

I. 單選題 (每題 2 分, 共 30 分)

- Which of the following acid/conjugate base pairs has the highest buffering capacity at pH 7.0?
 - Lactic acid/lactate ion, $pK_a = 3.86$
 - Monobasic phosphate/dibasic phosphate, $pK_a = 6.86$
 - Imidazole, imidazolium ion, $pK_a = 6.1$
 - Acetic acid/acetate ion, $pK_a = 4.76$
 - Bicarbonate ion/carbonate ion, $pK_a = 10.25$
- Which residue in globular proteins is a common site of phosphorylation?
 - Serine
 - Aspartate
 - Glutamine
 - Lysine
 - Arginine
- In the standard protocol for polyacrylamide gel electrophoresis in the presence of sodium dodecyl sulfate(SDS), the amount of SDS that binds to each protein depends primarily on:
 - the concentration of SDS
 - the isoelectric point of the protein
 - the pH of the gel buffer
 - the number of lysine and arginine residues in the protein
 - the molecular weight of the protein
- The rate of transport of a substance into a cell is drastically reduced when the formation of ATP is blocked. The transport system must be a form of:
 - simple diffusion
 - active transport
 - facilitated diffusion
 - both active transport and simple diffusion
 - both simple and facilitated diffusion
- The ability of a cell membrane to allow hydrophilic molecules to pass into a cell is determined by:
 - peripheral membrane proteins
 - integral membrane proteins
 - peripheral membrane carbohydrates
 - integral membrane carbohydrates
 - peripheral membrane lipids

(背面仍有題目,請繼續作答)

6. Estrogen and testosterone are steroid hormones, and are most likely to bind to:
 - A. membrane ion channel
 - B. enzyme linked membrane receptor
 - C. G-protein linked membrane receptor
 - D. cytoplasmic receptors

7. Conversion of glycogen to pyruvate need the following enzymes except:
 - A. phosphoglucomutase
 - B. glucantransferase
 - C. glycogen phosphorylase
 - D. sucrase

8. Free palmitate is degraded through β -oxidation in animal cells. If palmitate and C^{14} -coenzymeA are added to a liver homogenate, the radioactive labeled palmitoyl-CoA will be in which cellular fractions?
 - A. mitochondria
 - B. cytosol
 - C. glyoxysome
 - D. peroxisome
 - E. endoplasmic reticulum (ER)

9. Catabolism of amino acids can take place in the liver, except the following amino acids are only degraded in extrahepatic tissues:
 - A. valine
 - B. glycine
 - C. leucine
 - D. isoleucine
 - E. serine

10. What is the immediate precursor of thymidylate?
 - A. dCDP
 - B. dUMP
 - C. dCTP
 - D. dUDP

11. What is biosynthesized from inosinate?
 - A. XMP
 - B. TMP

- C. CMP
D. UMP
12. What is the immediate biosynthesis from α -Ketoglutarate?
A. Glutamine
B. Proline
C. Arginine
D. Glutamate
13. The antibodies diversity is created from immunoglobulin genes by:
A. gene recombination
B. gene repair
C. gene translocation
D. gene deletion
14. Following which reads the information encoded in the mRNA and transfers the appropriate amino acid to growing polypeptide chain during protein synthesis:
A. transfer RNA
B. ribosomal RNA
C. ribozyme
D. topoisomerase
15. The retrovirus that infect animal cells carry which enzyme within the viral particle:
A. RNA-dependent DNA polymerase
B. RNA-dependent RNA polymerase
C. DNA-dependent DNA polymerase
D. DNA-dependent RNA polymerase called reverse transcriptase

(背面仍有題目,請繼續作答)

II. 複選題 (每題 2 分, 全對才給分, 答錯不倒扣; 共 20 分)

- From the abbreviated name of the compound Gal(beta1->4)Glc, we know that
 - both sugars are beta anomers
 - the glucose residue is at the reducing end
 - the sugars are joined by a glycosidic bond
 - the compound is a D-enantiomer
- Changing 4 alanine residues in a protein to prolines would probably alter:
 - the primary structure
 - the secondary structure
 - the tertiary structure
 - nothing since alanine and proline are conservative substitutions
- Which of the following is a typical event associated with cell signaling?
 - Activation of G-proteins by exchanging GTP for GDP
 - Activation of protein kinases
 - Stimulation of apoptosis
 - Release of calcium ions from cell membranes
 - Production of the second messengers cAMP and IP3
- Following statements which are true?
 - DNA is hydrolyzed by alkali.
 - Polypurine tracts arranged in mirror repeats can assume a triple-helical H-DNA structure.
 - A strand of duplex DNA has a (A+T)/(C+G) ratio of 0.6. The ratio in the complementary strand is 1.67.
 - The absorption of UV light increases when double-stranded DNA is denatured.
- What is the degradation products of palmitic acid during the stage of β -oxidation in animal cells:
 - O₂
 - ATP
 - FADH₂
 - NADH
 - Acetyl CoA
 - H₂O

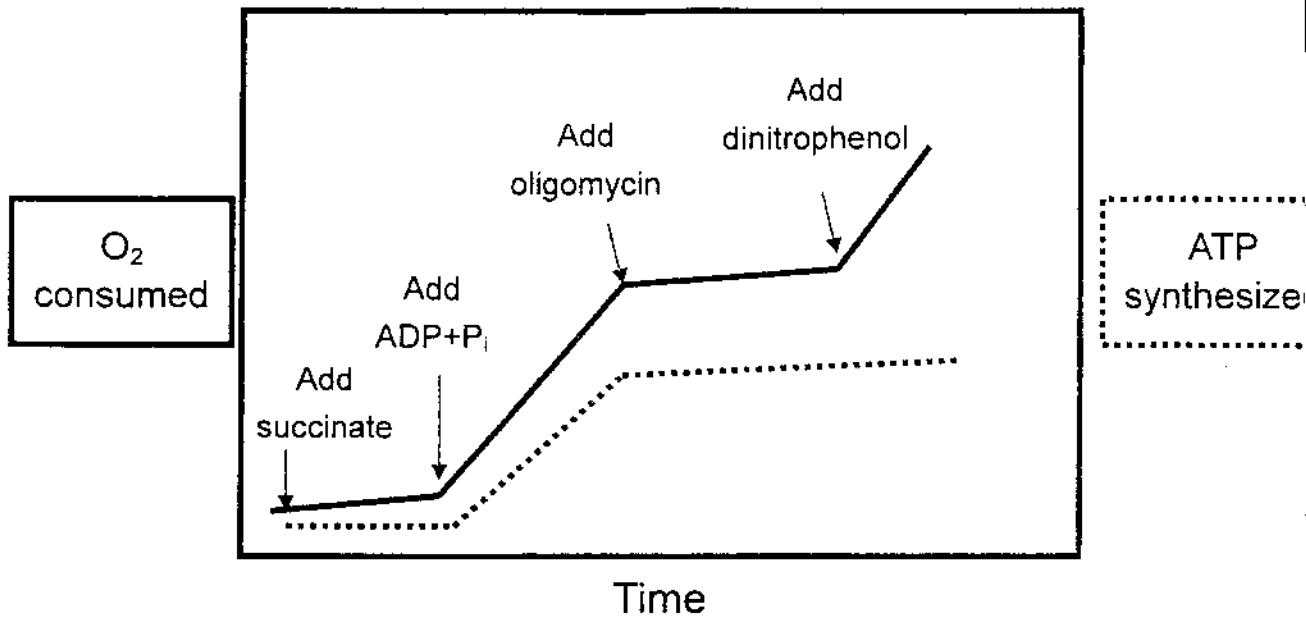
6. Following enzymes which is (are) catalyzed irreversible reactions in citric acid cycle:
- A. fumarase
 - B. aconitase
 - C. citrate synthase
 - D. isocitrate dehydrogenase
 - E. succinate dehydrogenase
7. Can hormones be classified by the way they get from the point of their release to their target tissue?
- A. Endocrine
 - B. Paracrine
 - C. Autocrine
 - D. Exocrine
8. What cells involve to the islets of Langerhans?
- A. α cell
 - B. β cell
 - C. χ cell
 - D. δ cell
9. Following methods which can be used to examine the protein expression during microbial infection?
- A. Western blot
 - B. Proteomics
 - C. Northern blot
 - D. ELISA
10. Which processes or elements are required for gene expression?
- A. RNA editing
 - B. RNA splicing
 - C. polyA tail addition
 - D. stop codon

III. 簡答題 (每題 5 分, 共 50 分)

1. A mixture of five proteins whose properties are listed below is loaded on a negatively charged column at pH 7. The column is eluted by increasing the salt concentration. What is the likely order of elution of the proteins from the column?

Protein	MW	pI
I.	10,000	12.4
II.	21,000	8.4
III.	45,000	9.5
IV.	98,000	10.6
V.	115,000	7.9

2. What is a holo enzyme?
3. What is the driving force for the formation of a lipid bilayer? Once it formed the membrane, what forces are involved in stabilizing the membrane structure?
4. The redox reaction
- $$\text{Pyruvate} + \text{NADH} + \text{H}^+ \rightleftharpoons \text{lactate} + \text{NAD}^+$$
- the E° values for the NAD^+/NADH and pyruvate/lactate redox pairs are -32 and -19 V, respectively.
- (a) Which is the strong oxidizing agent? Explain it.
- (b) What is the ΔE and the standard free-energy ΔG° at 25°C ?
- (c) What is the equilibrium constant for the reaction?
- (Faraday constant $96.5 \text{ kJ/V} \cdot \text{mol}$, gas constant $8.315 \text{ J/mol} \cdot \text{K}$)
5. Following figure is the result of an experiment which shows the relationship of O_2 consumption versus ATP formation in intact mitochondria *in vitro* with adding succinate; ADP + Pi; oligomycin (ATPase inhibitor); dinitrophenol (uncoupler) at different time point. Please describe the meaning of this figure?



6. Please describe or draw how ammonia is converted into urea in human.
7. Please describe how ethanol is oxidized to acetaldehyde in the liver.
8. A protein isolated from grouper brain has 215 amino acid residues, and it is encoded by a gene with 1,850 base pairs. Explain the relationship between the number of amino acid residues in the protein and the number of nucleotide pairs in its gene.
9. Do you know why the RNA virus replication have higher error rate than DNA virus?
10. What is DNA microarray? Why it is a very powerful tool for functional genomic study?