# 國立成功大學

# 110學年度碩士班招生考試試題

編　號：60

系　所：生物科技與產業科學系

科　目：生物化學

日　期：0203

節　次：第 1 節

備　註：不可使用計算機

編號： 60 **國立成功大學 110 學年度碩士班招生考試試題**

系　　所：生物科技與產業科學系

考試科目：生物化學　　考試日期：0203，節次：1



※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

選擇題: (每題 3 分, 共 45 分)

Q1- What type of bond is very prevalent in lipids and gives lipids their hydrophobic properties?

A) C and O elements can form an ionic bond
B) Nonpolar covalent gives lipids their hydrophobic properties
C) A radioactive isotope usually carries more positive charges than an original element
D) A hydrogen bond is the bond in which valence electrons are shared between electronegative and electropositive atom.

Q2- One of the buffers that contribute to pH stability in human blood is carbonic acid ($H_2CO_3$). Carbonic acid is a weak acid that, when placed in an aqueous solution, dissociates into a bicarbonate ion ($HCO_3^-$) and a hydrogen ion ($H^+$).

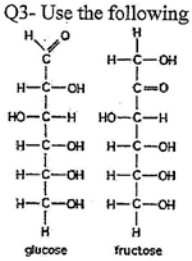
$H_2CO_3 \rightleftharpoons HCO_3^- + H^+$

Carbonic acid　Bicarbonate ion　Hydrogen ion

If the pH of blood drops, one would expect _____.

A) a decrease in the concentration of $H_2CO_3$ and an increase in the concentration of $HCO_3^-$
B) the concentration of bicarbonate ions ($HCO_3^-$) to increase
C) the $HCO_3^-$ to act as an acid and remove excess $H^+$ by the formation of $H_2CO_3$
D) the $HCO_3^-$ to act as a base and remove excess $H^+$ by the formation of $H_2CO_3$

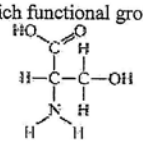
Q3- Use the following figure to answer the question.




The figure shows the structures of glucose and fructose. These two molecules are _____.

A) isotopes
B) enantiomers
C) structural isomers
D) *cis-trans* isomers

Q4- Which functional group is *not* present in this molecule?



A) carboxyl
B) hydroxyl
C) methyl
D) amino

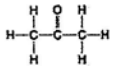
# 國立成功大學 110 學年度碩士班招生考試試題

系　　所：生物科技與產業科學系

考試科目：生物化學　　考試日期：0203，節次：1



Q5- Use the figures to answer the question.

A. 
B. 
C. 
D. 

Which molecule shown has a carbonyl functional group in the form of an aldehyde?

A) A
B) B
C) C
D) D

Q6- What is the major structural difference between starch and glycogen?

A) the types of monosaccharide subunits in the molecules
B) the type of glycosidic linkages in the molecule
C) whether glucose is in the α or β form
D) the amount of branching that occurs in the molecule

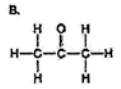
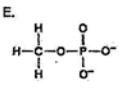
Q7 Which parts of the amino acids X and Y are involved in the formation of a peptide bond? X—Y

A) amino group of X and carboxyl group of Y
B) carboxyl group of X and side chain of Y
C) carboxyl group of X and amino group of Y
D) side chains of both X and Y

Q8- A series of enzymes catalyze the reactions in the metabolic pathway X → Y → Z → A. Product A binds to the enzyme that converts X to Y at a position remote from its active site. This binding decreases the activity of the enzyme. With respect to the enzyme that converts X to Y, substance A functions as _____.

A) an allosteric inhibitor
B) the substrate
C) an intermediate
D) a competitive inhibitor

Q9- Use the figures to answer the question.

A. 
B. 
C. 
D. 
E. 

Which molecules shown are ionized in a cell?

A) A + B + C
B) C + D + E
C) A + C + E
D) B + D + E

Q10- Cytochalasin D is a drug that prevents actin polymerization. A cell treated with cytochalasin D will NOT inhibit which following processes?

A) divide in two
B) contract muscle fibers
C) extend pseudopodia
D) move vesicles within a cell

Q11- For the virous PCR modifications, which aim to amplify DNA without purification?

A) Direct or colony PCR
B) Real-time or quantitative PCR
C) Droplet PCR

D) Nested PCR

Q12- For the monoclonal antibody, which statement is WRONG?
A) More suitable for therapeutic purpose
B) Bind to single epitope
C) Direct purified from serum
D) Low batch to batch variations

Q13- For the Sanger sequencing, which statement is WRONG?
A) Invented by Frederick Sanger in 1977 and still using today
B) Also known as chain termination method
C) Become a fundamental for human genome project
D) Do not require DNA amplification/cloning

Q14- For the protein A or G, which statement is WRONG?
A) Certain bacteria used to mimic antibody
B) Binds to antibody
C) Frequently used in antibody isolation
D) Binds to Fc region of the antibody

Q15- What is the most ideal procedure to isolate plasmid?
A) Remove protein → Binding of the plasmid → Remove RNA and genomic DNA → Wash → Elution
B) Remove protein, RNA, and genomic DNA → Binding of the plasmid → Wash → Elution
C) Remove RNA and genomic DNA → Binding of the plasmid → Wash → Elution
D) Binding of the plasmid → Wash → Elution

簡答題: (共 55 分)

1. What is the disulfide bond? (5%) and how to disrupt the disulfide bond? (5%)
2. Please draw the TCA cycle (or called tricarboxylic acid cycle and the Krebs cycle) started from the acetyl-CoA, including the energy consumption or the releasing of water, NADH and carbon dioxide, etc. (15%)
3. Please describe the principle of SDS-PAGE (sodium dodecyl sulfate polyacrylamide gel electrophoresis) for separating proteins. (15%)
4. From the following data to calculate the Km and total enzyme amount (μmol) based on the Michaelis-Menten equation. The turnover for an enzyme is known to 5000 $min^{-1}$. (15%)

| Substrate concentration (mM) | Initial velocity (μmol/min) |
|---|---|
| 1 | 129 |
| 2 | 199 |
| 4 | 351 |
| 6 | 499 |
| 100 | 695 |
| 1000 | 700 |