



AP[®] Biology
2003 Free-Response Questions

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2003 AP[®] BIOLOGY FREE-RESPONSE QUESTIONS

BIOLOGY
SECTION II

Time—1 hour and 30 minutes

Directions: Answer all questions.

Answers must be in essay form. Outline form is not acceptable. Labeled diagrams may be used to supplement discussion, but in no case will a diagram alone suffice. It is important that you read each question completely before you begin to write. Write all your answers on the pages following the questions in the pink booklet.

1. In fruit flies, the phenotype for eye color is determined by a certain locus. *E* indicates the dominant allele and *e* indicates the recessive allele. The cross between a male wild-type fruit fly and a female white-eyed fruit fly produced the following offspring.

	Wild-type Male	Wild-type Female	White-eyed Male	White-eyed Female	Brown-eyed Female
F1	0	45	55	0	1

The wild-type and white-eyed individuals from the F1 generation were then crossed to produce the following offspring.

F2	23	31	22	24	0
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- (a) Determine the genotypes of the original parents (P generation) and explain your reasoning. You may use Punnett squares to enhance your description, but the results from the Punnett squares must be discussed in your answer.
- (b) Use a Chi-squared test on the F2 generation data to analyze your prediction of the parental genotypes. Show all your work and explain the importance of your final answer.
- (c) The brown-eyed female in the F1 generation resulted from a mutational change. Explain what a mutation is, and discuss two types of mutations that might have produced the brown-eyed female in the F1 generation.

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Critical Values of the Chi-Squared Distribution

Probability (p)	Degrees of Freedom (df)				
	1	2	3	4	5
0.05	3.84	5.99	7.82	9.49	11.1

The formula for Chi-squared is:

$$\chi^2 = \sum \left[\frac{(o-e)^2}{e} \right]$$

where o = **observed** number of individuals

e = **expected** number of individuals

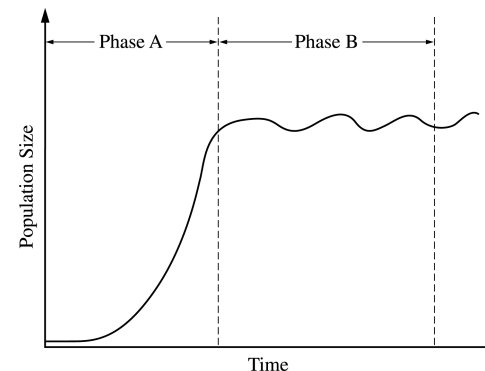
Σ = the **sum of the values** (in this case, the differences, squared, divided by the number expected)

2. Regulatory (control) mechanisms in organisms are necessary for survival. Choose **THREE** of the following examples and explain how each is **regulated**.

- (i) Flowering in plants
- (ii) Water balance in plants
- (iii) Water balance in terrestrial vertebrates
- (iv) Body temperature in terrestrial vertebrates

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3. Many populations exhibit the following growth curve:



- (a) Describe what is occurring in the population during phase A.
- (b) Discuss **THREE** factors that might cause the fluctuations shown in phase B.
- (c) Organisms demonstrate exponential (*r*) or logistic (*K*) reproductive strategies. Explain these two strategies and discuss how they affect population size over time.

4. Death is a natural and necessary part of life cycles at all levels of organization.

- (a) Discuss **TWO** examples of how cell death affects the development and functioning of a multicellular organism.
- (b) Discuss **ONE** example of how substances are degraded and reused in cells.
- (c) Discuss the evolutionary significance of death.

END OF EXAMINATION