Applied Practice

Inheritance, Genetic Mutations, and DNA Technology

STAAR Biology EOC

RESOURCE GUIDE

Volume 4

Printed in the United States of America.

APPLIED PRACTICE
Resource Guide
Inheritance, Genetic Mutations, and DNA Technology
STAAR Biology EOC

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Glossary of Terms

Allele – one version of a gene, which may differ in the specific nucleotide sequence from other versions of the same gene

Amniocentesis – a medical procedure in which fetal cells are collected from the amniotic sac surrounding a developing fetus for analysis of genetic abnormalities

Anneal – to stick together

Autosomes – chromosomes which do not carry traits for determining sex of the organism

Chromosomal mutation – a change in an organism's DNA involving a large portion of a chromosome

Codominance – both alleles for a trait are expressed

Crossing over – during Prophase 1 of meiosis, homologous chromosomes exchange genetic material

Deletion mutation – a mutation in which genetic material is lost

Dihybrid cross – a genetic cross between two individuals that differ in two traits

Diploid (2n) – a cell that contains two copies of every chromosome

DNA fingerprinting – a technique that examines the banding patterns of an individual's DNA

Dominant – a trait that is always expressed when the allele is present

F1, or First filial – the first generation offspring of a cross between two purebred parents, homozygous for opposite traits

Frame-shift mutation – deletion or insertion of a single nucleotide in a gene results in a shift of reading frame of the DNA triplets

Gamete – the reproductive cells; eggs or sperm

Gel electrophoresis – a technique used to separate DNA fragments by size in a gel matrix

Gene – a region of DNA that encodes a protein

Gene mutation – a change in the DNA of a specific gene

Genome – the entirety of all the DNA of an organism

Genotype – the genetic makeup of an organism; the combination of alleles for one or more traits

Haploid (n) – a cell that contains one copy of each chromosome

Choose the best answer to each question.

Use the codon chart below to help you answer questions 1-2.

Second Base

First Base	U				C				A				G				Third Base
	code	Amino Acid			code	Amino Acid			code	Amino Acid			code	Amino Acid			
U	UUU	Phe			UCU	Ser			UAU	Tyr			UGU	Cys			U
	UUC				UCC				UAC				UGC				C
	UUA	Leu			UCA				UAA	Stop			UGA	Stop			A
	UUG				UCG				UAG	Stop			UGG	Trp			G
C	CUU	Leu			CCU	Pro			CAU	His			CGU	Arg			U
	CUC				CCC				CAC				CGC				C
	CUA				CCA				CAA	Gln			CGA				A
	CUG				CCG				CAG				CGG				G
A	AUU	Ile			ACU	Thr			AAU	Asn			AGU	Ser			U
	AUC				ACC				AAC				AGC				C
	AUA				ACA				AAA	Lys			AGA	Arg			A
	AUG	Met			ACG				AAG				AGG				G
G	GUU	Val			GCU	Ala			GAU	Asp			GGU	Gly			U
	GUC				GCC				GAC				GGC				C
	GUA				GCA				GAA	Glu			GGA				A
	GUG				GCG				GAG				GGG				G

1 The DNA strand A-G-C-T-C-**A**-G is exposed to harmful UV radiation in the environment, causing the placement of a Thymine (T) nucleotide instead of the Adenine nucleotide (A) in position 6. The mutated strand, A-G-C-T-C-**T**-G is then transcribed and translated. The most likely outcome of this mutation is —

A the amino acid Ser will be placed in the protein instead of Arg

B the amino acid Arg will be placed in the protein instead of Ser

C the protein will be unaffected

D the protein will not be synthesized

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2 This type of mutation could best be described as a(n) —

F frame-shift mutation

G point mutation

H insertion mutation

J deletion mutation

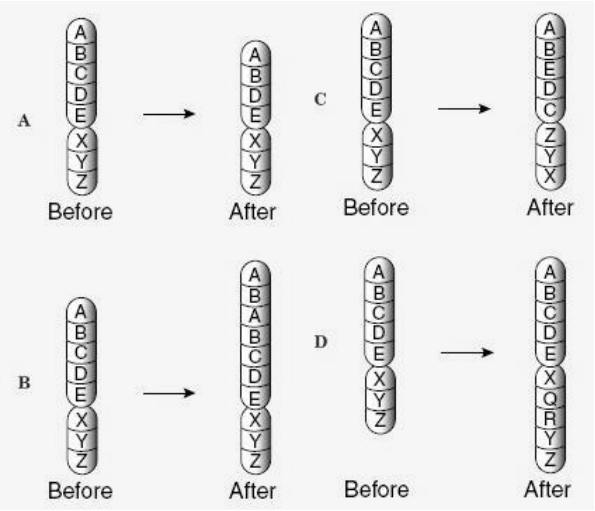
3 During crossing over in meiosis, part of a chromosome breaks off and is reattached upside down. This event is known as an inversion mutation and is best represented by —

A picture A

B picture B

C picture C

D picture D



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4 The mutation described in question 3 is classified as a chromosomal mutation because —

F only one gene is affected on the chromosome

G many genes on a single chromosome are affected

H several chromosomes are affected

J none of these

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5 Gene mutations which could potentially have no effect on the proteins produced by the organism include —

A point mutations

B frame-shift mutations

C insertion mutations

D deletion mutations

6 A large section of several hundred base-pairs from chromosome 13 is lost during a crossing over event of meiosis. Compared to a point mutation, the effect of this deletion on the organism would be —

F no different

G slightly less severe

H slightly more severe

J much more severe

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7 The best example of the "wobble base" phenomenon is —

A there are 3 different STOP codons, UAG, UAA, UGA

B there is only one START codon

C a mutation in the 3rd base of a codon encoding the amino acid GLY has no effect

D a mutation in the 2nd base of CAA could result in producing either HIS or GLN

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8 Mutations in DNA can be caused by —

F exposure to UV radiation

G exposure to certain chemical substances

H errors in DNA replication

J all of these