Chemicals & Human Health Toxicology Problem Set: Student Sheet

Directions

1. Answer the pre-questions (circle the answer in the Pre-Questions column).
2. Go to the website [www.biology.arizona.edu/chh](http://www.biology.arizona.edu/chh) and click on the link to the Toxicology Problem Set.
3. Write the correct answer in the column labeled Correct Answer. All of the answers can be found in the Toxicology Problem Set.
4. Explain the correct answer.

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| Pre-Questions (circle the answer you think is correct) | Correct Answer(write the letter of the correct answer from the website) | Explain(explain the correct answer) |
| Which statement is the most correct?1. Chemicals manufactured by humans are more dangerous to human health than naturally occurring chemicals.
2. Both natural and human-made chemicals are potentially toxic to humans.
3. Naturally occurring chemicals are more poisonous to humans than synthetic chemicals.
 | B | Give an example of each Natural toxic substance: rattlesnake poisonMan-made toxic substance:Ddt |
| One of the items below is a hazardous substance. Four are sources of a hazardous substances. Which one is a hazardous substance?1. clogged furnace
2. cigarette
3. a dog
4. paint applied before 1978
5. dust mite parts
 | E | What is a common health effect of this hazard? Allergic reactionWhat is the source for this hazard? dustmitesList 2 additional examples of a hazard and its source:

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| **Hazard:** | **Source:** |
| animal dander | fur-bearing animals, such as dogs or cats |
| carbon monoxide | broken appliances that incompletely burn natural gas or oil, such as furnaces or stoves |
| dust mite particles | dust mites living in beds, carpets, curtains, furniture |
| Lead | paint applied before 1978, batteries, water pipes |
| mercury | thermometers, filling in teeth, batteries |
| mold spores | molds which are found especially in damp places like showers |
| tobacco smoke | lighted cigarettes or cigars |

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| Which of the following is NOT a possible route of entry for a hazard?1. ingestion
2. absorption
3. exposure
4. inhalation
 | C | Describe the primary ways a hazard can enter the body:Ingestion (swallowing), absorption(nuclear waste), inhalation (smoking)Which route of entry may result in more of the toxicant in the blood and why?**Inhalation** - Chemicals can be breathed into the lungs, called inhalation. The inside surface of the lungs very large and is a poor chemical barrier. Many chemicals that are inhaled can easily and quickly enter the bloodstream from the lung tissue |

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| When DDT, a pesticide, enters the human body, it is .1. water soluble and is easily excreted in urine.
2. stored in the bones.
3. not toxic, but is processed by enzymes and becomes a different compound which is toxic.
4. fat soluble and can be stored in fat tissue.
 | D | Define solubility:Ability to dissolveWhat type of chemical is more easily eliminated from the body, water-soluble or fat-soluble?Water SolubleBased on your answer above, is DDT easily eliminated from our bodies? Why?No, not water soluble |
| Who took the largest dosage of aspirin?1. an adult woman who weighs 125 lbs. and took 300 mg of aspirin
2. a teenage boy who weighs 135 lbs. and took 600 mg of aspirin
3. a baby who weighs 20 lbs. and took 100 mg of aspirin
4. a chihuahua who weighs 5 lbs. and took 50 mg of aspirin
 |  | Define dose:Amount of a substance take.Calculate the dose for each person/animal in the question (show your calculations and include units):A: 300mg/125lb=2.4mg/lbB:600mg/135lb=4.4mg/lbC:100mg/20lb=5mg/lbD:50mg/5lb=10mg/lb |
| Which will NOT help you determine the dose of a hazardous gas received by a person?1. their respiration rate
2. their length of exposure to the gas
3. the source of the gas
4. their frequency of exposure to the gas
5. the concentration of the gas
6. the gas's chemical and biological properties
 | c | Will the dose be higher or lower if: a person breathes more rapidly?highera person is exposed once?lowera person is exposed over years?higherthe gas is easily absorbed?Higher |

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| Most hazardous substances exhibit a "dose-response relationship." What does this mean?1. The harm caused by the hazard increases as the amount of hazard entering the body (dose) increases.
2. It does not matter how big a dose you receive, you will always have same amount of harm/sickness.
3. Exposure to the hazard always results in harm.
4. Fifty percent of the people will die when exposed to 0.1 mg/kg.
 | A | Draw a dose-response curve:http://www.biology.arizona.edu/chh/problem_sets/toxicology/graphics/dosecurve.gif |
| A family home has a clogged furnace that is producing carbon monoxide, a hazardous gas.Which family member is likely to be harmed the most?1. Billy, the son who is in 1st grade
2. Baby Shea, who is going to be in preschool next year
3. Karla, the nanny who cares for the toddler every weekday morning
4. Ms. Nguyen, the mother who works at home.
5. Mr. Nguyen, the father who works at the University
 | B | Give 2 reasons for your answer:.The three important factors here are length of exposure, age and size. Baby Shea is most likely to be harmed because 1) he is the youngest and therefore smallest person in the house, and 2) along with his mother, Mrs. Nguyen, he spends the most time in the home. |
| All of the people listed below live in the same house. Who ismost likely to experience toxic effects from the second-hand smoke?1. the grandmother, who is very fit
2. the mother, who smokes
3. the father, who smokes
4. the teenage daughter, who has asthma
5. the son, who is in 5th grade
 | D | Explain your answer: A person's health status can affect their response to a hazard. In this case, the daughter who has asthma is most likely to suffer harmful effects because her lungs are already experiencing an illness and are less healthy than the other people who live there. |

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| There are several ways to control or reduce your exposure to a hazard. Opening a window in a room full of people who are smoking is an example of controlling your exposure to environmental tobacco smoke by .1. treating the symptoms of the hazard
2. diluting the hazard
3. distancing yourself from the hazard
4. removing the hazard
 | b | Explain your answer:By opening the window, fresh air will enter the room and the concentration of cigarette smoke will be reduced. This decreases your exposure to cigarette smoke, but does not completely eliminate exposure. Give 2 additional examples of how to control or reduce exposure to a hazard: Other ways to control a hazard are removing the source of the hazard, wearing protective gear, distancing yourself from the hazard, and treating the symptoms caused by the hazard. |
| Which environmental health scientist would determine ways to prevent and reduce exposure to second hand smoke?1. a toxicologist
2. an epidemiologist
3. an industrial hygienist
4. an occupational and environmental medicine physician
5. a pharmacologist
 | A | Do any of the careers described in this question interest you? Why or why not?Occupational and Environmental Medicine because I like the action instead of studying. |