**Study Guide for BIOS6606 Midterm**

**General Statistical Concepts**

Categorical: Nominal vs Ordinal

Continuous:discrete vs. continuous

Population vs. sample

Parameter vs. Statistic (μ vs. , σ vs. s)

Probability distribution, what is it

Bias vs. Sampling error

Experimental Unit, Observational Unit, Statistical Unit

Recognize technical replicates vs. biological replicates

Statistical significance vs biological/clinical significance

Measures of effect

**Hypothesis Testing**

H0 vs. HA

One-sided (one-tailed) vs. two-sided (two-tailed) hypotheses

p-value: Reject or Fail to Reject

Critical value and rejection region

Type I (false positive) and Type II (false negative) error; 

**Descriptive stats**

Types of measures of central tendency (know how to determine mean, median, and mode from a set of data)

Types of measures of variability (SD, variance, including determine IQR from data)

Right (Positive) skew and Left (Negative) skew; using skewness measure to determine amount of skew

**Graphing**

Frequency Distribution vs. Bar Graph

Interpreting Box plots

Error bars: SD, SEM, 95%CI - how are they different

Error bars: using to determine significance

**t-tests (one-sample, independent, paired) and non-parametric alternatives and z-score**

Assumptions (and how to assess each)

Null and alternate (two-sided) hypotheses

How to calculate degrees of freedom

Determining critical values from a table

How to interpret Prism output to make conclusions

Calculate z-score

**ANOVA (one-way, two-way, repeated measures) and non-parametric alternatives**

Assumptions (and how to assess each)

Null and alternate (two-sided) hypotheses

How to calculate degrees of freedom

Determining critical values from a table

How to interpret Prism output to make conclusions

Interaction and main effects – using graphic evidence to determine

Eyeball data and graphs to determin if there may be sphericity

**Choosing test to compare means (parametric tests on continuous data that are normal/symmetrical with equal variances) Also know their non-parametric equivalents**

|  |  |  |  |
| --- | --- | --- | --- |
|  | One mean | Two means: family of 2-sample t-tests | 3+ means: family of ANOVAs |
| Independent | Z-test (known variance) or one-sample t-test (unknown variance) | independent (unpaired) t-test | one-way or two-way ANOVA |
| Paired |  | paired t-test | 1-way or 2-way RM ANOVA |

**Tests on categorical data (chi-square, chi-square test of trend, chi-square goodness of fit test, Fisher’s exact, binomial, McNemar’s test)**

Assumptions (and how to assess each)

Null and alternate (two-sided) hypotheses

How to calculate degrees of freedom

How to expected values

Determining critical values from a table

How to interpret Prism output to make conclusions

**Know what the equations below are (for which test) and how decrees of freedom are calculated where appropriate. You may be asked to calculate one by hand**

z = (X - μ) / σ

   

