BGEN 55 - Advanced Genetics II

Face-to-Face Quiz: Mutation & Balance

Week 5 Formative Assessment

⚠️ Important Assessment Notice

This is a **graded formative assessment** to monitor student learning. Please read all instructions carefully before beginning.

📝 Graded: 50 points

📋 Quiz Overview

Assessment Structure

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Time Limit

75 minutes

In-class completion

📝

Questions

20 total questions

Mixed format

📊

Points

50 total points

Various point values

🔄

Attempts

1 attempt only

No retakes

🎯 Question Types & Content

Multiple Choice (10 questions × 2 points each = 20 points)

Content: Conceptual understanding, definitions, interpretation

Examples:

- "Which best describes mutation as an evolutionary force?"

- "What does $\hat{q} = \sqrt{(\mu/s)}$ represent?"
- "Which factor increases equilibrium frequency of a recessive deleterious allele?"

Calculation Problems (5 questions × 3 points each = 15 points)

Content: Mathematical applications, formula use

Examples:

- "Calculate p after 100 generations given p_0 and μ"
- "Find equilibrium frequency given μ and s"
- "Determine mutation rate from observed frequency"

Show your work for partial credit!

Short Answer (3 questions × 5 points each = 15 points)

Content: Explanation, analysis, application

Examples:

- "Explain why mutation is considered a weak but constant evolutionary force"
- "Describe how mutation-selection balance explains persistence of genetic disorders"
- "Analyze a scenario involving multiple evolutionary forces"

Key Formulas Provided:

$$\text{Recurrent Mutation: } p_t = p_0(1 - \mu)^t$$

$$\text{Mutation-Selection Balance: } \hat{q} = \sqrt{(\mu/s)} \text{ [recessive]}, \hat{q} = \mu/s \text{ [dominant]}$$

$$\text{Genetic Load: } L = 2\mu \text{ [recessive]}$$

📊 Grading & Policies

Grading Breakdown

Multiple Choice	Calculations	Short Answer
20 pts	15 pts	15 pts
40% of quiz	30% of quiz	30% of quiz

Partial Credit Policy:

- **Calculation problems:** Show work for potential partial credit
- **Short answer:** Graded on completeness, accuracy, and clarity
- **Multiple choice:** All-or-nothing scoring

Academic Integrity:

This quiz must be completed individually without unauthorized assistance. All work must be your own.

🎓 Preparation Strategies

Recommended Preparation

Content Review:

- **Mutation properties** and evolutionary significance
- **Recurrent mutation model** and calculations
- **Mutation-selection balance** for different inheritance patterns
- **Genetic load** concepts and calculations
- **Real-world applications** and case studies

Skill Practice:

- Work through all practice problems from Week 5
- Review worked examples and solutions
- Practice time management with similar questions
- Use the self-check quiz for concept verification

Study Schedule:

Day 1: Review concepts and formulas
Day 2: Practice calculations
Day 3: Work on application questions
Day 4: Final review and quiz preparation

🏫 Classroom Requirements

What to Bring to the Quiz:

- **Student ID** - required for verification
- **Writing utensils** - pens or pencils (blue/black ink recommended)
- **Calculator** - basic functions needed (graphing calculators allowed)
- **Scratch paper** - will be provided but you may bring your own

During the Quiz:

- **Arrive early** - quiz will start promptly at the scheduled time
- **Listen carefully** to all verbal instructions
- **Monitor your time** - clock will be visible
- **Answer all questions** - unanswered questions will be scored as zero
- **No electronic devices** other than calculators permitted

Academic Integrity: All university policies regarding academic integrity apply. Any form of cheating will result in serious consequences.

⏰ Time Management Strategy

Recommended Time Allocation (75 minutes total):

Multiple Choice	Calculations	Short Answer
20 minutes	30 minutes	20 minutes
~2 minutes per question	~6 minutes per question	~7 minutes per question

Review
5 minutes
Final check

Pro Tips:

- **Start with calculation questions** while your mind is fresh
- **Show your work** for calculation problems
- **Budget time carefully** - don't spend too long on any one question
- **Save time for review** to catch simple errors
- **Write clearly** - illegible answers may not receive credit

📚 Content Coverage

Topics Assessed

Mutation Fundamentals

- Mutation rate (μ) definition
- Properties of mutation
- Types of mutations
- Evolutionary significance

Recurrent Mutation

- One-way mutation model
- Allele frequency changes
- Time scale calculations
- Equilibrium concepts

Mutation-Selection Balance

- Equilibrium derivation
- Different inheritance patterns
- Genetic load concepts
- Real-world applications

Focus Areas: The quiz emphasizes application and analysis rather than simple recall. Be prepared to apply concepts to new scenarios and explain your reasoning.

🚀 Quiz Day Preparation

Quiz Date: Please refer to Course Schedule | Location: TBA

Final Checklist Before Quiz Day:

- ✅ Reviewed all Week 5 materials
- ✅ Practiced with calculations and applications
- ✅ Know quiz location and time
- ✅ Have calculator and writing utensils ready
- ✅ Get adequate rest the night before
- ✅ Plan to arrive 10-15 minutes early

Arrive with enough time to get settled before the quiz begins.

🍀 Good Luck!
