

1. A segment of a DNA strand has the following bases:

TAC GAT

What is the complementary strand of DNA?

- A UAG CAU
 - B TAG CAT
 - C ATG CTA
 - D AUG CUA
2. Which process must occur before DNA information is moved out of the nucleus by mRNA?
- A replication
 - B duplication
 - C translation
 - D transcription
3. Which relationship is **most similar** to the relationship below?

tRNA : ribosome

- A book : publisher
- B truck : factory
- C key : lock
- D baker : pie

4. Before a cell goes through either mitosis or meiosis, which process **must** be carried out by the DNA in the nucleus?

- A replication
- B nondisjunction
- C transcription
- D translation

5. The two molecules of DNA produced by successful replication have which characteristics?

- A They each contain identical chromosomes.
- B They each have different combinations of guanine, adenine, thymine, and cytosine.
- C They each contain one new and one old strand.
- D Their helixes twist in opposite directions.

6. Sexual reproduction provides for what to occur?

- A cloning
- B budding
- C genetic stability
- D genetic variation

7. Which would **most likely** favor species survival in changing environmental conditions?
- A genetic recombination
 - B energy involvement in gamete production
 - C length of life cycle
 - D number of offspring produced
8. Which term **best** describes the type of cell division in which parent cells produce daughter cells with the same number of chromosomes as the parent cells?
- A mitosis
 - B meiosis
 - C spermatogenesis
 - D oogenesis
9. What is the **primary** cause of variation in the offspring of sexually reproducing organisms?
- A cytoplasmic division
 - B environmental changes
 - C mutation
 - D recombination of alleles
10. Which is responsible for most genotypic and phenotypic variation among humans?
- A meiosis
 - B budding
 - C mitosis
 - D regeneration
11. Many plants are capable of asexual reproduction through budding and runner production, as well as sexual reproduction through flowering. Under which conditions is sexual reproduction advantageous?
- A when a plant is living in extreme but stable conditions
 - B when the environment is unstable and changing
 - C when individuals of a species are geographically isolated
 - D when a plant's particular genotype is favorable

12. In genetics research, what is the purpose of a test cross?
- A to determine the phenotypes of the parents
 - B to determine the genotypes of the parents
 - C to determine whether or not two parents could produce viable offspring
 - D to determine how many offspring can be produced by two parents
13. Several matings between the same male black guinea pig and female brown guinea pig produce a total of 12 brown and 14 black guinea pigs. If black is dominant and brown is recessive, what are the genotypes of the parents?
- A $BB \times bb$
 - B $Bb \times Bb$
 - C $BB \times Bb$
 - D $Bb \times bb$
14. Most sex-linked, recessive traits—including hemophilia and color blindness—appear in males. This phenomenon is **best** explained by which statement?
- A Males have an X chromosome with dominant genes.
 - B Most of the genes on the X and Y chromosomes of males are recessive.
 - C In males, the recessive sex-linked genes appear only on the Y chromosome.
 - D In males, the Y chromosome lacks the genes needed to mask the recessive genes on the X chromosome.

15. Examine the tables below.

Couple	Mother's Blood Type	Father's Blood Type
I	AB	O
II	O	A
III	B	AB

Baby	Baby's Blood Type
X	AB
Y	A
Z	O

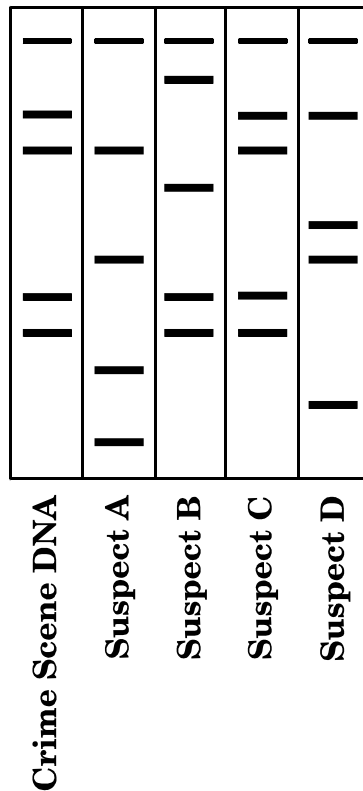
Which baby belongs to each of the couples?

- A I–X, II–Y, III–Z
- B I–Y, II–Z, III–X
- C I–Z, II–X, III–Y
- D I–X, II–Z, III–Y
-
16. Huntington's disease is a dominant trait. What are the chances that a child will develop Huntington's disease if one parent is heterozygous and the other is normal?
- A 0 out of 4
- B 1 out of 4
- C 2 out of 4
- D 3 out of 4

17. Some flowers show incomplete dominance. If RR = white and $R'R'$ = red, which phenotypic ratio would be expected in the offspring of two pink flowers?
- A 4 red : 0 pink : 0 white
 - B 0 red : 4 pink : 0 white
 - C 3 red : 0 pink : 1 white
 - D 1 red : 2 pink : 1 white
18. A couple has five children, all with blood type A. The mother's blood type is O, and the father's blood type is A. Based on this information, which describes the **most probable** genotype of the father?
- A diploid
 - B haploid
 - C heterozygous
 - D homozygous
19. A karyotype of a human female shows that she has only one sex chromosome. Which genotype would represent her genetic condition?
- A XO
 - B XXX
 - C XY
 - D XYY

20. The diagram below represents DNA fingerprints which are the result of gel electrophoresis done on several DNA samples found at a crime scene.

Gel Electrophoresis Results



Which suspect is linked to the crime scene by this DNA analysis?

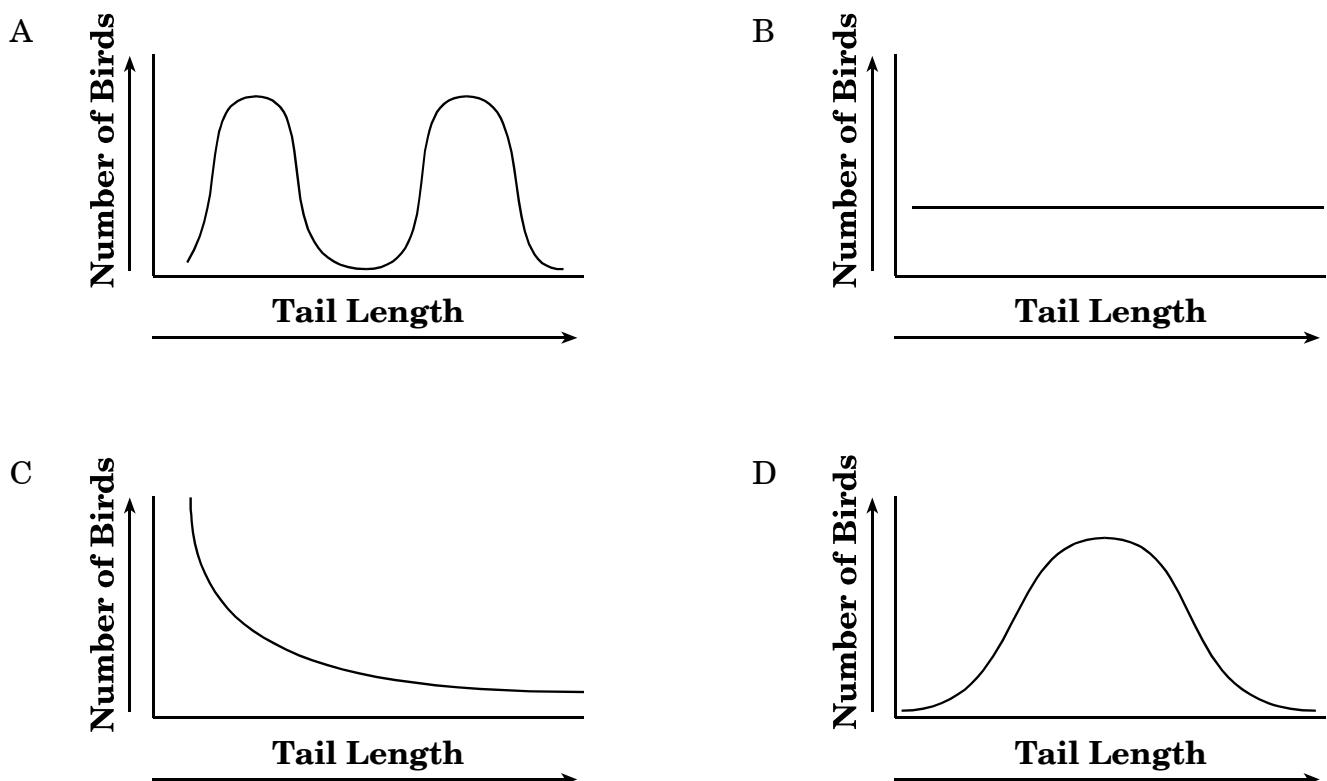
- A Suspect A
- B Suspect B
- C Suspect C
- D Suspect D

21. A plant nursery only grew one type of tomato. All of their tomatoes died from the same disease. What was ***most likely*** true of the tomato plant population?
- A It had a lot of resistance to disease.
 - B It had a few plants that were resistant to the disease.
 - C It had too much variation in its genes.
 - D It had little variation in its genes.

22. Most individuals of a certain species of bird have medium-length tails, but tail length ranges within the species from very short to very long.



If a new predator arrived that preferred birds with medium-length tails, which graph describes the **most likely** result?



23. According to evolutionary theory, which **best** describes the first living organisms from which all life evolved?
- A aerobic
 - B eukaryotic
 - C photosynthetic
 - D prokaryotic
24. Cauliflower, cabbage, broccoli, and kale have a close evolutionary relationship. Which is the **best** evidence for this relationship?
- A similar growth season
 - B percentage of identical DNA sequences
 - C common geographic distribution
 - D equal day length preference
25. A paleontologist is comparing the fossilized remains of two primates. Both animals had a prehensile tail. What can be concluded from this evidence?
- A They were not related.
 - B They lived on the ground.
 - C They evolved from a common ancestor.
 - D They had bipedal locomotion.
26. Variation within species was important to the development of Darwin's theory of evolution. Which statement does individual variation help explain?
- A Resources become limited over long periods of time.
 - B Populations often increase rapidly and without warning.
 - C Competition is fierce among members of different species.
 - D Some organisms survive and reproduce better than others.
27. Which is the **best** evidence that two animals had a common ancestor?
- A Both animals have a rare enzyme whose biochemical analysis matches.
 - B Both animals occupy a similar environmental niche.
 - C Both animals have evolved similar skeletal structures adapted to running.
 - D Both animals have the same number of chromosomes.

28. Variety within a species is **most likely** to result from which situation?

- A severe weather conditions that might occur, such as hurricanes or blizzards
- B adaptation to local environmental characteristics by isolated populations of the species
- C the extinction of competing species over a broad range of habitats
- D sex-specific coloring differences

29. Which could be considered biochemical evidence of an evolutionary relationship?

- A absence of vestigial structures
- B presence of embryonic gill slits
- C similar anatomical structures
- D presence of identical proteins

30. Which is the **best** evidence of an evolutionary relationship between two organisms?

- A similarity in behavior
- B similarity in niche
- C similarity in habitat
- D similarity in DNA

End of Goal 3 Sample Items

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Sample Items Key Report

- 1** **Objective:** **3.01**
Analyze the molecular basis of heredity including:
a. DNA replication.
b. Protein synthesis (transcription, translation).
c. Protein Synthesis.
c. Protein Synthesis.
Thinking Skill: Applying **Correct Answer:** C
- 2** **Objective:** **3.01**
Analyze the molecular basis of heredity including:
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b. Protein synthesis (transcription, translation).
c. Protein Synthesis.
c. Protein Synthesis.
Thinking Skill: Knowledge **Correct Answer:** D
- 3** **Objective:** **3.01**
Analyze the molecular basis of heredity including:
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Thinking Skill: Analyzing **Correct Answer:** B
- 4** **Objective:** **3.01**
Analyze the molecular basis of heredity including:
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Thinking Skill: Knowledge **Correct Answer:** A
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c. Protein Synthesis.
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Thinking Skill: Analyzing **Correct Answer:** C
- 6** **Objective:** **3.02**
Compare and contrast the characteristics of asexual and sexual reproduction.
Thinking Skill: Knowledge **Correct Answer:** D

Sample Items Key Report

7	Objective: 3.02 Compare and contrast the characteristics of asexual and sexual reproduction. Thinking Skill: Evaluating Correct Answer: A
8	Objective: 3.02 Compare and contrast the characteristics of asexual and sexual reproduction. Thinking Skill: Knowledge Correct Answer: A
9	Objective: 3.02 Compare and contrast the characteristics of asexual and sexual reproduction. Thinking Skill: Knowledge Correct Answer: D
10	Objective: 3.02 Compare and contrast the characteristics of asexual and sexual reproduction. Thinking Skill: Knowledge Correct Answer: A
11	Objective: 3.02 Compare and contrast the characteristics of asexual and sexual reproduction. Thinking Skill: Generating Correct Answer: B
12	Objective: 3.03 Interpret and predict patterns of inheritance. a. dominant, recessive and intermediate traits. b. Multiple alleles. c. Polygenic inheritance. d. Sex-linked traits. e. Independent assortment. f. Test cross. g. Pedigrees. h. Punnett squares. Thinking Skill: Applying Correct Answer: B
13	Objective: 3.03 Interpret and predict patterns of inheritance. a. dominant, recessive and intermediate traits. b. Multiple alleles. c. Polygenic inheritance. d. Sex-linked traits. e. Independent assortment. f. Test cross. g. Pedigrees. h. Punnett squares. Thinking Skill: Generating Correct Answer: D

Sample Items Key Report

- 14** **Objective:** **3.03**
Interpret and predict patterns of inheritance.
a. dominant, recessive and intermediate traits.
b. Multiple alleles.
c. Polygenic inheritance.
d. Sex-linked traits.
e. Independent assortment.
f. Test cross.
g. Pedigrees.
h. Punnett squares.
Thinking Skill: Evaluating **Correct Answer:** D
- 15** **Objective:** **3.03**
Interpret and predict patterns of inheritance.
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b. Multiple alleles.
c. Polygenic inheritance.
d. Sex-linked traits.
e. Independent assortment.
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h. Punnett squares.
Thinking Skill: Applying **Correct Answer:** B
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Interpret and predict patterns of inheritance.
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c. Polygenic inheritance.
d. Sex-linked traits.
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Thinking Skill: Applying **Correct Answer:** C

Sample Items Key Report

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Interpret and predict patterns of inheritance.
a. dominant, recessive and intermediate traits.
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c. Polygenic inheritance.
d. Sex-linked traits.
e. Independent assortment.
f. Test cross.
g. Pedigrees.
h. Punnett squares.
Thinking Skill: Generating **Correct Answer:** D
- 18** **Objective:** **3.03**
Interpret and predict patterns of inheritance.
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c. Polygenic inheritance.
d. Sex-linked traits.
e. Independent assortment.
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g. Pedigrees.
h. Punnett squares.
Thinking Skill: Analyzing **Correct Answer:** D
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Interpret and predict patterns of inheritance.
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c. Polygenic inheritance.
d. Sex-linked traits.
e. Independent assortment.
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g. Pedigrees.
h. Punnett squares.
Thinking Skill: Applying **Correct Answer:** A
- 20** **Objective:** **3.04**
Assess the impact of advances in genomics on individuals and society.
a. Human genome project.
b. Applications of biotechnology.
Thinking Skill: Analyzing **Correct Answer:** C

Sample Items Key Report

- 21 Objective: 3.05**
Examine the development of the theory of evolution by natural selection including:
a. Development of the theory.
b. The origin and history of life and Fossil and biochemical evidence.
c. Mechanisms of evolution.
d. Applications (pesticide and antibiotic resistance).
Thinking Skill: Generating **Correct Answer:** D
- 22 Objective: 3.05**
Examine the development of the theory of evolution by natural selection including:
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c. Mechanisms of evolution.
d. Applications (pesticide and antibiotic resistance).
Thinking Skill: Analyzing **Correct Answer:** A
- 23 Objective: 3.05**
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c. Mechanisms of evolution.
d. Applications (pesticide and antibiotic resistance).
Thinking Skill: Knowledge **Correct Answer:** D
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Thinking Skill: Applying **Correct Answer:** B
- 25 Objective: 3.05**
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Thinking Skill: Analyzing **Correct Answer:** C

Sample Items Key Report

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c. Mechanisms of evolution.
d. Applications (pesticide and antibiotic resistance).
Thinking Skill: Analyzing **Correct Answer:** D
- 27** **Objective:** **3.05**
Examine the development of the theory of evolution by natural selection including:
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c. Mechanisms of evolution.
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Thinking Skill: Analyzing **Correct Answer:** A
- 28** **Objective:** **3.05**
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c. Mechanisms of evolution.
d. Applications (pesticide and antibiotic resistance).
Thinking Skill: Analyzing **Correct Answer:** B
- 29** **Objective:** **3.05**
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c. Mechanisms of evolution.
d. Applications (pesticide and antibiotic resistance).
Thinking Skill: Analyzing **Correct Answer:** D
- 30** **Objective:** **3.05**
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c. Mechanisms of evolution.
d. Applications (pesticide and antibiotic resistance).
Thinking Skill: Knowledge **Correct Answer:** D