**INTRODUCTION TO BEHAVIOR GENETICS**
**DR HEWITT**
**HOMEWORK 3**
**QUESTION SHEET**

1. In animal cross-breeding studies starting with crosses between inbred strains, why is the phenotypic variance of the F2 generation expected to be greater than that of the F1 generation?

2. a. What do we mean when we say a selective breeding program has been 'successful?

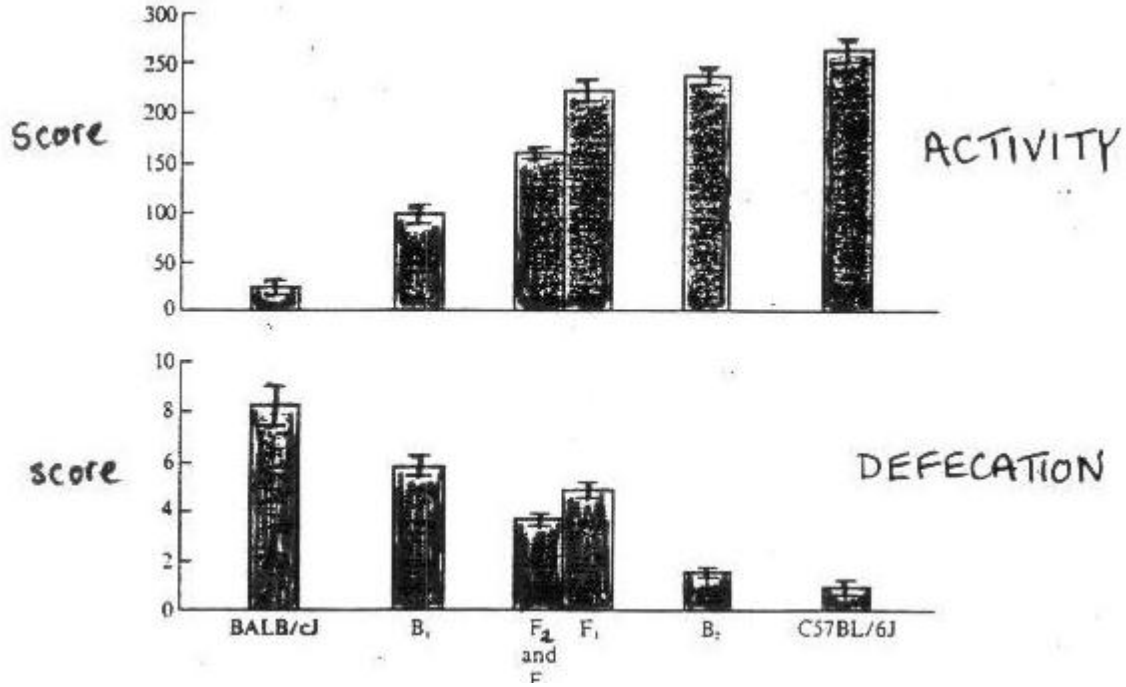
b. Name three examples of behaviors that have been shown to change in response to selection or to differ between inbred strains of mice.

c. What can we say about the **nature of action** and **the number of genes** involved in a trait from looking at the results of a successful selection study on that trait?

3. "We can demonstrate that **genetic** variance for behavior in the animal kingdom is nearly ubiquitous". Do you agree? Give reasons for your answer.

4. In a particular population of mice, certain individuals display a phenotype called "head shaking", which is inherited as a dominant trait. Other individuals display a recessive trait called "back-arching" . Which of these traits do you think would be easier to eliminate from the mouse population by selective breeding. Why?

5 . The figures below show the mean open-field activity and defecation scores of BALB/cJ and C57BL/6J mice and their derived F1, backcross (B1 and B2), F2 and F3 generations.




State whether you think the following statements are true or false regarding this data and give reasons for your answers:

i BALB/cJ and C57BL/6J could be inbred strains of mice.

ii. Activity and defecation scores are correlated.

iii Additive genetic effects are important in the control of open field defecation.

iv Genetic selection for open field activity could be successful **if it were started from the <u>F3</u> generation.**

6. After 30 generations of bidirectional selection for open-field **activity** in mice, there was a 30-fold difference between the activity levels of the high and low lines. There was also noticed to be a 7-fold difference in the open-field **defecation** scores, with the high activity line having low defecation scores.

a. State whether you think the following statements are true or false regarding this information and give reasons for your answers:

i. Open-field activity levels are heritable.
ii. Defecation scores are heritable.
iii. Defecation and activity are **phenotypically** correlated in the open field
iv Defecation is **genetically** correlated with activity in the open field.

b. In view of your answer to iv. above, what do you think this actually means in terms of the genes that control defecation and activity in the open field in mice?

INTRODUCTION TO BEHAVIORAL GENETICS PSYCH 3102 DR C.A.HEWITT

**HOMEWORK #3 ANSWER SHEET**

NAME_____

DATE_____

1. **Variance of the $F_2$ is expected to be greater than $F_1$ variance because**

2. **a. A selection study can be said to have been successful if**

   **b. Three examples of mice behaviors shown to respond to selection or differ between inbred lines** (be specific as to the trait)

   1._____

   2._____

   3._____

   **c. Nature of action**

   **and number of genes involved**

**3. "Genetic variance for behavior is nearly ubiquitous"**

**4. Trait easier to eliminate _____**

**Reason**

_____

_____

**5.** . i. _____Reason:

ii. _____Reason:

iii _____ Reason:

iv _____ Reason

**6. a.** i. _____Reason:

Ii . _____Reason:

iii. _____Reason:

iv. _____ Reason:

b**. Genes for open field activity and defecation are**