

Exercise 1: Choose the correct answer, if it exists, and complete the table at the end. 7p

- 1) Plasmids are:
 - a) Double-stranded RNA segments
 - b) Proteins associated with DNA
 - c) Circular fragments of extrachromosomal DNA
 - d) Coding regions of nuclear DNA
- 2) Which phase is characterized by the separation of sister chromatids?
 - a) Anaphase
 - b) Prophase
 - c) Telophase
 - d) Metaphase
- 3) What does a monocistronic gene produce?
 - a) One protein from one mRNA
 - b) Many proteins from one mRNA
 - c) One mRNA from many genes
 - d) A protein complex from multiple genes
- 4) What is the role of the promoter in prokaryotes?
 - a) Starts replication
 - b) Binds RNA polymerase to start transcription
 - c) Ends transcription
 - d) Encodes proteins
- 5) What are alleles?
 - a) DNA molecules
 - b) Different forms of a gene
 - c) Protein sequences
 - d) Chromosome numbers
- 6) What does the term “locus” refer to?
 - a) The shape of a gene
 - b) The function of a gene
 - c) The location of a gene on DNA
 - d) The number of alleles
- 7) What does “homozygous” mean?
 - a) Two different alleles
 - b) Two identical alleles
 - c) One allele only
 - d) No alleles present
- 8) What is the main function of structural genes?
 - a) To regulate other genes
 - b) To produce proteins with structural or enzymatic roles
 - c) To respond to environmental signals
 - d) To silence gene expression
- 9) Which of the following is a regulatory gene product?
 - a) Amylase
 - b) Actin
 - c) Transcription factor
 - d) Hemoglobin
- 10) What is the role of the terminator region in a prokaryotic gene?
 - a) It enhances translation
 - b) It signals the end of Replication
 - c) It binds ribosomes
 - d) It codes for regulatory proteins
- 11) Where is the promoter region located in relation to the RNA coding sequence?
 - a) Downstream
 - b) Within the coding region
 - c) Upstream
 - d) At the 3'
- 12) Which sequence is typically found around the -10 position in prokaryotic promoters?
 - a) TTGACA
 - b) TATAAT (Pribnow box)
 - c) AUG
 - d) CAAT
- 13) Which of the following is unique to eukaryotic genes compared to prokaryotic genes?
 - a) Promoter sequence
 - b) Terminator sequence
 - c) Introns and exons
 - d) RNA coding region
- 14) What is the function of introns in eukaryotic genes?
 - a) They code for proteins
 - b) They regulate translation
 - c) They are non-coding regions removed during RNA processing
 - d) They initiate transcription

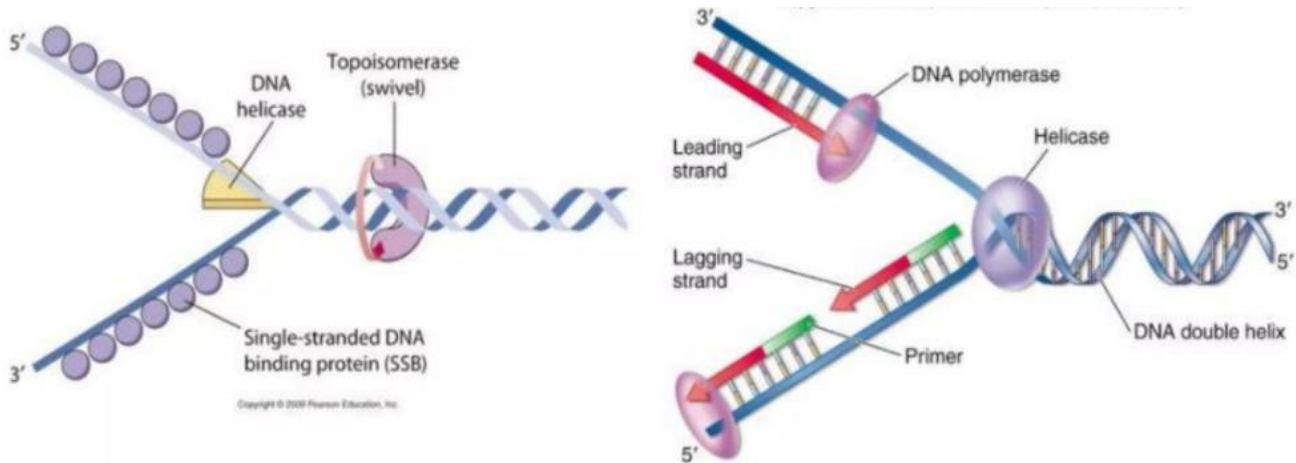
1	2	3	4	5	6	7
c	a	a	b	b	c	b
8	9	10	11	12	13	14
b	c	/	c	b	c	c

Exercise 2: 1.5

List the types of Horizontal Gene Transfer

1. Transformation
2. Transduction
3. Conjugation

Exercise 3 Complete the Figure 4p



8. Tile replication

Exercise 4 _7.5-

Part 1: In the laboratory of genetics and molecular biology, a team of researchers conducted a controlled breeding experiment to illustrate the mechanisms of heredity and trait transmission. A white-furred cat (*bb*) was crossed with a black-furred cat (*BB*). All offspring in the first generation (*F₁*) exhibited **black fur**

1. Explain the result of this cross:

- a) Trait studied **Fur Color** b) Alleles involved **B = black fur** and **b = white fur** c) Cross **BB × bb**
 d) Punnett square of the cross

	B	B
b	Bb	Bb
b	Bb	Bb

- e) Genotype obtained **100% Bb** f) Phenotype obtained **All black fur**

2. Analysis and interpretation of the results:

- g) The parents are **pure and homozygous**
 h) The *F₁* individuals are: **hybrid and heterozygous**
 m) The dominant allele is: **B (black fur)** n) The recessive allele is: **b (white fur)**

3. Mendelian law illustrated by this cross is: Law of dominance (First Mendelian law)

Part 2: The second cross occurs between the *F₁* individuals:

- a) The Cross **Bb × Bb**
 b) Punnett square: →

	B	b
B	BB	Bb
b	Bb	bb

- **Genotypes** → **1 BB : 2 Bb : 1 bb**
- **Phenotypes** → **Black : Black : White**
- **Proportions** → **3 black : 1 white**

Analysis and interpretation: → **Gametes containing the recessive allele have a chance to meet again. This forms the recessive genotype *rr* once more, resulting in white allele**

4. Mendelian law illustrated by this cross: The second law of segregation of Mendel is confirmed

Part 3

If a cross is made between a red-colored cow and a white-colored cow, and the resulting generation has roan-colored offspring (mixture of red and white hairs), how do you explain this cross, and what is it called? **Both alleles are expressed equally in the heterozygote Red and white appear together, forming the roan phenotype. This is **codominance****