Sci 9 Biomagnification & Toxicity Name:



**Materials/Identification:**

* *Silver paper clips* represent DDT
* *Blue paper clip*s represent algae (producers)
* *Pink* represents the shrimp that eats algae
* *Yellow* represents a small fish which eats the shrimp
* *White* large fish - like a bass which eats the small fish
* *Green* represents osprey eating the bass (large fish)

**Procedure:**

1. Roll a die - this tells you how much DDT your single algae ingests or absorbs through its environment. **Record this number in the producer’s level of the trophic pyramid.**
	* Ex. if you roll a 2 (attach 2 Silver paper clips to a blue paper clip because your algae will have 2 Silver paper clips on it)
2. Roll die, this is how many ALGAE your shrimp (PINK) eat. **Record the total number of DDT (Silver paper clips) of the trophic pyramid the primary consumers have ingested.**
	* Ex. if you roll a 3 (you will have to make 2 MORE algae paperclips with 2 Silver DDT paperclips on EACH one)
3. Roll die, this is how many SHRIMP your little fish (minnow) (YELLOW) eat. **Record the total number of DDT (Silver paper clips) of the trophic pyramid the secondary consumers have ingested.**
	* Ex. if you roll a 3 (you will have to make 2 MORE shrimp (Pink) which each having the Blue and Silver paperclips)
4. Roll die, this is how many LITTLE FISH (minnow), your BASS (WHITE) eats. **Record the total number of DDT (Silver paper clips) of the trophic pyramid the tertiary consumers have ingested.**
	* Ex. if you roll a 5 (you have to make 4 MORE Yellow organisms with the same number of Pink, Blue, and Silver paperclips)
5. Roll die, this is how many LARGE FISH (bass), your OSPREY (GREEN) eats. **CALCULATE the total number of DDT (Silver paper clips) in the quaternary consumers have ingested.**
	* Ex. if you roll a 6 (you have to make 5 MORE White organisms with the same number of White, Gold, Pink, Blue, and Silver paperclips)
	* OPTION: YOU DON’T ACTUALLY HAVE TO DO THIS STEP WITH THE PAPERCLIPS JUST CALCULATE IT!

**Summary Data Table:**

|  |  |  |
| --- | --- | --- |
| **Organism** | **DDT Ingested (ppm)** | **Name of Trophic Level/Feeding Relationship** |
| Algae |  |  |
| Shrimp |  |  |
| Minnow (small fish) |  |  |
| Bass (large fish) |  |  |
| Osprey |  |  |

**Conclusion Questions:**

1. Draw a generic pyramid of the food chain above **and** label the amount of DDT at each level. Include each organisms name and its feeding level (example algae is producer, second level is….)
2. Why does a substance like Caffeine not bioaccumulate but heavy metals like mercury and lead do? Identify where these toxins are stored in the human body.
3. Compare the amount of DDT found in the osprey with the amount of toxin found in one phytoplankton. Specifically, how many more times DDT is in the osprey.
4. What is the difference between the terms biomagnification and bioaccumulation?
5. The FDA suggests that all people limit the amount of larger predator fish that are consumed, such as tuna, swordfish, and shark. Based off the results of this, why would that advice be prudent? Why is it especially prudent for pregnant women and children?

**Part 2: WHAT’S THE RISK?**

**PART 1: GOOGLE: Good Guide or** **Go to** [**http://www.goodguide.com**](http://www.goodguide.com)

Enter each product type below into the white search box in the middle of the page. Choose a specific example and write its name underneath the product type.Complete the rest of the row for that specific example.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Product Type and Name** | **Overall Score** | **Ingredient(s) of Concern** | **Level of Concern (H,M,L,?)** | **Ingredient(s) Human Health Impact**  | **SAFER Alternative Product** |
| 1. Shampoo/Conditioner
 |  |  |  |  |  |
| 1. Toothpaste
 |  |  |  |  |  |
| 1. Deodorant
 |  |  |  |  |  |
| 1. Hair Styling Product
 |  |  |  |  |  |
| 1. Hand Soap
 |  |  |  |  |  |
| 1. Body Shower Soap
 |  |  |  |  |  |
| 1. Shaving Cream
 |  |  |  |  |  |
| 1. Dishwashing Soap
 |  |  |  |  |  |
| 1. Laundry Detergent
 |  |  |  |  |  |
| 1. Lip Balm/Chap Stick
 |  |  |  |  |  |
| 1. Mouthwash
 |  |  |  |  |  |
| 1. Sunscreen
 |  |  |  |  |  |
| 1. Moisturizer
 |  |  |  |  |  |
| 1. Makeup
 |  |  |  |  |  |

**PART 3:** Calculate your own mass in kg. Calculate the human LD50 for the compounds in the data table on below. How many total g would be required to kill 50% of perfect duplicates of yourself? Use the LD50 values in the table below. (1 kg = 2.2 lbs.) Example if you weigh 175 lbs. divide it by 2.2 to get your weight in lbs.

**Your weight in kg: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

|  |  |  |
| --- | --- | --- |
| **Substance** | **LD50, oral, Rat (mg/kg)** | **LD50, oral, human (g/person)****SHOW WORK IN SPACE PROVIDED** |
| Benzladehyde (almond flavor) | 1300 |  |
| Propyle glycol (moisturizer) | 20,000 |  |
| Caffeine | 192 |  |
| Diazinon (ant dust killer) | 139 |  |
| Parathion (pesticide) | 4.0 |  |

1. What is the LD50 of graph A?
2. What is the threshold dose for graph A?
3. What is the LD50 of graph B?
4. What is the threshold dose for graph B?

**PART 4:** GOOGLE: *EPA radiation dose calculator* and click on the SECOND link

What is your yearly radiation dose: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mrem.

1. The average American is exposed to 620 mrem are you over or under that figure?
2. Copy down your radiation percent exposure WITHOUT radon using the pie chart to the right:

**PART 5:** Please rate the risks on a 1 to 10 scale: a **ten being an activity or event which you perceive as a great risk, not to yourself, but, to the average citizen** of the United States, and a one being an activity or event which you perceive as a minor risk to the average citizen of the United States:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Natural disasters | Structure fires | Drowning | Driving an automobile | Drinking tap water | Tobacco use | Bicycling | Indoor air pollution | Outdoor air pollution | Alcohol use | Medical X-rays | Flying commercial airlines | Being overweight | Pesticide residues on food | Terrorism | AIDS | Living with a smoker | Toxic waste | Drug abuse | Living in poverty |
| You Think |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Actual Risk |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**Conclusion Questions:**

1. Identify **one ingredient** in the product you use on a daily basis that is the most toxic to your health and you should stop buying immediately:
2. Research the LD50 of that ingredient:
3. How is LD50 different from ED50?