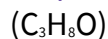
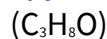


## Exam II

Administered: Friday, October 11, 2019  
24 points

For each problem part: 0 points if not attempted or no work shown,  
1 point for partial credit, if work is shown,  
2 points for correct numerical value of solution

**Problem 1. (16 points)** Consider the following data for the enthalpy of fusion for two alcohols

1-PropanolIsopropyl Alcohol

taken from the NIST Chemistry Webbook, <http://webbook.nist.gov/chemistry/>.

**Enthalpy of fusion of 1-propanol**

$\Delta_{fus}H$ (kJ/mol)	Temperature (K)	Reference
5.372	148.75	<a href="#">Counsell, Lees, et al., 1968, 2</a>
5.4	148.7	<a href="#">van Miltenburg and van den Berg, 2004</a>
5.37	148.8	<a href="#">Counsell, Lees, et al., 1968</a>
5.192	147.0	<a href="#">Parks and Huffman, 1926, 2</a>

**Enthalpy of fusion of isopropyl alcohol**

$\Delta_{fus}H$ (kJ/mol)	Temperature (K)	Reference
5.410	185.20	<a href="#">Andon, Counsell, et al., 1963</a>
5.372	184.67	<a href="#">Kelley, 1929</a>
5.41	185.2	<a href="#">Domalski and Hearing, 1996</a>
5.301	184.6	<a href="#">Parks and Kelley, 1928</a>
5.297	184.6	<a href="#">Parks and Kelley, 1925</a>

Perform the following tasks.

- Determine the sample mean of the enthalpy of fusion of 1-propanol.
- Determine the sample mean of the enthalpy of fusion of isopropyl alcohol.
- Determine the sample variance of the enthalpy of fusion of 1-propanol.
- Determine the sample variance of the enthalpy of fusion of isopropyl alcohol.
- Identify the appropriate distribution to describe the difference of means in this case?
- Determine the lower limit of a 98% confidence interval on the difference of means of the enthalpy of fusion.
- Determine the upper limit of a 98% confidence interval on the difference of means of the enthalpy of fusion.
- Explain your findings in language a non-statistician can understand.

**Problem 2. (8 points)**

Consider a battery with a distribution of lifetimes described by the normal distribution with a population mean of 5.0 years and a population variance of 1.0 years.

- (a) What is the probability that a battery lasts at least 7.0 years?
- (b) What is the probability that a device with a redundant power system running on four batteries has no batteries working in 7.0 years?
- (c) What is the probability that a device with a redundant power system running on four batteries has all batteries working in 7.0 years?
- (d) What is the probability that a device with a redundant power system running on four batteries has at least one battery still working in 7.0 years?