

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.

<b>Couple</b>	<b>Mother's Blood Type</b>	<b>Father's Blood Type</b>
I	AB	O
II	O	A
III	B	AB

<b>Baby</b>	<b>Baby's Blood Type</b>
X	AB
Y	A
Z	O

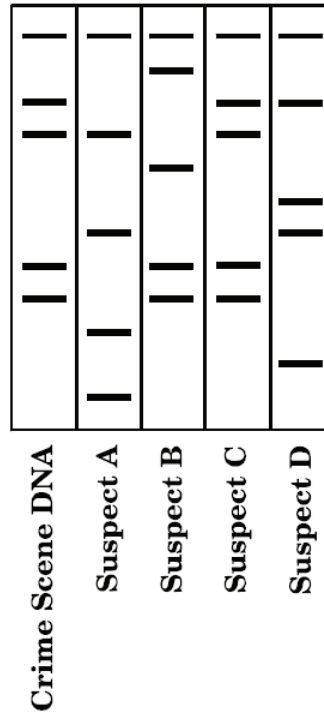
Which baby belongs to each of the couples?

- 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?

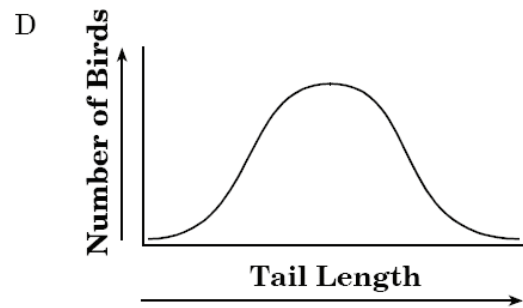
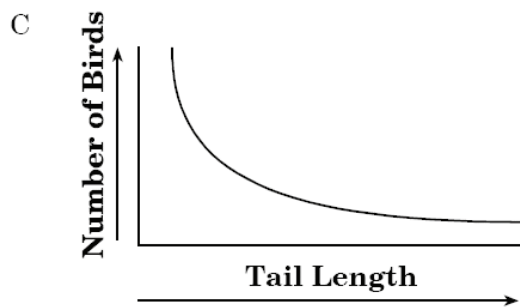
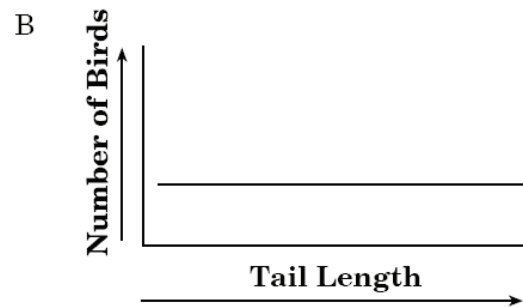
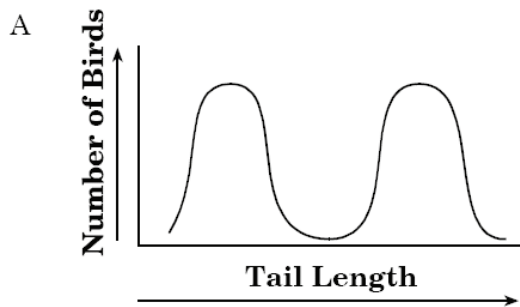
- A Suspect A
- B Suspect B
- C Suspect C
- D Suspect D

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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