

**COURSE CODE: BIO 211 (M) 2019/2020**

**UNIVERSITY OF ESWATINI**

**FINAL EXAMINATION PAPER: NOVEMBER 2019**

**PROGRAMMES: B.Sc. II, B. Ed Primary II, B. Ed  
Secondary II**

**TITLE OF PAPER: GENETICS**

**COURSE CODE: BIO 211**

**TIME ALLOWED: THREE HOURS**

- INSTRUCTIONS: SECTIONS**
- 1. THIS PAPER IS DIVIDED INTO TWO**
  - 2. ANSWER QUESTION 1 & 2  
(COMPULSORY) FROM SECTION A and  
ANY TWO QUESTIONS FROM SECTION  
B.**
  - 2. EACH QUESTION CARRIES TWENTY  
FIVE (25) MARKS**
  - 3. ILLUSTRATE YOUR ANSWERS WITH  
LARGE AND CLEARLY LABELLED  
DIAGRAMS WHERE APPROPRIATE.**

**SPECIAL REQUIREMENTS: CALCULATOR**

**THIS PAPER IS NOT TO BE OPENED UNTIL PERMISSION HAS  
BEEN GRANTED BY THE INVIGILATORS**

**SECTION A: (Compulsory, answer all questions in this section.)**

**Question 1: Answer all multiple questions on the provided grid**

1. Which of the following is not a constituent of deoxyribonucleotides?
  - A. Phosphate moieties
  - B. Deoxyribose
  - C. Ribose
  - D. Organic bases
  
2. Which base pair(s) typically occur(s) in double-stranded DNA?
  - A. G-C
  - B. G-T
  - C. G-A
  - D. G-G
  
3. Which structural property of DNA is crucial for the conservation of genetic information?
  - A. Antiparallelism
  - B. The ability to form a double helix
  - C. Base-pair complementarity
  - D. All of the above
  
4. In the diploid cells of an organism, there can be one or two different \_\_\_\_\_ of a given single-copy nuclear gene.
  - A. Chromosomes
  - B. Loci
  - C. Genotypes
  - D. Alleles

5. Which of the following are characteristics of DNA
- A. A single-strand of DNA will bind to a sequence that is complementary to it via hydrogen bonds.
  - B. Antigen-antibody complexes react specifically with DNA and form the basis for Western blotting.
  - C. Antibodies that recognize DNA bind tightly to it, forming highly specific probes.
  - D. No two DNA sequences are exactly identical.
  - E. A single strand of DNA will bind tightly to a sequence identical to it.
6. Which of the following statements is true?
- A. Phenotypes are inherited; genotypes are expressed.
  - B. Environment influences genotype but not phenotype.
  - C. A given allele will always result in the same phenotype.
  - D. Environment can influence both genotype and phenotype
  - E. None of the above.
7. When referring to two homologous chromosomes in an individual diploid cell, which of the following statements is the most accurate?
- A. These chromosomes will normally be identical alleles.
  - B. These chromosomes will not normally carry the same genes in the same order.
  - C. These chromosomes will normally carry the same genes, in the same order.
  - D. All of the above.
8. Mitosis takes place in
- A. Haploid cells only.
  - B. Diploid cells only.
  - C. Haploid or duplicate cells.
  - D. Bacterial cells.
  - E. None of the above.

9. Meiosis takes place in
- A. Haploid cells only.
  - B. Somatic cells.
  - C. Haploid or diploid cells.
  - D. Diploid cells only.
  - E. None of the above.
10. An allele of a gene is best described as
- A. A highly related gene found at a different locus.
  - B. The regulatory regions of a gene.
  - C. A variation in the nucleotide sequence of a given gene that is always associated with a detectable phenotype.
  - D. A variation in the nucleotide sequence of a given gene
  - E. All of the above.
11. An individual displays a dominant phenotype. To determine whether the individual is homozygous for the dominant allele or heterozygous at that locus, it would be best to do a
- A. Testcross.
  - B. Complementation test.
  - C. Epistasis test.
  - D. Genome sequencing analysis.
  - E. None of the above.
12. What are the repeating units of nucleic acids?
- A. phosphate molecules
  - B. nucleotides
  - C. bases
  - D. sugar molecules
13. A heritable feature is a \_\_\_\_\_ and may have two or more variants called \_\_\_\_\_.
- A. trait/characteristics
  - B. character/traits
  - C. character/factors
  - D. trait/factors

14. Which of the following statements about DNA base pairing is correct?
- A. A forms 2 hydrogen bonds with G; T forms 3 hydrogen bonds with C
  - B. A forms 3 hydrogen bonds with T; G forms 2 hydrogen bonds with C
  - C. A forms 2 covalent bonds with T; G forms 3 covalent bonds with C
  - D. A forms 2 hydrogen bonds with T; G forms 3 hydrogen bonds with C
15. \_\_\_\_\_ portions of chromosomes are relaxed.
- A. Heterochromatin
  - B. Euchromatin
  - C. Facultative chromatin
  - D. Constitutive
16. A cross between two heterozygotes for one trait yields a phenotypic ratio of 2: 1. What is the best explanation?
- A. The dominant trait is lethal in its homozygous form.
  - B. The trait forms sterile progeny.
  - C. Either the dominant or the recessive allele in its homozygous form is lethal.
  - D. The trait causes semisterility in one of the parents.
  - E. The recessive allele for the trait is lethal in its homozygous form.
17. Dosage compensation of X-linked genes in mammals is achieved by
- A. A gene that is turned off in males that allows expression of the X-chromosome.
  - B. The addition of methyl groups to the Y-chromosome.
  - C. X-inactivation in females that have more than one X-chromosomes, resulting genetic mosaics in cells with one functional X-chromosome.
  - D. A site on a chromosome which controls x-expression called the x-hyperactivation centre.

E. E. Both X-chromosomes in the female being inactivated.

18. The four cells produced in meiosis will have a:

- A.  $2n$  number of chromosomes and will differ genetically from each other.
- B.  $2n$  number of chromosomes and will be genetically identical to each other.
- C.  $n$  number of chromosomes and will be genetically identical to each other.
- D.  $n$  number of chromosomes and will differ genetically from each other.

19. In the F<sub>1</sub> generation of a monohybrid cross, the phenotypic ratio would be:

- A. 3:1
- B. 1:2:1
- C. 2:1:1
- D. 1:1:2

20. Long butternuts crossed with round butternuts result in all oval progeny. This type of inheritance is:

- A. Multiple alleles.
- B. Complete dominance.
- C. Co-dominance.
- D. Incomplete dominance.

21. During meiosis I

- A. Homologous chromosomes align and are joined through synapsis.
- B. Homologous chromosomes align independently at the metaphase plate, similar to what occurs during mitosis.
- C. Homologous chromosomes align and are held together only at their centromeres.
- D. Sister chromatids separate.

E. both b and d

22. Which blood groups are codominant?

A.  $I^A$  and  $I^O$

B.  $I^B$  and  $I^O$

C.  $I^A$  and  $I^B$

23. Which of the following statements is true?

A. Environment can influence both genotype and phenotype.

B. Phenotypes are inherited; genotypes are expressed.

C. Environment influences genotype but not phenotype.

D. A given allele will always result in the same phenotype.

E. None of the above.

**[Total Marks=25]**

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