Exam, Form: A

Name: _____

Student Number: _____

TA: _____

Date: _____

In the following tasks you have to decide, if a one-sample t-test is significant or not. The situation is as follows: It is assumed that the pH-value of a certain water is 6.7 (pH=6.7, Null Hypothesis). From this water 10 samples are taken and the following pH-values are measured: pH: 6.76 6.85 6.94 6.88 6.69 6.90 6.76 6.61 6.78 6.89. Assume that a corresponding vector `pH` has been generated in R. Please decide by looking at the ouput of R if the following t-tests are significant or not significant.

1.
```
> t.test(pH,mu=6.7,conf.level=0.99)

        One Sample t-test

data:  pH
t = 3.2116, df = 9, p-value = 0.01063
alternative hypothesis: true mean is not equal to 6.7
99 percent confidence interval:
 6.698739 6.913261
sample estimates:
mean of x
    6.806
```

   (a) The test is significant, i.e. the null hypothesis (pH=6.7) is rejected!

   (b) The test is not significant, i.e. the null hypothesis (pH=6.7) is accepted.

2.
```
> t.test(pH,mu=6.7,conf.level=0.95)

        One Sample t-test

data:  pH
t = 3.2116, df = 9, p-value = 0.01063
alternative hypothesis: true mean is not equal to 6.7
95 percent confidence interval:
 6.731337 6.880663
sample estimates:
mean of x
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   (a) The test is significant, i.e. the null hypothesis (pH=6.7) is rejected!

   (b) The test is not significant, i.e. the null hypothesis (pH=6.7) is accepted.

In the following tasks you have to decide, if a two-sample t-test is significant or not. The situation is as follows: pH-values of two different waters are measured (10 samples from each, pH1:6.76 6.85 6.94 6.88 6.69 6.90 6.76 6.61 6.78 6.89; pH2: 6.85 7.08 6.72 6.99 7.04 6.77 6.97 6.75 7.00 6.86). Assume that the corresponding vectors `pH1` and `pH2` have been generated in R. Please decide by looking at the ouput of R if the following t-tests are significant or not significant. The null hypothesis is that the pH of the two waters is equal.

3.
```
> t.test(pH1,pH2,conf.level=0.95)

        Welch Two Sample t-test

data:  pH1 and pH2
t = -1.8447, df = 17.225, p-value = 0.08235
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.20783051  0.01383051
sample estimates:
mean of x mean of y
    6.806     6.903
```

   (a) The test is significant, i.e. the null hypothesis (pH1=pH2) is rejected!

   (b) The test is not significant, i.e. the null hypothesis (pH1=pH2) is accepted.

4.
```
> t.test(pH1,pH2,conf.level=0.90)

        Welch Two Sample t-test

data:  pH1 and pH2
t = -1.8447, df = 17.225, p-value = 0.08235
alternative hypothesis: true difference in means is not equal to 0
90 percent confidence interval:
 -0.188405386 -0.005594614
sample estimates:
mean of x mean of y
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   (a) The test is significant, i.e. the null hypothesis (pH1=pH2) is rejected!

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Answer Key for Exam A

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