

**CHEMISTRY 253**  
**Spring, 2015 - Dixon**  
**Last Group Assignment**  
**Open Book – But 30 min. Time Limit**

Group Names \_\_\_\_\_

1. Ethanol ( $C_2H_5OH$ ) has some advantages and disadvantages as a fuel. It is relatively easy to produce from sugars and starch. One way to overcome some disadvantages of ethanol as a fuel is to convert some ethanol to acetic acid ( $CH_3COOH$ ) and to combine acetic acid with ethanol to form ethyl acetate ( $C_2H_5O_2CCH_3$ ). 8 pts

compound	melting point	boiling point	octanol water partition coefficient
ethanol	-114°C	78.4°C	0.50
ethyl acetate	-119°C	77°C	4.6

a) By looking at the stoichiometry of the reaction of ethyl acetate with oxygen (vs. ethanol), which appears to be a more energy dense fuel? (you can also compare the reactions with coal – C or methane if that helps).

b) Give one property of ethyl acetate is likely to overcome a disadvantage of using ethanol.

2. Many insecticides have low oral  $LD_{50}$  values but high dermal  $LD_{50}$  values for humans. (12 pts)

a) Does this make the dermal route or the oral route more dangerous for humans?

b) Insect's "skin" is much more porous than that of humans. How will that affect the toxicity of methyl parathion in insects.

c) Methyl parathion, which has an oral  $LD_{50}$  of 14 mg/kg, accidentally contaminated wheat flour so that 0.08% by mass of the wheat flour was methyl parathion. How many grams of contaminated wheat would be needed to be consumed to cause a lethal dose in a "typical" 38 kg boy.