

# 國立中山大學 109 學年度 碩士暨碩士專班招生考試試題

科目名稱：分子生物學【生科系碩士班乙組】

## — 作答注意事項 —

考試時間：100 分鐘

- 考試開始鈴響前不得翻閱試題，並不得書寫、劃記、作答。請先檢查答案卷（卡）之應考證號碼、桌角號碼、應試科目是否正確，如有不同立即請監試人員處理。
- 答案卷限用藍、黑色筆(含鉛筆)書寫、繪圖或標示，可攜帶橡皮擦、無色透明無文字墊板、尺規、修正液（帶）、手錶(未附計算器者)。每人每節限使用一份答案卷，不得另攜帶紙張，請斟酌作答。
- 答案卡請以 2B 鉛筆劃記，不可使用修正液（帶）塗改，未使用 2B 鉛筆、劃記太輕或污損致光學閱讀機無法辨識答案者，其後果由考生自行負擔。
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- 可否使用計算機請依試題資訊內標註為準，如「可以」使用，廠牌、功能不拘，唯不得攜帶具有通訊、記憶或收發等功能或其他有礙試場安寧、考試公平之各類器材、物品（如鬧鈴、行動電話、電子字典等）入場。
- 試題及答案卷（卡）請務必繳回，未繳回者該科成績以零分計算。
- 試題採雙面列印，考生應注意試題頁數確實作答。
- 違規者依本校招生考試試場規則及違規處理辦法處理。

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一、單選題（每題 2 分，共 60 分。答錯不倒扣。）：

1. Which chemical bonds contribute to the thermodynamic stability of the DNA double helix and the specificity of base pairing?  
(A) Covalent bonds. (B) Van der Waals bonds. (C) Hydrogen bonds.  
(D) Ionic bonds. (E) Hydrophobic bonds.
2. Which process takes place during the anaphase of mitosis?  
(A) Bivalent attachment. (B) Condensation of chromosomes. (C) Cytokinesis.  
(D) Proteolysis of cohesion. (E) Re-formation of nuclear envelope.
3. Which of the following statements is correct regarding DNA replication?  
(A) Okazaki fragments are formed on the leading strand.  
(B) Initiation of DNA synthesis requires an RNA primer.  
(C) DNA helicases remove supercoils at the replication fork.  
(D) DNA polymerase I mainly functions in prokaryotic DNA replication.  
(E) DNA ligases stabilize the separated strands.
4. During DNA replication, the ssDNA-binding proteins (SSBs):  
(A) are typically found more on the leading strand than on the lagging strand.  
(B) prevent the folding of the single-stranded DNA.  
(C) cover the bases to prevent base-pairing.  
(D) interact with ssDNA in a sequence-dependent manner.  
(E) form a lot of hydrogen bonds with the phosphate backbone.
5. Which histone is NOT a component of nucleosome core particle?  
(A) H1. (B) H2A. (C) H2B. (D) H3. (E) H4.
6. Which kind of DNA damage occurs most frequently under normal physiological conditions?  
(A) Alkylation. (B) Acetylation. (C) Methylation. (D) Deamination.  
(E) Formation of thymine dimer.
7. Which statement is correct regarding the function of the enzyme involved in the RecBCD pathway in *Escherichia coli*?  
(A) RecBCD recognizes Holliday junctions.  
(B) RuvC induces double-strand breaks.  
(C) RecA facilitates strand invasion.  
(D) Rad51 catalyzes the resolution of Holliday junctions.  
(E) RuvAB generates single strands for invasion.
8. Exchange of genetic material between cells by direct cell-to-cell contact is called:  
(A) conjugation. (B) injection. (C) infection. (D) transformation. (E) transduction.
9. Which eukaryotic RNA polymerase transcribes tRNA genes?  
(A) RNA polymerase I. (B) RNA polymerase II. (C) RNA polymerase III.  
(D) RNA polymerase IV. (E) RNA polymerase V.

10. Which of the following types of noncoding RNA mainly functions in the processing and chemical modification of ribosomal RNAs (rRNAs)?  
(A) Small interfering RNAs (siRNAs). (B) Small nuclear RNAs (snRNAs).  
(C) Small nucleolar RNAs (snoRNAs). (D) Piwi-interacting RNAs (piRNAs).  
(E) Small rDNA-derived RNAs (srRNAs).
11. How does Rho-independent termination work?  
(A) RNA polymerase recognizes an RNA element (rut site) and stops transcription.  
(B) RNA forms a stem-loop structure that disrupts the elongation complex.  
(C) A poly-A signal sequence recruits poly-A polymerase and signals termination.  
(D) A repressor facilitates detachment of RNA polymerase from the RNA-DNA duplex.  
(E) RNase H hydrolyzes the phosphodiester bonds of RNA in the RNA-DNA duplex.
12. Among the three binding sites for tRNA in ribosomes, the P-site:  
(A) is the binding site for the aminoacylated-tRNA.  
(B) is the binding site for the tRNA that is released.  
(C) holds the tRNA linked to the growing polypeptide chain.  
(D) is the first location to which the t-RNA binds during the protein synthesis process.  
(E) moves the tRNA to the E-site when a stop codon is reached.
13. Polysome profiling involves mRNAs with different numbers of associated ribosomes separated by:  
(A) reverse phase chromatography. (B) ion exchange chromatography.  
(C) mass spectrometry. (D) sucrose gradient centrifugation.  
(E) sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE).
14. Which consensus sequence is involved in the initiation of translation in prokaryotes?  
(A) Shine-Dalgarno sequence. (B) Kozak sequence. (C) Okazaki sequence.  
(D) -35 element. (E) TATA element.
15. During the RNA editing process, deamination of cytosine results in its conversion to:  
(A) adenine. (B) guanine. (C) inosine. (D) thymine. (E) uracil.
16. Which region of tRNA is responsible for base pairing between tRNA and mRNA?  
(A) Acceptor stem. (B) Variable loop. (C) Anticodon loop. (D) D loop. (E) ΨU loop.
17. How does nonsense suppression work?  
(A) Point mutation of the nucleotide close to the nonsense codon.  
(B) RNA editing on the nonsense codon.  
(C) Insertion of a nucleotide during the gene replication.  
(D) Mutation of a tRNA so that it can bind with the nonsense codon.  
(E) Mutation of a release factor so that it cannot terminate translation.
18. What is the inducer of the *lac* operon and binds to the Lac repressor?  
(A) Lactose. (B) Glucose. (C) IPTG. (D) X-gal. (E) GABA.

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19. The first codon of mRNA translated by a ribosome is typically:  
(A) UGA. (B) GUA. (C) AGU. (D) AUG. (E) AAA.
20. Which of the following statements is correct regarding imprinting?  
(A) Imprinting follows the rules of Mendelian inheritance.  
(B) Histone acetylation is responsible for imprinting.  
(C) Maintenance methyltransferase is involved in the imprinting process.  
(D) Sickle cell disorder is a disorder associated with imprinting.  
(E) Maintenance of the lysogenic state via cell division is an example of imprinting.
21. The  $\lambda$  repressor encoded by the *cI* gene can act as a repressor or an activator. How does the  $\lambda$  repressor act as an activator to stimulate transcription of the *cI* gene?  
(A) It binds to  $O_{R2}$  and contacts RNA polymerase at  $P_{RM}$  to stimulate transcription.  
(B) It binds to  $O_{R3}$  and contacts RNA polymerase at  $P_R$  to stimulate transcription.  
(C) It binds to  $O_{L2}$  and contacts RNA polymerase at  $P_{LM}$  to stimulate transcription.  
(D) It binds to  $O_{L3}$  and contacts RNA polymerase at  $P_L$  to stimulate transcription.  
(E) It binds to  $O_{RE}$  and contacts RNA polymerase at  $P_{RE}$  to stimulate transcription.
22. Which of the following nucleotides is hydrolyzed in both transcription and in translation elongation?  
(A) ATP. (B) CTP. (C) GTP. (D) TTP. (E) UTP.
23. Which of the following do NOT typically interact with an elongating RNA polymerase II?  
(A) Histone-modifying enzymes. (B) Chromatin remodeling complexes.  
(C) Mediator complexes. (D) Capping enzymes. (E) Histone chaperones.
24. An enhancer:  
(A) is a *trans*-acting sequence that stimulates transcription.  
(B) cannot activate a promoter upstream from this same enhancer.  
(C) can be located at any distance from a promoter.  
(D) activates a promoter via an insulator between the enhancer and the promoter.  
(E) directly interacts with RNA polymerase II to stimulate transcription.
25. Which enzyme is generally linked to transcriptional activation in eukaryotes?  
(A) Histone methyltransferase. (B) Histone acetyltransferase.  
(C) Histone phosphorylase. (D) Histone demethylase. (E) Histone deacetylase.
26. Which enzyme is responsible for transcriptional silencing in eukaryotes?  
(A) DNA methylase. (B) DNA acetylase. (C) DNA polymerase. (D) DNA ligase.  
(E) DNA endonuclease.
27. The five RNAs (U1, U2, U4, U5, and U6) identified in the spliceosome are:  
(A) small nucleolar RNAs (snoRNAs). (B) small nuclear RNAs (snRNAs).  
(C) small interfering RNAs (siRNAs). (D) long non-coding RNAs (lncRNAs).  
(E) small rDNA-derived RNAs (srRNAs).



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28. Which of the following statements is correct regarding DNA transposition?
- (A) Autonomous transposons cannot move in the absence of nonautonomous transposons.
  - (B) Virus-like retrotransposition involves target-site-primed reverse transcription.
  - (C) RNA-mediated transposition involves insertion of RNA into a new target site.
  - (D) Transposase cleaves the 5' ends of the element DNA and leaves the 3' terminating strands uncut. These strands are called the nontransferred strands.
  - (E) Replicative transposition results in cointegration with 2 copies of transposon.
29. Which of the following features is true regarding telomerase?
- (A) It carries its own DNA template.
  - (B) It adds a repeat sequence to the 5' end of telomeres.
  - (C) Its activity is high in somatic cells and low in most cancer cells.
  - (D) It relocates after polymerization reaches the end of the template.
  - (E) It shortens the length of telomeres and leads to disastrous results.
30. During the embryonic development, homeotic genes:
- (A) determine the dorsal-ventral polarity.
  - (B) control the number of body segments.
  - (C) encode morphogens that establish gradients.
  - (D) are usually expressed by the mother during oogenesis.
  - (E) are defined by mutations that convert one anatomical structure into another.
- 二、複選題（每題 4 分，共 40 分。每錯一選項扣 2 分，得分低於零分或所有選項均未作答者，該題以零分計）：
31. Which of the following components are usually absent in the processed pseudogene that arises from integration of reverse-transcribed mRNAs?
- (A) Exon. (B) Intron. (C) Poly-A tail. (D) Promoter. (E) 3' untranslated region.
32. Which of the following mutation types may lead to frameshift mutation?
- (A) Point mutation. (B) Insertion. (C) Deletion. (D) Substitution. (E) Missense mutation.
33. Which of the following features are true regarding tyrosine recombinases?
- (A) They introduce double-strand breaks.
  - (B) They introduce Holliday junctions.
  - (C) They cleave all four DNA strands before strand exchange.
  - (D) They break and rejoin one pair of DNA strands at a time.
  - (E) They include the Cre recombinase that recognizes the *loxP* site.
34. Which of the following statements are correct regarding RNA splicing?
- (A) Release of group I introns is catalyzed by spliceosomes.
  - (B) An intron is spliced out through two transesterification reactions.
  - (C) The 5' splice site is recognized by the U1 snRNP.
  - (D) Group II introns are the most commonly used for eukaryotic genes.
  - (E) Group I introns release a linear intron.

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35. Which statements are correct regarding the expression of the *lac* operon?
- (A) Genes in the *lac* operon are expressed at high levels when both lactose and glucose are present at high levels.
  - (B) The site bound by the *lac* repressor is called the *lac* operator.
  - (C) The *lac* repressor is expressed regardless of whether or not lactose is present.
  - (D) The *lac* operon is not transcribed when neither the activator nor the suppressor binds its site on DNA.
  - (E) Catabolite activator protein (CAP) binds to the CAP site when glucose is absent.
36. Which steps take place during the establishment and maintenance of lysogeny?
- (A) The *N* and *cro* genes are transcribed, but the *cII* and *cIII* genes are not transcribed.
  - (B) The CII protein binds a site upstream from  $P_{RE}$ .
  - (C) The repressor protein stimulates transcription of the *cI* gene and binds  $O_R$  and  $O_L$ .
  - (D) The Cro protein binds  $O_R$  and stimulates transcription of the *cro* and *cII* genes.
  - (E) The Q protein helps the RNA polymerase to transcribe through  $T_R'$ .
37. Which rRNAs are included in the eukaryotic ribosomes?
- (A) 5S rRNA. (B) 16S rRNA. (C) 18S rRNA. (D) 23S rRNA. (E) 28S rRNA.
38. Which are correct regarding riboswitches that regulate translation initiation?
- (A) These riboswitches are typically found within the 3' untranslated region.
  - (B) Each riboswitch is made up of an aptamer and an expression platform.
  - (C) The aptamer undergoes structural changes in response to the changes in the expression platform.
  - (D) The ribosome-binding site is typically found in the expression platform.
  - (E) The ligand-binding site is typically found in the aptamer.
39. Which of the following statements are correct regarding RNA silencing?
- (A) Small interfering RNAs (siRNAs) are derived from hairpin precursor RNAs.
  - (B) MicroRNAs (miRNAs) are derived from double-stranded RNAs.
  - (C) Both siRNAs and miRNAs are generated by the enzyme called Dicer.
  - (D) The small RNA complement to the target mRNA is called the passenger RNA.
  - (E) RNA-dependent RNA polymerase can enhance the efficiency of RNA silencing.
40. Synthetic biology is defined as a field of science that involves redesigning organisms for useful purposes using the concept of forward engineering. According to this definition, which of the following studies are considered as synthetic biology?
- (A) Biosynthesis of artemisinic acid in yeasts.
  - (B) Production of  $p53^{-/-}$  mice to analyze the effect of *p53* on tumor formation.
  - (C) Design of light-sensing gene regulatory circuits in *Escherichia coli*.
  - (D) Establishment of an *Arabidopsis* T-DNA insertional mutant collection.
  - (E) Synthesis of a minimal bacterial genome.

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題號：421001

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## 一、 Multiple choice question (40 points)

- When two carbohydrates are epimers:  
(A) one is a pyranose, the other a furanose.  
(B) one is an aldose, the other a ketose.  
(C) one is  $\alpha$ conformation, the other in  $\beta$ conformation.  
(D) they differ only in the configuration around one carbon atom.  
(E) they rotate plane-polarized light in the same direction.
- Isomers of sugar in which the position of ketone and aldehyde groups have been changed are called:  
(A) anomers.  
(B) diastereoisomers.  
(C) enantiomers.  
(D) epimers.  
(E) None of the above.
- Chitin and agarose are  
(A) polysaccharides.  
(B) polypeptides.  
(C) polynucleotides.  
(D) lipids.  
(E) enzymes.
- Which of the following is true about glycoprotein?  
(A) They can act in cell-cell recognition.  
(B) They can be found on the outer face of the cell membrane only.  
(C) O-linked oligosaccharides is attached to the amide nitrogen of an Asn residue.  
(D) (A)、(B)、(C)  
(E) (A)、(B)
- Glycolysis is enhanced by  
(A) glucose-1-phosphate,  
(B) fructose-1,6-bisphosphate,  
(C) fructose-2,6-bisphosphate,  
(D) glucose-6-phosphate and fructose-1,6-bisphosphate,  
(E) fructose-1,6-bisphosphate and fructose-2,6-bisphosphate.
- When a muscle is stimulated to contract aerobically, less lactic acid is formed than when it contracts anaerobically because:  
(A) glycolysis does not occur to significant extent under aerobic conditions.  
(B) muscle is metabolically less active under aerobic than anaerobic conditions.  
(C) the lactic acid generated is rapidly incorporated into lipids under aerobic conditions.  
(D) under aerobic conditions in muscle, the major energy-yielding pathway is the pentose phosphate pathway, which does not produce lactate.  
(E) under aerobic conditions, most of the pyruvate generated as a result of glycolysis is oxidized by the citric acid cycle rather than reduced to lactate.
- In glycolysis, the NADH formed in the glyceraldehyde 3-phosphate dehydrogenase reaction in vigorously contracting muscle must be reoxidized to  $\text{NAD}^+$  if glycolysis is to continue. The most important reaction involved in the reoxidation of NADH is:  
(A) dihydroxyacetone phosphate  $\Rightarrow$  glycerol 3-phosphate.  
(B) pyruvate  $\Rightarrow$  lactate.  
(C) glucose 6-phosphate  $\Rightarrow$  fructose 6-phosphate.  
(D) isocitrate  $\Rightarrow$   $\alpha$ -ketoglutarate.  
(E) oxaloacetate—malate.

試題請隨卷繳回，請留意背面是否有題



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共 8 頁第 2 頁

8. The function of glycogen phosphorylase is
  - (A) the conversion of glucose - I - phosphate to glucose-6-phosphate.
  - (B) to break down ATP.
  - (C) to catalyze the phosphorolysis of glucose-1-phosphate from glycogen molecules.
  - (D) to inhibit the production of glucose-1-phosphate.
  - (E) to stimulate the build up of glycogen.
9. Muscle glycogen cannot contribute directly to blood glucose levels because
  - (A) muscle glycogen cannot be converted to glucose 6-phosphate.
  - (B) muscle lacks phosphoglucoisomerase.
  - (C) muscle contains no glucokinase.
  - (D) muscle contains no glycogen phosphorylase.
  - (E) muscle lacks glucose 6-phosphatase.
10. Which one of the following statements is not true:
  - (A) Low blood glucose will promote dephosphorylation of pyruvate kinase.
  - (B) ATP is an allosteric factor for controlling glycogen phosphorylase b.
  - (C) The first step in glycogen breakdown does not require ATP.
  - (D) Phosphorylated glycogen phosphorylase and glycogen synthase can both be dephosphorylated by the same phosphatase.
  - (E) Complete breakdown of glycogen catalyzes by glycogen debranching enzyme.
11. Which of the reactions of the citric acid cycle listed below results in the formation of a high-energy phosphate compound?
  - (A) succinate dehydrogenase.
  - (B) succinyl CoA synthetase.
  - (C) isocitrate dehydrogenase.
  - (D) citrate synthase.
  - (E) alpha-ketoglutarate dehydrogenase.
12. In eukaryotic cells, glycolysis occurs in the \_\_\_\_\_, and the TCA cycle reactions take place in \_\_\_\_\_.
  - (A) mitochondria; mitochondria.
  - (B) cytoplasm; mitochondria.
  - (C) cytoplasm; cytoplasm.
  - (D) mitochondria; ribosomes.
  - (E) cytoplasm; ribosomes.
13. Which is not correct regarding the electron transport chain complex in mitochondria?
  - (A) Cytochrome oxidase carries electrons from cytochrome c to oxygen.
  - (B) Q cycle occurs through complex IV.
  - (C) Succinate dehydrogenase is a subunit of complex II.
  - (D) NADH : ubiquinone oxidoreductase is complex I.
14. The final reduced species in the electron transport chain is
  - (A) H<sub>2</sub>O.
  - (B) cytochrome c.
  - (C) ubiquinone.
  - (D) NADH.
  - (E) O<sub>2</sub>.
15. During ATP synthesis protons move “down” their electrochemical gradient through
  - (A) the F<sub>0</sub> complex of ATP synthase.
  - (B) the F<sub>1</sub> complex of ATP synthase.
  - (C) a proton channel protein.
  - (D) CoQH<sub>2</sub>-cytochrome c reductase.

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16. An important difference between respiratory inhibitors and uncouplers is that
  - (A) uncouplers are toxic substances while respiratory inhibitors are not.
  - (B) uncouplers do not inhibit electron transport while respiratory inhibitors do so.
  - (C) the effect of respiratory inhibitors cannot be characterized spectroscopically while that of uncouplers can.
  - (D) none of the above.
17. Dinitrophenol (DNP) uncouples mitochondrial electron transport from oxidative Phosphorylation by
  - (A) dissipating the proton gradient.
  - (B) inhibiting cytochrome oxidase.
  - (C) dissociating the  $F_0$  and  $F_1$  units of the ATP synthase complex.
  - (D) binding irreversibly to ubiquinone.
  - (E) blocking the adenine nucleotide carrier (ATP/ADP exchanger).
18. Photosynthetic organisms use which of the following molecules as a reductant?
  - (A)  $H_2O$
  - (B) Carbohydrate
  - (C) molecular oxygen gas
  - (D)  $C_2O$
  - (E)  $N_2$
19. In photosynthesis, all of the following reactions are directly dependent on light except
  - (A) carbon fixation.
  - (B) synthesis of ATP.
  - (C) electron transport.
  - (D) removal of electrons from  $H_2O$ .
20. Which of the following sequences correctly represents the flow of electrons during photosynthesis?
  - (A)  $NADPH \Rightarrow O_2 \Rightarrow CO_2$
  - (B)  $H_2O \Rightarrow NADPH \Rightarrow$  Calvin cycle
  - (C)  $H_2O \Rightarrow$  electron transport chain  $\Rightarrow O_2$
  - (D)  $NADPH \Rightarrow$  chlorophyll  $\Rightarrow$  Calvin cycle
21. Which compartment of chloroplasts becomes acidic when the electron transport system is operating?
  - (A) Lumen inside the thylakoid sac.
  - (B) Stroma.
  - (C) Space between inner and outer membranes.
  - (D) Thylakoid membranes.
  - (E) Cytoplasm.
22. Amino acids are joined together by an amide linkage called a
  - (A) protein bond.
  - (B) disulfide bond.
  - (C) acrylate bond.
  - (D) peptide bond.
  - (E) PTM bond.
23. which of the following  $\alpha$ -amino acids has the highest absorbance at 280 nm?
  - (A) Tyr
  - (B) Trp
  - (C) Gly
  - (D) Glu
  - (E) Phe

# 國立中山大學 109 學年度碩士暨碩士專班招生考試試題

科目名稱：生物化學【生科系碩士班乙組】

題號：421001

※本科目依簡章規定「不可以」使用計算機(混合題)

共 8 頁第 4 頁

24. What is the main stabilizing force in the secondary structure of proteins  
(A) peptide bond.  
(B) hydrogen bond.  
(C) disulfide bond.  
(D) hydrophobic bond.
25. What is one unit of urea biosynthesized from?  
(A) two units of  $\text{NH}_4^+$  and one unit of  $\text{CO}_2$ .  
(B) one unit of  $\text{NH}_4^+$  as well as one unit of carboxyl and amino groups of arginine.  
(C) one unit of  $\text{NH}_4^+$ , one carboxyl group of aspartate, and one unit of amino group of arginine.  
(D) one unit of  $\text{NH}_4^+$ , one carboxyl group of arginine, and one unit of amino group of aspartate.  
(E) one unit of  $\text{NH}_4^+$ , one unit of  $\text{CO}_2$  and one unit of amino group of aspartate.
26. Arginine is considered \_\_\_\_\_.  
(A) Glycogenic.  
(B) Ketogenic.  
(C) Glycogenic and ketogenic.  
(D) Neither glycogenic nor ketogenic.  
(E) None of above.
27. Tryptophan is considered \_\_\_\_\_.  
(A) Glycogenic.  
(B) Ketogenic.  
(C) Glycogenic and ketogenic.  
(D) Neither glycogenic nor ketogenic.  
(E) None of above.
28. A deficiency of the following enzyme can lead to phenylketonuria  
(A) Tyrosinase.  
(B) Creatine synthase.  
(C) Phenylalanine hydroxylase.  
(D) Phenylalanine  
(E) Cystathionine lyase.
29. Which set of compounds listed below can serve as precursors for heme?  
(A) Gly, succinyl-CoA.  
(B) Gly, propionyl-CoA.  
(C) Gly, acetic acid.  
(D) Biliverdin, CO, Fe.  
(E) Bilirubin, CO, Fe.  
(F) Gly, biliverdin.
30. Myoglobin and the subunits of hemoglobin have:  
(A) no obvious structural relationship.  
(B) very different primary and tertiary structures.  
(C) very similar primary and tertiary structures.  
(D) very similar primary structures, but different tertiary structures.  
(E) very similar tertiary structures, but different primary structures.
31. Which of the following lipids is not a saturated fatty acid?  
(A) lauric acid  
(B) linoleic acid.  
(C) myristic acid.  
(D) stearic acid.  
(E) arachidic acid.

國立中山大學 109 學年度碩士暨碩士專班招生考試試題

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共 8 頁第 5 頁

32. Which of the following best describes the cholesterol molecule?  
(A) Nonpolar, charged.  
(B) Nonpolar, uncharged.  
(C) Amphipathic.  
(D) Polar, charged.  
(E) Polar, uncharged.
33. The primary storage form of lipid is \_\_\_\_\_ and it is normally stored in the \_\_\_\_\_.  
(A) Phospholipid; liver.  
(B) cholesterol; muscles.  
(C) monoacylglycerol; adipocytes .  
(D) triacylglycerols; adipocytes.  
(E) triacylglycerols; liver.
34. Which of the following molecules or substances contain, or are derived from, fatty acids?  
(A) sphingolipids.  
(B) prostaglandins.  
(C) beeswax.  
(D) prostaglandins and sphingolipids  
(E) prostaglandins、sphingolipids and beeswax.
35. Aspirin inhibits the synthesis of which of the following sets of eicosanoids?  
(A) prostaglandin  $E_2$  and leukotriene  $A_4$ .  
(B) thromboxane  $A_2$  and leukotriene  $C_4$ .  
(C) prostaglandin  $F_2$  and thromboxane  $A_2$ .  
(D) prostaglandin  $A_2$  and 5-hydroperoxyeicosatetraenoic acid (5-HPETE) .  
(E) all of them.
36. Which of the following is on the surface of a lipoprotein particle?  
(A) cholesterol and phospholipids  
(B) cholesterol and triacylglycerol  
(C) cholesterol ester and phospholipids  
(D) cholesterol ester and triacylglycerol  
(E) phospholipids and triacylglycerol
37. All of the following statement associated with plasma lipoproteins are true EXCEPT:  
(A) They have a nonpolar core consisting of triacylglycerols and cholesterol esters.  
(B) VLDL is the vehicle that liver uses to deliver triacylglycerols to the periphery.  
(C) They are the only carriers of lipid-based energy in the blood.  
(D) LDL function is to carry cholesterol to tissues.  
(E) HDL functions by carrying cholesterol away from tissues.
38. Dietary lipids are "packaged" in the intestine into \_\_\_\_\_ for transport in the blood stream.  
(A) HDL,  
(B) IDL,  
(C) VLDL,  
(D) Chylomicrons,  
(E) LDL.
39. Which of the following protein binds to LDL receptor ?  
(A) ApoAI.  
(B) ApoB-48 .  
(C) ApoC-II.  
(D) ApoD .  
(E) ApoE.

# 國立中山大學 109 學年度碩士暨碩士專班招生考試試題

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題號：421001

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共 8 頁第 6 頁

40. Which of the following conditions would most likely result in the accumulation of cholesterol in extrahepatic tissues?

- (A) a deficiency in lipoprotein lipase.
- (B) a deficiency in acyl CoA:cholesterol acyltransferase.
- (C) a deficiency in apoprotein A-I.
- (D) a high level of HDL.
- (E) a high level of lecithin -cholesterol acyltransferase.

## 二、 Matching Item(10 points)

1. The following reagents are often used in protein chemistry. Match the reagent with the purpose for which it is best suited. (10 points)

- (A) CNBr (cyanogen bromide).
- (B) Edman reagent (phenylisothiocyanate).
- (C) Sanger reagent (FDNB, fluorodinitrobenzene).
- (D) dithiothreitol.
- (E)  $\beta$ -mercaptoethanol.
- (F) chymotrypsin.
- (G) trypsin.
- (H) performic acid.

- \_\_\_\_\_ (1) hydrolysis of peptide bonds on the carboxyl side of Lys and Arg.
- \_\_\_\_\_ (2) cleavage of peptide bonds on the carboxyl side of Met.
- \_\_\_\_\_ (3) cleavage of peptide bonds on the carboxyl side of Phe、Tyr and Tip.
- \_\_\_\_\_ (4) breakage of disulfide (-S-S-) bonds.
- \_\_\_\_\_ (5) determining the amino-terminal amino acid in a polypeptide.

## 三、 Answer question (50points)

1. Name and outline of 5 different enzymes when you chew and ingest your breakfast. (10points)





# 國立中山大學 109 學年度碩士暨碩士專班招生考試試題

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題號：421001

※本科目依簡章規定「不可以」使用計算機(混合題)

共 8 頁 第 8 頁

5. Describe the urea cycle and its function in human? (5points)

6. Explain what and why is the sickle cell anemia? (5points)

# 國立中山大學 109 學年度 碩士暨碩士專班招生考試試題

科目名稱：普通生物學【生科系碩士班甲組】

## —作答注意事項—

考試時間：100 分鐘

- 考試開始響前不得翻閱試題，並不得書寫、劃記、作答。請先檢查答案卷（卡）之應考證號碼、桌角號碼、應試科目是否正確，如有不同立即請監試人員處理。
- 答案卷限用藍、黑色筆(含鉛筆)書寫、繪圖或標示，可攜帶橡皮擦、無色透明無文字墊板、尺規、修正液（帶）、手錶(未附計算器者)。每人每節限使用一份答案卷，不得另攜帶紙張，請衡酌作答。
- 答案卡請以 2B 鉛筆劃記，不可使用修正液（帶）塗改，未使用 2B 鉛筆、劃記太輕或污損致光學閱讀機無法辨識答案者，其後果由考生自行負擔。
- 答案卷（卡）應保持清潔完整，不得折疊、破壞或塗改應考證號碼及條碼，亦不得書寫考生姓名、應考證號碼或與答案無關之任何文字或符號。
- 可否使用計算機請依試題資訊內標註為準，如「可以」使用，廠牌、功能不拘，唯不得攜帶具有通訊、記憶或收發等功能或其他有礙試場安寧、考試公平之各類器材、物品（如鬧鈴、行動電話、電子字典等）入場。
- 試題及答案卷（卡）請務必繳回，未繳回者該科成績以零分計算。
- 試題採雙面列印，考生應注意試題頁數確實作答。
- 違規者依本校招生考試試場規則及違規處理辦法處理。

# 國立中山大學 109 學年度碩士暨碩士專班招生考試試題

科目名稱：普通生物學【生科系碩士班甲組】

題號：421004

※本科目依簡章規定「不可以」使用計算機(問答申論題)

共 1 頁第 1 頁

1. 試舉一例說明性擇與天擇的作用為何會產生衝突？其各別對物種的個體適存度(fitness)與族群演化的效應為何？(25分)
2. 在高中到大學的課本中經常以人類手臂、鳥類翅膀與蝙蝠的翼手比較為例來說明趨同演化與同源結構的關聯性。然而跨物種比較一個看來很像的結構並判斷其是否為同源結構在這個後基因體時代變得相當不容易。試舉一例說明為何根據肉眼可見的形態結構在物種之間的相似性未必能判斷其同源性？(25分)
3. 柴山與恆春半島滿洲都有所謂猴害的問題？然而柴山是一個封閉地區，缺乏果園，而滿州是一個開放區域，附近具有大量農作物栽培。請就可利用資源、族群遺傳、社會性動物生態的關點說明這兩個獼猴族群的未來發展可能會有什麼差異？原因是什麼？(25分)
4. 許多學者會對同一個生態或演化現象提出完全衝突的對立假說，而這些假說也會因為新證據不斷被提出來而存在著競爭關係。請就你所知說明一組能夠解釋一個演化或生態現象的對立假說，並說明兩個假說的差異，以及各自支持的證據與弱點為何。(25分)

# 國立中山大學 109 學年度 碩士暨碩士專班招生考試試題

科目名稱：生態學【生科系碩士班甲組】

## — 作答注意事項 —

考試時間：100 分鐘

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- 試題採雙面列印，考生應注意試題頁數確實作答。
- 違規者依本校招生考試試場規則及違規處理辦法處理。



國立中山大學 109 學年度碩士暨碩士專班招生考試試題

科目名稱：生態學【生科系碩士班甲組】

題號：421002

※本科目依簡章規定「不可以」使用計算機(混合題)

共 2 頁第 1 頁

一、選擇題(單選，共 30 分，每題 3 分)

1. The zone that most closely resembles a boreal forest is the \_\_\_\_\_ zone.
  - A. lower montane
  - B. montane
  - C. subalpine
  - D. alpine
  - E. upper alpine
2. Which of the following types of change occurs over generations rather than within a lifetime?
  - A. Acclimatization
  - B. Transpiration
  - C. Equilibration
  - D. Adaptation
  - E. Pubescence
3. A grizzly bear feasting on a recently killed deer is an example of the transfer of \_\_\_\_\_ energy.
  - A. radiant
  - B. chemical
  - C. autotrophic
  - D. symbiotic
  - E. kinetic
4. If a population of monkeyflowers has 500 members with 135 of genotype DD, 280 of genotype Dd, and 85 of genotype dd, what is the frequency of the D allele?
  - A. 0.135
  - B. 0.275
  - C. 0.415
  - D. 0.5
  - E. 0.55
5. Which of the following is characteristic of an *r*-selected species?
  - A. Short lifespan
  - B. Low rate of reproduction
  - C. High parental investment
  - D. Delayed development
  - E. Long lifespan
6. Black walnut trees release juglone and other chemicals that can be toxic to other plants. This is a possible example of
  - A. isoclines.
  - B. exploitation competition.
  - C. allelopathy.
  - D. character displacement.
  - E. chthamalus.
7. Assume that lions running on grass neither benefit nor are harmed by this interaction, but their activity helps the grass grow. This is an example of a
  - A. mutualism.
  - B. endosymbiosis.
  - C. ammensalism.
  - D. symbiosis.
  - E. commensalism.

國立中山大學 109 學年度碩士暨碩士專班招生考試試題

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共 2 頁第 2 頁

8. Species that feed on more than one trophic level are called
- A. omnivores.
  - B. herbivores.
  - C. tertiary consumers.
  - D. primary producers.
  - E. secondary consumers.
9. The final theoretical stage of succession is called the \_\_\_\_\_ stage.
- A. omega
  - B. ultimate
  - C. penultimate
  - D. climax
  - E. pioneer
10. Species that occur in one area, but nowhere else on Earth, are called \_\_\_\_\_ species.
- A boreal
  - B. endemic
  - C. beta
  - D. local
  - E. invasive

二、問答題(共 70 分)

1. Defining “Natural selection” (7 points).
2. Describe “adaptive evolution”? (7 points).
3. Defining “Allelopathic agent” (7 points).
4. Defining “competitive exclusion” (7 points)
5. Defining “habitat” (7 points)
6. Defining “facilitation” (7 points)
7. Defining “community” (7 points)
8. Defining “dynamic equilibrium model” (7 points)
9. Defining “The standard redundancy model” (7 points)
10. Defining “net primary production” (7 points)