

(一)、選擇題，每題 3 分，共 60 分，所有考題務必在答案卷上作答。

1. Which of the following tripeptides would be most likely to be soluble in a hydrophilic solution like phosphate buffer?
  - A) N - phenylalanine- alanine-glycine-C
  - B) N - leucine - alanine - lysine - C
  - C) N - proline - phenylalanine - leucine - C
  - D) N - arginine - lysine - proline - C
  - E) N - glutamate - aspartate - glycine - C
2. Collagen fibrils are strengthened by covalent cross-links between \_\_\_\_\_ and \_\_\_\_\_ residues.
  - A) lysine, hydroxyproline
  - B) lysine, hydroxylysine
  - C) proline, lysine
  - D) proline, hydroxyproline
  - E) proline, hydroxylysine
3. How many carbons from 13 original glucose molecules enter the Krebs cycle in the absence of oxygen?
  - A) 78
  - B) 0
  - C) 13
  - D) 26
  - E) 52
4. What is the maximum number of 100 amino acid long polypeptides that could be made?
  - A) 20
  - B)  $20^{101}$
  - C)  $100^{20}$
  - D)  $20^{100}$
  - E) 2,000
5. You treat a partially purified preparation of protein with a reagent that breaks bonds between sulfur atoms. Which level(s) of protein structure are likely to be affected the most?
  - A) Both the tertiary and quaternary levels of structure
  - B) Both the secondary and tertiary levels of structure
  - C) Both the primary and secondary levels of structure
  - D) Tertiary and quaternary levels of structure
  - E) Quaternary levels of structure

(背面仍有題目,請繼續作答)

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6. How is the energy used to make ATP via the electron transport chain generated?
- A) Electrons bound to  $\text{FADH}_2$  are used to generate a proton gradient across the inner mitochondrial membrane.
  - B) Electrons bound to NADH are used to generate a proton gradient across the inner mitochondrial membrane.
  - C) Electrons bound to NADH are used to generate a  $\text{H}^+$  ion gradient across the inner mitochondrial membrane.
  - D) The energy from electrons bound to reduced coenzymes is used to create a steep electrochemical gradient.
  - E) all of the above
7. What is largely responsible for the negative charge on many oligosaccharide chains?
- A) glucose
  - B) galactose
  - C) glutamic acid
  - D) sialic acid
  - E) aspartic acid
8. The temperature at which a lipid bilayer shifts from a fluid state to a crystalline gel is called the \_\_\_\_\_.
- A) pH optimum
  - B) transition temperature
  - C) gelation temperature
  - D) transition series
  - E) temperature optimum
9. Which polysaccharide bond cannot be broken by mammalian enzymes that normally digest polysaccharides?
- A)  $\alpha(1\rightarrow6)$  glycosidic linkages
  - B) phosphate ester linkages
  - C)  $\beta(1\rightarrow6)$  glycosidic linkages
  - D)  $\beta(1\rightarrow4)$  glycosidic linkages
  - E)  $\alpha(1\rightarrow4)$  glycosidic linkages
10. Doubling the concentration of enzyme will \_\_\_\_\_ the  $V_{\max}$  and \_\_\_\_\_ the  $K_M$ .
- A) halve, halve
  - B) double, not alter
  - C) not change, not alter
  - D) not alter, double
  - E) double, double

11. The effect of a competitive inhibitor can be reversed by \_\_\_\_\_.
- A) massaging the enzyme
  - B) heating the reaction mixture
  - C) changing the pH
  - D) increasing inhibitor concentration
  - E) increasing substrate concentration
12. Enzymes work by \_\_\_\_\_.
- A) changing the free energy of the products and speeding up the reaction
  - B) raising the activation energy of a reaction and thus speeding up the reaction.
  - C) lowering the activation energy of a reaction and thus speeding up the reaction
  - D) raising the  $\Delta G$  of a reaction and thus speeding up the reaction
  - E) lowering the  $\Delta G$  of a reaction and thus speeding up the reaction
13. Glycolysis occurs in the \_\_\_\_\_; the Krebs (TCA) cycle occurs in the \_\_\_\_\_ of eukaryotes and the \_\_\_\_\_ of prokaryotes.
- A) cytoplasm, mitochondria, cytoplasm
  - B) cytoplasm, cytoplasm, cytoplasm
  - C) cytoplasm, photosynthesis, cytoplasm
  - D) cytoplasm, mitochondria, mitochondria
  - E) mitochondria, cytoplasm, mitochondria
14. You are studying two strands of DNA. They have exactly the same length, but the first one has a very high G + C/A + T ratio of 3.4. The second DNA strand has a more moderate G + C/A + T ratio of 2.3. Which of the two strands will have the highest melting temperature and why?
- A) the first strand because it contains fewer H bonds
  - B) the second strand because it contains fewer H bonds
  - C) neither since their melting temperatures are the same
  - D) the first strand because it contains more H bonds
  - E) the second strand because it contains more H bonds
15. Human topoisomerase II is a target for numerous drugs like etoposide and doxorubicin that are used to kill rapidly dividing cancer cells. How do the drugs work?
- A) The drugs bind to the enzyme and keep cleaved DNA strands from being resealed.
  - B) The drugs bind cofactors needed by the enzyme.
  - C) The drugs inhibit the Krebs cycle in cancer cells which indirectly affects human topoisomerase II.
  - D) The drugs cleave topoisomerase II between amino acids 44 and 45 in the polypeptide chain.
  - E) The drugs denature the enzyme.

(背面仍有題目,請繼續作答)

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16. What feature of mature mRNAs is thought to protect them from premature degradation by cellular exonucleases?
- A) exons
  - B) introns
  - C) consensus sequences
  - D) poly(A) tail
  - E) 5'-methylguanosine cap
17. DNA binding proteins often can read the sequence of nucleotides along the DNA without having to separate the chains. How do they do this?
- A) The conformations of the ribose sugars reflect the DNA sequence.
  - B) The conformations of the phosphate groups reflect the DNA sequence.
  - C) The DNA binding proteins often contain domains that fit into the DNA grooves.
  - D) The conformations of the deoxyribose sugars reflect the DNA sequence.
18. What type of DNA sequences is composed of short sequences of DNA 1 – 5 base pairs long in small clusters of 10 – 40 base pairs in length? These sequences are scattered quite evenly throughout human DNA.
- A) minisatellite DNAs
  - B) microsatellite DNAs
  - C) consensus sequences
  - D) satellite DNAs
19. Why would changes in the genes for transcription factors be expected to generate major phenotypic differences?
- A) They can affect the expression of large numbers of other genes.
  - B) Their gene products normally denature more rapidly than other gene products.
  - C) Their gene products are remarkably stable.
  - D) They can affect the expression of small numbers of other genes.
  - E) They are extremely powerful genes.
20. What is the major determinant of RNA folding?
- A) formation of complementary base pair regions
  - B) ionic bonds
  - C) hydrophobic interactions
  - D) van der Waals forces
  - E) hydrophobic interactions

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(二)、解釋下列名詞，每題 5 分，共 25 分，所有考題務必在答案卷上作答。

1. Proteasome
2. Frameshift mutations
3. Molecular chaperones
4. DNA methylation
5. Site-directed mutagenesis

(三)、回答下列問題，所有考題務必在答案卷上作答。

1. Describe three features of eukaryotic transcripts that generally are not shared with prokaryotic transcripts. (6%)
2. What is a cDNA microarray? How might microarray technology become a powerful weapon in the war on cancer? (9%)