Name_____ SSN_____

PCB 3063-02 EXAM 1 Spring 1999

SECTION		
I (VOCAB)	**12**	_____
II (DEFINITIONS)	**12**	_____
III (MULTIPLE CHOICE)	**26**	_____
IV (SHORT ANSWER)	**16**	_____
V (LONG PROBLEMS)	**34**	_____
(bonus)	**5**	_____
TOTAL (100 PTS)	**100**	_____

Class Average _____

Class Range _____

HONOR CODE
"I did not give or receive help on this exam"

(SIGN) _____

Name_____ SSN_____

I. (12 points, 1 pt each) VOCABULARY:

1) The study of biologically inherited traits is called _____

2) The process of making an RNA strand from a DNA template is called _____

3) An individual having the same allele of a given gene on homologous chromosomes is said to be _____

4) The _____ of a organism refers to observable characteristics of an organism.

5-8) Mitosis is conventionally divided into four stages known as _____ _____, _____, and _____

9) X and Y chromosomes are called sex chromosomes to distinguish them from the other pairs of chromosomes, which are called _____

10) _____ is a condition where the cell has more than two complete sets of chromosomes.

11) Mature reproductive cells such as eggs or sperm are called _____

12) The _____ of an organism refers to the genetic (allelic) composition of its genome.

II. (12 points, 3 points each) DEFINITIONS:

Give brief definitions, twenty words or less each (complete and correct = full credit; partial and correct = partial credit; any part incorrect = no credit; > 20 word answer= no credit)

1) allele

2) epistasis

3) 9:3:3:1 ratio

4) homolog

III. (26 Points) MULTIPLE CHOICE (Cicle ONE letter for each):

1) (2 pt.) A cell's chromosomes can be found in the

A Cytoplasm
B Endoplasmic reticulum
C Nucleus
D Vesicles

2) (3 pt.) Starting with a cross between *AA* and *aa*, the proportion of heterozygotes in the F2 progeny will be

A 1 / 8
B 1 / 4
C 1 / 3
D 1 / 2
E All heterozygotes

3) (3 pt) Probabilities are calculated using the multiplication rule when they

A Are equally likely
B Are independent
C Are mutually exclusive
D Occur disproportionately

4) (3 pt) A mutation in which the gene product is produced in greater abundance than in wildtype is called

A Hypomorph
B Epimorph
C Hypermorph
D Neomorph
E Zenomorph

5) (4 pt) Mating of two organisms produces a 1:1 ratio of phenotypes in the progeny. The parental genotypes are

A *Aa x Aa*
B *Aa x aa*
C *AA x aa*
D *AA x AA*

6) (3 pt) The chromatids in a pair of chromosomes are held together at a specific region of the chromosome called

A Centromere
B Mitotic spindle
C Centrosome
D Chromosome binding site

7) (4 pt) A genetically important event called crossing-over occurs during which meiotic stage

A Prophase I
B Anaphase I
C Telophase I
D Metaphase II
E Telophase II

8) (4 pt) Turner syndrome is the result of

A Trisomy of the X chromosome
B The presence of an extra Y chromosome
C The absence of an Y chromosome
D Monosomy of the X chromosome
E An extra chromosome number 13

IV (Short Answers, 16 points)

1) (**4 points**) Instead of the expected 9:3:3:1 ratios in an F2 generation from true-breeding parents, one sees a 9:7 ratio. **A**) (2 pt) Explain, and **B**) (2 pt) What does this suggest about the metabolic requirements for phenotype expression in this case?

2) (**4 points**) Trisomy 13 is known as Patau syndrome. If in a child with Patau syndrome two of the three copies of chromosome 13 both carry the father's father's centromere, then when during the meiotic process did the nondisjunction event occur?

3) (**4 points**) What is the genetic basis for Down syndrome? the mechanistic basis (error) for it's occurance? and the genetic nomenclature for the syndrome ? [in the form, for example, the Patau Syndrome = 47,13+]

5) (**4 points**) Describe Mendel's Second Law of Inheritance.

V (Long Problems, 34 points,)

1) (**8 points**)**.** A tomato breeder is examining crosses for five Mendelian traits:
a) fruit shape (Normal *O*-, oblong *o o*)
b) fruit color (red *R*-, yellow *r r*)
c) flower color (yellow *W*-, white *w w*)
d) plant height (Tall *D*-, dwarf *d d*)
e) leaf shape (Normal *B*-, broad *b b*)

She makes the following cross:

O o R r W w D d B b X *o o R r w w D d b b*

(Show your work on the following--use the back of the page if necessary)
What proportion of the progeny will <u>phenotypically</u> resemble

(a) the first parent (the one on the left) ?

(b) the second parent?

(c) either parent?

(d) neither parent?

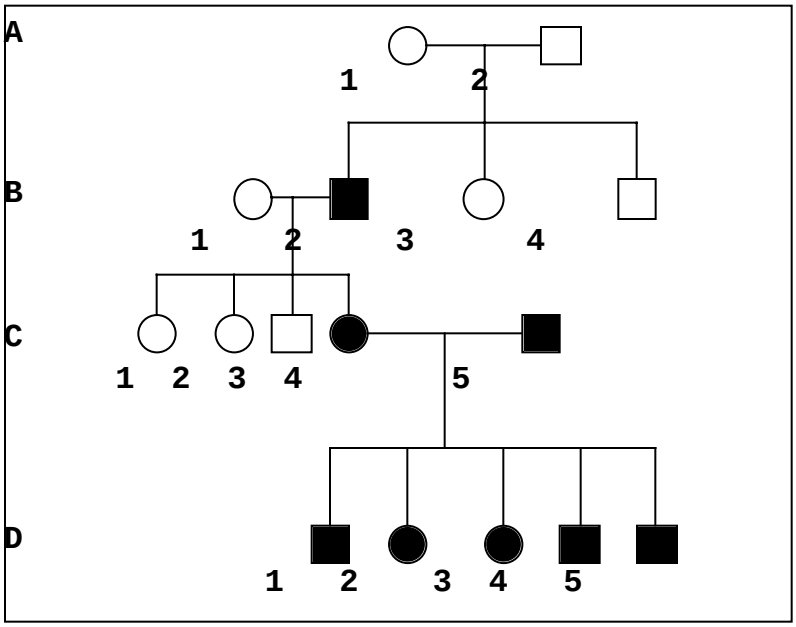
What proportion of the progeny will <u>genotypically</u> resemble
(e) the first parent?

(f) the second parent?

(g) either parent?

(h) neither parent?

2) Pedigree:(**8 points**)



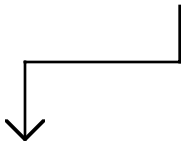
Albinism is a homozygous recessive condition resulting in a total lack of pigment. Using the pedigree for albinism above, indicate the genotypes using *A* and *a* to indicate dominance and recessivity. Solid figures indicate an albino individual.

A. A - 1
B. A - 2
C. B - 1
D. B - 2
E. C - 3
F. C - 4
G. C - 5
H. D - 1

3) (**sex chromosomes: 8 points**.).
Explain why an man with Klinefelter syndrome can exhibit mosaicism for an X-linked trait (4 points) AND list three main components of the Lyon hypothesis (4 points).

4. (**10 points**) In Drosophila, the allele dp^+ determines long wings and *dp* determines short (dumpy) wings. At a separate locus e^+ determines gray body and *e* determines ebony body. Both loci are autosomal. (dp is recessive to dp+ and e is recessive to e+).
The following crosses were made, starting with pure-breeding parents.

P long, ebony X short, gray



F1 long, gray X short, ebony (pure)

F2	long, ebony	62
	long, gray	40
	short, gray	59
	short, ebony	39
TOTAL		200

Use the χ^2 test to see if these loci fit with the idea of independent assortment (which would produce a 1:1:1:1 of the four F2 categories above). (**a**) calculate χ^2, **showing your work (suggestion: set up a table with columns for F2 class, # observed, # expected, ...)**, (**b**) state the which degrees of freedom curve you will use, (**c**) state the p value, and (**d**) indicate whether you accept or reject your hypothesis.

hypothesis - independent assortment of 2 unlinked traits: