

國立中央大學104學年度碩士班考試入學試題

所別：企業管理學系碩士班 一般乙組(一般生)

科目：生物化學(含分子生物學)

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*請在答案卷(卡)內作答

參考用

Part I. Multiple choice questions (total 62%): each of questions or incomplete statements below is followed by five suggested answers or completions. Select the one that is best in each case.

- All glycosaminoglycans contain which of the following?
 - a sulfate ester
 - a $\beta(1\rightarrow4)$ glycosidic bond
 - a carboxylate
 - an amine group that is either acetylated or sulfated
 - all of the above
- Which one of the following is **TRUE** of the pentoses found in nucleic acids?
 - C-5 and C-1 of the pentose are joined to phosphate groups.
 - C-5 of the pentose is joined to a nitrogenous base, and C-1 to a phosphate group.
 - The pentoses are always in the β -furanose forms.
 - The bond that joins nitrogenous bases to pentoses is an *O*-glycosidic bond.
 - The straight-chain and ring forms undergo constant interconversion.
- Which of the following statements is **NOT TRUE** concerning glycolysis in anaerobic muscle?
 - It is an endergonic process.
 - It results in net synthesis of ATP.
 - It results in synthesis of NADH.
 - Its rate is slowed by a high [ATP]/[ADP] ratio.
 - Fructose 1,6-bisphosphatase is one of the enzymes of the pathway.
- Which one of the following statements is **TRUE** of enzyme catalysts?
 - Their catalytic activity is independent of pH.
 - They are generally equally active on D and L isomers of a given substrate.
 - They can increase the equilibrium constant for a given reaction by a thousand-fold or more.
 - They can increase the reaction rate for a given reaction by a thousand-fold or more.
 - To be effective, they must be present at the same concentration as their substrate.
- Which one of the following directly results in the activation of glycogen synthase?
 - Binding of glucose-6-phosphate
 - Dephosphorylation of multiple residues by phosphoprotein phosphorylase-1 (PP1)
 - Phosphorylation of specific residues by casein kinase II (CKII)
 - Phosphorylation of specific residues by glycogen synthase kinase-3 (GSK-3)
 - The presence of insulin
- Which combination of cofactors is involved in the conversion of pyruvate to acetyl-CoA?
 - Biotin, FAD, and TPP
 - Biotin, NAD^+ , and FAD
 - NAD^+ , biotin, and TPP
 - Pyridoxal phosphate, FAD, and lipoic acid
 - TPP, lipoic acid, and NAD^+
- In the Watson-Crick model of DNA structure:
 - both strands run in the same direction, $3' \rightarrow 5'$; they are parallel.
 - phosphate groups project toward the middle of the helix, where they are protected from interaction with water.
 - T can form three hydrogen bonds with either G or C in the opposite strand.
 - the distance between the sugar backbone of the two strands is just large enough to accommodate either two purines or two pyrimidines.
 - the distance between two adjacent bases in one strand is about 3.4 Å.

注意：背面有試題

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8. Why is it *surprising* that the side chains of tryptophan residues in proteins can interact with lectins?
- (a) because the side chain of tryptophan is hydrophilic and lectins are hydrophobic.
 - (b) because the side chain of tryptophan is (-) charged and lectins are generally (+) charged or neutral.
 - (c) because the side chain of tryptophan can make hydrogen bonds and lectins cannot.
 - (d) because the side chain of tryptophan is hydrophobic and lectins are generally hydrophilic.
 - (e) None of the above.
9. What is the general reaction type catalyzed by most of the sirtuins?
- (a) deadenylation
 - (b) deacetylation
 - (c) dehydrogenation
 - (d) deamination
 - (e) dehydration
10. Which of the following statements concerning the β oxidation of fatty acids is **TRUE**?
- (a) About 1,200 ATP molecules are ultimately produced per 20-carbon fatty acid oxidized.
 - (b) One FADH_2 and two NADH are produced for each acetyl-CoA.
 - (c) The free fatty acid must be carboxylated in the β position by a biotin-dependent reaction before the process of β oxidation commences.
 - (d) The free fatty acid must be converted to a thioester before the process of β oxidation commences.
 - (e) Two NADH are produced for each acetyl-CoA.
11. In the human genetic disease maple syrup urine disease, the metabolic defect involves:
- (a) a deficiency of the vitamin niacin.
 - (b) oxidative decarboxylation.
 - (c) synthesis of branched chain amino acids.
 - (d) transamination of an amino acid.
 - (e) uptake of branched chain amino acids into liver.
12. In the nitrogen fixation process, which step of the electron transfer process requires ATP hydrolysis?
- (a) transfer of electron from ferredoxin to the 4Fe-4S complex
 - (b) transfer of electron from 4Fe-4S complex to the P cluster
 - (c) transfer of electron from P cluster to iron-molybdenum cofactor (FeMo-co)
 - (d) transfer of electron from FeMo-co to nitrogen
 - (e) none of the above
13. The synthesis of which of the following molecules would be inhibited by aspirin?
- (a) prostaglandin F_2
 - (b) prostaglandin D_2
 - (c) prostaglandin E_2
 - (d) prostaglandin H_2
 - (e) all of the above
14. Which of the following is accomplished in one enzyme catalyzed reaction?
- (a) progesterone to androstenedione
 - (b) 17-hydroxyprogesterone to cortisol
 - (c) progesterone to aldosterone
 - (d) androstenedione to testosterone
 - (e) androstenedione to estradiol
15. Which enzyme of the pyrimidine synthesis pathway is the most highly regulated?
- (a) carbamoyl phosphate synthetase
 - (b) aspartate transcarbamoylase
 - (c) orotate phosphoribosyltransferase

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- (d) UMP kinase
- (e) nucleoside diphosphate kinase

16. Which of the following statements are **NOT TRUE** concerning the structures of myoglobin and hemoglobin?

- (a) The tertiary structure of myoglobin is similar to that of a subunit of hemoglobin
- (b) Myoglobin contains one binding site for oxygen per molecule
- (c) Myoglobin contains one binding site for oxygen per heme
- (d) Hemoglobin contains one binding site for oxygen per molecule
- (e) Hemoglobin contains one binding site for oxygen per heme

17. Which of the following statements is **TRUE** concerning integral membrane proteins?

- (a) Hydrophobic interactions anchor them within the membrane
- (b) Ionic interactions and hydrogen bonds occur between the protein and the fatty acyl chains of the membrane lipids
- (c) These proteins can be solubilized by solution of high ionic strength
- (d) Hydropathy plots can be used to determine the amino acid sequence of the protein
- (e) All of the above

18. Which of the following descriptions about the nucleotide excision repair is **NOT TRUE**?

- (a) Damaged nucleotides are removed by nick translation
- (b) The first enzyme in this pathway cleaves two phosphodiester bonds
- (c) This system is chiefly responsible for the mutagenic effect of ultraviolet light
- (d) This process begins up to a kbp away from the site to be repaired
- (e) Deficiency of this enzyme in humans greatly increases the risk of skin cancer

19. Which of the following descriptions about the initiation of eukaryotic DNA replication is **NOT TRUE**?

- (a) ORC recognizes replication origins
- (b) Cdc18 and Cdt1 binding to recruit MCM
- (c) MCM binds to DNA and unwinds DNA, so it has a helicase activity
- (d) Cdc45 binding to form pre-initiation complex
- (e) Pre-Replicative complex (Pre-RC) formation occurs in S phase

Questions 20-24 refer to the following proteins for translation (10%)

- (a) IF-2
- (b) EF-Tu
- (c) EF-Ts
- (d) EF-G
- (e) RF-2

20. Which protein exchanges GDP with GTP of GTP binding protein _____

21. In an *E. coli* cell, what protein factor is responsible for translocation _____

22. Which protein recognizes stop codon UAA _____

23. Which protein factor is responsible for delivering each aminoacyl-tRNA to the ribosome? _____

24. In an *E. coli* cell, what protein factor is responsible for attaching the initiator tRNA? _____

Questions 25-31 refer to the following eukaryotic proteins for transcription (16%)

- (a) TBP/TFIID
- (b) TFIIF
- (c) TFIIH
- (d) RNA polymerase I
- (e) RNA polymerase II

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25. 28S rRNA is synthesized by _____
26. mRNA is synthesized by _____
27. Promoter is recognized by _____
28. Which protein associates with poly II through termination _____
29. During synthesis of mRNA, DNA unwinding requires _____
30. Polymerase II is phosphorylated by _____
31. C-terminal domain of which protein is associated with processing factors _____

Part II. Short Answer and Essay Questions (total 38%):

1. Why is amino acids cysteine important? Is it possible use methionine instead of cysteine? (6%)
2. Why does a mammal go to the energetic expense of making urea from ammonia rather than simply excreting ammonia, as do bacteria (6%)
3. Define oxidation and reduction? Can an oxidation occur without a simultaneous reduction? Why or Why not? (6%)
4. Please describe the difference between oxidative phosphorylation and photophosphorylation (10%)
5. DNA replication in lagging strand requires the nick translation. How is the nick translation proceeded and which enzymes are involved? (10%)

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