**Protein Synthesis, Meiosis and Mutations Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Honors Biology**

1. What are the main structural differences between DNA and RNA?

 a. RNA contains nucleotides and hydrogen bonds, and DNA does not.

 b. DNA contain ribose sugar and uracil, whereas RNA contains deoxyribose

 sugar and thymine.

 c. DNA contain deoxyribose sugar and uracil, whereas RNA contains deoxyribose

 sugar and methionine.

 d. DNA contain ribose sugar and thymine, whereas RNA contains deoxyribose

 sugar and uracil.

 e. DNA contain deoxyribose sugar and thymine, whereas RNA contains ribose

 sugar and uracil.

2-4.

Label the following processes below.

 a. replication 2 b. translation 4 c. transcription 3

 

4.

3.

2.

5. What is a gene?

 a. a region of RNA that codes for a protein

 b. a region of DNA that codes for a protein

 c. a region of DNA that codes for an amino acid

 d. a group of 5 codons

6. Which process does NOT take place in the nucleus?

 a. transcription

 b. translation

 c. replication

 d. a & b

 e. all of the above

7. ***Transcribe*** the following DNA code

 TACAAGCAGGGTACCACT

 a. UACAAGCAGGGUACCACU

 b. ATGTTCGTCCCATGGTGA

 c. AUGUUCGUCCCAUGGUGA

 d. methionene-phenylalanine-valine-proline-tryptophan-stop

8. tRNA stands for\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, which makes sense due to its role involving \_\_\_\_\_\_\_\_\_\_\_\_

 a. taurine RNA; proteins

 b. transfer RNA; amino acids

c. telophase RNA; cell division

 d. two stranded RNA; ribosomes

 e. translational RNA; anti-codons

Label the diagram below with the following choices

9. anti-codon c 11. ribosome a 13. Codon d

10. mRNA e 12. protein (polypeptide chain) e



A

B

14. The previous diagram shows the process of

a. translation

b. mitosis

c. transcription

d. replication

e. meiosis

15. The END product of the above process is a \_\_\_\_\_\_\_\_\_\_\_\_\_ molecule based on a segment of the DNA code.

 a. ribosome c. tRNA e. mRNA

 b. amino acid d. protein

16. The following diagram shows the process of

a. meiosis

b. mitosis

c. translation

d. replication

e. transcription



17. The END product of the above process is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_ molecule based on a segment of the DNA code.

 a. ribosome c. mRNA e. protein

 b. amino acid d. tRNA

18. What is the complimentary **tRNA** code for the following DNA code?

TAC

1. ATG
2. UAC
3. AUG
4. methionene

19. The above would best be referred to as a(n):

 a. polypeptide chain

 b. codon

 c. anti-codon

 d. triplet

 e. tetrad

20. Would a bacterial cell undergo meiosis?

 a. yes b. No c. at certain points in the life cycle

21. How many chromosomes does a human haploid cell have?

 a. 46 c. 48

 b. 24 d. 23

22. How many chromosomes does a human skin cell have?

 a. 46 c. 48

 b. 24 d. 23

23. The Virginia state bat is the big-eared bat (*Plecotus rafenesquii*). If the big-eared bat’s diploid cells have 28 chromosomes, how many chromosomes will a big-eared bat’s egg cell have?

 a. 28 b. 7 e. 23

 b. 14 c. 29

24. A female (biologically) has the following sex chromosomes

 a. XXY c. XY

 b. XX d. XYY

25. If a human patient has an extra chromosome 13 (trisomy 13), how many total chromosomes would this individual have?

 a. 46 c. 47

 b. 45 d. 23

26. When does crossing-over occur?

 a. Prophase I of meiosis c. Metaphase II of meiosis

 b. metaphase of mitosis d. interphase of mitosis

 e. interphase of meiosis

27. What is the correct notation for a karyotype of a female with Down’s syndrome?

 a. 47, XX, +21 c. 46, XX, +18 e. 47, XX, +13

 b. 47, XY, +21 d. 46, XY, +18

28. In an embryo, cells are dividing rapidly. Are these cells undergoing mitosis or meiosis? (since it’s an embryo fertilization has already occurred)

 a. mitosis b. meiosis

29. How many times does a cell undergo anaphase in meiosis?

 a. 1 c. 2

 b. 3 d. 4

30. How many times is the DNA replicated in meiosis?

 a. 1 c. 2

 b. 3 d. 4

# Vocabulary Matching: Choose the BEST answer.

31. C gamete a. the name of the cell that is created from the fusion of two reproductive cells.

32. D haploid cells b. An undifferentiated cell

33. **E** diploid cell c. a reproductive or sex cell

34. **B** stem cell d. these cells have half the amount of genetic

information (1 set of chromosomes) as body cells.

 The abbreviation for these cells is 1N.

35. **A** zygote

e. cells which contain a homologous *pair* of

each chromosome

36. Which types of mutations will likely result in a frameshift mutation?

 a. insertion

 b. substitution

 c. deletion

 d. premature stop

 e. both a & c

37. Which of the following is most likely to result in a silent mutation?

 a. insertion

 b. substitution

 c. deletion

 d. premature stop

 e. both a &c

38. Identify the below mutation



1. gene mutation; insertion
2. chromosome mutation; duplication
3. gene mutation; substitution
4. chromosome mutation; translocation

**Short answers**

39-40. A substitution mutation occurs at base 157 in a gene. How many amino acids will be unaffected by this frameshift mutation? You may use a calculator. Show your work.

52 (3 bases per codon, 1 codon per amino acid)

41-48. Given the original DNA sequence, identify the following types of mutations AND their effects (Be as specific as possible). Show the transcription and translation steps.

**TACACCTTGGCGACGACT**

1. TACACCTTAGCGACGACT
2. TACGACCTTGGCGACGACT

 c. TACACCTTGGCGACAACT

49-52. There are advantages and disadvantages of sexual reproduction and asexual reproduction. First, describe the differences between the two (try to use vocabulary we learned in class), and then describe at least one advantage of each. Be specific as to which method you are describing.

53-56. What is crossing-over? When does it occur in the cell cycle? What biological advantage does it give to biological populations? Why is this advantage important for survival of the species?



57-61. Write the amino acid sequence for the following DNA strand. *Show me the steps.*

TACAAAGACGTCAACGATATT

62-65. How can a mutation be silent? Be specific, and start with a description of what a silent mutation is.

**Bonus Questions.**

1. What is G-banding, and what determines the banding patterns? (possible 2 points)

2. Which enzyme is responsible for adding complimentary RNA nucleotides during the transcription process?

3. How does RNA polymerase “know” where to start transcribing a gene?

4. Use the below karyotype to diagnose the individual. Include the patient’s sex, diagnosis, and the notation describing the karyotype.

