**PRACTICE EXAM II ANSWER KEY**

 Exam II will be made up of questions similar to the examples below and similar to questions you have received on the last 2 homeworks.

**Matching**

A generation of animals expected to differ from each other genetically (eg. The F2 generation) *segregating generation*

A psychiatric disorder characterized by long-term thought disorders, hallucinations and disorganized speech. *schizophrenia*

Twins who are genetically no more alike than ordinary brothers and sisters. *DZ twins*

The process of deciding which type (either MZ or DZ) a pair of twins is.

*zygosity determination*

A generation of animals not expected to differ from each other genetically.

*non-segregating generation*

An estimate of the additive genetic contribution to variation in a population.

*narrow heritability*

Twins who are genetically identical. *MZ twins*

An estimate of the total genetic contribution to variation in a population.

*broad heritability*

Possible answers

non-segregating generation            narrow heritability                        MZ twins

half-siblings                                   back cross                                  manic depression

zygosity determination                   selection differential                      schizophrenia

broad heritability                           DZ twins                                     dominance deviation

segregating generation                   correlation                                  allele-sharing method

concordance                                identical-by-descent method

**Twin studies**

The following table gives the reported correlations for same-sex twins raised together for 4 traits. Assume that the sample sizes are large.

TRAIT                                MZ CORRELATION                   DZ CORRELATION

Body mass index (BMI)                     0.80                                             0.40

General cognitive ability                      0.86                                              0.60

Extraversion (EXT)                           0.50                                              0.13

Dust allergy (ALL)                            0.52                                              0.21

Basing your answers on these correlations and assuming the validity of twin study methods:

Which trait is the least influenced by non-shared environments? *general cognitive ability*

Justify your answer. *Has the highest MZ correlation, indicating lowest variance due to individual experience (= non-shared e)*

Which trait is most influenced by the shared environment? *general cognitive ability*

Justify your answer. *DZ correlation is > ½ the MZ correlation - indicates the twins are MORE similar than we would expect on genetics only, shared experiences have made them more similar*

What is the narrow heritability of BMI? *0.8 or 80%*

Show how you arrived at this answer. *Since there is no evidence here for shared environment, the heritability simply = MZ correlation*

For which 2 traits might non-additive genetic influences (eg. dominance) be a factor?

*extraversion and dust allergy*

Justify your answer. *DZ correlation is < ½ MZ correlation, indicating DZ twins are LESS similar than we expect on additive gene action only.*

**Cross-breeding studies of animal behavior.**

Two inbred strains of fruit flies (Drosophila melanogaster), P1 and P2, were crossed to give the F1 generation. Flies from the F1 were bred to give the F2 generation. Male flies were placed with a standard "target" female and the amount of time spent in courtship was recorded. The sample sizes, mean courtship time observed for the 4 generations, and the variance for each generation are given below:

GENERATION         SAMPLE SIZE        MEAN COURTSHIP                VARIANCE

TIME (%)          IN COURTSHIP

TIME

            P1                           100                             74.0                                                344

            P2                           100                             70.0                                                372

            F1 100                             84.0                                                383

            F2                           400                             74.9                                               621

Do the generation means give evidence of genetic influences on courtship activity? *yes*

Justify your answer. *Inbred strains P1 and P2 have different mean scores reflecting genetic differences between the strains*

Do the generation variances give evidence of genetic influences on courtship activity? *yes*

Justify your answer. *F2 is a segregating generation and would be expected to have a bigger variance if genes influenced the trait – the F2 here DOES have a larger variance, hence there is evidence genes influence the trait*

Given that genes seem to be important in determining courtship time, what do the generation means tell you about the nature of that genetic control?

*Since the F1 generation mean does NOT fall midway between the 2 parental means, there appears to be NON-ADDITIVE gene effects eg dominance for long courtship time.*