110學年度 學士後醫學系招生考試

普通生物及生化概論試題封面

考試開始鈴響前，請勿翻閱本試題！

★考試開始鈴響前，請注意：

一、除准考證、應考文具及一般手錶外；行動電話、穿戴式裝置及其他物品均須放在臨時置物區。

二、請務必確認行動電話已取出電池或關機，行動電話及手錶的鬧鈴功能必須關閉。

三、就座後，不可擅自離開座位或與其他考生交談。

四、坐定後，雙手離開桌面，確認座位號碼、答案卡號碼與准考證號碼相同，以及抽屜中、桌椅下或座位旁均無非考試必需用品。如有任何問題，請立即舉手反應。

五、考試開始鈴響前，不得翻閱試題本或作答。

六、考試全程不得吃東西、喝水及嚼食口香糖。

七、違反上述規定，依「筆試規則及違規處理辦法」議處。

★作答說明：

一、考試時間：100 分鐘。

二、本試題（含封面）共 **16** 頁，如有缺頁或毀損，應立即舉手請監試人員補發。

三、本試題共 90 題，皆為單選題，共計 150 分；每題答錯倒扣，不作答不計分。

四、答題依題號順序劃記在答案卡上，寫在試題本上無效；答案卡限用 2B 鉛筆劃記，若未按規定劃記，致電腦無法讀取者，考生自行負責。

五、試題本必須與答案卡一併繳回，不得攜出試場。

Choose one best answer for the following questions

【單選題】每題 1 分，共計 30 分，答錯 1 題倒扣 0.25 分，倒扣至本大題零分為止，未作答，不給分亦不扣分。1~15 題為普通生物，16~30 題為生化概論。

1. The formation of new species occurred in populations that are geographically isolated from one another is _____.
   (A) peripatric speciation (B) sympatric speciation (C) allopatric speciation
   (D) parapatric speciation (E) artificial speciation

2. If a species contains 23% adenine in its genome, what is the percentage of guanine it would contain?
   (A) 23% (B) 46% (C) 25% (D) 44% (E) 27%

3. Several butterfly species that are edible to birds have very similar color patterns to the generally inedible Monarch butterfly. This is best described as an example of _____.
   (A) Batesian mimicry (B) Müllerian mimicry (C) crypsis
   (D) aposematic coloration (E) subterfuge

4. Which description about the status of action potential of voltage-gated Na^+ and K^+ channels is **FALSE**?
   (A) resting state: both Na^+ and K^+ channels close
   (B) depolarization: some Na^+ channels open and K^+ channels close
   (C) rising phase of action potential: both Na+ and K+ channels open
   (D) falling phase of action potential: Na^+ channels close and K^+ channels open
   (E) None of the above

5. In vertebrates with four-chambered hearts, the _____ receives oxygenated blood directly from the _____.
   (A) right ventricle, lungs (B) right ventricle, right atrium
   (C) left atrium, left ventricle (D) left ventricle, left atrium
   (E) left ventricle, lungs

6. Which description about the endocrine system is **FALSE**?
   (A) Epinephrine synthesized from tyrosine is secreted from adrenal medulla.
   (B) Posterior pituitary synthesizes and secrets antidiuretic hormone (ADH) and oxytocin.
   (C) Parathyroid hormone (PTH) raises blood Ca^{2+} level by stimulating kidneys and bones.
   (D) Glucocorticoids increase blood glucose and suppress immune system in long-term stress response.
   (E) None of the above

7. Which description about digestive system is **FALSE**?
   (A) Pantothenic acid, a component of coenzyme A, causes fatigue in deficiency.
   (B) Magnesium, an enzyme cofactor, causes nervous system disturbance in deficiency.
   (C) Cholecystokinin (CCK) stimulates the release of enzyme from pancreas.
   (D) Leptin, produced by adipose tissue, stimulates appetite.
   (E) None of the above

8. Which description about cyclic AMP (cAMP) is **FALSE**?
   (A) It is formed from ATP by phosphodiesterase.
   (B) It activates protein kinase A.
   (C) It regulates the activity of synaptic ion channels.
   (D) It regulates the expression of *LacZ (ß*-galactosidase*)* in *E. coli.*
   (E) None of the above

9. Which ion in plants is **NOT** matched with its function?
   (A) Zn^{2+} -- water balance
   (B) K^{+} -- stomata operation
   (C) Fe^{3+} -- chlorophyll synthesis
   (D) Mg^{2+} -- component of the chlorophyll
   (E) None of the above

10. Which one is **NOT** a common model organism in developmental genetics?
   (A) *Mus musculus*
   (B) *Caenorhabditis elegans*
   (C) *Cinnamomum camphora*
   (D) *Arabidopsis thaliana*
   (E) None of the above

11. During the local inflammatory response, what chemical is released by mast cells that increase capillary permeability?
   (A) proteases (B) heparin (C) histamine (D) IgE (E) complement

12. If the smooth endoplasmic reticulum was removed from the cell, which of the following processes would be mostly affected?
   (A) protein synthesis
   (B) packaging proteins
   (C) secreting proteins
   (D) lipid synthesis
   (E) transporting proteins

13. Blockage of the common bile duct would affect _____.
   (A) starch digestion
   (B) cellulose digestion
   (C) lipid digestion
   (D) protein digestion
   (E) nucleotide digestion

14. Which bone belongs to the appendicular skeleton?
   (A) skull
   (B) vertebral column
   (C) rib cage
   (D) femur
   (E) sternum

15. A patient has a blood pressure of 120/75, a pulse rate of 50 beats/min, a stroke volume of 60 mL/beat, and a respiratory rate of 25 breaths/min. This person's cardiac output per minute will be _____.
(A) 1,000 mL (B) 1,500 mL (C) 3,000 mL (D) 4,500 mL (E) 7,200 mL

16. Which of the following cell conditions involves reverse transcriptase activity?
(A) replicate DNA lagging strand
(B) replicate DNA leading strand
(C) replicate viral RNA
(D) replicate DNA in SV40 virus
(E) replicate mRNA

17. Which of the following chemicals is allosteric activator of carbamoyl phosphate synthetase I?
(A) *N*-Acetylglutamate (B) Citrulline (C) Ornithine
(D) Aspartate (E) Glutamine

18. Which of the following metabolites is produced by uracil degradation?
(A) Uric acid (B) β-Alanine (C) Carbamoyl phosphate
(D) β-Aminoisobutyrate (E) Ammonia

19. The 5′→3′ exonuclease activity of *E. coli* DNA polymerase I is involved in _____ during DNA replication.
(A) proofreading
(B) removal of RNA primers
(C) sealing of nick
(D) formation of Okazaki fragments
(E) formation of a nick at the origin

20. Glutamate is metabolically converted to α-ketoglutarate and NH_4^+ in mitochondria matrix of hepatocyte by a process described as _____.
(A) hydrolysis (B) transamination (C) oxidative deamination
(D) one-carbon transfer (E) thiolysis

21. Posttranslational modification of proteins may include the followings **EXCEPT**
(A) adding disulfide bridge.
(B) adding cofactors and prosthetic groups.
(C) cleavaging the nascent peptide.
(D) adding a signal sequence at the N-terminus.
(E) adding oligosaccharides in endoplasmic reticulum.

22. Which one of these characteristics is **FALSE** for the α-helix in protein?
    (A) There are 3.6 amino acids per turn.
    (B) There is a requirement for glycine in every third amino acid residue.
    (C) A H-bond forms between the carbonyl oxygen of the n^{th} amino acid residue and the amido proton of the $(n + 4)^{th}$ amino acid residue.
    (D) Proline is typically not found in the α-helix.
    (E) A single turn of the helix extends about 5.4 Å along the long axis.

23. Which form of tetrahydrofolate is used in the enzymatic transfer of formyl group, as in purine synthesis and in the formation of formyl-methionine in prokaryotes?
    (A) N^5-Formyl-tetrahydrofolate (B) N^5-Formimino-tetrahydrofolate
    (C) N^{10}-Formyl-tetrahydrofolate (D) N^5, N^{10}-Methenyl-tetrahydrofolate
    (E) Tetrahydrofolate

24. Hydroxylation of proline residues in collagen is catalyzed by proly1 4-hydroxylase. The enzymatic action of prolyl 4-hydroxylase requires: ① Ascorbic acid; ② α-Ketoglutarate; ③ Cu^{2+}; ④ ATP; ⑤ Fe^{2+}
    (A) ①,②,③ (B) ①,②,④ (C) ①,②,⑤ (D) ①,③,④ (E) ①,④,⑤

25. Which of the following reactions requires vitamin K?
    (A) carboxylation of glutamate (B) ADP ribosylation of tyrosine
    (C) methylation of arginine (D) oxidation of cysteine
    (E) amidation of C-terminus of the polypeptide

26. Which of the following proteins plays a dual role in modulating protein folding and conformation of steroid hormone receptors in eukaryotic cells?
    (A) CroES-CroEL complex (B) Hsp60 (C) Prefoldin
    (D) Hsp90 (E) Chaperonin

27. By completing β-oxidation of fatty acid with odd number of carbons, _____ will enter the citric acid cycle. ① acetyl-CoA; ② malate; ③ α-ketoglutarate; ④ succinyl-CoA
    (A) ①,② (B) ①,③ (C) ①,④ (D) ②,③ (E) ③,④

28. Which of the following tools is **NOT** used to quantify the level of gene expression?
    (A) real-time RT-PCR (B) RNase protection assay (C) Northern blotting
    (D) Western blotting (E) Southern blotting

29. Enzymes are potent catalysts because they _____.
(A) are consumed in the reactions they catalyze
(B) are very specific and the converted products cannot return to substrates
(C) drive reactions to completion, while other catalysts drive reactions to equilibrium
(D) increase the equilibrium constants for the reactions they catalyze
(E) lower the activation energy for the reactions they catalyze

30. What is the major apo-lipoprotein and lipid in high-density lipoprotein (HDL)?
(A) ApoB-48, cholesterol ester
(B) ApoB-100, phospholipid
(C) ApoE, free cholesterol
(D) ApoA-I, phospholipid
(E) ApoA-II, cholesterol ester

【單選題】每題 2 分，共計 120 分，答錯 1 題倒扣 0.5 分，倒扣至本大題零分為止，未作答，不給分亦不扣分。31~60 題為普通生物，61~90 題為生化概論。

31. Which description about the hormones regulation in human reproduction is **FALSE**?
(A) Inhibin inhibits anterior pituitary to secret follicle-stimulating hormone (FSH) in male.
(B) Testosterone inhibits hypothalamus to secret gonadotropin-releasing hormone (GnRH) in male.
(C) Low levels of estradiol inhibits anterior pituitary to secret FSH in female.
(D) High levels of estradiol stimulates hypothalamus to secret GnRH in female.
(E) None of the above

32. Regarding to the mitochondria, which statement is **FALSE**?
(A) According to the concept of endosymbiotic theory, the mitochondria extracted from monkey can be transferred into human cells.
(B) The genome size of plant mitochondria is much larger than animal's.
(C) A cell can contain more than one mitochondria.
(D) Mitochondria can produce ATP more quickly than glycolysis.
(E) Mitochondria can do transcription and translation.

33. What do synaptic signaling and paracrine signaling have in common?
(A) Cells bind a membrane bound signal on a neighboring cell.
(B) Cells release a signal that affects cells at long distances.
(C) Cells release a signal that affects itself and neighboring cells.
(D) Cells release a signal that affects neighboring cells.
(E) Cells release a signal through gap junctions to affect neighboring cells.

34. Which of the following descriptions about cell division is **FALSE**?
(A) Animal cells form centrioles during cell division.
(B) Animal cells form a cleavage furrow to form new daughter cells.
(C) There is phragmoplast alignment of Golgi-derived vesicles in plant cell division.
(D) The cell plate is the final partitioning of plant cells.
(E) Plant cells resort to binary fission.

35. Which is a common feature of gymnosperms and angiosperms?
(A) pollen tubes (B) flagellated sperms
(C) sperms carried by windborne pollen (D) fruits
(E) flowers

36. Which description about the immune system is **FALSE**?
(A) Helper T cells bind antigen-presenting cells (APCs) need Class II major histocompatibility complex (MHC) and accessory protein (CD8).
(B) APCs secret cytokines such as interleukin-1 (IL-1) and tumor necrosis factor (TNF) for T cell activation.
(C) Cytotoxic T cell releases perforin and granzymes to kill infected cells.
(D) Pathogens can be disposed by antibodies through neutralization, opsonization, or complement system activation
(E) None of the above

37. Which description about virus is **FALSE**?
(A) Provirus is the viral DNA incorporated into host cell's DNA.
(B) The envelope of RNA virus contains the cell membrane of host and glycoproteins of virus.
(C) Adenovirus, papillomavirus, herpesvirus, and poxvirus are DNA viruses.
(D) Virods are DNA molecules that infect plant cells.
(E) None of the above

38. Breakdown of the fat storage at brown fat tissue in some animals increases when _____.
(A) torpor (B) exercising (C) shivering (D) hibernation (E) sleeping

39. In nature, population size could be controlled by a density-independent factor. Which of the followings would be a possible case?
(A) forest fires (B) competition (C) parasites
(D) predation (E) infection disease

40. In plants, the red light can be absorbed by _____.
    (A) Pr type phytochrome
    (B) Plastoquinone (PQ) of photosystem II (PSII)
    (C) carotenoids
    (D) ribulose biphosphate (RuBP)
    (E) ATP synthase

41. Which event for muscle contraction is **FALSE**?
    (A) Binding of acetylcholine to receptors stimulates Ca^{2+} pumping into sarcoplasmic reticulum.
    (B) Binding of tropomyosin to actin covers myosin-binding site.
    (C) Binding of Ca^{2+} to troponin exposes myosin-binding site of actin.
    (D) Binding of ATP releases myosin from actin.
    (E) None of the above

42. Which description about the diseases is **FALSE**?
    (A) Severe combined immunodeficiency (SCID) is caused by adenosine deaminase deficiency.
    (B) Cystic fibrosis (CF) is caused by a Na^{+} transporter gene deficiency.
    (C) Tay-Sachs disease is caused by a lipid metabolized gene deficiency.
    (D) α_1- Antitrypsin deficiency causes emphysema.
    (E) None of the above

43. Which description about the excretory system is **FALSE**?
    (A) The nasal glands of marine birds concentrate salt.
    (B) The Malpighian tubes of insects remove nitrogenous wastes.
    (C) Glucose and amino acids are reabsorbed in descending limb of the loop of Henle.
    (D) The juxtaglomerular apparatus (JGA) releases renin when blood pressure drops.
    (E) None of the above

44. Which description about the circulatory and respiratory systems is **FALSE**?
    (A) The spike (QRS complex) of electrocardiogram (ECG) represents the signal passing from atrioventricular (AV) node to heart apex.
    (B) Individuals with a high ratio of LDL/HDL have risk for atherosclerosis.
    (C) The diaphragm contracts during inhalation in human.
    (D) Medulla can detect the decreased blood pH.
    (E) None of the above

45. Which description about the nervous system is **NOT** matched with its function?
(A) Acetylcholine stimulates heart muscle.
(B) Reticular formation regulates arousal and sleep.
(C) Parasympathetic nerves stimulate stomach activity.
(D) Amygdala controls emotional memory.
(E) None of the above

46. Which assumption is **NOT** the basis for Hardy-Weinberg equilibrium?
(A) random mating
(B) natural selection
(C) large population with genetic drift
(D) no gene migration of alleles into or out of the population
(E) no mutation

47. What is the primary original source of genetic variation in a population?
(A) mutation (B) genetic drift (C) inbreeding
(D) cloning (E) None of above

48. Which protist is **NOT** matched with its disease?
(A) *Plasmodium* - malaria
(B) *Trichomonas* - sexual transmitted disease
(C) *Leishmania* - skin disease
(D) *Trypanosoma* - intestinal infection
(E) None of the above

49. Which description about fungi is **FALSE**?
(A) Athlete's foot and ringworm are caused by fungi.
(B) *Candida albicans* is a fungi to infect vagina.
(C) Forming buds instead of spores are more effectively in sticking to lung cells.
(D) Coccidioidomycosis is treated with antibiotics.
(E) None of the above

50. Which description about the reproductive system is **FALSE**?
(A) Spermatheca is used to store sperms in female fruit fly.
(B) Epididymis is used to store sperms in men.
(C) Oogenesis begins at embryonic development of women.
(D) Hypothalamus is stimulated by combinations of high levels estradiol and progesterone.
(E) None of the above

51. Which of the following animals has the largest basic metabolic rate (BMR) per body mass?
(A) 500 kg horse (B) 60 kg human (C) 60 kg alligator
(D) 0.5 kg lizard (E) 0.5 kg rat

52. Which is the **WRONG** description about sexual reproduction of fungi?
(A) Fungi release pheromones to find the correction mating type.
(B) After plasmogamy, nuclei of two mycelia fuse immediately.
(C) A zygote is formatted after karyogamy.
(D) A heterokaryon contains two coexisting, genetically different nuclei.
(E) A heterokaryon can be extended hours, days, or even years.

53. In a large population of a plant species, which of the following situations is the least likely to change allele frequencies within the population?
(A) A forest fire destroys most of individuals in the population
(B) Radioactive fallout from an accident at a nuclear power plant
(C) Microhabitats within the range of the population where certain phenotypes have a better chance of surviving
(D) The preference of a pollinator for a certain flower color
(E) Wind pollination of the flowers

54. Which of the following is **NOT** related to the parasympathetic nervous system?
(A) Lacrimal glands that produce tears
(B) Fight or flight responses
(C) Nerves in the stomach and trunk
(D) Nerves that go to the bladder
(E) Nerves and blood vessels responsible for the male erection

55. Which of the followings is **NOT** a steroid hormone?
(A) progesterone (B) testosterone
(C) mineralocorticoid (D) estradiol
(E) follicle-stimulating hormone

56. A patient **CANNOT** form new long-term memories after a serious brain damage of _____.
(A) somatosensory cortex (B) motor cortex (C) frontal lobe of cortex
(D) thalamus (E) hippocampus

57. Which is **NOT** a function of the pigment epithelium in retina?
(A) absorption of scattered light
(B) phagocytizing shed outer discs
(C) isomerize the all-trans retinal to the 11-cis form
(D) delivery of nutrients to the photoreceptors
(E) creating the dark current of the photoreceptors

58. The form and function of nephrons in vertebrate kidney have a different adaptation to meet their requirements for osmoregulation. Which one is **CORRECT**?
(A) Freshwater fishes conserve salt in their proximal tubules and excrete large volumes of dilute urine.
(B) Amphibians conserve water on land by reabsorbing water from collecting duct.
(C) Mammals that inhabit in fresh water have relatively long loops of Henle.
(D) Birds have shorter loops of Hendle.
(E) Most reptiles excrete uric acid by juxtamedullary nephron.

59. Which organ or tissue is differentiated from mesoderm?
(A) epidermis of skin (B) nervous system (C) adrenal medulla
(D) dermis of skin (E) thymus

60. _____ are **NOT** derived from myeloid stem cell.
(A) Basophils (B) Erythrocytes (C) Lymphocytes
(D) Monocytes (E) Platelets

61. Ribonucleotide reductase catalyzes the reduction of ribonucleotides to deoxyribonucleotides. Which of the following cofactors are essential for the activity of ribonucleotide reductase?
① NADPH; ② Thioredoxin; ③ NADH; ④ Glutaredoxin; ⑤ Tetrahydrofolate
(A) ①,②,⑤ (B) ①,②,④ (C) ①,③,⑤ (D) ②,③,⑤ (E) ②,③,④

62. In eukaryotic matured mRNA, which one of the following statements is **FALSE**?
(A) Both 5’ and 3’ ends contain a free 3-OH group on ribose.
(B) Intron is removed in the matured RNA.
(C) Poly(A) tail is added to 3’ end in matured RNA.
(D) Methylation can be found on 5’ end.
(E) Splicing needs snRNAs.

63. A cell that is unable to synthesize or obtain tetrahydrofolate would probably be deficient in the biosynthesis of _____.
(A) dGMP (B) dCMP (C) dAMP (D) dTMP (E) dUMP

64. Pompe disease is a glycogen storage disease caused by defect in _____.
(A) glycogen phosphorylase (B) lysosomal α-1,4-glucosidase
(C) glycogen branching enzyme (D) glucose-6-phosphatase
(E) phosphorylase kinase

65. Which of the following statements about allosteric regulation are **CORRECT**? ① Substrate is a heterotropic allosteric modulator. ② Allosteric regulation can increase or decrease the catalytic activity of enzymes. ③ Allosteric enzymes typically have oligomeric structure. ④ The activity of some allosteric enzymes is regulated by feedback inhibition. ⑤ Allosteric modulators cannot induce conformational change of allosteric enzymes.
(A) ①,②,③ (B) ①,②,④ (C) ①,③,④ (D) ①,③,⑤ (E) ②,③,④

66. Which of the following statements about ribozyme are **CORRECT**? ① Peptidyl transferase is a ribozyme. ② Aminoacyl-tRNA synthetase is a ribozyme. ③ The substrate of ribozyme is RNA. ④ Hammerhead ribozyme is involved in trans-splicing reaction. ⑤ RNase P is a ribozyme.
(A) ①,②,③ (B) ①,③,④ (C) ①,④,⑤ (D) ①,③,⑤ (E) ②,④,⑤

67. Which of the following statements about microRNAs (miRNAs) are **CORRECT**? ① miRNAs originate from exogenous dsRNA. ② miRNAs form a perfect complementary to its target mRNA. ③ Some miRNAs can functionally inhibit mRNA translation. ④ Some miRNAs can promote mRNA decay. ⑤ miRNAs are transcribed by RNA polymerase III.
(A) ①,⑤ (B) ②,③ (C) ③,④ (D) ②,④ (E) ③,⑤

68. Which of the following statements about glycogen is **FALSE**?
(A) Glucose-6-phosphate is released from nonreducing ends of the glucose polymer by the action of the enzyme glycogen phosphorylase.
(B) In glycogen breakdown, it involves sequential phosphorolytic cleavages of α(1→4) bonds.
(C) Glycogen is the storage polysaccharide in skeletal and liver cells.
(D) Glycogen is a polymer of glucose in α(1→4) linkages with α(1→6) linked branches.
(E) The breakdown of glycogen in skeletal muscle ultimately enters glycolysis to generate ATP.

69. Which of the following statements for Shine-Dalgarno sequence are **CORRECT**?
① Shine-Dalgarno sequence is found in prokaryotic mRNA. ② Shine-Dalgarno sequence is a purine-rich sequence. ③ Shine-Dalgarno sequence can base-pair with a sequence of tRNA. ④ Shine-Dalgarno sequence is involved in DNA replication. ⑤ Shine-Dalgarno sequence can base-pair with a sequence of 16S rRNA.
(A) ①,②,③ (B) ①,②,⑤ (C) ①,③,④ (D) ①,④,⑤ (E) ①,②,④,⑤

70. Which of the following statements about nitric oxide (NO) are **CORRECT**? ① Cellular NO is produced from lysine. ② Nitroglycerine is an NO donor. ③ Nitric oxide synthase is involved in the production of NO. ④ Adenyl cyclases are receptors for NO. ⑤ NO production in endothelial cells leads to vasodilation.
(A) ①,②,③ (B) ②,③,④ (C) ③,④,⑤ (D) ①,③,④ (E) ②,③,⑤

71. Which of the following statements about oxidative phosphorylation are **CORRECT**?
① Oxidative of NADPH occurs in mitochondria. ② The production of ATP is driven by electron transport and proton gradient. ③ The process of chemiosmotic coupling is involved in the synthesis of ATP in mitochondria. ④The production of ATP is mediated by a substrate-level phosphorylation of ADP. ⑤ The electron transport is inhibited by 2,4-dinitrophenol.
(A) ①,③,⑤ (B) ①,②,③ (C) ②,③ (D) ③,④,⑤ (E) ③,⑤

72. Which of the following statements about *lac* operon is **CORRECT**? ① The repressor is the protein product of *lac* Z gene. ② The *lac* operon can be turned on by β-galactoside. ③ Repressor binds to the operator and blocks the binding of RNA polymerase to promoter. ④ Isopropyl-β-D-thiogalactoside can bind to Lac repressor to turn on protein expression. ⑤ In the *lac* operon model, the genes within the operon will be expressed if lactose is present in *E. coli.*
(A) ①,②,③ (B) ①,②,④ (C) ②,③,④ (D) ③,④,⑤ (E) ②,③,④,⑤

73. Which of the following statements about glutathione are **CORRECT**? ① Glutathione is an antioxidant. ② Glutathione is a tetrapeptide. ③ Glutathione is not involved in detoxification of xenobiotics. ④ The biosynthsis of glutathione synthesis occurs as a part of γ-glutamyl cycle. ⑤ Oxidized glutathione is reduced by glutathione reductase.
(A) ①,②,③ (B) ①,③,④ (C) ①,④,⑤ (D) ②,③,④ (E) ①,②,⑤

74. Which of the following statements about citric acid cycle is **FALSE**?
(A) The first reaction is to synthesize citric acid.
(B) In addition to CTP, NADH and QH_2 are also produced in citric acid cycle.
(C) The acetyl group of acetyl-CoA is released in the form of CO_2 when it enters citric acid cycle.
(D) The product of the last step, oxaloacetate, is also the reactant of the first step.
(E) It occurs in mitochondrial matrix.

75. Which of the following statements about amino acids is **CORRECT**? ① Methionine is sulfur-containing amino acids. ② The UV absorbance of phenylalanine at 280 nm is lower than that of tyrosine. ③ Disulfide bond can be reduced by performic acid. ④ The side chain of histidine is an imidazole ring. ⑤ The pI value of arginine is lower than that of lysine.
(A) ①,②,③ (B) ①,③,④ (C) ②,③,④ (D) ①,②,④ (E) ②,③,⑤

76. Which of the following enzymes are aspartate protease ? ① Subtilisin; ② Cathepsin D; ③ HIV-protease; ④ Thrombin; ⑤ Pepsin
(A) ①,②,③ (B) ①,②,④ (C) ①,②,⑤ (D) ②,③,④ (E) ②,③,⑤

77. Which of the following statements for the structure of proteins are **CORRECT**? ① A bond between amino acids is peptide bond. ② Disulfide bonds in proteins are formed by serine. ③ The amino acid sequence is the primary structure of proteins. ④ The coil-coiled motif is the tertiary structure of proteins. ⑤ The quaternary structure of proteins contains two or more polypeptide chains.
(A) ①,③,⑤ (B) ②,③,④ (C) ②,③,⑤ (D) ①,③,④ (E) ①,②,③

78. In order to infect cells, the hemagglutinin of the influenza virus binds with _____ in the cell surface glycoproteins or glycolipids.
(A) sialic acid (B) gluconic acid (C) *N*-acetylmuramic acid
(D) uronic acid (E) muramic acid

79. In electron-transport chain, the transferring sequence of the electrons passing from NADH to oxygen is:
(A) Complex I→Complex III→Complex IV→Complex V
(B) Complex I→Complex II→Complex III→cytochrome c→Complex IV
(C) Complex I→Q→Complex II→Complex III→cytochrome c→Complex IV
(D) Complex I→Complex II →Complex III →Complex IV
(E) Complex I→Q→Complex III→cytochrome c→Complex IV

80. Which of the following **BEST** explains the "wobble" hypothesis proposed by Francis Crick?
(A) The genetic code is degenerate in that most amino acids have more than one codon.
(B) The genetic code is ambiguous in that each codon can specify more than one amino acid.
(C) The anticodon can pair with any part of the corresponding codon.
(D) The 5'-base of the anticodon can make non Watson-Crick hydrogen bonds with several different bases at the 3'-position of the codon.
(E) Inosine can pair up with C, G, or U.

81. Phospholipids show asymmetric distribution on membrane of erythrocytes. Which of the following phospholipids prefer to distribute on the outer leaflet of erythrocyte membrane?
① phosphatidylcholine; ② phosphatidylserine; ③ phosphatidylinositol; ④ sphingomyelin; ⑤ phosphatidylethanolamine
(A) ①,② (B) ①,③ (C) ①,④ (D) ②,③ (E) ②,⑤

82. Mammalian phosphofructokinase, the major flux-controlling enzyme of glycolysis, is regulated by ① allosteric activator, fructose 2, 6-bisphosphate; ② allosteric inhibitor, ATP; ③ allosteric activator, AMP; ④ allosteric inhibitor, ADP; ⑤ allosteric activator, Citrate
(A) ①,②,③ (B) ①,③,④ (C) ①,②,⑤ (D) ①,③,⑤ (E) ①,④,⑤

83. Misfolding of protein causes a broad range of disease. Which of the following human diseases linked to misfolding of proteins are **CORRECT**? ① Alzheimer's disease, β-Amyloid peptide ; ② Creutzfeldt-Jakob disease, Prion protein ; ③ Cystic fibrosis, Superoxide dismutase I; ④ Hungtington's disease, α-Synuclein; ⑤ Familial amyloidotic polyneuropathy, Transthyretin.
(A) ①,②,③ (B) ①,②,④ (C) ②,③,⑤ (D) ③,④,⑤ (E) ①,②,⑤

84. Which of the following statements about the inhibition of enzyme activity is **FALSE**?
(A) Transition state analogs can be used as competitive inhibitor.
(B) Irreversible inhibition can be analyzed using Michaelis-Menten equation.
(C) Increasing substrate concentration can counteract the effect of competitive inhibitor.
(D) An uncompetitive inhibition does not affect the slope of the Lineweaver-Burk plot.
(E) The irreversible inhibitor is covalently linked with the catalytic residue at the active site of the enzyme.

85. Which of the following enzymes are involved in the purine salvage pathways? ① GMP synthetase; ② Adenine phosphoribosyl transferase; ③ Purine nucleoside phosphorylase; ④ Hypoxanthine-guanine phosphoribosyltransferase; ⑤ Adenylosuccinate lyase
(A) ①,② (B) ②,③ (C) ③,④,⑤ (D) ②,④ (E) ②,③,④

86. Which of the following statements for cholesterol are **CORRECT**? ① Cholesterol is a precursor of lanosterol. ② Cholesterol is a component of cell membrane in human erythrocyte. ③ Cholesterol is a precursor of bile acids. ④ Cholesterol is terpene-based lipid. ⑤ Cholesterol reduces the transition temperature of phospholipids in cell membrane.
(A) ①,②,③ (B) ①,③,⑤ (C) ①,②,④ (D) ②,③,④ (E) ②,④,⑤

87. Which of the following statements is **CORRECT** in DNA repair?
(A) AlkB is involved in base-excision repair.
(B) AP endonuclease is involved in mismatch repair.
(C) ABC excinuclease is involved in nucleotide-excision repair.
(D) DNA photolyase is involved in direct repair.
(E) Dam methylase is involved in methyl-directed repair.

88. A peptide is digested by chymotrypsin, and the resulting peptides are shown as following: Gly-Asn; Asp-Met-Leu-Phe; Leu-Lys-Trp; Met-Arg-Ala-Tyr. The C-terminal amino acid of the starting peptide (the one cleaved with chymotrypsin) is
(A) Asn (B) Phe (C) Trp (D) Tyr (E) Gly

89. Which of the followings inhibit fatty acid synthesis: ① malonyl CoA; ② glucagon; ③ citrate; ④ phosphorylated acetyl-CoA carboxylase
(A) ①,②,③ (B) ①,②,④ (C) ①,③,④ (D) ②,③,④ (E) ①,②,③,④

90. Which of the following statements about pentose phosphate pathway is **FALSE**?
(A) The major pathway is to produce five-carbon sugars.
(B) The major products are two molecules of NADPH and one molecule of ribulose-5-phosphate.
(C) Oxidation of glucose 6-phosphate to 6-phosphoglucono-δ-lactone is the first reaction.
(D) It provides ribose-5-phosphate for nucleotide biosynthesis.
(E) It occurs exclusively in the mitochondria.