

亞洲大學

97 學年度碩士班入學招生考試試題紙

學系別	考試科目	考試日期	時 間
生物科技學系碩士班	生物化學(A-2)	97.4.26	10:40-12:20

Part I. Multiple choice Question (單選題): 30%

1. Tryptophan operon is regulated by:
(A) allosteric regulation (B) feedback regulation
(C) attenuation regulation (D) all of the above
2. When lactose concentration is high, lac operon is:
(A) activated by dissociating from repressor protein.
(B) activated by associating with repressor protein.
(C) inhibited by dissociating from repressor protein.
(D) inhibited by associating with repressor protein.
3. What is the direction for DNA and RNA synthesis, respectively?
(A) 5' to 5' and 5' to 5'
(B) 5' to 3' and 5' to 3'
(C) 5' to 5' and 5' to 3'
(D) 5' to 3' and 5' to 5'
4. The concept of "induced fit" refers to the fact that:
(A) enzyme-substrate binding induces movement along the reaction coordinate to the transition state.
(B) enzyme-substrate binding induces an increase in the reaction entropy, thereby catalyzing the reaction.
(C) substrate binding may induce a conformational change in the enzyme, which then brings catalytic groups into proper orientation.
(D) when a substrate binds to an enzyme, the enzyme induces a loss of water (desolvation) from the substrate.
5. By adding SDS (sodium dodecyl sulfate) during the electrophoresis of proteins, it is possible to:
(A) measure an enzyme's specific activity.
(B) preserve a protein's native structure and biological activity.
(C) determine a protein's isoelectric point.
(D) separate proteins exclusively on the basis of molecular weight.

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6. In the Watson-Crick structure of DNA, the:
- (A) adenine content of one strand must be equivalent to the thymine content in both the same strand and the complementary strand.
 - (B) purine content (fraction of bases that are purines) must be the same in both strands.
 - (C) two strands are antiparallel.
 - (D) 2'-hydroxyl groups in ribose sometimes participate in hydrogen bonding.
7. In an α helix, the R groups on the amino acid residues:
- (A) stack within the interior of the helix.
 - (B) alternate between the outside and the inside of the helix.
 - (C) generate the hydrogen bonds that form the helix.
 - (D) are found on the outside of the helix spiral.
8. The structural classification of proteins (based on motifs) is based primarily on their:
- (A) subunit content and arrangement.
 - (B) amino acid sequence.
 - (C) evolutionary relationships.
 - (D) secondary structure content and arrangement.
9. The interactions of ligands with proteins:
- (A) are relatively rare in biological systems.
 - (B) are usually transient.
 - (C) usually result in the inactivation of the proteins.
 - (D) are relatively non-specific.
10. Generation of antibody diversity occurs in part as a result of:
- (A) alternative mRNA splicing.
 - (B) DNA recombination.
 - (C) transcription errors.
 - (D) translation errors.

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11. After one hour of electrophoresis in an agarose gel at a field strength of 5 volts/cm, one DNA fragment migrated 10 cm while another DNA fragment migrated only 6 cm. From this information you can conclude:

- (A) that the DNA that migrated 10 cm is larger than the DNA that migrated 6 cm.
- (B) that the DNA that migrated 10 cm is smaller than the DNA that migrated 6 cm.
- (C) nothing about the sizes of the DNA fragments without information about the migration of DNA size standards.
- (D) that the experiment failed.

12. Hydrophobic interactions make important energetic contributions to:

- (A) membrane structure.
- (B) three-dimensional folding of a polypeptide chain.
- (C) binding of a hormone to its receptor protein.
- (D) All of the above are true.

13. Which of the following is true about the difference between fatty acid degradation and biosynthesis?

- (A) Fatty acid degradation is in cytosol while its biosynthesis is in mitochondria.
- (B) Fatty acid degradation starts at carboxyl end while its biosynthesis starts at methyl end.
- (C) The final product for fatty acid degradation is propionyl CoA while the final product for its biosynthesis is acetyl CoA.
- (D) The malonyl-CoA is involved in the fatty acid degradation, but the malonyl-CoA is not involved in its biosynthesis.

14. Acetyl-CoA for de novo fatty acid biosynthesis is formed by the energy-dependent cleavage of:

- (A) pyruvate.
- (B) oxaloacetate.
- (C) citrate.
- (D) α -ketoglutarate.

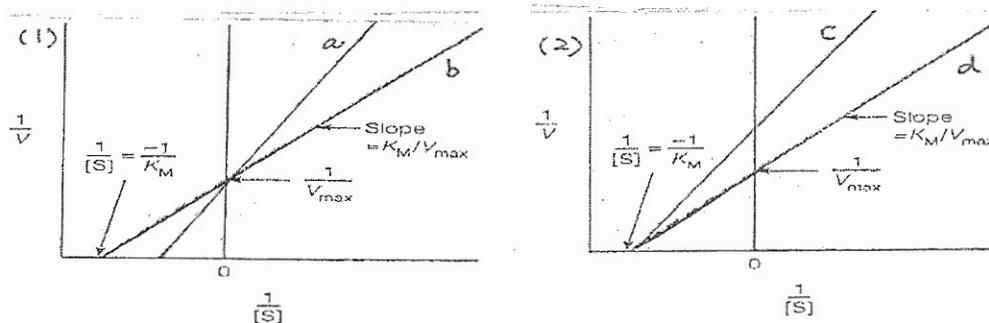
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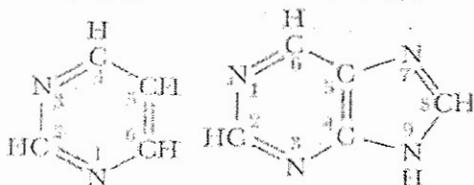
15. Which lines are the inhibitor lines (with inhibitors) for Plot (1) and (2) below, respectively?

- (A) a, c (B) b, d (C) a, d (D) b, c



16. The structures of purine and pyrimidine are shown below. The N atom at the position 1 of a purine molecule comes from:

- (A) glutamine (B) glycine (C) aspartate (D) tyrosine



17. The process of long chain fatty acid oxidation in liver is regulated in part by the interaction of:

- (A) acetyl-CoA with carnitine acyl transferase I.
 (B) acetyl-CoA with carnitine acyl transferase II.
 (C) malonyl-CoA with carnitine acyl transferase I.
 (D) malonyl-CoA with carnitine acyl transferase II.

18. Which is responsible for DNA replication in eukaryotic mitochondria?

- (A) DNA polymerase α (B) DNA polymerase β
 (C) DNA polymerase γ (D) DNA polymerase δ

19. Which of the following are trans-acting elements?

- (A) hormone responsive elements (B) enhancers
 (C) transcription factors (D) operon

20. Which are the two subunits for eukaryotic ribosome?

- (A) 30S, 50S (B) 40S, 60S (C) 30S, 70S (D) 40S, 80S

21. How many net ATPs will be generated after one glucose molecule is oxidized completely to CO_2 and H_2O in muscle?

- (A) 26 (B) 28 (C) 30 (D) 32

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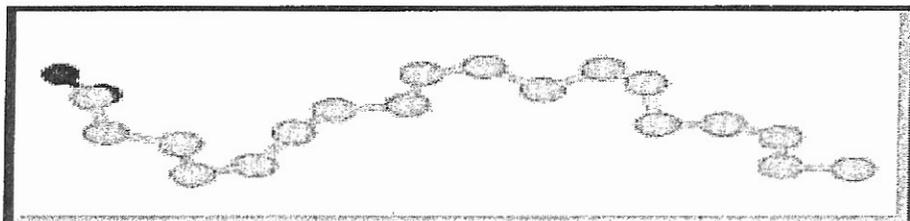
22. Continuing from the above question, which shuttle mechanism is used for transport the metabolite between mitochondria and cytosol in muscle?
(A) glycerol-phosphate shuttle (B) pyruvate-oxaloacetate shuttle
(C) citrate-succinate shuttle (D) malate-aspartate shuttle
23. Deamination of 5-methyl cytosine leads to:
(A) C to A transversion mutations (B) C to A transition mutations
(C) G to A transversion mutations (D) G to A transition mutations
24. If the fifth carbon of the glucose is labeled with radioisotope, which of the following is not radioactive?
(A) glyceraldehyde-3-phosphate (B) dihydroxyacetone phosphate
(C) pyruvate (D) phosphoenolpyruvate
25. Which of the following proceeds at the inner membrane of mitochondria?
(A) succinate → fumarate (B) phosphoenolpyruvate → pyruvate
(C) glucose-6-phosphate → glucose (D) none of the above
26. Continuing from the above question, how many ATP can the energy generated through this process be converted to through electron transport and oxidative phosphorylation in mammalian cells?
(A) 0.5 ATP (B) 1.5 ATP (C) 2.5 ATP (D) 3.5 ATP
27. Continuing from the above question, the sequence for the electron transport chain will be :
(A) Complex I → coenzyme Q → complex III → cytochrome c → complex IV
(B) Complex II → coenzyme Q → complex III → cytochrome c → complex IV
(C) Complex III → coenzyme Q → complex II → cytochrome c → complex IV
(D) Complex IV → coenzyme Q → complex III → cytochrome c → complex I

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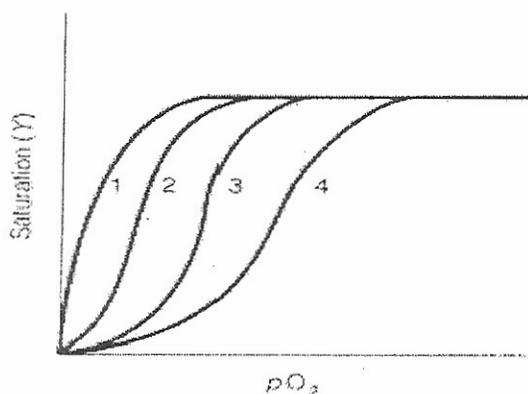
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28. The figure shown below is a ball-and-stick representation of the crystal structure of a lipid (Note that the H atoms, which are often not evident in X-ray crystallography, are not shown). This lipid is:



- (A) linolenic acid (B) palmitic acid
 (C) triacylglycerol (D) phosphatidylethanolamine

29. Several oxygen dissociation curves are listed in the figure below.



If curve #2 indicates the purified hemoglobin in a solution containing physiological concentration of CO₂ and BPG at pH 7.0, then which curve should represent the oxygen dissociation curve when the pH increases?

- (A) 1 (B) 2 (C) 3 (D) 4

30. What is the abbreviation for
 $\text{CH}_3(\text{CH}_2)_4\text{CH}=\text{CH}(\text{CH}_2)\text{CH}=\text{CH}(\text{CH}_2)_7\text{COOH}$?

(A) 18:2 Δ 9,10,12,13 (B) 18:2 Δ 9,12
 (C) 18:2 Δ 6,7,9,10 (D) 18:2 Δ 6,9

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Part II. Short answer questions (簡答題): 70%

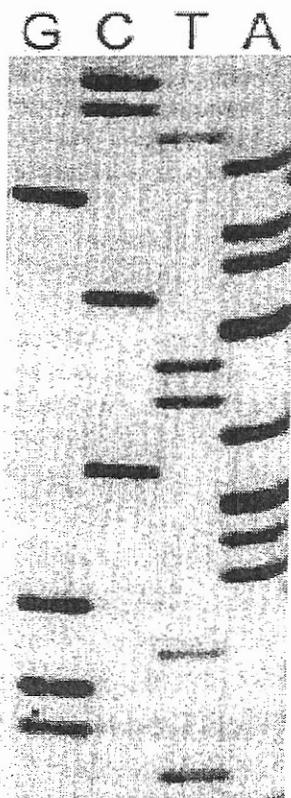
1. Describe one method used to separate proteins by their size and one method to separate proteins by their charge. In each case, describe the basis of separation and indicate if the method is primarily for purposes of purification or analysis. (10%)
2. Dr. Mark treated an unknown disaccharide with α -glucosidase, β -galactosidase, α -fructosidase and β -fructosidase and found that only β -galactosidase could hydrolyze this disaccharide. What was the disaccharide Dr. Mark analyzed? Explain your answer. (5%)
3. Dr. Allen hydrolysed a polysaccharide to get a collection of disaccharides, trisaccharides, tetrasaccharides, *etc.* She found that all disaccharide fraction consisted of only one kind of molecule---cellobiose. Based on these findings, what was the polysaccharide Dr. Allen analyzed? Explain your answer. (5%).
4. Below are the peptide fragments generated after CNBR or pepsin treatment.
CNBR treatment: Arg-Thr
Phe-Ser-Met
Arg-Thr-Phe-Arg-Thr-Met
Pepsin treatment: Arg-Thr
Phe-Ser-Met
Phe-Arg-Thr-Met
What is the complete amino acid sequence of this polypeptide? (5%)
5. The photo shown below is the result of a DNA sequence gel using the Sanger method.
 - (1) Explain the principle for Sanger method. (10%)
 - (2) Write out the correct DNA sequence of the template strand. You must indicate the orientation of the sequence in your answer. (10%)

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Top



Bottom

6. One human gene sequence is listed below.

5'-ATGCCGTAAGTACACAATTTCTCAGTTACCATGGAGTAAGTC
GCTACGATATGCACAGAGTGACTGATTGAAGCTAACATAATA
AACCATTCGACTAA-3'

- (1) How many introns are there in this gene? (5%)
- (2) Write out the mature RNA sequence for this gene. (10%)
- (3) Using the genetic code provided, write out 2 possible polypeptides translated from the mature RNA sequence. (10%)

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The Genetic Code

First Position	Second Position				Third Position
5' end	U	C	A	G	3' end
U	Phe	Ser	Tyr	Cys	U
	Phe	Ser	Tyr	Cys	C
	Leu	Ser	STOP	STOP	A
	Leu	Ser	SeCys; STOP	Trp	G
C	Leu	Pro	His	Arg	U
	Leu	Pro	His	Arg	C
	Leu	Pro	Gln	Arg	A
	Leu	Pro	Gln	Arg	G
A	Ile	Thr	Asn	Ser	U
	Ile	Thr	Asn	Ser	C
	Ile	Thr	Lys	Arg	A
	Met	Thr	Lys	Arg	G
G	Val	Ala	Asp	Gly	U
	Val	Ala	Asp	Gly	C
	Val	Ala	Glu	Gly	A
	Val	Ala	Glu	Gly	G