BGEN 55 - Advanced Genetics II

Discussion Guidelines

Synthesizing Week 5 Concepts

🎯 Discussion Purpose

This discussion activity helps you integrate concepts from Week 5 and apply them to real-world scenarios. Through thoughtful dialogue with peers, you'll deepen your understanding of mutation as an evolutionary force and its implications.

💬 Focus: Hereditary Hemochromatosis Case Study

🗓️ Discussion Timeline

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Initial Post	**Peer Responses**	**Grading & Feedback**
Due: Please see LMS	Due: Please see LMS	Within 3 days
Analyze the case study	Engage with 2+ classmates	Instructor evaluation

📋 Discussion Requirements

Initial Post (Due Thursday)

Your initial post should address **at least two** of the following prompts:

1. **The Evolutionary Puzzle:** Why does the hemochromatosis allele persist at such high frequencies despite being deleterious? Which hypothesis (heterozygote advantage, founder effect, or recent selection change) do you find most convincing and why?
2. **Model Limitations:** How does the hemochromatosis case illustrate the limitations of simple mutation-selection balance models? What additional evolutionary forces seem to be at play?
3. **Medical Implications:** Given the high frequency and incomplete penetrance, what are the ethical considerations for population screening programs? Should everyone be tested?
4. **Future Evolution:** How might modern medicine (effective treatment making s ≈ 0) affect the future evolutionary trajectory of this allele?

Post Requirements:

- 250-400 words
- Clear thesis statement
- Evidence from course materials
- Specific examples and calculations

- Proper scientific terminology

Peer Responses (Due Sunday)

Respond to **at least two** classmates' posts with substantive comments that:

- Build upon their ideas
- Ask thoughtful questions
- Offer alternative perspectives
- Make connections to other concepts
- Provide additional evidence or examples

Response Requirements:

- 50-150 words each
- Specific references to classmates' points
- Constructive and respectful tone
- Evidence of critical thinking

💡 Discussion Prompts & Ideas

Prompt 1: The Evolutionary Puzzle

Key Concepts to Consider:

- Compare observed frequency (q ≈ 0.07) with mutation-selection balance prediction
- Calculate the mutation rate needed to explain the frequency
- Evaluate the three main hypotheses
- Consider population history and migration patterns

Discussion Starters:

- "The heterozygote advantage hypothesis is compelling because..."
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- "The required mutation rate of _____ seems unrealistic because..."

Prompt 2: Model Limitations

Key Concepts to Consider:

- Assumptions of mutation-selection balance models
- Role of genetic drift in small populations
- Impact of migration and gene flow
- Changing selection pressures over time

Discussion Starters:

- "This case shows that real populations often deviate from models because..."
- "Genetic drift might be important here since..."

- "The assumption of constant selection pressure is problematic because..."

Prompt 3: Medical Implications

Key Concepts to Consider:

- Incomplete penetrance and variable expressivity
- Cost-benefit analysis of genetic screening
- Ethical considerations in population genetics
- Impact of medical interventions on evolution

Discussion Starters:

- "Screening makes sense when..."
- "The low penetrance complicates decisions because..."
- "From an evolutionary perspective, treatment might..."

📊 Grading Rubric

Criteria	Excellent (4-5 pts)	Good (3 pts)	Needs Improvement (1-2 pts)
Content Understanding	Demonstrates deep understanding of concepts with accurate calculations	Shows basic understanding with minor errors	Major conceptual errors or misunderstandings
Critical Thinking	Original insights, evaluates multiple hypotheses, considers limitations	Repeats concepts without deep analysis	Superficial treatment without analysis
Evidence & Examples	Uses specific evidence, calculations, and relevant examples	Some evidence but lacks specificity	Little or no supporting evidence
Peer Engagement	2+ substantive responses that advance discussion	2 basic responses with minimal engagement	Fewer than 2 responses or superficial comments
Writing Quality	Clear, organized, professional writing with proper terminology	Generally clear with some errors	Unclear writing with major errors

Total: 25 points (Initial Post: 15 points, Peer Responses: 10 points)

💬 Participation Tips

✅ **Do:**

- **Start early** to allow time for thoughtful responses
- **Use specific examples** and calculations from the case study
- **Reference course materials** to support your points
- **Ask open-ended questions** to encourage discussion
- **Build on others' ideas** rather than just agreeing
- **Use proper scientific terminology** accurately

❌ **Avoid:**

- **Waiting until the last minute**
- **Vague statements** without evidence
- **Simply repeating** what others have said
- **Personal attacks** or disrespectful comments
- **Overusing quotes** without original analysis
- **Ignoring peer responses** after posting

🔍 Resources for Success

Key Resources:

- **Hereditary Hemochromatosis Case Study** - Detailed analysis and data
- **Week 5 at a Glance** - Formula reference and key concepts
- **Mutation-Selection Balance Lecture** - Theoretical foundation
- **Worked Examples** - Sample calculations and applications

Technical Requirements:

- Stable internet connection
- Ability to post text with basic formatting
- Calculator for numerical analysis
- Access to course materials for reference

🎓 Learning Outcomes

Through successful participation in this discussion, you will demonstrate ability to:

- Apply mutation-selection balance concepts to real genetic disorders
- Evaluate multiple evolutionary hypotheses using evidence
- Calculate and interpret equilibrium frequencies
- Consider ethical implications of population genetics
- Engage in scientific discourse with peers
- Integrate multiple Week 5 concepts in a unified analysis