

Breeding and Genetics Exam 1 Practice (Sample)

Study Guide



Everything you need from our exam experts!

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Introduction

Preparing for a certification exam can feel overwhelming, but with the right tools, it becomes an opportunity to build confidence, sharpen your skills, and move one step closer to your goals. At Examzify, we believe that effective exam preparation isn't just about memorization, it's about understanding the material, identifying knowledge gaps, and building the test-taking strategies that lead to success.

This guide was designed to help you do exactly that.

Whether you're preparing for a licensing exam, professional certification, or entry-level qualification, this book offers structured practice to reinforce key concepts. You'll find a wide range of multiple-choice questions, each followed by clear explanations to help you understand not just the right answer, but why it's correct.

The content in this guide is based on real-world exam objectives and aligned with the types of questions and topics commonly found on official tests. It's ideal for learners who want to:

- Practice answering questions under realistic conditions,
- Improve accuracy and speed,
- Review explanations to strengthen weak areas, and
- Approach the exam with greater confidence.

We recommend using this book not as a stand-alone study tool, but alongside other resources like flashcards, textbooks, or hands-on training. For best results, we recommend working through each question, reflecting on the explanation provided, and revisiting the topics that challenge you most.

Remember: successful test preparation isn't about getting every question right the first time, it's about learning from your mistakes and improving over time. Stay focused, trust the process, and know that every page you turn brings you closer to success.

Let's begin.

How to Use This Guide

This guide is designed to help you study more effectively and approach your exam with confidence. Whether you're reviewing for the first time or doing a final refresh, here's how to get the most out of your Examzify study guide:

1. Start with a Diagnostic Review

Skim through the questions to get a sense of what you know and what you need to focus on. Your goal is to identify knowledge gaps early.

2. Study in Short, Focused Sessions

Break your study time into manageable blocks (e.g. 30 - 45 minutes). Review a handful of questions, reflect on the explanations.

3. Learn from the Explanations

After answering a question, always read the explanation, even if you got it right. It reinforces key points, corrects misunderstandings, and teaches subtle distinctions between similar answers.

4. Track Your Progress

Use bookmarks or notes (if reading digitally) to mark difficult questions. Revisit these regularly and track improvements over time.

5. Simulate the Real Exam

Once you're comfortable, try taking a full set of questions without pausing. Set a timer and simulate test-day conditions to build confidence and time management skills.

6. Repeat and Review

Don't just study once, repetition builds retention. Re-attempt questions after a few days and revisit explanations to reinforce learning. Pair this guide with other Examzify tools like flashcards, and digital practice tests to strengthen your preparation across formats.

There's no single right way to study, but consistent, thoughtful effort always wins. Use this guide flexibly, adapt the tips above to fit your pace and learning style. You've got this!

Questions

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- 1. Which statement best defines the expected progeny difference (EPD) for a trait?**
 - A. The average performance of the trait across the population.**
 - B. The difference between a sire's and dam's phenotype for the trait.**
 - C. The standard deviation of progeny performance.**
 - D. The expected progeny difference is the expected performance of the progeny of a parent, expressed as a deviation from the mean.**

- 2. Which statement best defines regression?**
 - A. the correlation coefficient measuring strength**
 - B. the expected or average change in one variable (Y) per unit change in another variable (X) - measures cause and effect**
 - C. a measure of association**
 - D. a method for identifying outliers**

- 3. Which of the following are two methods to account for environmental differences in phenotype data?**
 - A. Adjust records and deviate from contemporary group mean**
 - B. Increase feed**
 - C. Use only young animals**
 - D. Ignore environment**

- 4. What are two reasons we test males and not females?**
 - A. Genetic diversity and reproduction rate**
 - B. Cost (and time) and contribution to next generation**
 - C. Safety concerns and ease of sampling**
 - D. Age and size differences**

- 5. What is epistasis?**
 - A. A random mating system**
 - B. An interaction between alleles at different loci on the same chromosome (can inhibit expression)**
 - C. Mutation rate at a single locus**
 - D. Migration between populations**

- 6. When selecting animals for a trait with high heritability, selection will be:**
- A. Not affected by heritability.**
 - B. Depends on density of population.**
 - C. More effective.**
 - D. Less effective.**
- 7. How do BV and EBV differ in terms of the genetic loci they summarize?**
- A. BV is associated with a single locus; EBV involves many loci**
 - B. BV and EBV are equivalent concepts**
 - C. EBV involves environmental variance**
 - D. BV is not used in breeding**
- 8. Which statement best describes a transmittable gene effect?**
- A. Environmental effects that are inherited.**
 - B. Only the genetic effects that are associated with individual alleles can be predictably transmitted to the progeny (additive, BV, or EPD)**
 - C. All genetic effects including dominance and epistasis.**
 - D. Non-genetic inheritance.**
- 9. What is considered low, moderate, and high heritability?**
- A. Low <0.3 ; Moderate 0.3-0.6; High >0.7**
 - B. Low <0.1 ; Moderate 0.2 to 0.4; High >0.5**
 - C. Low <0.05 ; Moderate 0.1-0.3; High >0.6**
 - D. Low <0.2 ; Moderate 0.1-0.3; High >0.4**
- 10. Which trait characteristic is most relevant when considering heritability for selection?**
- A. Economic importance**
 - B. Leg weight**
 - C. Coat color**
 - D. Non-economic trait**

Answers

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1. D
2. B
3. A
4. B
5. B
6. C
7. A
8. B
9. B
10. A

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Explanations

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1. Which statement best defines the expected progeny difference (EPD) for a trait?
- A. The average performance of the trait across the population.
 - B. The difference between a sire's and dam's phenotype for the trait.
 - C. The standard deviation of progeny performance.
 - D. The expected progeny difference is the expected performance of the progeny of a parent, expressed as a deviation from the mean.**

EPD represents the expected difference in performance of a parent's offspring compared with the population mean for a trait. It isolates additive genetic merit and is estimated from pedigree and progeny data to separate genetic effects from environmental influences. Because it's expressed as a deviation from the mean, a positive EPD means the progeny are expected to perform above average for that trait, while a negative EPD means below average. This is different from the overall population average, from any simple difference between sire and dam phenotypes, or from a measure of variation like a standard deviation. The idea that the EPD reflects the expected progeny performance of a parent, expressed as a deviation from the mean, is what makes it a useful tool for selection.

2. Which statement best defines regression?
- A. the correlation coefficient measuring strength
 - B. the expected or average change in one variable (Y) per unit change in another variable (X) - measures cause and effect**
 - C. a measure of association
 - D. a method for identifying outliers

Regression expresses how Y tends to change on average when X changes by a unit. In a simple linear model, $Y \approx \beta_0 + \beta_1 X$, and β_1 is the slope—the expected change in Y for each one-unit increase in X. This makes regression a predictive tool: knowing X lets you estimate the typical Y and quantify the rate at which Y changes as X changes. It's different from a simple correlation, which measures how strongly two variables move together but doesn't specify how much Y changes per unit of X. While regression results can inform discussions about causality, they do not by themselves prove that changes in X cause changes in Y without proper study design and control of confounding factors. The other ideas—just measuring correlation strength, a broad notion of association, or identifying outliers—don't capture the per-unit change in Y that defines regression.

3. Which of the following are two methods to account for environmental differences in phenotype data?

- A. Adjust records and deviate from contemporary group mean**
- B. Increase feed**
- C. Use only young animals**
- D. Ignore environment**

Phenotypes reflect both genetics and the environment, so to compare animals fairly you adjust for those environmental effects. The two effective ways are adjusting records to remove environmental influences and using deviations from the contemporary group mean. Adjusting records applies correction factors so a phenotype is placed on a common environmental baseline, highlighting genetic differences rather than management or age effects. Deviations from the contemporary group mean express an individual's performance relative to its peers raised under similar conditions, effectively canceling out shared environmental influence within that group. Together, these methods separate non-genetic variation from genetic merit, improving the accuracy of genetic evaluations. Increasing feed or restricting to young animals don't directly account for environmental differences in the data, and ignoring environment leaves environmental noise in the results.

4. What are two reasons we test males and not females?

- A. Genetic diversity and reproduction rate**
- B. Cost (and time) and contribution to next generation**
- C. Safety concerns and ease of sampling**
- D. Age and size differences**

The main idea is about practical efficiency and how genetic information is passed on. Testing males is often chosen because it saves time and money: a single male can sire many offspring, so figuring out his genotype or carrier status quickly informs the genetics of a large number of progeny. This makes the testing effort pay off sooner and for more animals. In contrast, females typically produce fewer offspring and may require longer cycles (gestation, multiple matings, or waiting for births), increasing cost and time per animal tested. So the two reasons are: cost (and time) and the fact that a male's genotype influences the next generation for many offspring. The other options don't capture these practical testing advantages as directly.

5. What is epistasis?

- A. A random mating system
- B. An interaction between alleles at different loci on the same chromosome (can inhibit expression)**
- C. Mutation rate at a single locus
- D. Migration between populations

Epistasis is a gene-gene interaction where the effect of a allele at one locus depends on which alleles are present at another locus. In other words, one gene can mask or modify the phenotypic expression of another gene, altering expected Mendelian patterns. For example, a gene that controls pigment production can be overridden if a separate gene controlling pigment deposition is in a state that prevents display, so the color doesn't appear even though pigment is produced. This shows how two loci interact to shape the phenotype, not just a single locus acting alone. The other options describe different biological processes (mating patterns, mutation rates, or migration) and don't capture this inter-locus interaction.

6. When selecting animals for a trait with high heritability, selection will be:

- A. Not affected by heritability.
- B. Depends on density of population.
- C. More effective.**
- D. Less effective.

High heritability means most differences among individuals for that trait come from genetics rather than the environment. When you select animals based on phenotype for a trait with high h^2 , the observed selection differential translates directly into genetic gain in the next generation. This is captured by the breeder's idea that the response to selection is proportional to h^2 times the selection differential; with h^2 high, the same differential yields a larger response. So selection is more effective. Statements about population density aren't the driver of genetic gain, and saying it's not affected by heritability ignores this key relationship. For traits with lower heritability, environmental effects dilute the phenotype, making selection less efficient.

7. How do BV and EBV differ in terms of the genetic loci they summarize?

- A. BV is associated with a single locus; EBV involves many loci**
- B. BV and EBV are equivalent concepts**
- C. EBV involves environmental variance**
- D. BV is not used in breeding**

The key idea is that both breeding value and estimated breeding value reflect additive genetic contributions from many genes, not just one. The true breeding value of an individual is the sum of the average effects of alleles across the genome—the cumulative additive effect from all loci that influence the trait. In almost all quantitative traits, many loci contribute small amounts, so BV represents a polygenic additive value rather than a single-locus effect. Estimated breeding value, on the other hand, is our statistical prediction of that true BV. It uses available data—phenotypes, genealogical relationships, and often marker information—to infer the additive genetic value. Because it's based on data, EBV is an estimate and its accuracy improves with more information. Both concepts summarize additive effects across multiple loci; EBV just provides an empirical estimate of BV rather than a fixed, known quantity. So, the idea that a breeding value is tied to a single locus isn't accurate for typical polygenic traits, and EBV isn't defined simply by environmental variance. BV and EBV both reflect many loci, with EBV being the data-driven estimate of BV.

8. Which statement best describes a transmittable gene effect?

- A. Environmental effects that are inherited.**
- B. Only the genetic effects that are associated with individual alleles can be predictably transmitted to the progeny (additive, BV, or EPD)**
- C. All genetic effects including dominance and epistasis.**
- D. Non-genetic inheritance.**

The idea is that only the part of genetic merit that adds up from the alleles themselves is reliably passed to offspring. Additive genetic effects, coming from individual alleles and summing across loci, are inherited in a predictable way from parents to progeny. This is why breeders focus on breeding value and predicted progeny difference—BV and EPD are measures of that additive, transmissible component. Non-additive effects like dominance (allele interactions at the same locus) and epistasis (interactions between loci) don't transmit in a straightforward, predictable manner, so they aren't described as transmittable in the same sense. Environmental effects and non-genetic inheritance aren't genetic transmission to offspring, so they don't fit as transmittable gene effects.

9. What is considered low, moderate, and high heritability?

- A. Low <0.3 ; Moderate 0.3-0.6; High >0.7
- B. Low <0.1 ; Moderate 0.2 to 0.4; High >0.5**
- C. Low <0.05 ; Moderate 0.1-0.3; High >0.6
- D. Low <0.2 ; Moderate 0.1-0.3; High >0.4

Heritability expresses how much of the variation we see in a trait within a population is due to genetic differences rather than the environment, and it ranges from 0 to 1. In practice, people describe, in broad terms, how strong that genetic influence is using rough cutoffs: very small genetic contribution is considered low (about 0.1 or less), a moderate contribution is around 0.2 to 0.4, and a strong genetic influence is about 0.5 or higher. The given set of ranges matches this common interpretation: low less than 0.1, moderate from 0.2 to 0.4, and high greater than 0.5. This aligns with the intuitive idea that a trait with h^2 near 0.05 is barely genetic, near 0.3 has substantial but not exclusive genetic influence, and above 0.6 is largely determined by genetics. Other formats typically shift the cutoffs in ways that would misclassify many traits' levels of genetic influence.

10. Which trait characteristic is most relevant when considering heritability for selection?

- A. Economic importance**
- B. Leg weight
- C. Coat color
- D. Non-economic trait

When deciding which traits to improve through selection, you look at how much of the trait's variation is due to genetics (heritability) and, crucially, how much that trait matters economically. Economic importance determines whether improving the trait will boost profitability, so it guides the selection goal. Even if a trait is heritable, if it has little or no economic value, prioritizing it isn't worthwhile; conversely, economically important traits will be targeted, and their heritability will influence how rapidly you can achieve genetic gain. In short, economic importance is the most relevant characteristic because it ties the potential genetic response directly to breeding objectives and economic return.

Next Steps

Congratulations on reaching the final section of this guide. You've taken a meaningful step toward passing your certification exam and advancing your career.

As you continue preparing, remember that consistent practice, review, and self-reflection are key to success. Make time to revisit difficult topics, simulate exam conditions, and track your progress along the way.

If you need help, have suggestions, or want to share feedback, we'd love to hear from you. Reach out to our team at hello@examzify.com.

Or visit your dedicated course page for more study tools and resources:

<https://breedinggenetics1.examzify.com>

We wish you the very best on your exam journey. You've got this!

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