1. A chemical plant has a mean $\mu$ daily production of at least 740 tons of a product when it is operating properly. The output was measured on a random sample of 36 days, yielding $\bar{y} = 712$ and $s = 24$ tons/day. Perform a test of $H_0: \mu \geq 740$ versus $H_1: \mu < 740$. Show work for each of the following steps:

a. (4) Test statistic $t = (712 - 740)/(24/6) = -28/4 = -7$

b. (4) $P$-value = extremely small, less than .0001.

c. (4) Do you believe it is plausible that the plant is operating properly, or are you convinced that it is not? Why?

No, it is not plausible because the $p$-value is extremely small. The probably of getting a value of $t$ as extreme as -7 is less than .0001 if, indeed, the null hypothesis were true.

2. Five carbon content measurements were made on a silicon wafer on each of two consecutive days to determine if the calibration of the spectrometer would change from one day to the next. The means and standard deviations were $\bar{y}_1 = 2.106$, $\bar{y}_2 = 2.099$, $s_1 = 0.029$, and $s_2 = 0.033$. Perform a test of $H_0: \mu_1 = \mu_2$ versus $H_1: \mu_1 \neq \mu_2$. Show work.

a. (4) Test statistic: $t = (2.106 - 2.099)/((.029^2 + .033^2)/5)^{1/2} = .007/ =.356$

b. (4) $P$-value in terms of an inequality: $P> .5$ (Even if df=120, the $p$-value would be >.5)

c. (4) Can you conclude that the calibration of the spectrometer changed from day 1 to day 2? Why or why not?

No, because a value of $|t|= .365$ would occur more 50% of the time by chance alone.