2008 Topic 3 and 7 Test PRACTICE BANK

By TOPIC And Subtopics

3.1 Chem elements and Water (and general)

1. Which of the following are connected by a hydrogen bond?

   A. The hydrogen and oxygen atoms of a water molecule

   B. A base pair of a DNA molecule

   C. Two amino acid molecules of a dipeptide

   D. Two glucose molecules in a disaccharide

2. What is a consequence of hydrogen bonding between water molecules?

A. Water is able to evaporate easily.
B. Water is transparent.
C. Water can dissolve carbohydrates, lipids and proteins.
D. Ice melts and water boils at relatively high temperatures.

3. Which processes involve the unwinding (uncoiling) of the DNA double helix and its separation into two strands of nucleotides?

A. Replication and telophase of mitosis
B. Telophase of mitosis and translation
C. Translation and transcription
D. Transcription and replication

4. Carbon is the basis for life on earth largely because it

   a) is tetravalent and able to form 4 bonds
   b) is highly electronegative
   c) forms many polar bonds
   d) increases hydrogen bonds

5. Which compounds are both organic and found in living organisms?

	Glucose $C_6H_{12}O_6$	Carbon dioxide CO_2	Urea $OC(NH_2)$	Calcium Carbonate $CaCO_3$
A.	✓	×	×	✓
B.	×	✓	✓	×
C.	✓	×	✓	×
D.	✓	✓	✓	✓

Key: ✓ = present × = absent

3.2 and 7.5 Carbs, lipids, proteins

6. Which of the following reactions occurs when a dipeptide is formed from amino acids?

   A. Hydrolysis

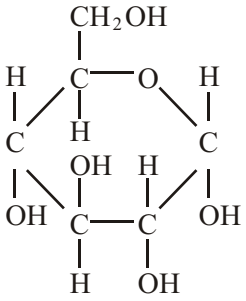
   B. Denaturation

   C. Condensation

   D. Oxidation

7. Which molecule represents ribose?

A.



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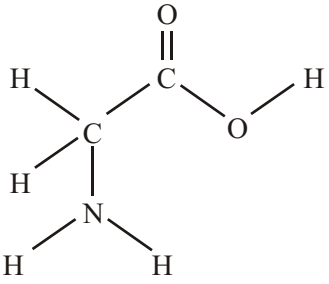

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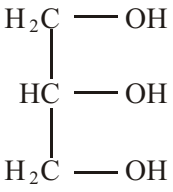
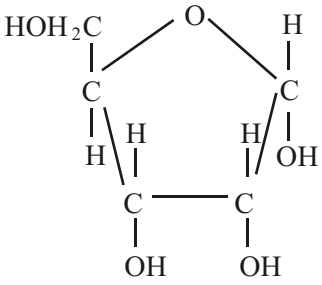


D.



8. Which is **not** a primary function of protein molecules?

   A. Hormones

   B. Energy storage

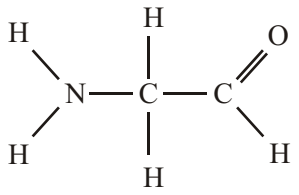
   C. Transport

   D. Structure

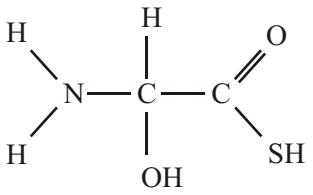
(1)

9. Which structure represents an amino acid?

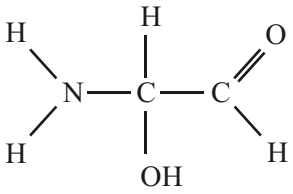
A.



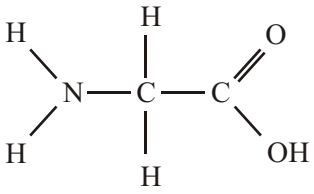
B.



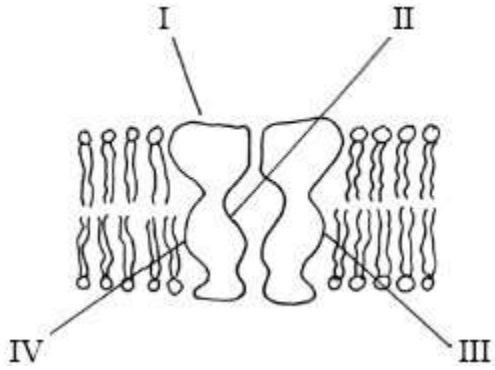
C.



D.



10. The diagram below shows a channel protein in a membrane. Which parts of the surface of the protein would be composed of polar amino acids.



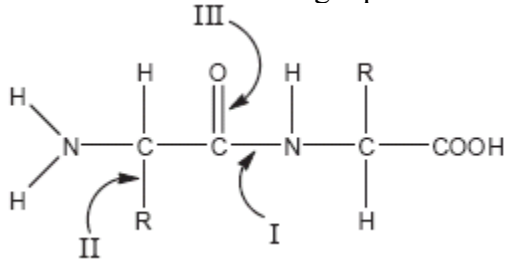
A. I and II only

B. II and III only

C. III and IV only

D. I and IV only

11. Which of the following represents the peptide linkage of a dipepetide?



A. I
B. II

C. III
D. IV

12. What is the maximum number of fatty acids that can be condensed with glycerol?
A. One
B. Two
C. Three
D. Four

3.3. and 7.1 DNA Structure

13. What is the composition of the backbone of DNA?

A. Alternating sugar and phosphate molecules

B. Complementary base pairs

C. Alternating sugar and base molecules

D. A polysaccharide

14. Which of the following are connected by a hydrogen bond?

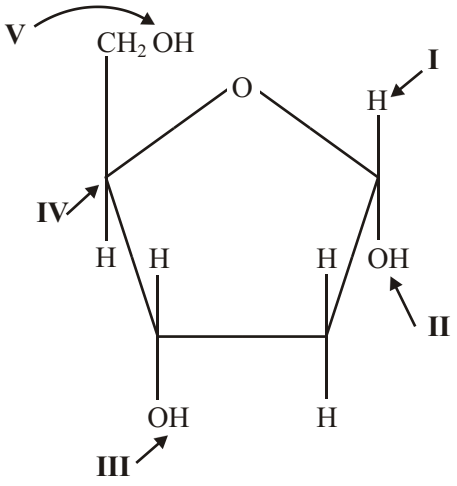
A. The hydrogen and oxygen atoms of a water molecule

B. A base pair of a DNA molecule

C. Two amino acid molecules of a dipeptide

D. Two glucose molecules in a disaccharide

15. To which parts of the deoxyribose molecule do phosphates bind in DNA?



A. I and V

B. III and IV

C. II and III

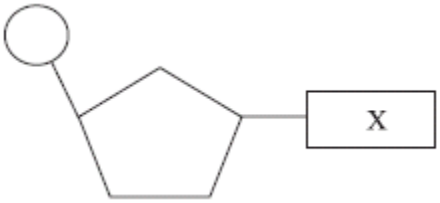
D. III and V

16. Which of the following is NOT a component of chromatin?
    a. Histone proteins
    b. DNA
    c. Restriction enzymes
    d. Nucleosomes

17. Which substance is a base that is found in DNA?
A. Adenosine
B. Cytokinin
C. Guanine
D. Uracil

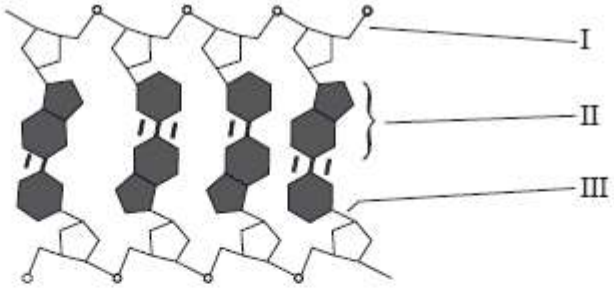
18. What is a nucleosome?
A. The protein core of a chromosome
B. Histone proteins and DNA
C. A chain of ribosomes
D. The material within the nuclear membrane

19. The diagram below represents a DNA nucleotide. What could the part labelled X represent?



A. Ribose
B. Uracil
C. Guanine
D. Phosphate

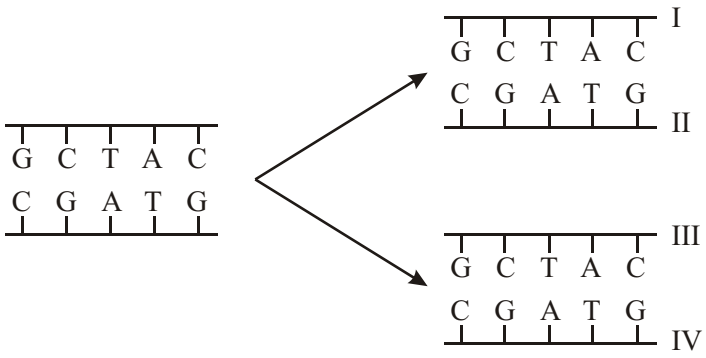
20. The drawing below shows a short section of a DNA molecule. What is labelled by I, II and III?



	I	II	III
A.	3′ end	purine	hydrogen bond
B.	5′ end	pyrimidine	covalent bond
C.	3′ end	pyrimidine	hydrogen bond
D.	5′ end	purine	covalent bond

3.4 and 7.2 DNA replication

21. The diagram below shows a short section of DNA molecule before and after replication. If the nucleotides used to replicate the DNA were radioactive, which strands in the replicated molecules would be radioactive?



A. II and III only

B. I and III only

C. I and II only

D. I, II, III and IV

22. A biochemist isolated and purified molecules needed for DNA replication. When some DNA was added replication occurred, but the DNA molecules formed were defective.

Each consisted of a normal DNA strand paired with segments of DNA a few hundred nucleotides long. Which of the following had been left out of the mixture?

A. DNA ligase

B. Helicase

C. Nucleotides

D. DNA polymerase

23. Which enzyme removes the RNA primer during replication?

A. RNA primase

B. DNA polymerase I

C. DNA ligase

D. Helicase

24. What is the function of helicase?

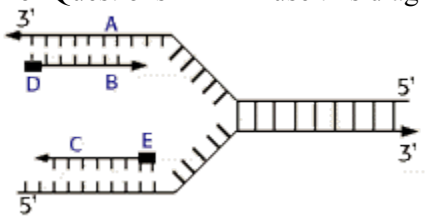
A. It forms bonds between DNA nucleotides.

B. It adds new nucleotides to the DNA helix.

C. It forms the DNA helix.

D. It separates DNA strands.

For Questions 11-12—use this diagram



25. In the above diagram of the process of DNA replication at a replication fork, the strand labeled B is the:

A template strand
B lagging strand
C leading strand
D Okazaki fragment
E RNA primer

26. In the above diagram of the process of DNA replication at a replication fork, the black boxes labeled D and E are:

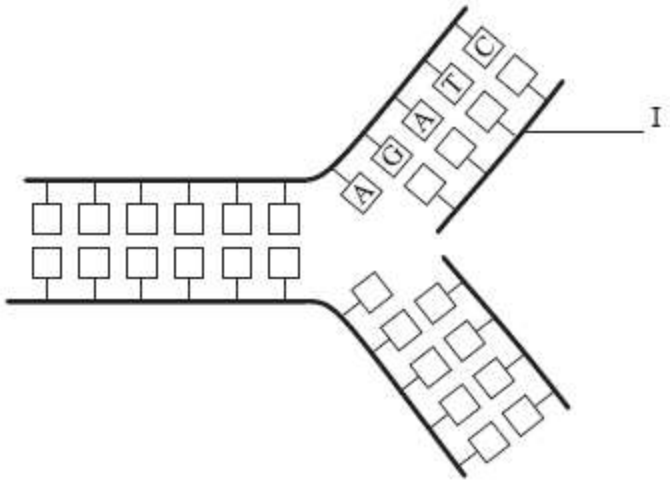
A RNA primers

B DNA template strands
C Okazaki fragments
D DNA polymerase
E Newly synthesized DNA strand

27. For the DNA strand 5'-TACGATCATAT-3' the correct complementary DNA strand is:
    A. 3'-TACGATCATAT-5'
    B. 3'-ATGCTAGTATA-5'
    C. 3'-AUGCUAGUAUA-5'
    D. 3'-GCATATACGCG-5'
    E. 3'-TATACTAGCAT-5'

28. What is the function of DNA polymerase I?
A. To add appropriate nucleotides in the 3′ 5′ direction
B. To remove the RNA primers and replace them with DNA
C. To join together the Okazaki fragments
D. To join together both strands of DNA to the histones

29. The diagram below shows the bases on a short section of DNA during replication. Identify the sequence of bases on the new complementary strand labelled I in the diagram.



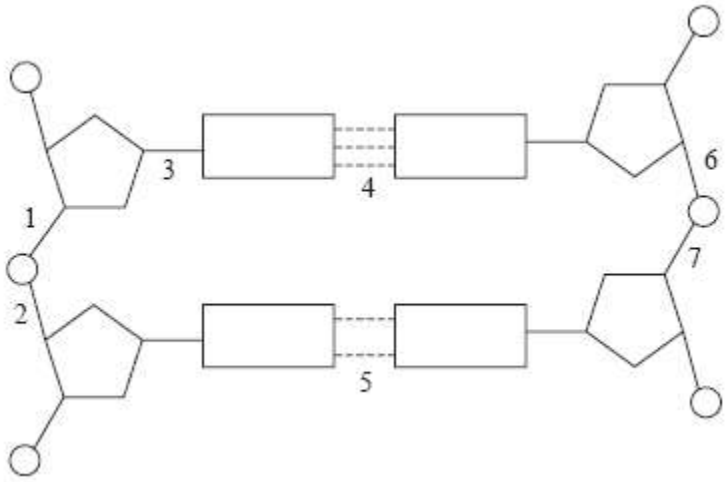
A. CTAG
B. CUAG
C. TCGA
D. AGCT

30. In the bacterium *Escherichia coli* the DNA can be replicated at nearly 2000 base pairs per second.Human DNA is replicated at more than 5 million base pairs per second. Why is the replication of human DNA so much faster?

A. Human cells have a higher concentration of DNA nucleotides in their cytoplasm.
B. Human cells have a faster form of DNA polymerase.

C. Human cells operate at a higher temperature.
D. Human cell DNA replication starts at several points simultaneously.

31. During the process of replication, which bond(s) in the diagram of DNA below is/are broken?



A. 3
B. 4, 5
C. 1, 2, 6, 7
D. 1, 7, 4, 5

3.5, 7.3,7.4, 7.8 Transcription and Translation

32. What is removed to form mature eukaryotic mRNA?

A. RNA primers

B. Exons

C. RNA polymerases

D. Introns

33. Where do transcription and translation occur in eukaryotic cells?

	Transcription	Translation
A.	Cytoplasm	Cytoplasm
B.	Cytoplasm	Mitochondria
C.	Nucleus	Cytoplasm
D.	Nucleus	Nucleus

34. The region on DNA where RNA polymerase attaches and where initiation of RNA transcription begins is known as:

a. terminator region
b. promoter region
c. start anticodon
d. transcription unit
e. elongation unit

35. What is a difference between the sense and antisense strands of DNA?

A. Nucleotides are linked to the sense strand by hydrogen bonding during transcription, but not to the antisense strand.
B. The sense strand has the same base sequence as tRNA, but the antisense strand does not.
C. Nucleotides are linked to the antisense strand by hydrogen bonding during transcription, but not to the sense strand.
D. The antisense strand has the same base sequence as mRNA but the sense strand does not.

36. During the process of translation which of the following statements describes the relationship between nucleic acids?

A. Anticodons on mRNA bind to complementary codons on DNA.
B. Anticodons on tRNA bind to complementary codons on mRNA.
C. Bases on DNA bind to complementary bases on mRNA.
D. A single strand of mRNA is produced from the DNA in the nucleus.

37. What is an intron?

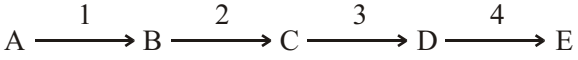
A. The 3'→ 5' strand of a DNA double helix
B. The 5' → 3′ strand of a DNA double helix
C. A section of mRNA removed before translation
D. A tRNA with a start anticodon

38. Which cellular component includes nucleic acid with structural protein?

A. tRNA
B. DNA polymerase
C. Ribosome
D. mRNA

3.6 and 7.6 Enzymes

39. Consider the metabolic pathway shown below.



If there is end-product inhibition, which product (B to E) would inhibit which enzyme (1 to 4)?

	Product	Enzyme
A.	C	4

B.	B	3
C.	B	4
D.	E	1

40. Which of the following could cause denaturation of an enzyme?

A. Substrate concentration

B. A competitive inhibitor

C. High temperature

D. Low salt concentration

41. What can reduce the effect of a competitive inhibitor of an enzyme?

A. Decrease the temperature at which the reaction takes place.

B. Increase the temperature at which the reaction takes place.

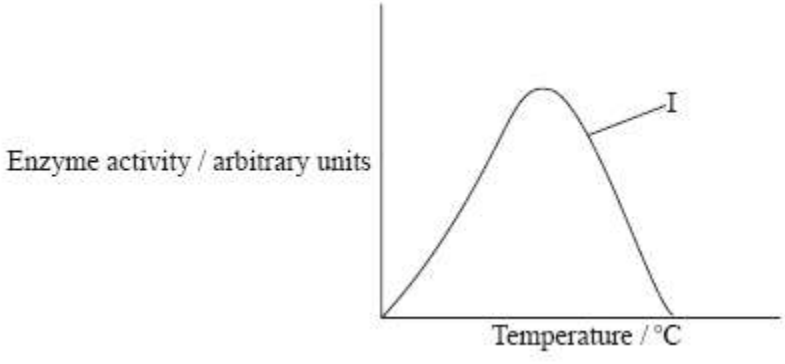
C. Increase the substrate concentration.

D. Add a non-competitive inhibitor.

42. What is an active site?

A. The part of an enzyme that binds only to the product molecules.
B. The sequence of amino acids responsible for the catalytic activity of enzymes.
C. The sequence of amino acids responsible for the structure of an enzyme.
D. The specific area responsible for the activity of all proteins.

43. The graph below shows enzyme activity plotted against temperature. What is happening at point I?

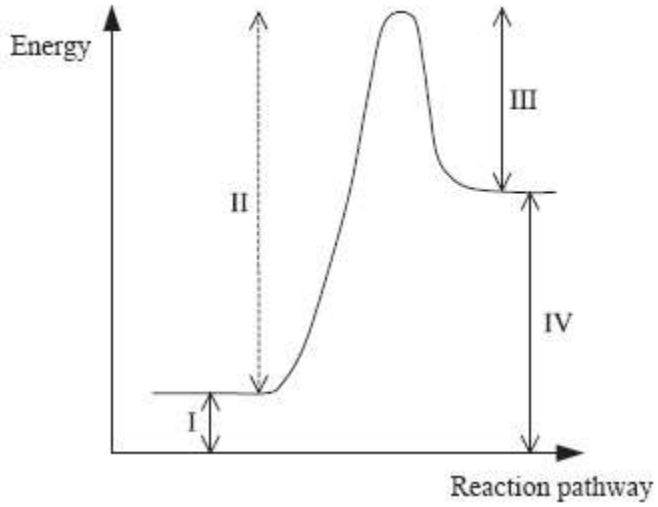


A. The enzyme is being denatured.
B. pH changes are slowing the reaction.
C. The concentration of the substrate remains constant.
D. The reaction is increasing in speed.

44. What occurs in the induced fit model for enzyme catalysed reactions?
A. There is an exact fit between a specific substrate and a specific enzyme.
B. The enzyme can change shape to accommodate the substrate.
C. The substrate can change its shape to fit a number of enzymes.
D. Other substrates can bind away from the active site.

45. What determines the specificity of an enzyme for its substrate?
A. The temperature at which it is operating
B. The optimum pH of the enzymes
C. The concentration of the substrate
D. The structure of the enzyme molecule

46. The reaction below shows the energy changes in a chemical reaction.



What would happen to the changes in energy if this reaction was controlled by an enzyme?
A. I would increase.
B. II would decrease.
C. I and IV would decrease.
D. II and III would decrease.

47. Which statement describes how allosteric enzymes work?

	Reversible	Competitive inhibition	End-product inhibition	Active and inactive forms
A.	×	×	✓	✓
B.	✓	×	✓	✓
C.	✓	✓	×	✓
D.	×	✓	×	×

Key: ✓ = yes × = no

48. What effect do enzymes have on the activation energy of exergonic and endergonic reactions?

	Activation energy of exergonic reactions	**Activation energy of endergonic reactions**
A.	increases	increases
B.	decreases	decreases
C.	increases	decreases
D.	decreases	increases

Essays

1) Distinguish between the structure of DNA and RNA.

DNA	**RNA**
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....

(Total 3 marks)

3) Compare DNA transcription with translation.

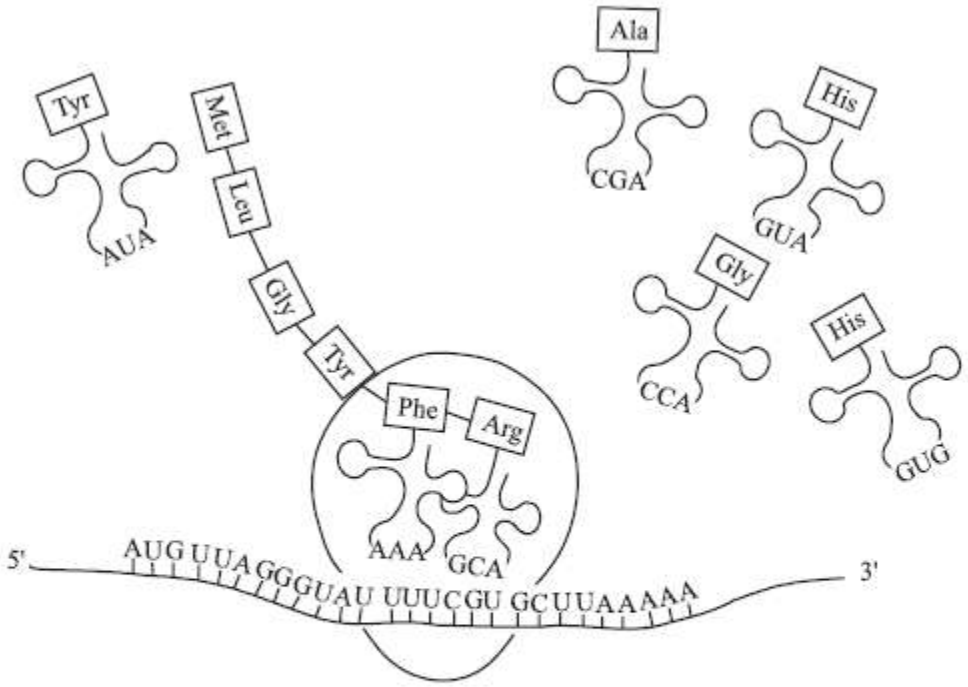
(Total 4 marks)

4) (a) The process of translation involves the use of transfer RNA (tRNA) and amino acids. Outline the structure of tRNA. *[4]*
(b) Draw the basic structure of an amino acid, and label the groups that are used in peptide bond formation.
(c) Explain the process of translation. *[9]*

5) The structure of the DNA double helix was described by Watson and Crick in 1953.
Explain the structure of the DNA double helix, including its subunits and the way in which they are bonded together.

(Total 8 marks)

6) The information needed to make polypeptides is carried in the mRNA from the nucleus to the ribosomes of eukaryotic cells. This information is decoded during translation. The diagram below represents the process of translation.



Key:	Ala = Alanine
Tyr = Tyrosine	Gly = Glycine
Met = Methionine	His = Histidine
Leu = Leucine	Phe = Phenylalanine

(a) Annotate the diagram to show the direction in which the ribosome moves during translation. [1]

(b) State the name of the next amino acid which will attach to the polypeptide. [1]

(c) Explain how the amino acid was attached to the tRNA. [3]

(d) Identify **two** locations within a eukaryotic cell where translation occurs. [1]

(a) Determine the mRNA sequence that is coded by the following strand of DNA.
Sense: A T G C T A G A C
T A C G A T C T G
mRNA: . . . . . *[1]*
(b) skip.
(c) Outline the structure of nucleosomes.