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-Propanol
(C_3H_8O)

Isopropyl Alcohol
(C_3H_8O)

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	Counsell, Lees, et al., 1968, 2
5.4	148.7	van Miltenburg and van den Berg, 2004
5.37	148.8	Counsell, Lees, et al., 1968
5.192	147.0	Parks and Huffman, 1926, 2

Enthalpy of fusion of isopropyl alcohol

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

Perform the following tasks.
(a) Determine the sample mean of the enthalpy of fusion of 1-propanol.
(b) Determine the sample mean of the enthalpy of fusion of isopropyl alcohol.
(c) Determine the sample variance of the enthalpy of fusion of 1-propanol.
(d) Determine the sample variance of the enthalpy of fusion of isopropyl alcohol.
(e) Identify the appropriate distribution to describe the difference of means in this case?
(f) Determine the lower limit of a 98% confidence interval on the difference of means of the enthalpy of fusion.
(g) Determine the upper limit of a 98% confidence interval on the difference of means of the enthalpy of fusion.
(h) 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?