

Name _____

/120

All problems are worth 20 points.

1. A random sample of 12 strands of the same brand of fiber glass shows an average Young's modulus of 0.3182×10^6 psi with a standard deviation of 0.0086×10^6 psi.

a) Calculate a 95% confidence interval for the expected Young's Modulus of this kind of Fiber glass.

b) Calculate a 95 % confidence interval for the variance of the Young's Modulus of this kind of Fiber glass.

c) What assumptions did you make in these calculations?

2. A soft drink manufacturer wants to determine if one of its fill operations is working properly. A random sample of ten '1 liter' bottles of the same soft drink showed an average fill of 0.996 liters with a standard deviation of 0.005 liters. At a 1% level of significance, is it true that the average fill is under 1 liter? Show your work and reasoning.

What would be a Type II Error in the context of this problem?

3. A random sample of 540 lung cancer patients showed that 423 had a marked reduction in pain by using a new experimental drug.

a) Calculate with 95% confidence the proportion of all lung cancer patients whose pain level this drug would reduce.

b) Is it true at a 5% level of significance that this drug reduces pain in at least 75% of lung cancer patients?

c) What is the significance probability (p -value) of this test?

4. Two different chemical companies provide MgO (Magnesium Oxide). Using 6 different x-ray diffraction runs on a sample purchased from Company A gave an average lattice constant of 4.18 Angstroms with a standard deviation of 0.03 Angstroms. Using 10 different x-ray diffraction runs on a sample purchased from Company B gave an average lattice constant of 4.20 Angstroms with a standard deviation of 0.02 Angstroms.

At a 1% level of significance, is there a real difference in the crystal structure of the MgO provided by both companies?

What assumptions did you make in this determination?

5. A study was conducted to determine if office background noise at an office decreases productivity. Twelve office workers were studied at work for one week both before and after the wearing of noise-reduction head gear. Their productivity on a 100 point scale as determined by the company conducting the study were recorded as follows:

Subject	1	2	3	4	5	6	7	8	9	10	11	12
Before	81	86	79	84	79	87	86	75	87	93	85	77
After	83	84	89	85	78	87	91	74	89	86	89	78

At a 5% level of significance is there evidence that wearing the noise reduction headgear increases worker productivity?

6. A six-sided die is tossed 600 times and the number of times each face comes up is recorded. The results are shown below.

Face	Number of Times Observed
1	84
2	107
3	118
4	92
5	97
6	102

Is it true at a 5% level of significance that this die was not tossed fairly?