

※ 注意：請於試卷內之「選擇題作答區」依序作答。(選擇題共 25 題，每題 4 分)

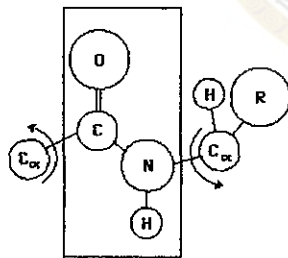
1. Titration of valine by a strong base, for example NaOH, reveals two  $pK$ 's. The titration reaction occurring at  $pK_2$  ( $pK_2 = 9.62$ ) is:

- A)  $-\text{COOH} + \text{OH}^- \rightarrow -\text{COO}^- + \text{H}_2\text{O}$   
 B)  $-\text{COOH} + -\text{NH}_2 \rightarrow -\text{COO}^- + -\text{NH}_3^+$   
 C)  $-\text{COO}^- + -\text{NH}_3^+ \rightarrow -\text{COOH} + -\text{NH}_2$   
 D)  $-\text{NH}_3^+ + \text{OH}^- \rightarrow -\text{NH}_2 + \text{H}_2\text{O}$   
 E)  $-\text{NH}_2 + \text{OH}^- \rightarrow -\text{NH}^- + \text{H}_2\text{O}$

2. Which of the following is correct with respect to the amino acid composition of proteins?

- A) Larger proteins have a more uniform distribution of amino acids than smaller proteins.  
 B) Proteins contain at least one each of the 20 different standard amino acids.  
 C) Proteins with different functions usually differ significantly in their amino acid composition.  
 D) Proteins with the same molecular weight have the same amino acid composition.  
 E) The average molecular weight of an amino acid in a protein increases with the size of the protein.

3. In the diagram below, the plane drawn behind the peptide bond indicates the:



- A) absence of rotation around the C—N bond because of its partial double-bond character.  
 B) plane of rotation around the C—N bond.  
 C) region of steric hindrance determined by the large C=O group.  
 D) region of the peptide bond that contributes to a Ramachandran plot.  
 E) theoretical space between  $-180$  and  $+180$  degrees that can be occupied by the  $\phi$  and  $\psi$  angles in the peptide bond.

4. Determining the precise spacing of atoms within a large protein is possible through the use of:

- A) electron microscopy  
 B) light microscopy  
 C) molecular model building  
 D) Ramachandran plots  
 E) x-ray diffraction

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5. An allosteric interaction between a ligand and a protein is one in which:

- A) binding of a molecule to a binding site affects binding of additional molecules to the same site.
- B) binding of a molecule to a binding site affects binding properties of another site on the protein.
- C) binding of the ligand to the protein is covalent.
- D) multiple molecules of the same ligand can bind to the same binding site.
- E) two different ligands can bind to the same binding site.

6. The concept of "induced fit" refers to the fact that:

- A) enzyme specificity is induced by enzyme-substrate binding.
- B) enzyme-substrate binding induces an increase in the reaction entropy, thereby catalyzing the reaction.
- C) enzyme-substrate binding induces movement along the reaction coordinate to the transition state.
- D) substrate binding may induce a conformational change in the enzyme, which then brings catalytic groups into proper orientation.
- E) when a substrate binds to an enzyme, the enzyme induces a loss of water (desolvation) from the substrate.

7. Chargaff's rules state that in typical DNA:

- A)  $A = G$
- B)  $A = C$
- C)  $A = U$
- D)  $A + T = G + C$
- E)  $A + G = T + C$

8. Which of the following is a palindromic sequence?

- A) AGGTCC  
TCCAGG
- B) CCTTCC  
GCAAGG
- C) GAATCC  
CTTAGG
- D) GGATCC  
CCTAGG
- E) GTATCC  
CATAGG

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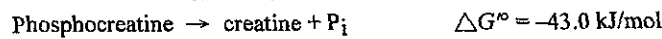
9. Compounds that generate nitrous acid (such as nitrites, nitrates, and nitrosamines) change DNA molecules by:
- A) breakage of phosphodiester bonds
  - B) deamination of bases
  - C) depurination
  - D) formation of thymine dimers
  - E) transformation of A to T
10. The PCR reaction mixture does *not* include:
- A) all four deoxynucleoside triphosphates
  - B) DNA containing the sequence to be amplified
  - C) DNA ligase
  - D) heat-stable DNA polymerase
  - E) oligonucleotide primer(s)
11. Which of the following molecules or substances contain, or are derived from, fatty acids?
- A) Beeswax
  - B) Prostaglandins
  - C) Sphingolipids
  - D) Triacylglycerols
  - E) All of the above contain or are derived from fatty acids.
12. An example of a glycerophospholipid that is involved in cell signaling is:
- A) arachidonic acid
  - B) ceramide
  - C) phosphatidylinositol
  - D) testosterone
  - E) vitamin A (retinol)
13. An integral membrane protein can be extracted with:
- A) a buffer of alkaline or acid pH
  - B) a chelating agent that removes divalent cations
  - C) a solution containing detergent
  - D) a solution of high ionic strength
  - E) hot water

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14. Steroid hormones are carried on specific carrier proteins because the hormones:

- A) are too unstable to survive in the blood on their own.
- B) cannot dissolve readily in the blood because they are too hydrophobic.
- C) cannot find their target cells without them.
- D) need them in order to pass through the plasma membrane.
- E) require subsequent binding to specific receptor proteins in the nucleus.

15. The standard free-energy changes for the reactions below are given.



What is the overall  $\Delta G^\circ$  for the following reaction?



- A)  $-73.5 \text{ kJ/mol}$
- B)  $-12.5 \text{ kJ/mol}$
- C)  $+12.5 \text{ kJ/mol}$
- D)  $+73.5 \text{ kJ/mol}$
- E)  $\Delta G^\circ$  cannot be calculated without  $K_{eq}$

16. If glucose labeled with  $^{14}\text{C}$  at C-1 (the aldehyde carbon) were metabolized in the liver, the first radioactive pyruvate formed would be labeled in:

- A) all three carbons
- B) both A and C
- C) its carbonyl carbon
- D) its carboxyl carbon
- E) its methyl carbon

17. Which of the following is true of glycogen synthesis and breakdown?

- A) Phosphorylation activates the enzyme responsible for breakdown, and inactivates the synthetic enzyme.
- B) Synthesis is catalyzed by the same enzyme that catalyzes breakdown.
- C) The glycogen molecule "grows" at its reducing end.
- D) The immediate product of glycogen breakdown is free glucose.
- E) Under normal circumstances, glycogen synthesis and glycogen breakdown occur simultaneously and at high rates.

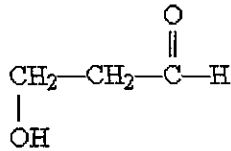
18. Which of the following is *not* an intermediate of the citric acid cycle?
- A) Acetyl-coA
  - B) Citrate
  - C) Oxaloacetate
  - D) Succinyl-coA
  - E)  $\alpha$ -Ketoglutarate
19. If the 16-carbon saturated fatty acid palmitate is oxidized completely to carbon dioxide and water (via the oxidation pathway and the citric acid cycle), and all of the energy-conserving products are used to drive ATP synthesis in the mitochondrion, the net yield of ATP per molecule of palmitate is:
- A) 3
  - B) 10
  - C) 25
  - D) 108
  - E) 1,000
20. Urea synthesis in mammals takes place primarily in tissues of the:
- A) brain
  - B) kidney
  - C) liver
  - D) skeletal muscle
  - E) small intestine
21. Uncoupling of mitochondrial oxidative phosphorylation:
- A) allows continued mitochondrial ATP formation, but halts  $O_2$  consumption.
  - B) halts all mitochondrial metabolisms.
  - C) halts mitochondrial ATP formation, but allows continued  $O_2$  consumption.
  - D) slows down the citric acid cycle.
  - E) slows the conversion of glucose to pyruvate by glycolysis.
22. Which of the following is derived from a sterol?
- A) Bile salts
  - B) Gangliosides
  - C) Geraniol
  - D) Phosphatidylglycerol
  - E) Prostaglandins

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23. Nonessential amino acids:

- A) are amino acids other than those required for protein synthesis.
- B) are not utilized in mammalian proteins.
- C) are synthesized by plants and bacteria, but not by humans.
- D) can be synthesized in humans as well as in bacteria.
- E) may be substituted with other amino acids in proteins.

24. What functional groups are present on this molecule?



- A) ether and aldehyde
- B) hydroxyl and aldehyde
- C) hydroxyl and carboxylic acid
- D) hydroxyl and ester
- E) hydroxyl and ketone

25. Phosphoric acid is tribasic, with  $pK_a$ 's of 2.14, 6.86, and 12.4. The ionic form that predominates at pH 3.2 is:

- A)  $\text{H}_3\text{PO}_4$
- B)  $\text{H}_2\text{PO}_4^-$
- C)  $\text{HPO}_4^{2-}$
- D)  $\text{PO}_4^{3-}$
- E) none of the above

試題隨卷繳回