

## EOCT Biology Genetics (EOCT\_Biology\_Genetics)

Name: \_\_\_\_\_

Date: \_\_\_\_\_

1. Genetics is the study of

- A. bacteria.
- B. evolution.
- C. heredity.
- D. reproduction.

2. Cells secrete proteins, often as enzymes, that have been engineered or directed by the DNA in the nucleus. Which processes are involved in protein synthesis?

- A. transfer to RNA, then to amino acids
  - B. transcription into RNA, then translation into amino acids
  - C. replication of DNA, then transcription into enzymes
  - D. translation into RNA, then replication into DNA
- 

3. Sexual reproduction results from the joining of two specialized sex cells called gametes. When a sperm and ovum combine to form a cell, what is this cell called?

- A. embryo
  - B. fetus
  - C. zygote
  - D. baby
- 

4. During translation, the tRNA anti-codon GGA codes for what amino acid?

- A. alanine
  - B. tyrosine
  - C. proline
  - D. glutamic
- 

5. Artificial selection is human intervention allowing only the **best** organisms to produce offspring. How is this process **most** useful to humanity?

- A. It allows the development of new species not dependent on the environment.
  - B. It allows geneticists to emphasize desirable traits in food, plants, and animals.
  - C. It prevents the development of new species.
  - D. It gives the existing species a better chance to reproduce in greater numbers.
- 

6. If the sequence of nucleotides were AGC on a strand of DNA, what would be the nucleotide sequence on a strand of mRNA formed during transcription?

- A. ACG
  - B. UCG
  - C. TGC
  - D. TCG
- 

7. The process of asexual reproduction forms offspring from

- A. a single organism.
  - B. the process of mating.
  - C. male and female parents.
  - D. the joining of two sets of chromosomes.
-

8. To maintain the number of chromosomes from parents to offspring during sexual reproduction, two steps are required. The first, meiosis, results in
- A. twice as many chromosomes as in the original cell.
  - B. rearranged chromosomes of the same size and number.
  - C. larger chromosomes than those in the original cell.
  - D. half the number of chromosomes as in the original cell.
- 

9. The process of meiosis, which is a special kind of cell division, forms gametes for
- A. growth.
  - B. repair.
  - C. replacement.
  - D. reproduction.
- 

10. Most animals reproduce sexually. The egg and sperm cells involved in sexual reproduction are formed by
- A. budding.
  - B. cloning.
  - C. meiosis.
  - D. regeneration.
- 

11. What happens during meiosis?
- A. The number of chromosomes increases from haploid to diploid.
  - B. The number of chromosomes decreases from diploid to haploid.
  - C. There is a segregation of dominant and recessive genes.
  - D. There is an integration of dominant and recessive genes.
- 

12. Which is true of meiosis?
- A. Identical cells are produced.
  - B. Haploid cells are produced.
  - C. Fertilized cells are produced.
  - D. Somatic cells are produced.
- 

13. Which is usually considered a disadvantage of asexual reproduction?
- A. It is a fast method of reproduction.
  - B. It produces a large number of offspring.
  - C. It requires two parents.
  - D. It produces identical offspring.
- 

14. Half of Wendy's chromosomes came from her mother and half from her father. Few of her chromosomes are identical to those of either parent because most of the genes on them have been exchanged with genes on other chromosomes. What process accounts for this?
- A. independent assortment
  - B. crossing over
  - C. nondisjunction
  - D. segregation
-

15. An egg and a sperm cell each have 16 chromosomes. How many chromosomes will the new life form they produce have?

- A. 8
  - B. 16
  - C. 32
  - D. 64
- 

16. The function of mRNA is to

- A. carry genetic information from the nucleus to the site of protein synthesis.
  - B. begin the "unzipping" of the DNA molecule.
  - C. maintain homeostasis within the cell during mitosis.
  - D. direct the movement of centrosomes during meiosis.
- 

17. All chromosomes are composed of

- A. DNA
  - B. Lipids
  - C. RNA
  - D. Carbohydrates
- 

18. What is (are) formed during replication?

- A. amino acids
  - B. DNA
  - C. protein
  - D. RNA
- 

19. Hemophilia is more common in males than females because it is caused by a

- A. dominant gene found on the X chromosome.
  - B. dominant gene found on the Y chromosome.
  - C. recessive gene found on the X chromosome.
  - D. recessive gene found on the Y chromosome.
- 

20. Which condition is caused by a chromosome going the wrong way during genetic formation producing a zygote with an extra chromosome?

- A. color blindness
  - B. Cooley's anemia
  - C. Down's syndrome
  - D. hemophilia
- 

21. Which is in the shape of a double helix?

- A. amino acid
  - B. DNA
  - C. enzyme
  - D. protein
- 

22. Messenger RNA carries genetic information in groups of three bases known as

- A. amino acids.
  - B. codons.
  - C. enzymes.
  - D. helixes.
-

23. As each section of the genetic code on DNA is transcribed to mRNA, the two strands of DNA rejoin. Then the mRNA moves into the cytoplasm through a pore in the nuclear membrane. Ribosomes attach to the mRNA, in the cytoplasm, to carry out the formation of a protein. What is this process called?
- A. mutation
  - B. synthesis
  - C. translation
  - D. transference
- 
24. Which **best** shows the proper code-structure sequence in protein synthesis?
- A. DNA, mRNA, mRNA, polypeptide, enzyme
  - B. DNA, mRNA, tRNA, polypeptide, enzyme
  - C. enzyme, polypeptide, mRNA, mRNA, DNA
  - D. mRNA, DNA, mRNA, enzyme, polypeptide
- 
25. Proteins are built up or synthesized by the code stored in the DNA molecules. Which concept about protein synthesis in an organism is NOT correct?
- A. The DNA code of nitrogen bases is the same as the protein code.
  - B. RNA is a chemical that acts as a messenger for DNA.
  - C. The ribosomes are the parts of cells where proteins are manufactured.
  - D. The sequence of DNA bases determines the arrangement of amino acids in a protein.
- 
26. Which describes a current use of genetic engineering?
- A. identifying hereditary diseases
  - B. vaccinating a child for measles
  - C. making human insulin using bacteria
  - D. treating cancer with radiation therapy
- 
27. Which of the following DNA base pairs are correct?
- A. A-T T-A
  - B. A-A C-C
  - C. A-T G-A
  - D. A-T T-G
- 
28. In which way is meiosis different from mitosis?
- A. Meiosis produces cells without nuclei.
  - B. Meiosis produces egg and sperm cells.
  - C. Chromosomes divide during mitosis but not during meiosis.
  - D. Mitosis results in cells with one half the number of chromosomes.
- 
29. In living things, whether plant or animal, the carrier of hereditary instructions is
- A. DNA.
  - B. genetic vacuole.
  - C. messenger RNA.
  - D. mitochondria in animals, chloroplasts in plants.
-

30. An organism that is capable of passing on a trait for a specific disease to its offspring, but which does NOT express the disease itself, is described as which of the following?

- A. a carrier
  - B. a homozygote
  - C. a mutant
  - D. a purebred
- 

31. A normal cell formed by fertilization, containing two copies of each chromosome, one from the mother and one from the father, is

- A. diploid.
  - B. haploid.
  - C. a gamete.
  - D. an allele.
- 

32. **The gene for red/green colorblindness in humans is recessive and primarily affects males. It must be located on**

- A. the X chromosome
  - B. the Y chromosome
  - C. both the X and Y chromosomes
  - D. either the X or Y chromosome
- 

33. **A gene that is sex-linked is BEST described as which of the following?**

- A. It results in all male offspring.
  - B. It results in all female offspring.
  - C. It is located on the X chromosome.
  - D. It is located inside the mitochondria.
- 





34. **Athletes are often concerned with the question of how much protein they need in their diets because of the requirement of growing muscles for protein. Just as muscles need the basic building block of protein, protein itself has basic building blocks also. Which of the following are the basic building blocks of protein?**

- A. nitrates
  - B. amino acids
  - C. monosaccharides
  - D. nucleotides
- 

35. **The process by which the order of bases in messenger RNA (mRNA) codes for the order of amino acids in a protein is called**

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

36. Which of the following correctly shows the shape of a DNA molecule?

- A.  
- B.  
- C.  
- D.  

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37. Which of the following shows how information is transformed to make a protein?

- A. DNA  RNA  protein
- B. gene  chromosome  protein
- C. cell respiration  ATP  protein
- D. ATP  amino acid  protein

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38. The observed trait that appears in an organism as a result of its genetic makeup is the organism's

- A. allele
- B. genotype
- C. phenotype
- D. karyotype

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39. Within an individual mouse, four different mutations occurred in different genes, located on separate chromosomes and in different cells, as shown in the table below.

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Which of these mutations could be passed on to the mouse's offspring?

- A. white fur
- B. blue eyes
- C. thin fur
- D. short tail
-

40. Two spotted leopards produce a litter of four cubs. Three of the cubs are spotted and one is solid black. The black coat is **probably** what type of trait?

- A. dominant
  - B. recessive
  - C. polygenic
  - D. sex-linked
- 

41. Which statement correctly describes the difference between DNA and RNA? A. RNA contains the base thymine, while DNA contains the base uracil.

- B. DNA contains the sugar ribose, while RNA has the sugar deoxyribose.
  - C. RNA is shaped like a single chain, while DNA is shaped like a double-helix.
  - D. RNA is always found inside the nucleus of a cell, while DNA is often found outside of the nucleus of a cell.
- 

42. Which statement BEST describes the role that DNA plays in storing and transmitting cellular information? A. DNA acts as a molecular blueprint for proteins, storing information in the nucleus.

- B. DNA carries amino acids to the ribosome in the construction of proteins.
  - C. DNA acts as a message that tells ribosomes what proteins to make.
  - D. DNA travels from cell to cell carrying messages.
- 

43. Determining the paternity of a child  
Helping doctors diagnose specific diseases  
Identifying criminal suspects

All of these are functions of

- A. electron microscopes.
  - B. DNA fingerprinting.
  - C. genetic engineering.
  - D. nuclear medicine.
- 

44. A certain gene for albinism occurs in alligators. When the defective gene is present, the alligator's skin is white and the animal has blue eyes. The DNA gene sequences for the normal coloration gene and for the albino gene are shown.

Normal: AAC CAC GGT AGC CCC

Albino: AAC CAA GGT AGC CCC

What type of DNA point mutation leads to albino alligators?

- A. deletion
  - B. duplication
  - C. insertion
  - D. substitution
-

45. What type of information-coding biomolecule NEVER has uracil in its sequence?

- A. DNA
- B. messenger RNA
- C. ribosomal RNA
- D. transfer RNA

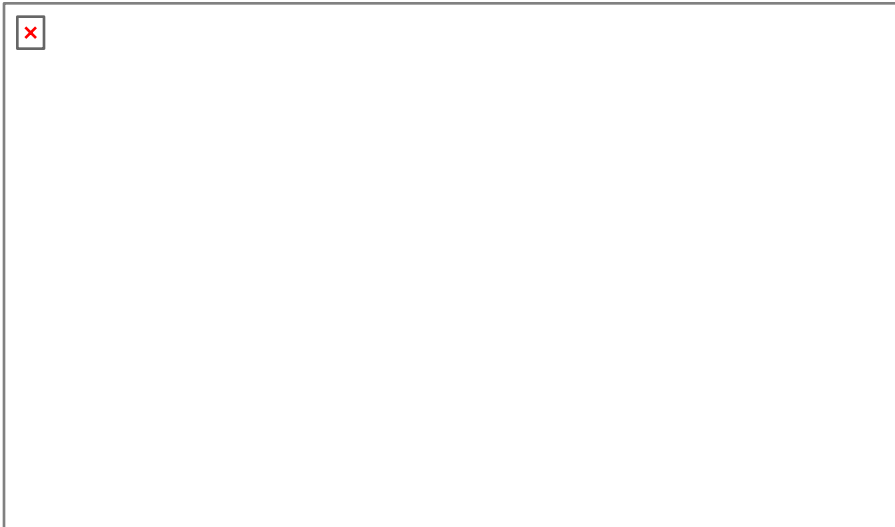
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46. What is the primary reason that DNA is stored in the nucleus of a cell for the purposes of information transfer?

- A. When the DNA is in one central location, ribosomes can migrate to the nucleus to read the code and make their proteins.
- B. DNA is in the nucleus because the nucleus also stores amino acids to make the proteins in the directions.
- C. The chromosomes where the DNA code is stored are much too large to be read by individual ribosomes, so many RNA messages are sent from the nucleus.
- D. The DNA is housed in the nucleus because the nucleus is passed on to daughter cells in one intact package, when cells divide.

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47.



The picture shows an insertion mutation, where a piece of chromosome 4 is mistakenly inserted into chromosome 20. In what situation is this type of mutation the MOST likely to happen?

- A. when DNA is exposed to harmful ultraviolet rays
- B. when DNA is exposed to harmful chemicals that cause mutations
- C. when DNA replicates during the formation of sex cells in meiosis
- D. when DNA replicates during the formation of regular body cells during mitosis

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48. Suppose that a gene for growth hormone is discovered in cats. If a drug company wanted to mass-produce the hormone by cloning the gene into bacteria, what would it need to do?

- A. place the cat gene into a plasmid and place the plasmid into bacteria
  - B. make a DNA fingerprint of the cat gene and insert it into bacteria
  - C. change the sequence of the bacteria's DNA so that it makes the cat hormone
  - D. remove the nucleus of a cat cell and place it into bacteria
-



49. One of the fundamental laws that Mendel discovered while working with sweet pea plants was the law of independent assortment. What does this law state?

- A. Pairs of alleles for the same trait separate from each other during meiosis.
  - B. Different genes separate during meiosis, independently of each other.
  - C. A Punnett square has a fixed ratio of percentages in the offspring.
  - D. When a dominant gene and a recessive gene are present, the dominant gene will appear in the phenotype.
- 

50. A type blood-clotting disorder, known as Factor V deficiency, results when a single DNA base is deleted from the gene for the protein. The correct sequence for this gene appears as this:

AAC TAT TTG TAG CAT CCG GAG

Based on this correct sequence, which defective DNA sequence would result in Factor V deficiency?

Defective I: AAC TAT TTG GTA GCA TCC GGA G

Defective II: AAC TTT TTG TAG CAT CCG GAG

Defective III: AAC ATT TGT AGC ATC CGG AG

Defective IV: AAC TAT TTG TTG TAG CAT CCG GAG

- A. Defective Sequence I
  - B. Defective Sequence II
  - C. Defective Sequence III
  - D. Defective Sequence IV
- 

51. A police detective finds a speck of blood at a crime scene. He knows that there is not enough DNA in the sample for the crime lab to use directly. What is likely the first step that the crime lab will take, in order to have enough DNA to work with?

- A. clone the DNA sample in bacteria
  - B. do a DNA fingerprint directly on the sample
  - C. use the polymerase chain reaction on the sample
  - D. use restriction enzymes to digest the sample into smaller pieces
- 

52. In parakeets, the gene for green feathers is dominant to the gene for yellow feathers. Knowing that meiosis produces an assortment of alleles, suppose that a green male parakeet mates with a female yellow parakeet. The male's genotype is Gg, while the female parakeet's genotype is gg. What percentage of the offspring will have yellow feathers? A. 0%

- B. 25%
  - C. 50%
  - D. 75%
-

53. In fruit flies, white eyes are a sex-linked recessive trait. Suppose that a red-eyed female with genotype  $X^R X^r$  mates with a male with genotype  $X^R Y$ . Describe the females from this cross.
- A. 100% will be red-eyed non-carriers
  - B. 50% will be red-eyed; 50% will be white-eyed
  - C. 50% will be red-eyed purebred; 50% will be red-eyed carriers of the white eye gene
  - D. 25% will be red-eyed purebred; 50% will be red-eyed carriers of the white eye gene; and 25% will be white-eyed
- 

54. Which type of information-coding molecule fits the correct description?
- A. DNA is clover-leaf shaped and carries amino acids to the ribosome for protein production.
  - B. Messenger RNA is single-stranded, and serves as a copy of the DNA code for the ribosome.
  - C. Transfer RNA is part of the structure of the ribosome that makes proteins.
  - D. Proteins serve as the genetic code to build new DNA molecules.
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55. Put the listed events into the correct sequence.
- I: Transfer RNA carries amino acids to the ribosome.
  - II: Double-stranded DNA serves as a genetic blueprint.
  - III: Messenger RNA travels to the ribosome.
  - IV: Proteins are produced by the ribosome in translation.
  - V: Transcription creates a messenger RNA copy of a gene in the DNA.

- A. II, I, V, III, IV
- B. IV, II, V, III, I
- C. II, V, III, I, IV
- D. I, IV, II, V, III

56. This chart compares the base sequences of homologous segments of DNA from three primates. Based on this information, how many differences in the resulting amino acid sequences would you expect to find between humans and chimpanzees?
- A. 2
  - B. 3
  - C. 4
  - D. 6
- 

57. After a culture of cells is allowed to multiply and is viewed through a microscope, the cells are x-rayed with high-energy radiation for less than 1/100th of a second. After the radiation, many newly reproduced cells appear different. What has probably occurred?
- A. Contamination
  - B. Mutation
  - C. Bacterial infection
  - D. Speciation
-

58. One strand of DNA could be as long as a football field if it were stretched out lengthwise. One of the factors allowing DNA to fit inside the nucleus of a cell is its ability to —

- A. break apart into separate genes
- B. extend to form very long, thin molecules
- C. coil tightly around associated proteins
- D. denature from the effect of an enzyme

## Answer Key

1. B) hybrids.
2. C) heredity.
3. B) transcription into RNA, then translation into amino acids
4. C) gamete formation, fertilization, zygote formation
5. C) zygote
6. C) proline
7. B) It allows geneticists to emphasize desirable traits in food, plants, and animals.
8. B) UCG
9. A) a single organism.
10. D) half the number of chromosomes as in the original cell.
11. D) reproduction.
12. C) meiosis.
13. B) large supply of cytoplasm for food.
14. D) The original chromosome number is restored.
15. B) The number of chromosomes decreases from diploid to haploid.
16. B) Haploid cells are produced.
17. D) It produces identical offspring.
18. B) crossing over
19. D) It is the same process that occurs in body cell division.
20. C) 32
21. A) carry genetic information from the nucleus to the site of protein synthesis.
22. B) DNA and protein.
23. B) one time
24. B) DNA
25. C) recessive gene found on the X chromosome.
26. C) Down's syndrome

27. B) deoxyribonucleic acid
28. B) codons.
29. A) egg.
30. A) fertilization.
31. C) controlled breeding
32. A) inbreeding
33. C) translation
34. B) DNA, mRNA, tRNA, polypeptide, enzyme
35. A) The DNA code of nitrogen bases is the same as the protein code.
36. A) Sperm carry only the Y chromosome.
37. A) chromatid
38. C) making human insulin using bacteria
39. B) meiosis
40. C) meiosis
41. C) The process produces cells with half the normal number of chromosomes.
42. A) One of each pair of chromosomes comes from each parent.
43. C) number of chromosomes
44. A) I and II only
45. B)
46. B) Meiosis produces egg and sperm cells.
47. A) 23
48. B) DNA replication
49. A) more variation among offspring
50. A) DNA.
51. A) meiosis

52. A) a carrier

53. A) diploid.

54. C) an abnormality in the number of chromosomes within an organism.

55. A) the X chromosome

56. C) It is located on the X chromosome.

57. B) amino acids

58. A) translation



59. D)

60. B) nondisjunction

61. A) DNA  RNA  protein

62. C) phenotype

63. A) Some base sequences code for protein production.

64. B) blue eyes

65. B) a mutation in DNA

66. B) recessive

67. C) RNA is shaped like a single chain, while DNA is shaped like a double-helix.

68. A) DNA acts as a molecular blueprint for proteins, storing information in the nucleus.

69. B) DNA fingerprinting.

70. B) asexual reproduction
71. D) substitution
72. D) the natural alteration of the color gene during meiosis
73. A) DNA
74. B) two
75. B) It produces little or no genetic variability in the offspring.
76. D) The codons would be complementary and T would be changed to U, resulting in UUG GUA GCC.
77. C) The chromosomes where the DNA code is stored are much too large to be read by individual ribosomes, so many RNA messages are sent from the nucleus.
78. C) when DNA replicates during the formation of sex cells in meiosis
79. A) place the cat gene into a plasmid and place the plasmid into bacteria
80. D) four
81. D) sexual reproduction
82. B) Different genes separate during meiosis, independently of each other.
83. C) Defective Sequence III
84. C) use the polymerase chain reaction on the sample
85. D) 153
86. C) 50%
87. C) 50% will be red-eyed purebred; 50% will be red-eyed carriers of the white eye gene
88. B) Messenger RNA is single-stranded, and serves as a copy of the DNA code for the ribosome.
89. C) II, V, III, I, IV
90. B) a substitution error in a DNA base
91. A) 2
92. B) Mutation
93. C) coil tightly around associated proteins