

## Science 9 - LD<sub>50</sub> Questions

1. The LD<sub>50</sub> for rat poison is 0.27mg/kg. If a rat with a mass of 0.85 kg ingested 0.50 mg of rat poison will it possibly die?

$$\begin{aligned}\text{Mass} &= 0.85 \text{ kg} \\ \text{Dosage} &= 0.50 \text{ mg} \\ \text{LD}_{50} &= 0.27 \text{ mg/kg}\end{aligned}$$

$$\begin{aligned}\text{Max Dosage} &= \text{Mass} \times \text{LD}_{50} \\ &= 0.85 \text{ kg} \times 0.27 \text{ mg/kg} \\ &= 0.2295 \text{ mg} \sim 0.23 \text{ mg}\end{aligned}$$

0.50 mg > 0.23 mg - The dosage given (0.5 mg) is larger than the max dosage (0.23mg), therefore the rat will possibly die.

2. Find the max amount of theobromine in grams needed to reach the max LD<sub>50</sub> for a 23 kg dog. Theobromine LD<sub>50</sub> = 255 mg/kg

$$\begin{aligned}\text{Mass} &= 23 \text{ kg} \\ \text{Dosage} &= ? \\ \text{LD}_{50} &= 255 \text{ mg/kg}\end{aligned}$$

$$\begin{aligned}\text{Max Dosage} &= \text{Mass} \times \text{LD}_{50} \\ &= 23 \text{ kg} \times 255 \text{ mg/kg} \\ &= 5865 \text{ mg or } 5.87 \text{ g}\end{aligned}$$

The maximum dosage that can be given to a 23 kg dog to reach LD<sub>50</sub> for theobromine is 5.87 g

3. Which is more toxic, Solution A which has an LD<sub>50</sub> of 0.2mg/kg, or Solution B which had an LD<sub>50</sub> of 2 mg/kg?

The lower the LD<sub>50</sub> concentration is for a chemical the more toxic it is. Thus solution A's LD<sub>50</sub> of 0.2mg/kg would be more toxic than solution B's of LD<sub>50</sub> of 2 mg/kg.

4. Find the amount of arsenic needed to reach the LD<sub>50</sub> amount for a 1.75 kg duck. Arsenic LD<sub>50</sub> = 13 mg/kg

Mass = 1.75 kg  
Dosage = ?  
LD<sub>50</sub> = 13 mg/kg

$$\begin{aligned}\text{Max Dosage} &= \text{Mass} \times \text{LD}_{50} \\ &= 1.75 \text{ kg} \times 13 \text{ mg/kg} \\ &= 22.75 \text{ mg}\end{aligned}$$

The maximum dosage that can be given to a 1.75 kg duck to reach its LD<sub>50</sub> for arsenic is 22.75 mg

5. Whoops, Mr. K ate too much ice cream and has an irrational fear of dying from eating too much sugar. The LD<sub>50</sub> for sugar is 29,700 mg/kg. Mr.K weighs 80.5kg, and ate about 800 grams of sugar. Is he going to be okay?

Mass = 80.5 kg  
Dosage = 800 g  
LD<sub>50</sub> = 29700 mg/kg

$$\begin{aligned}\text{Max Dosage} &= \text{Mass} \times \text{LD}_{50} \\ &= 80.5 \text{ kg} \times 29700 \text{ mg/kg} \\ &= 2390850 \text{ mg}\end{aligned}$$

Convert answer from mg to g

$$2390850/1000 = 2390.85 \text{ g}$$

800 g < 2390.85 g - The dosage given (800 g) is lower than the max dosage (2390.85 g), therefore Mr.K will survive another day to gorge on ice cream.