**注意：考試開始鈴響前，不得翻閱試題，**

**並不得書寫、畫記、作答。**

國立清華大學 111 學年度學士後醫學系單招試題

系所班組別：學士後醫學系
自然科學組

科目代碼：0102

考試科目：生物與生化

## —作答注意事項—

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2. 作答中如有發現試題印刷不清，得舉手請監試人員處理，但不得要求解釋題意。
3. 考生限在答案卷上標記「由此開始作答」區內作答，且不可書寫姓名、准考證號或與作答無關之其他文字或符號。
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5. 答案卷可用任何書寫工具作答，惟為方便閱卷辨識，請儘量使用藍色或黑色書寫；答案卡限用 2B 鉛筆畫記；如畫記不清（含未依範例畫記）致光學閱讀機無法辨識答案者，其後果一律由考生自行負責。
6. 其他應考規則、違規處理及扣分方式，請自行詳閱准考證明上「**國立清華大學試場規則及違規處理辦法**」，無法因本試題封面作答注意事項中未列明而稱未知悉。

# 國立清華大學 111 學年度學士後醫學系單獨招生試題

考試科目：生物與生化

[單選題]每題 2.5 分，共計 150 分。答錯一題倒扣 0.625 分，未作答，不給分亦不扣分。



1. Which of the following descriptions about brown algae is **NOT** correct?
   (A) They are the smallest and least complex algae.
   (B) They are multicellular and mostly marine.
   (C) They contain chlorophylls and carotenoids in their plastids for photosynthesis
   (D) Some species, such as Japanese "kombu", are eaten as human food.
   (E) Their cell walls contain gel-forming polysaccharides called algin.

2. Which of the following descriptions about fungi is **NOT** correct?
   (A) They are a group of eukaryotic organisms that includes yeasts, molds, and mushrooms.
   (B) They are incapable of photosynthesis.
   (C) Fungal membranes contain a unique steroid called ergosterol, which is a drug target of athlete's foot treatment.
   (D) Mycorrhizal fungi form symbiotic relationships only with legumes.
   (E) Fungal cell walls are made of chitin.

3. Which of the following descriptions about methicillin-resistant *Staphylococcus aureus* (MRSA) is **NOT** correct?
   (A) *Staphylococcus aureus* is a type of bacteria found on healthy people's skin
   (B) *Staphylococcus aureus* causes lung infection and other infection
   (C) People with MRSA skin infections often can get swelling, warmth, redness, and pain in infected skin.
   (D) MRSA strains are resistant to all aminoglycosides including kanamycin and gentamicin.
   (E) The resistance of MRSA strains is caused by the acquisition of the *mecA* gene implicated in the biosynthesis of bacterial cell wall.

4. Which of the following descriptions about Crassulacean acid metabolism (CAM) is **NOT** correct?
   (A) The benefit of CAM to the plant is the ability to leave most leaf stomata closed during the day.
   (B) During the night, CAM plants allow $CO_2$ to enter and be fixed as organic acids.
   (C) During the day, the stomata of CAM plants close to conserve water, and the organic acids stored in the vacuoles of bundle sheath cells are released.

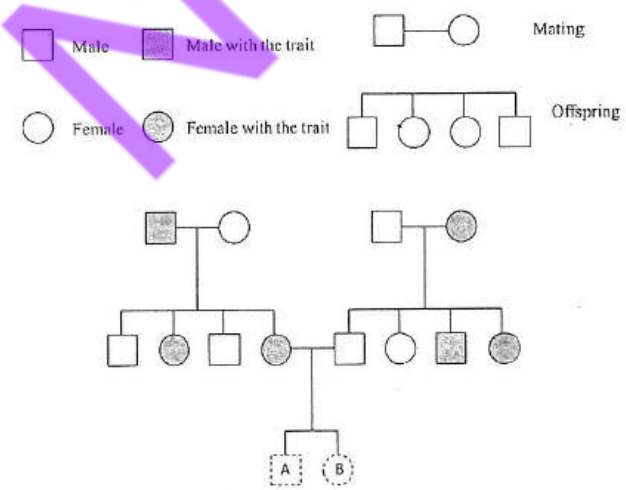
(D) Pineapple is the economically valuable crop possessing CAM.
(E) Cactus utilize the CAM as an adaptation for arid conditions.

5. Which of the following plant pigments mostly absorb red and far-red light to regulate plant responses, including seed germination and shade avoidance?
(A) Phytochrome
(B) Phototropin
(C) Cryptochrome
(D) ZEITLUPE
(E) UVR8

6. During the development, the ectoderm eventually gives rise to?
(A) Nervous system
(B) Muscle
(C) Lungs
(D) Connective tissue
(E) Digestive tube

7. Which of the following is not a feature of insects?
(A) Book lung
(B) Malpighian tubules
(C) Open circulatory system
(D) Tracheal system
(E) Exoskeleton

8. This is a genealogy that has a common genetic trait. Given that one gene pair is involved, what is the inheritance pattern?




(A) Autosomal dominant
(B) Sex-linked dominant

(C) Autosomal recessive
(D) Sex-linked recessive
(E) The probability that individual A has the trait is 25%

9. The coat color phenotype of Labrador Retriever mainly has three main colors: black, chocolate and yellow, which are affected by the genes of the unlinked B (black) and E (pigment distribution) loci. What kinds of offspring would you expect from the cross of a black female (BbEe) and a yellow male (Bbee)?
(A) Black, BBEe: 1/8
(B) Yellow, BBee: 1/4
(C) Chocolate, bbEe: 1/16
(D) Yellow, Bbee: 1/8
(E) Black, BbEe: 1/8

10. Which of the following should be consistent among identical twins?
(A) The set of T cell antigen receptors produced.
(B)The set of major histocompatibility (MHC) molecules produced.
(C) The susceptibility to a particular virus.
(D) The set of antibodies produced.
(E) Epigenetic modifications.

11. About Down syndrome, which of the following statements is **NOT** correct?
(A) Down syndrome is usually the result of an extra chromosome 21, which means that each body cell has 47 chromosomes.
(B) The frequency of Down syndrome increases with the mother's age.
(C) This is mainly caused by nondisjunction during meiosis I, but not meiosis II.
(D) Chromosomal mutation can be easily studied by analysis of Karyotypes.
(E) Recent data suggest that by age 35, nearly 100% of people with Down syndrome develop Alzheimer syndrome.

12. Which of following is not a mechanism altering allele frequencies over time to cause evolutionary change?
(A) Random mating.
(B) Genetic drift.
(C) Natural selection.
(D) Gene flow.
(E) All above cause evolutionary change.

13. Xeroderma pigmentosum (XP) is a rare clinical disease associated with sun sensitivity and a high risk for skin malignancy in sun-exposed areas. Which of the

following defective DNA repair systems may be involved?
(A) Nucleotide excision repair, NER
(B) Mismatch excision repair, MMR
(C) Base excision repair, BER
(D) Non-homologous end joining, NHEJ
(E) Double-strand breaks repair, DSBR

14. Half of the Nobel Prize in Physiology or Medicine 2021 was awarded to the discovery of *piezo1 and 2*, which are responsible for the
(A) Olfaction
(B) Vision
(C) Hearing
(D) Touch
(E) Taste

15. At neuromuscular junction, the receptor on the muscle to receive the signal from the presynaptic neuron is a
(A) Voltage-gated channel
(B) ligand-gated channel for acetylcholine
(C) ligand-gated channel for epinephrine
(D) metabotropic receptors for acetylcholine
(E) metabotropic receptors for epinephrine

16. Which of the following one about oligodendrocytes is true?
(A) One type of glia cell in the periphery nervous system
(B) Wrapping dendrites to form myelin sheaths
(C) Decrease the speed of electronic conduction
(D) Only in mammalian system
(E) None of above

17. Parkinson's disease is characterized by a range of motor symptoms and mainly caused by
(A) the loss of dopamine-producing nerve cells.
(B) the degeneration of the upper motor and lower motor neurons.
(C) rapid and uncoordinated electrical firing in the brain.
(D) autoimmune disease producing antibodies to the acetylcholine receptors on skeletal muscle fibers.
(E) imbalances of autonomic nervous system

18. Circadian rhythms are coordinated by suprachiasmatic nucleus in the
(A) Hippocampus
(B) Hypothalamus
(C) Amygdala
(D) Cerebellum
(E) Cerebral cortex

19. Which of the following hormone increases during the luteal phase of the ovarian cycle?
(A) Androgens
(B) Follicle-stimulating hormone
(C) Luteinizing hormone
(D) Estrogens
(E) Progesterone

20. Which body response is correct under dehydration?
(A) The hypothalamus produces atrial natriuretic peptide to induce aquaporin
(B) Juxtaglomerular apparatus releases the enzyme renin to degrade angiotensin II
(C) Aldosterone increase reabsorbtion of $K^+$ and water in the distal tubules and collecting tube
(D) Low blood pressure stimulates parasympathetic system to decrease heart rate and cardiac contraction
(E) None of above

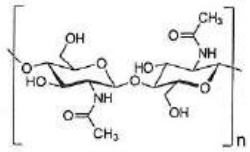
21. Which of the following is a strategy for bony fish in sea water to regulate osmolarity?
(A) Drinking sea water
(B) High concentrations of urea and trimethylamine oxide (TMAO) in body fluids
(C) Uptake ions by gill
(D) Excretion of large amounts of water in urine
(E) All of above

22. The primary function of the descending limb of the loop of Henle is
(A) Filtration of ions
(B) Reabsorption of water
(C) Secretion of ions
(D) Excretion of water

(E) Excretion of ions

23. Which of the following structures is stored primarily in the cells of the liver and skeletal muscle?

(A)



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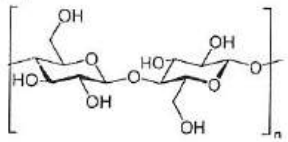

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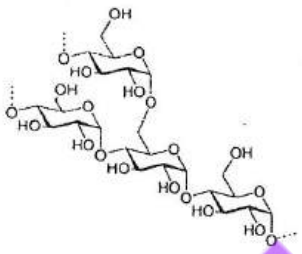
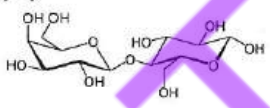
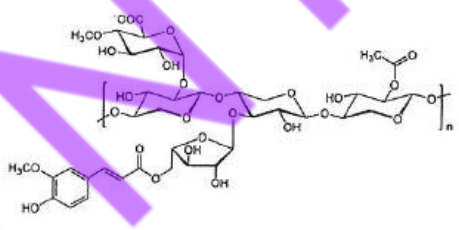


(D)



(E)



24. At a later stage of this immune response, the change in B cell production from one antibody class to another antibody class that responds to the same antigen is due to _____.

(A) the rearrangement of V region genes in that clone of responsive B cells.

(B) a switch in the kind of antigen-presenting cell involved in the immune response.

(C) allows responsive B cells to repeat somatic recombination of light chain gene segments.

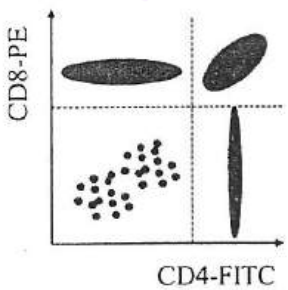
(D) a patient's reaction to the first kind of antibody made by the plasma cells.
(E) the rearrangement of immunoglobulin heavy-chain C region DNA.

25. Adenosine deaminase (ADA) deficiency is an inherited disorder that damages the immune system and causes severe combined immunodeficiency (SCID). All of the following steps were performed for gene therapy when a patient with defective ADA was treated. **Except**?
(A) Human leukocyte antigen (HLA) testing should be performed before gene therapy.
(B) Haematopoietic stem cells were collected from the patient's bone marrow.
(C) CD34 positive cells were transduced with a viral vector expressing functional ADA.
(D) The transfected cells were grown in culture to ensure ADA gene is active.
(E) The transfected cells are reinfused into the same patient.

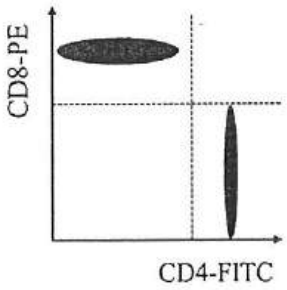
26. Which of the following core technical principles is **NOT** involved in RNA vaccine technology?
(A) N1-Methylpseudouridine
(B) Aluminum-containing adjuvants
(C) Lipid Nanoparticle (LNP) platform
(D) In vitro transcription
(E) Target DNA sequence design

27. CD4 and CD8 are molecules present on the surface of T cells where they interact with major histocompatibility (MHC) molecules. Which of the staining pattern of lymphocytes in different lymphoid organs by FITC-anti-CD4 and PE-anti-CD8 antibodies is correct?

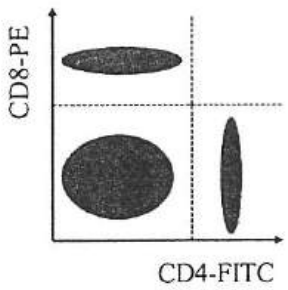
(A) Thymus



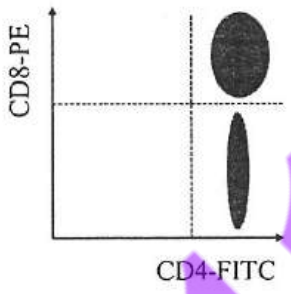

(B) Spleen



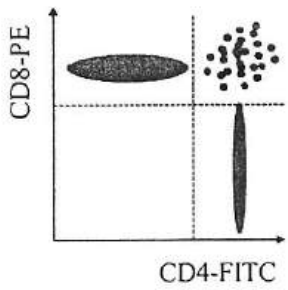
(C) Bone marrow




(D) Tonsil




(E) Lymph node




28. Alpha-D-glucose undergoes conversion to beta-D-glucose in solution. If at 300K there is 70% conversion, what is the △G (J/mole) for the reaction?

| | |
|---|---|
| ln1 | = 0.00 |
| ln2 | = 0.69 |
| ln3 | = 1.10 |
| ln4 | = 1.39 |
| ln5 | = 1.61 |
| ln6 | = 1.79 |
| ln7 | = 1.95 |
| ln8 | = 2.08 |
| ln9 | = 2.20 |

(A) 2120
(B) 2369
(C) 2743
(D) 4864
(E) 5487

29. Which of the following statements about peptidoglycan is **incorrect**?
(A) It is the main component of bacterial cell wall, which helps bacteria maintain a certain shape and resist hypotonic environments.
(B) The polysaccharide chain of peptidoglycan is a β(1-4) linked copolymer of N-acetylglucosamine and N-acetylmuramic acid.
(C) The polysaccharide chains of peptidoglycan are cross-linked together through tetrapeptides.
(D) One end of the tetrapeptide chain links to a N-acetylglucosamine in the polysaccharide chain at the C-2 position.
(E) In many Gram negative bacteria, two adjacent tetrapeptide chains are joined directly between the ε-amino group of lysine in one chain and the carboxyl group of D-alanine in the other.

30. For the same mass of glycogen, amylose, amylopectin, and cellulose, rank the initial rate of hydrolysis of these polysaccharides by alpha-1,4-glucosidase.
(A) cellulose > amylopectin > glycogen > amylose
(B) glycogen > amylose > cellulose > amylopectin
(C) amylose > cellulose > amylopectin > glycogen
(D) amylopectin > glycogen > amylose > cellulose
(E) glycogen > amylopectin > amylose > cellulose

31. The Km and Vmax of hexokinase I for glucose are 100 μM and 30 μM/min and the Km and Vmax of hexokinase II for glucose are 10 mM and 50 μM/min, respectively. Which of the following descriptions about the kinetics of the two enzymes is most likely to be **correct**?
(A) If the glucose concentration is 50 μM, the reaction velocity of hexokinase I will be ~20 μM/min.
(B) If the glucose concentration is 50 μM, the reaction velocity of hexokinase I will be ~25 μM/min.
(C) If the glucose concentration is 1.0 mM, the reaction velocity of hexokinase II will be ~30 μM/min
(D) If the glucose concentration is 30 mM, the reaction velocity of hexokinase II may reach 50 μM/min.
(E) Compared to hexokinase II, hexokinase I is more efficient when the glucose concentration is higher than 10 mM.

32. Which of the following statements about fibrous proteins is **incorrect?**
(A) Fibrous proteins usually have good mechanical strength and play a structural role in living organisms.
(B) The central rod domain of α-keratin is an α-helix structure flanked by non-helical N- and C- terminal domains.
(C) Pairs of right-handed α-helces of α-keratin wrap around each other to form a left-twisted coiled coil.
(D) Collagen is an extensible and low glycine content fibrous protein.
(E) Silk fibroin is primarily composed of stacked antiparallel β sheets.

33. Which of the following descriptions about phenylalanine hydroxylase deficiency is **not true**?
(A) The ability of cells to produce tyrosine is reduced.
(B) It may result in the accumulation of pyruvate in the body.
(C) The amount of phenylpyruvate excreted in the urine is greatly increased.
(D) The resulting disease is called phenylketonuria, which often affects intellectual development in untreated patients.
(E) Such patients can be treated with a diet low in phenylalanine.

34. Which of the following antimitotic drugs stimulates microtuble polymerization and stabilizes microtubules?
(A) taxol
(B) nocodazole
(C) colchicine
(D) vincristine
(E) vinblastine

35. Protein acetylation is an important mode of regulation. Which of the following statements about reversible protein acetylation is **incorrect?**
(A) Protein acetylation usually uses acetyl-CoA as the acetyl group donor.
(B) The deacetylation reaction often involves the participation of $NAD^+$ as a cofactor.
(C) The reaction typically occurs at the α-amino group of a lysine in the target protein.
(D) Almost all enzymes in the TCA cycle can be regulated by protein acetylation
(E) Sirtuin-3 is a mitochondrial deacetylase that activates a TCA cycle enzyme - isocitrate dehydrogenase.

36. The kinetic constants for wild-type and mutant ATPase are listed in the table. Which of the following statements of this ATPase is **TRUE**?

| Enzyme | $K_m$ (μM) | $k_{cat}$ ($sec^{-1}$) |
|---|---|---|
| Wile-type | 1 | 50 |
| R160A | 80 | 20 |
| R160E | 200 | 22 |
| R160K | 10 | 30 |
| E36A | 4 | 0.1 |
| E36Q | 3 | 0.3 |

(A) Among the mutants, E36A has the highest catalytic efficiency.
(B) The positive charge of residue R160 is important for ATP hydrolysis.
(C) Residue E36 stabilizes the phosphate group.
(D) Residue E36 is likely to be a catalytic residue.
(E) Increase in ATP concentration can increase the catalytic efficiency of R160 mutants.

37. Which of the following statements about sickle cell anemia is **incorrect**?
(A) The red blood cells have a crescent shape making them difficult to pass through the capillaries.
(B) Hb S (sickle hemoglobin) differs from normal Hb A by only one amino acid substitution.
(C) The difference between the molecular structures of Hb S and normal Hb A is the presence of a hydrophobic protrusion on the surface of Hb S protein.
(D) The solubility of deoxyHb S is lower than that of deoxyHb A, so insoluble Hb S fibers may be observed frequently.
(E) When binding with oxygen, Hb S can interact with the cell membrane and cause cell damage.

38. Binding of oxygen to hemoglobin may be affected by many effectors. Which of the following statements about these effects is **correct**?
(A) Metabolically active tissues produce more acid and $CO_2$, which can promote the binding of oxygen to hemoglobin.
(B) NO· is a low-affinity ligand for hemoglobin so nitric oxide poisoning rarely occurs.
(C) NO· irreversibly binds to the -SH functional group of Cys 93 in the β chain of hemoglobin resulting in inactivation of the hemoglobin.
(D) The binding of 2,3-bisphosphoglycerate to hemoglobin can promote the

release of oxygen from hemoglobin.

(E) The reason why the adult-type and fetal-type hemoglobins have different $O_2$ binding ability is because that the two proteins have different heme binding activities.

39. Which of the following statements about the characteristics of allosteric enzymes is **correct**?

(A) Allosteric enzymes are often monomeric.

(B) The effectors of allosteric enzymes are typically enzyme inhibitors.

(C) Reactions catalyzed by allosteric enzymes generally follow Michaelis-Menten kinetics.

(D) Most allosteric enzymes are regulated through protein phosphorylation.

(E) Binding of an effector molecule on a non-catalytic site of the enzyme can result in a change in substrate binding affinity.

40. According to its function and structure, the electron transport chain can be divided into four complexes. Which of the following descriptions about these complexes is **incorrect**?

(A) Complex I oxidizes NADH and reduces coenzyme Q.

(B) Complex II oxidizes succinate and reduces coenzyme Q.

(C) Complex III transfers electrons from coenzyme Q to cytochrome c.

(D) Coenzyme Q is a highly hydrophilic molecule that is confined by the mitochondrial membrane.

(E) Complex IV obtain electron from cytochrome c.

41. Acetoacetic acid is one of the major components of ketone bodies. In case,1 mole acetoacetic acid is completely oxidized in cells. How many moles of high-energy bond will be generated?

(A) 13

(B) 18

(C) 23

(D) 26

(E) 28

42. The process of β-oxidation of saturated fatty acids involves a repeated sequence of four reactions which do **not** include:

(A) Stearoyl-CoA desaturase introduces double bonds in the long-chain fatty acids.

(B) Enoyl-CoA hydratase adds an OH group at the β carbon position of the fatty

acid.

(C) L-hydroxyacyl-CoA dehydrogenase and $NAD^+$ oxidize the newly generated β–hydroxyl group to produce a ketoacyl-CoA derivative.

(D) Ketoacyl thiolase transfers a two-carbon unit from β-ketoacyl-CoA to another CoA molecule to form acetyl-CoA.

(E) One of the four acyl-CoA dehydrogenases introduces a double bond at the α carbon of the fatty acid.

43. Regarding the structure and function of plasma membrane, which of the following statement is incorrect for plasma membrane?

(A) Plasma membrane consists of three classes of amphipathic lipids: phospholipids, glycolipids, and sterols.

(B) Plasma membranes are involved in a variety of cellular processes including cell adhesion

(C) Glycolipids embedded in the outer lipid layer.

(D) Phosphatidylserine is a component of the plasma membrane and is distributed dominantly in the outer plasma membrane.

(E) Plasma membrane has large amount of proteins, usually around half of membrane volume.

44. Which of the following peptides would be the most likely to have an N-myristoyl anchor?

(A) YRPQNLC

(B) GAREFDR

(C) MGRCVLN

(D) NILWAKG

(E) SIPGNYT

45. Which of the following is **true** about the distribution of phospholipids on cell membranes?

(A) Under normal physiological conditions, the lateral diffusion rate of phospholipids in the cell membrane is approximately several nanometers per second.

(B) Compared with lateral movement, the transverse movement of phospholipids between the inner and outer leaflets of the cell membrane is much faster.

(C) Floppase can actively transport amphiphilic lipids from the inner leaflet to the outer leaflet.

(D) When phosphatidylserine is found in the outer leaflet, scramblase uses the

energy of ATP to move it to the inner leaflet.

(E) The distribution ratio of phosphatidylserine in the inner and outer leaflets of the cell membrane is approximately the same.

46. Which of the following is a semi-essential amino acid; that is, this amino acid is essential in infants but not in adult.

(A) Proline

(B) Histidine

(C) Leucine

(D) Tyrosine

(E) Lysine

47. Allopurinol is in a class of medicationswhich can alleviate the production of uric acid in the body. Which of the following statement is incorrect for allopurinol?

(A) Allopurinol is used to reduce gout attacks.

(B) Allopurinol undertakes metabolism in the liver where it transforms into its active metabolite.

(C) Allopurinol is a structural isomer of hypoxanthine.

(D) Allopurinol is a uricosuric, it cannot be used in people with poor kidney function.

(E)Allopurinol is an inhibitor of the enzyme xanthine oxidase.

48. Phenylketonuria is an inborn error of metabolism that results in decreased metabolism of the amino acid phenylalanine. The unavailability of the following factor might result in phenylketonuria?

(A) thiamine

(B) biotin

(C) tetrahydrobiopterin

(D) tetrahydrofolate

(E) lipoamine

49. Comparing the ubiquitination and sumoylation pathways, which of the following statements are **TRUE**?

(1) Both types of protein modification can target proteins for proteasome-mediated degradation

(2) Both types of protein modification can be used to regulate DNA repair.

(3) Before modification, SUMOs need to be proteolytically processed.

(4) Both types of modification can provide a new binding site for an interacting

partner.

(5) For both types of modification, ligation occurs between a Gly residue on substrate proteins and a Lys residue on the modifiers.

(A) 234

(B) 135

(C) 245

(D) 123

(E) 345

50. The polymerase chain reaction (PCR) is a powerful technology to amplify DNA. If the detection sensitivity of DNA agarose gel is $10^5$ molecules of double-stranded DNA and the starting material contains 100 double-stranded DNA molecules, what is the minimal number of PCR cycles to detect the DNA by agarose gel electrophoresis? (assume the efficiency of every PCR cycle is 100%)

(A) 5

(B) 8

(C) 10

(D) 16

(E) 32

51. RNA interference is a technique commonly used to modulate gene expression. Which of the following descriptions about this technology is **incorrect**?

(A) Double-stranded RNA usually produces better interference effect than single-stranded RNA does.

(B) The RNA delivered into the cell is first trimmed into 21-23 nucleotide siRNA by the endoribonuclease Dicer.

(C) siRNA binds to the target gene promoter and prevents transcription through the action of the RNA-induced silencing complex (RISC).

(D) RISC has RNA helicase and RNase H activities.

(E) RISC can cleave the mRNA bound by siRNA, so that the protein cannot be translated.

52. mRNA is a single-stranded RNA that corresponds to the sequence of a gene; meanwhile, mRNA is read by a ribosome in the process of protein synthesis. Which of the following statement is incorrect for mRNA and its role on RNA processing?

(A) mRNA is derived from its upstreamed precursor hnRNA.

(B) Caps are regularly observed on the 5'-end of mRNA with unmodified pppA and pppT structure.

(C) Poly A tails are polymers of 200 to 300 adenylated residues linked with phosphodiester bonds.

(D) All hnRNA introns have a guanine-uracil sequence on the 5' border of their intron/exon junctions.

(E) Polyadenylation assists stabilize mRNA.

53. In the Ramachandran plot as shown below, clusters of dots show:

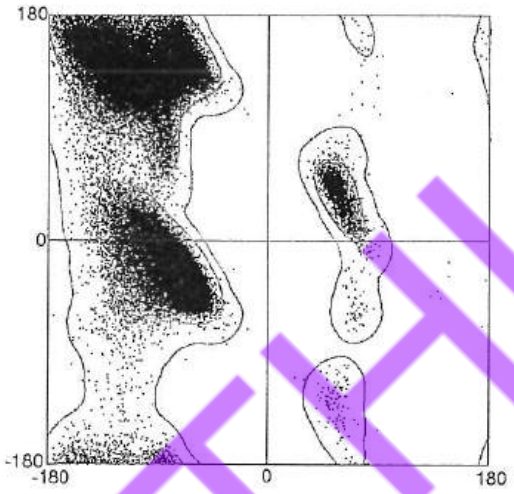
(1) where the phi and psi angles are energetically favorable

(2) the tertiary structure

(3) the folding energy

(4) where beta strands occur

(5) where alpha helices, beta strands, and turns do not occur




(A) 2, 5

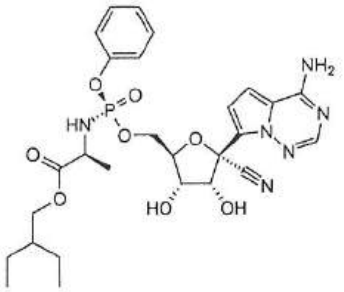
(B) 1, 5

(C) 2, 3

(D) 1, 4

(E) 4, 5

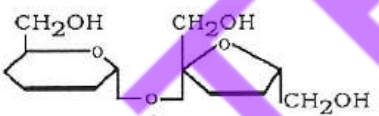
54. Remdesivir is an FDA approved antiviral treatment for Covid-19. The structure of remdesivir is shown below. Which of the following statement about remdesivir is correct?



(A) The structure of this antiviral drug mimics ribonucleotide.
(B) It is subjected to phosphorylation to form bioactive bisphosphate in cells.
(C) It is a guanine nucleotide analog.
(D) It targets DNA-dependent RNA polymerase.
(E) It inhibits viral entry.

55. Which of the following amino acid contains two chiral centers?
(A) Proline
(B) Isoleucine
(C) Tyrosine
(D) Phenylalanine
(E) Tryptophan

56. Which of the following best describes the disaccharide shown below?



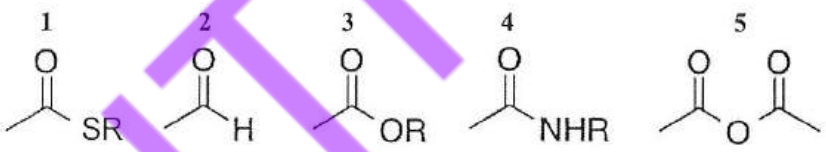
(A) The glycosidic bond is β(2→4).
(B) The glycosidic bond is α(1→2).
(C) The glycosidic bond is α(2→4).
(D) One of the sugar moieties is a ribose.
(E) The disaccharide is maltose.

57. Which of the following protein modifying reagents is **correctly** defined?
(A) 2-mercaptoethanol: readily oxidizes -SH group and forms disulfide bridges in proteins.
(B) cyanogen bromide: the Br ion reacts with the nucleophilic sulfur atom of the target amino acid that leads to protein cleavage.
(C) phenylisothiocyanate: reacts with free carboxyl groups in protein.
(D) cyanogen bromide: specifically reacts with internal cysteine residues
(E) guanidinium HCl: disrupts ionic interactions and hydrogen bonds

58. Which of the following amino acid has a strong and broad absorption signal 3400cm$^{-1}$ in the infrared spectrum?
(A) Tryptophan
(B) Glycine
(C) Proline
(D) Leucine
(E) Tyrosine

59. Chorismate mutase converts chorismate to prephenate. Which of the following is **NOT** relevant to the reaction catalyzed by the enzyme?
(A) The enzyme catalyzes the reaction via a chair transition state
(B) The reaction involves a concerted two-molecule sequential reaction.
(C) The enzymatic reaction involves the stabilization of the transition state by 12 electrostatic and hydrogen bond interactions
(D) In the reaction, one carbon-oxygen bond is broken and one carbon-carbon bond is formed.
(E) Formation of a near attack conformation is facile in the chorismate mutase active site.

60. Which one is the correct ranking of the relative reactivity of the following carbonyl groups?




(A) 1 > 2 > 4 > 5 > 3
(B) 5 > 2 > 1 > 3 > 4
(C) 5 > 2 > 3 > 1 > 4
(D) 4 > 1 > 3 > 2 > 5
(E) 1 > 2 > 3 > 4 > 5

# 國立清華大學學士後醫學系考試 各科試題參考答案

科目名稱:英文

| 題號 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 答案 | D | E | B | D | A | B | D | B | C | C | B | C | E | E | B |
| 題號 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 答案 | C | D | A | D | C | C | C | A | D | A | E | E | B | D | A |
| 題號 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 |
| 答案 | D | B | D | E | A | C | A | A | D | E | A | B | E | C | C |
| 題號 | 46 | 47 | 48 | 49 | 50 | | | | | | | | | | |
| 答案 | B | A | C | E | D | | | | | | | | | | |

科目名稱: 生物與生化

| 題號 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 答案 | A | D | D | C | A | A | A | B | A | B | C | A | A | D | B |
| 題號 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 答案 | E | A | B | E | E | A | B | C | E | A | B | A | A | D | E |
| 題號 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 |
| 答案 | D | D | B | A | C | D | E | D | E | D | C | A | D | B | C |
| 題號 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| 答案 | B | D | C | A | C | C | B | D | A | B | B | E | E | B | B |

科目名稱：化學與物理

| 題號 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
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| 答案 | B | D | E | E | C | C | A | C | E | C | E | C | D | D | D |
| 題號 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 答案 | E | A | B | D | E | D | A | A | C | B | E | A | C | C | C |
| 題號 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 |
| 答案 | D | B | E | E | C | C | E | D | A | B | D | B | A | E | D |
| 題號 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| 答案 | B | D | C | E | B | E | D | A | A | B | A | A | B | C | B |

科目名稱：資訊科學

| 題號 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 答案 | B | A | D | B | D | D | D | D | D | A | B | B | B | C | E |
| 題號 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 答案 | C | A | D | D | E | C | B | D | B | A | B | D | C | B | A |