

Dr. Casey
Exam 1
Fall 2007
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.

	12 hr LC ₅₀	96 hr LC ₅₀	EC ₅₀	EC ₉₀
25 µg/L	_____			
120 µg/L	_____			
535 µg/L	_____			
1.15 mg/L	_____			

b. Define the following terms and explain how the magnitude of an LD₅₀ would vary between these two exposure scenarios.

chronic exposure

acute exposure

2. a. What is different about the parameters LC_{50} and LD_{50} ?

b. A new insecticide is being evaluated for nontarget impacts on earthworms. Describe two different experiments, one where the outcome is described using an LC_{50} and one resulting in an LD_{50}

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. Explain why the curve for the essential nutrient has its characteristic shape. Relate each region of the curve to the health status of the organisms.

4. The following experiment is performed with an aquatic invertebrate, *Daphnia magna*.

<u>Compound</u>	<u>Concentration (mg/L)</u>	<u>% Inhibition of Reproduction</u>
A	13	62
B	964	6.3
C	150	46
A + B		

a. Which compound has the highest IC_{50} ? Which compound is the most toxic?

Highest IC_{50} _____

Most toxic _____

b. Compound A is administered with Compound C at the concentrations listed above. The reproductive inhibition of the mixture is 22%. Classify the interaction as additivity, synergism, potentiation or antagonism. Briefly explain your answer.

5. a. Draw a graph demonstrating the principle of probabilistic risk assessment involving effects of a chemical on an organism. Include exposure and effects distributions in the graph and then describe how such data would be used to determine the likelihood of adverse effects in the environment.

b. Briefly describe one limitation each for determining the exposure and effects assessments in a risk assessment for an agricultural chemical that is broadly used throughout the United States.