Part 1: Multiple choice questions (80 pts).

1. Individuals with the disorder xeroderma pigmentosum are hypersensitive to sunlight. This occurs because their cells are impaired in what way?
   A. They cannot replicate DNA.
   B. They cannot exchange DNA with other cells.
   C. They cannot repair thymine dimers.
   D. They do not recombine homologous chromosomes during meiosis.

2. Telomeres replicate differently than the rest of the chromosome. This is a consequence of which of the following?
   A. DNA polymerase that cannot replicate the leading strand template to its 5' end
   B. gaps left at the 5' end of the lagging strand
   C. gaps left at the 3' end of the lagging strand because of the need for a primer
   D. the "no ends" of a circular chromosome

3. The followings are the top strands of the DNAs. Which of them is a DNA palindrome?
   A. 5'-GGGAAA-3'
   B. 5'-CGCCGC-3'
   C. 5'-GGGGGG-3'
   D. 5'-AATATT-3'

4. Which process is suitable for a retrovirus replicates its genome?
   A. ssRNA → dsRNA → ssRNA
   B. ssRNA → ds RNA → dsDNA
   C. ssRNA → RNA-cDNA → dsDNA
   D. ssRNA → dsDNA → cDNA

5. Cytosine makes up 42% of the nucleotides in a sample of DNA from an organism. Approximately what percentage of the nucleotides in this sample will be thymine?
   A. 8%    B. 16%    C. 31%    D. 42%

6. It became apparent to Watson and Crick after completion of their model that the DNA molecule could carry a vast amount of hereditary information in which of the following?
   A. phosphate-sugar backbones
   B. sequence of bases
   C. complementary pairing of bases
   D. different five-carbon sugars

7. Pyrimidines differ from purines in that they
   A. are smaller
   B. are polar
   C. are found in DNA but not RNA
   D. mutate very rapidly

8. An enzyme that cuts at specific DNA sequences is called a
   A. Restriction polymerase
   B. Restriction ligase
   C. Restriction peptidase
9. tRNA of Valine has the GAU-anticodon. Which of the following is the triplet encoding for Valine on DNA template?
A. TGG    B. GUA    C. GAT    D. ACC

10. In the structure of a nucleic acid, which Carbon molecules of the deoxyribose are linked to the phosphate, the hydroxyl and the nitrogenous base?
A. C1, C3, C5    B. C3, C1, C5    C. C5, C3, C1    D. C2, C3, C5

11. Which of these repair mechanisms is responsible for repairing a mutation that occurs in an adult cell from overexposure to the sun?
A. Proofreading    B. Excision repair    C. Recombinant repair    D. Mismatch repair

12. What is the basis for the difference in how the leading and lagging strands of DNA molecules are synthesized?
A. The origins of replication occur only at the 5' end.
B. Helicases and single-strand binding proteins work at the 5' end.
C. DNA polymerase can join new nucleotides only to the 3' end of a growing strand.
D. DNA ligase works only in the 3' → 5' direction.

13. The activity of DNA polymerase that is helpful for preventing errors during DNA replication is
A. proofreading    B. mismatch repair    C. Nucleotide excision    D. base excision

14. When bacteria produce mammalian proteins, cDNA is used rather than genomic DNA. Which of the following is the best explanation?
A. It is easier to clone cDNA than genomic DNA of comparable size.
B. It is not possible to clone the entire coding region of the gene.
C. Most eukaryotic genes have introns that cannot be removed in bacteria.
D. Most eukaryotic gene promoters do not function in bacteria.

15. The bond that joins two nucleotides together is called a
A. amide bond.
B. peptide bond.
C. hydrogen bond
D. phosphodiester bond.

16. How many replication forks are seen in an eukaryotic DNA chain during its replication?
A. 1    B. 2    C. 2n (n = number of replicons)    D. many

17. At a specific area of a chromosome, the sequence of nucleotides below is present where the chain opens to form a replication fork: 3' C C T A G G C T G C A A T C C 5'
A primer is formed starting at the underlined T (T) of the template. Which of the following represents the primer sequence?
A. 3' G C C T A G G 5'    B. 5' A C G T T A G G 3'
C. 5' A C G U U A G G 3'    D. 3' G C C U A G G 5'
18. In *E. coli*, there is a mutation in a gene called dnaB that alters the helicase that normally acts at the origin. Which of the following would you expect as a result of this mutation?
A. No proofreading will occur.
B. No replication fork will be formed.
C. The DNA will supercoil.
D. Replication will occur via RNA polymerase alone.

19. There are 4 palindromic sequences: (1) GATTTC; (2) GAATTC; (3) GATATC; (4) GACTTC
Which one can generate the sticky ends after a restriction cutting at G-A site?
A. 1, 2 B. 1, 3 C. 3, 4 D. 2, 3

20. DNA electrophoresis on agarose gel at 100 V of voltage. The result reveal the two DNA bands with different sizes. Which one is the larger?
A. a B. b

Part 2: Answer the questions (20 pts)
Quan sát hình ảnh sau:

21. Sự biến đổi phân tử DNA như hình trên gọi là gì?
22. Kiểu biến đổi (1) từ DNA gốc thành DNA mới gọi là gì?
23. Kiểu biến đổi (2) từ DNA gốc thành DNA mới gọi là gì?
24. Hình dưới là kết quả sau ly tâm của giai đoạn biến tính protein. Cho biết tên của các phân chất 1,2,3.

25. Hóa chất dùng để biến tính protein là gì?
26. Các base nào thuộc nhóm purine?
27. Đồng enzyme tổng hợp sợi DNA từ RNA là gì?

TRƯỞNG KHÓA/DEAN    TRƯỞNG BỘ MÔN/CHAIRMAN
**ANSWER SHEET**

Part 1: MCQs. Circle the choice.

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Part 2: Answer the questions

21. …………………………………………………………………………………………………………………………………

22. …………………………………………………………………………………………………………………………………

23. …………………………………………………………………………………………………………………………………

24. (1)……………………………..(2)………………………………………..(3)………………………………………..

25. …………………………………………………………………………………………………………………………………

26. …………………………………………………………………………………………………………………………………

27. …………………………………………………………………………………………………………………………………

**Student’s name** | **Student’s code** | **Scores**

Instructor’s signature: Le Nguyen Uyen Chi
ANSWER SHEET

Part 1: MCQs. Circle the choice.

1   A   B   C   D
2   A   B   C   D
3   A   B   C   D
4   A   B   C   D
5   A   B   C   D
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16  A   B   C   D
17  A   B   C   D
18  A   B   C   D
19  A   B   C   D
20  A   B   C   D

Part 2: Answer the questions

21……DNA mutation (Đột biến diếm/ ĐB thay thế)
22……ĐB sai nghĩa (nhầm nghĩa, có nghĩa, missense)
23……ĐB im lặng (cầm, silent)
24. (1)……đích DNA……(2)……chất tủa protein, v.v…. (3)……phenol……
25……phenol/chloroform…………………………………………………………………………
26……adenine và guanine……………………………………………………………………
27……E pm ngược (reverse transcriptase)…