

Exam II

Administered: Monday, October 12, 2020
22 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 biochemicals



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

Enthalpy of fusion of ibuprofen

$\Delta_{fus}H$ (kJ/mol)	Temperature (K)	Method	Reference
39.5	350.4	DSC	Cilurzo, Alberti, et al., 2010
27.94	347.6	DSC	Hong, Hua, et al., 2010
26.6	346.4	DSC	Wassvik, Holmén, et al., 2006
26.65	348.	N/A	Gracin and Rasmuson, 2002
25.7	350.9	DSC	Li, Zell, et al., 1999

Enthalpy of fusion of acetaminophen

$\Delta_{fus}H$ (kJ/mol)	Temperature (K)	Method	Reference
27.6	443.2	DSC	Mota, Carneiro, et al., 2009
27.0	440.3	DSC	Vecchio and Tomassetti, 2009
26.49	441.9	AC,DSC	Xu, Sun, et al., 2006
26.2	443.	DSC	Romero, Bustamante, et al., 2004
26.02	441.2	N/A	Manzo and Ahumada, 1990

Perform the following tasks.

- Determine the sample mean of the enthalpy of fusion of ibuprofen.
- Determine the sample mean of the enthalpy of fusion of acetaminophen.
- Determine the sample variance of the enthalpy of fusion of ibuprofen.
- Determine the sample variance of the enthalpy of fusion of acetaminophen.
- Identify the appropriate distribution to describe the difference of means in this case?
- Determine the lower limit of a 95% confidence interval on the difference of means of the enthalpy of fusion.
- Determine the upper limit of a 95% confidence interval on the difference of means of the enthalpy of fusion.
- Explain your findings in language a non-statistician can understand.

(continued on back)

Problem 2. (6 points)

We attend a (socially distanced and outdoor) concert featuring an accomplished guitarist, who plays a 12 string guitar. In the hands of this guitarist, who practices several hours every day, the lifetime of an individual guitar string follows the normal distribution with a mean of 3.7 months and a standard deviation of 0.5 months.

- (a) What is the probability that a string lasts at least 4.0 months?
- (b) What is the probability that this 12-string guitar has zero strings break (all 12 strings working) in 4.0 months?
- (c) What is the probability that this 12-string guitar has more than 6 strings break (less than 6 strings working) in 4.0 months?