Poison Homework

You may have to make some assumptions to do this problems. It's ok, just state what they are.

1. The LD_{50} of ethanol is 10.6 g/kg in young rats. How many shots of tequila would you need to drink to have a 50% chance of dying? List any assumptions. You may lie about your weight. Don't forget to consider: The percentage of ethanol in tequila, any rat/human margin of safety you wish to impart, the size of a "shot", etc.

2. Based on the LD_{50} of YOUR poison, how much would result in a 50% chance of dying. Use the unit appropriate to your poison (e.g., mg, tablets, volume, conc in air, etc.) Cite the source of your number(s).

3. Drug X has a half-life of 71.9 minutes. If 570 mg of drug X was administered intraveneously to a 70.4 kg patient, what dose will be in his system at time zero? After 1.00 hours? When will 99% of the drug be eliminated?

3. Consider the following data regarding aspirin.
pKa = 3.5; $t_{1/2}$ = 17 min; principle metabolism reaction = hydrolysis; LD_{50} = 225 mg/kg

a. What is the reported lethal dose for an adult female (130 lbs), in number of tablets of aspirin? (Tablets = 325 mg)

b. Assuming a first order process and rapid absorption, what would be the concentration of aspirin in the woman an hour after taking two 325 mg tablets?

c. Explain, chemically, why absorption is rapid.

4. Consider Rohypnol (fw = 313.39 g/mol).
pKa = 1.8; $t_{1/2}$ = 3 hour in plasma, 16-35 hr for elimination;
1% eliminated unchanged in urine, 10% unchanged in feces and rest as metabolites in urine

a. Why is there a difference in the half-life of the drug in plasma and in overall elimination?

b. Assuming a dose of 1 mg, what would be the expected concentration of unchanged drug in a urine sample of 25 mL?

c. If the LOD/LOQ for this drug in a mass spectrometer is 2.5 µg/L, how long after the dose will it be possible to detect unmetabolized drug in urine?

5. A death investigator returns from a scene of a questioned death. The victim is an older woman with a history of depression. The investigator found an empty bottle of prescription Valium (5 mg/tab) on the nightstand with an half-empty bottle of wine. The investigator suspects that the woman may have committed suicide by taking the entire bottle of tablets with a glass of wine. Comment on this hypothesis, assuming the LD_{50} of diazepam (active ingredient of Valium) is 100 mg/kg.