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## Biometry Midterm Exam – 2006

(1) **5 points each** Define the following, explaining what each definition actually means.

(a)  $\beta$

(b)  $s_X$

(c)  $Z$

(d)  $\sigma_{\hat{p}}$  (Remember that  $\hat{p}$  is the sample proportion,  $X/n$ , with  $X$  = the count of occurrences of the outcome of interest, and  $n$  = the total number of observations).

(2) **20 points** When does it mean to be “x% confident the value of parameter  $q$  lies in the interval  $(l, u)$ ”? Define as precisely as you can what “confident” means in this usage, and what it is we are “confident” about.

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**(3) 20 points** When is it true that  $\sigma_{\bar{x}} = \sigma_X / \sqrt{n}$ ? That is, what conditions must be met for this to be true? Why is it true when those conditions are met?

**(4) 20 points** Why isn't the probability of making a Type I error in a statistical hypothesis test equal to the chosen  $\alpha$ ?

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**(5) 20 points** Meta-analysis is a statistical method in which results from multiple studies addressing the same hypothesis are combined so that the overall strength of the accumulated evidence can be determined. It does not simply count up how many of the studies had “significant” results and how many didn’t. Rather, it in effect combines the data from all the studies (with weighting to deal with sample sizes and other relevant differences among the studies), to perform an overall test of significance.

Using your knowledge of how statistical hypothesis testing works, explain how two or more “negative” (i.e. non-significant) studies could yield a “positive” (i.e. significant) result when combined. (For simplicity, you might think of simply combining two data sets obtained from identical studies.)