbered question is worth 20 points. Answer 10 of the questions. If you answer more than 10, I will grade only the first 10. Answer each question in the space provided. If you need more space, use the back of the sheet. Answer thoroughly!

1. a. Match the following toxicity parameters with the listed concentrations. All concentrations refer to the response of the same organism to the same toxicant. The listed times correspond to the duration of exposure.

	24 hr LC ₅₀	12 hr LC ₅₀	IC ₅₀	IC ₁₀
121 μ g/L	_____			
189 μ g/L	_____			
459 μ g/L	_____			
2.87 mg/L	_____			

b. A standard bioassay organism, the fathead minnow (*Pimephales promelas*), is exposed to the herbicide atrazine to investigate nontarget effects. Describe two experiments, one using a chronic exposure and one using an acute exposure, that could be conducted with this organism. Include the duration of exposure, relative concentrations (relatively high or low) and endpoint for each experiment.

2. a. What is the difference between dose and dosage?

b. Two toxicologists are arguing over the appropriate endpoint for a bioassay in which the toxicity of an airborne industrial chemical is being quantified in rats. One says that the results should be determined as an LD_{50} while the other recommends LC_{50} . Is there any significant difference in these terms? Explain why there is no difference, or if there is a difference, explain how it would influence the way in which data are obtained from the bioassay.

3. a. Draw a typical dose-response curve for the following two cases. For the xenobiotic case, assume that the endpoint is mortality and graphically represent the determination of the LC_{10} , LC_{50} and LC_{90} .

- the toxicant is a xenobiotic
- the toxicant is an essential nutrient

b. Using the xenobiotic curve, label the LOEL and the NOEL. Explain what these terms mean.

4. The following data were obtained for a bioassay.

Compound	Administered Dose (mg)	Enzyme Activity (α M/s)
Control		94
A	40	65
B	20	67
C	20	12
D	40	83
A+B	40 mg A/20 mg B	75
C+D	20 mg C/40 mg D	2

a. Rank the compounds in terms of increasing IC_{50} values.

Lowest IC_{50} _____ Highest IC_{50}

b. Identify the type of interaction occurring with each mixture (additivity, synergism, potentiation, antagonism). Explain your answer.

5. a. Diffusion across a membrane can be described by the following equation. How is the parameter “d” related to the relative rate of uptake by different routes of exposure (dermal, oral, ingestion, injection)?

$$\text{Rate of diffusion} = \frac{D \times S_a \times P_c (C_H - C_L)}{d}$$

b. How does the parameter $(C_H - C_L)$ relate to the rate of diffusion from the gut into adjacent blood vessels?