111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. A root is not uniform but has distinct zones. Starting from the tip, which of the following orders of the zones is **CORRECT**?
   (A) Apical meristem → root cap → zone of elongation → zone of maturation/root hairs
   (B) Root cap → zone of elongation → apical meristem → zone of maturation/root hairs
   (C) Root cap → apical meristem → zone of elongation → zone of maturation/root hairs
   (D) Root cap → apical meristem → zone of maturation/root hairs → zone of elongation
   (E) Root cap → zone of elongation → zone of maturation/root hairs → apical meristem

2. Regarding gravitropism when a plant root is put horizontally, which of the following is **TRUE**?
   (A) Statolith is composed of lipid.
   (B) Statolith triggers the redistribution of calcium in root cells.
   (C) High concentration of auxin in the lower side of root cell increases the cell elongation.
   (D) Blue light signal is involved in gravitropism.
   (E) Fertilizer induces the gravitropism.

3. Red tides are dangerous because of _____.
   (A) the dinoflagellates that cause them produce a strong neurotoxin
   (B) the euglenoids that cause them produce a toxin that causes severe flulike symptoms
   (C) the green algae that cause them produce a severe allergic reaction in most people
   (D) the diatoms that cause them produce severe gastric distress
   (E) the red algae that cause them can disrupt shipping by clogging propellers

4. A torpor for animals to survive long period of high temperature and water scarcity can be called as _____.
   (A) hibernation (B) estivation (C) thermoregulation
   (D) acclimatization (E) adaptation

5. Which stage of human cell mitotic division begins the separation of sister chromatids?
   (A) Interphase (B) Prophase (C) Prometaphase
   (D) Metaphase (E) Anaphase

6. In a cell, the function of which organelle is corrected with “Breakdown”?
   (A) Rough endoplasmic reticulum (B) Smooth endoplasmic reticulum
   (C) Peroxisomes (D) Mitochondria
   (E) Extracellular matrix

7. Two species of lizards live in close proximity and feed on insects and arthropods. They prefer distinctly different niches. This phenomenon is _____.
   (A) resource partitioning
   (B) competitive exclusion
   (C) allopatric competition
   (D) sympatric competition
   (E) sympatric competition and allopatric competition

8. _____ is also as club fungus.
   (A) Ascomycetes (B) Basidiomycetes (C) Mucoromycetes
   (D) Chytrids (E) Zoopagomycetes

9. The scientific name of a species consists of _____.
   (A) a minimum of three descriptive adjectives
   (B) the capitalized family name and genus name
   (C) the capitalized phylum name and a specific epithet
   (D) the capitalized genus name and a specific epithet
   (E) the capitalized species name and subspecies name

10. In the human renal system, _____ ion (or molecule) concentration in the blood is regulated by secretion into the distal tubule.
   (A) Na^+ (B) K^+ (C) Cl^- (D) HCO_3^- (E) H_2O

11. Based on the Human Genome Project (HGP), which category of regions exists the smallest amount of our total DNA?
   (A) Repetitive DNA that includes transposable elements and related sequences
   (B) Repetitive DNA unrelated to transposable elements
   (C) Unique noncoding DNA
   (D) Exons that include regions of genes coding for proteins
   (E) Introns and regulatory sequences

12. The primary reason that polar regions are cooler than the equator is that _____.
   (A) the polar atmosphere is thinner and contains less greenhouse gases than the rest of the atmosphere
   (B) the poles are always pointing away from the sun
   (C) solar radiation strikes the poles at a lower angle and travels through more atmosphere
   (D) the poles are farther from the sun than is the equator
   (E) all of the above

13. Which one of the following statements is **FALSE** about temperate phage?
(A) Bacteriophages can undergo lytic pathway in their life cycle.
(B) Phage DNA is incorporated into the bacterial chromosomes.
(C) Certain prophage gene expression causes host bacteria pathogenic.
(D) λ phage is a temperate phage.
(E) Temperate phage never destroys host cells.

14. The hypothesis of endosymbiosis proposes that which kind of organelles in human cells were formerly small prokaryotes?
(A) Nucleus
(B) Mitochondria
(C) Lysosome
(D) Golgi apparatus
(E) Rough endoplasmic reticulum

15. In the human digestive system, which tissue (or organ) does **NOT** exist in exocrine glands?
(A) Salivary glands
(B) Stomach
(C) Gallbladder
(D) Liver
(E) Small intestine

16. What following pairs have the lowest dissociation constant?
(A) Enzyme and substrate
(B) Typical receptor and ligand interaction
(C) Antibody and antigen
(D) Sequence-specific protein and DNA
(E) Biotin and avidin

17. What difference(s) is there between cellulose and chitin?
(A) N-acetyl moiety
(B) α1→4 and β1→4 linkages
(C) α1→4 and α1→3 linkages
(D) Galactose and glucose moiety
(E) α1→4 and α1→6 linkages

18. What is the precursor of long-chain fatty acids?
(A) Linoleate
(B) α-Linolenate
(C) Oleate
(D) Stearate
(E) Palmitate

19. Which amino acid side chain has the highest pKa?
(A) Arginine (B) Cysteine (C) Histidine (D) Lysine (E) Tyrosine

20. What statement for cell cycle is **FALSE**?
(A) G0: reentry point
(B) G1 phase: RNA and protein synthesis. No DNA synthesis.
(C) S phase: DNA synthesized doubles
(D) G2 phase: DNA and protein synthesis continue
(E) M phase: mitosis

21. In the pairs of precursor/product, which is **FALSE**?
(A) acetyl-CoA/fatty acid
(B) isopentenyl diphosphate/cholesterol
(C) glutamine/purines
(D) arginine/pyrimidine
(E) dihydroxyacetone phosphate/triacylglycerol

22. Which of the following coenzymes is required for methionine synthase?
(A) methylcobalamin (B) pyridoxal phosphate (C) tetrahydrofolic acid
(D) S-adenosylmethionine (E) NADH

23. Which of the following is located in mitochondria intermembrane space?
(A) complex II (B) coenzyme Q (C) complex III
(D) cytochrome C (E) complex IV

24. Which of the following polysaccharides contains sulfate groups?
(A) heparin (B) hyaluronic acid (C) peptidoglycan
(D) chitin (E) None of the above

25. In humans, uric acid is an end product in the metabolism of_____.
(A) Amino acids (B) Phospholipids (C) Purines
(D) Pyrimidines (E) Cholesterol

26. Which of the following statements about miRNAs and siRNAs is **FALSE**?
(A) miRNAs can block the translation of mRNA.
(B) miRNAs is a non-coding RNA.
(C) miRNAs and siRNAs promote mRNA degradation.
(D) RNA polymerase II regulates the expression of miRNA gene.
(E) Drosha is involved in the processing of miRNAs and siRNAs

27. In aerobic state, the reaction of glycolysis (one molecule of glucose) produces_____.
(A) two molecules of pyruvate, four molecules of ATP, and two molecules NADH miRNAs can block the translation of mRNA
(B) two molecules of pyruvate, two molecules of ATP, and four molecules NADH
(C) two molecules of pyruvate, two molecules of ATP, and three molecules NAD^+
(D) two molecules of pyruvate, two molecules of ATP, and two molecules NADH
(E) two molecules of pyruvate, two molecules of ATP, and two molecules NAD^+

28. Spike (S) is a glycoprotein found on the surface of coronaviruses. S protein has 1273 residues in SARS-CoV-2 and has a molecular weight of 180–200 kDa. Based on the above information, we know that_____.
    (A) the SARS-CoV-2 has a genome of 29,881 bp in length
    (B) the expressed S protein from *E. coli* would have a molecular weight around 140 kDa
    (C) S protein is a dimmer
    (D) S protein binds to the host cell by recognizing the receptor ACE2
    (E) S protein plays a key role in cell membrane fusion process

29. Which of the following pairs about the accumulated molecules and metabolic disorder is **NOT** correct?
    (A) Homogentisate - Alkaptonuria
    (B) Tyrosine - Phenylketouria
    (C) Homocysteine - Homocystinuria
    (D) Branched-chain α-keto acids - Maple syrup urine disease
    (E) Uric acid - Gout

30. The following statements about DNA replication is *E. coli* are correct ***except***:
    (A) Both leading strand and lagging strand require primer.
    (B) DNA polymerase adds a new nucleotide to the free 3'OH of the existing nucleic acid.
    (C) The principal replication enzyme is DNA polymerase I.
    (D) It also has a 3'→5' exonuclease activity.
    (E) It is a processive enzyme.

【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. Based on the biological species concept, reproductive isolation is a key factor of speciation. Which of the following is **NOT** a "prezygotic reproductive barrier"?
    (A) Habitat isolation (B) Mechanical isolation (C) Hybrid breakdown
    (D) Behavioral isolation (E) Temporal isolation

32. The virus causes COVID-19 disease. This virus is _____.
    (A) double-strand DNA virus (B) single-strand RNA virus
    (C) single-strand DNA virus (D) similar to λ phage
    (E) naked RNA virus

33. Which of the following creatures will be the best outgroup if you are reconstructing a phylogenetic tree of cats using cladistics?
(A) domestic cats (B) leopards (C) lions
(D) tigers (E) wolves

34. Which of the following is the best description about CRISPR?
(A) CRISPR is directed to its target gene by a guide DNA molecule.
(B) CRISPR contains nuclease to destroy target RNA.
(C) CRISPR is not acquired but is preexisted in bacteria.
(D) CRISPR can be applied to knockout target gene.
(E) All of the above are correct.

35. Which of the following does **NOT** match with its function?
(A) Chlorophyll a: Component of P700 reaction center
(B) ATP synthase: Chemiosmotic phosphorylation
(C) Cyclic electron transport: Electron flow from water to NADPH
(D) RuBP: Conjugates carbon dioxide
(E) Carotenoids: Absorption of excess light

36. Which of the following is **TRUE**?
(A) The contents of the phloem are under pressure, and the contents of the xylem are under tension.
(B) Sieve tube members are dead cells.
(C) Vessel element protoplasm is unique because the vacuolar membrane disintegrates, allowing vacuolar water to mix with the cytosol.
(D) Phloem sap movement is driven by the atmospheric water potential.
(E) Phloem sap moves only short distances, whereas xylem sap moves long distances.

37. If a normal body cell of a plant contains 5 picograms (pg) of DNA, then that cell at the end of prophase of mitosis contains _____.
(A) 2.5 picograms (B) 5 picograms (C) 10 picograms
(D) 15 picograms (E) 20 picograms

38. In a smooth blood vessel, what is the relationship between blood pressure and the velocity of blood flow?
(A) When blood pressure is low, velocity is high.
(B) When blood pressure is low, velocity is low.
(C) When blood pressure is high, velocity is low.
(D) Velocity is always constant while blood pressure varies.
(E) Blood pressure is always constant while velocity varies.

39. Which of the following statements is **FALSE** about the comparisons of Gram-positive and Gram-negative bacteria?
    (A) Gram-positive bacteria have thicker peptidoglycan in their cell wall.
    (B) Gram-positive bacteria show less resistant to antibiotics.
    (C) Gram-negative bacteria contain endotoxin whereas Gram-positive bacteria not.
    (D) Gram-positive bacteria consist of abundant lipopolysaccharides within cell wall.
    (E) All of the above

40. The inner mitochondrial membranes in liver cells have roughly five times the surface area of the outer mitochondrial membranes, allowing for faster rates of which process below?
    (A) glycolysis
    (B) citric acid cycle
    (C) substrate-based phosphorylation
    (D) oxidative phosphorylation
    (E) β-oxidation

41. What is/are the functions of 5' cap in the eukaryotic mRNA?
    (A) facilitate the export of mRNA from nucleus
    (B) prevent from hydrolytic enzyme digestion
    (C) mediate the ribosome attachment to mRNA
    (D) B+C
    (E) A+B+C

42. Which step of a basidiomycete's life cycle would be interrupted if an enzyme that blocked hyphae fusion was introduced?
    (A) germination (B) fertilization (C) plasmogamy
    (D) karyogamy (E) meiosis

43. Which statement describing the blood flow through the circulation of healthy human cardiovascular system is **TRUE**?
    (A) Left ventricle → Left atrium → Pulmonary vein → Capillaries of lungs
    (B) Right atrium → Right ventricle → Left ventricle → Left atrium
    (C) Capillaries of abdominal regions and legs → Aorta → Left atrium → Left ventricle
    (D) Capillaries of head and arms → Superior vena cava → Right atrium → Right ventricle
    (E) Inferior vena cava → Right ventricle → Right atrium →Pulmonary artery

44. Which kind of neurotransmitters does **NOT** belong to biogenic amines?
    (A) Acetylcholine (B) Dopamine (C) Epinephrine
    (D) Norepinephrine (E) Serotonin

45. Which of following does **NOT** belong to "Innate immunity"?
(A) Mucus membranes (B) Skin (C) Nostril hairs
(D) Natural killer cells (E) Lymphocytes

46. Which kind of hormone (or neurotransmitter) is involved in regulation of circadian rhythm in human?
(A) Melanin (B) Oxytocin (C) Melatonin
(D) Acetylcholine (E) Dopamine

47. What is the plant hormone which is produced in roots and promotes the attraction of mycorrhizal fungi to the roots?
(A) brassinosteroids (B) jasmonates (C) strigolactones
(D) abscisic acid (E) gibberellins

48. Which of the following hormones does **NOT** match the response it elicits?
(A) Salicylic acid: Resistance of plants to some pathogens
(B) Ethylene: Fruit abscission
(C) Auxin: Apical dominance
(D) Brassinosteroids: Leaf morphogenesis
(E) Abscisic acid: Release of seeds from dormancy

49. Which phylum is characterized by animals that have a segmented body?
(A) Platyhelminthes (B) Arthropoda (C) Mollusca
(D) Cnidaria (E) Porifera

50. Some evolutionary changes can occur when the conditions for Hardy-Weinberg equilibrium are not met. Which of the following matches is **FALSE**?
(A) Adaptive evolution: No natural selection
(B) Genetic drift: No gene flow
(C) Founder effect: Extremely large population size
(D) Stabilizing selection: No natural selection
(E) Sexual dimorphism: Random mating

51. Which description about speciation is **FALSE**?
(A) Speciation can occur rapidly.
(B) Speciation can not be driven by few genes.
(C) A species may originate from polyploidy.
(D) Species can take place without geographic separation.
(E) Divergence of allopatric population can lead to reproductive isolation.

52. Flower color in sweet peas is controlled by two genes, *C/c* and *E/e*. *C* is dominant to *c* and *E* is dominant to *e*. A plant produces purple flowers only if it contains at least one dominant allele for each gene; otherwise it produces white flowers. If two plants heterozygous for both genes are crossed, what will be the phenotypic ratio for purple: white flowers?
(A) 3:1 (B) 4:1 (C) 9:7 (D) 5:3 (E) 15:1

53. A person with an extra copy of what number of chromosome has a condition called "Down syndrome"
(A) Chromosome 9 (B) Chromosome 13 (C) Chromosome 18
(D) Chromosome 21 (E) Chromosome X

54. Regarding damage to the AV node of heart, what type of wave can cause an Electrocardiography (ECG) ?
(A) The absence of the T wave (B) The absence of the P wave
(C) Multiple Q waves (D) Multiple T waves
(E) Multiple P waves

55. If the mitochondria were removed from a cell, which of the following would **NOT** immediately stop?
(A) Glycolysis
(B) The citric acid cycle
(C) Thermogenic respiration
(D) Oxidative phosphorylation in the electron transport chain of respiration
(E) Malate-aspartate shuttle

56. About phytochrome, which statement is **FALSE**?
(A) Red light can lead to the production of Pfr for activating the subsequent flower gene in long-day plant.
(B) Pfr and Pr are the proteins with the same amino acid sequence.
(C) The Pr can be abundantly found in leaves.
(D) In theory, phytochrome contains only one gene that can express one protein.
(E) The flowering response induced by a short flash of light can be also converted by a short darkness in a black box.

57. In the bundle sheath cells of C4 plants, CO_2 can be fixed by _____ and produce _____ during the dark reaction of photosynthesis.
(A) oxaloacetatic acid (OAA), malate (B) OAA, phosphoenolpyruvate (PEP)
(C) pyruvate, malate (D) PEP, malate
(E) RuBP, 3-Phosphoglycerate

58. The best description or link about the concept of plant "hypersensitive response" defense system could be that _____.
    (A) the infected cell will produce restriction enzymes to digest virus
    (B) the infected cell will produce antibody to restrict virus
    (C) plants can induce a broad area of cell death surrounding the infected cell
    (D) plants can produce volatile attractant to recruit the parasitoid predator
    (E) plants can increase vascular system to remove pathogen more quickly

59. In additional to the potential of many cancer cells to grow uncontrollably, which of the following scenarios is most likely to result in a tumor?
    (A) Lack of appropriate cell death
    (B) The order of cell cycle stages can be changed
    (C) Inability to form spindles
    (D) Failure of cells to enter the S shape
    (E) Most cancer cells are senescent

60. In human bodies, which functional area is mainly located in the occipital lobe of the brain?
    (A) Hearing (B) Reading (C) Smell (D) Speech (E) Vision

61. What amino acid is often phosphorylated by active insulin receptor?
    (A) Serine (B) Threonine (C) Tyrosine (D) Histidine (E) Arginine

62. What compound offers the one-carbon unit to produce N^5, N^{10}-methylene tetrahydrofolate in one carbon metabolism?
    (A) Methionine (B) Serine (C) S-Adenosyl methionine
    (D) Choline (E) Glycine

63. What enzyme(s) is required for the cleavage of the unmethylated strand during the mismatched repair?
    (A) MutL (B) MutH
    (C) MutS (D) DNA helicase II/exonuclease VII
    (E) Exonuclease I/exonuclease X

64. What domain(s) of regulatory proteins for gene regulation is involved in dimerization?
    (A) Helix-turn-helix (B) Helix-loop-helix (C) Zinc finger
    (D) Homeodomain (E) All of the above

65. Which statement for hemoglobin (the oxygen-binding protein in red blood cells) is **FALSE**?
(A) Hemoglobin exists in T and R states and R state prefers to bind oxygen.
(B) Oxygen binding converts hemoglobin from T to R state.
(C) Oxygen binding to hemoglobin is both allosteric and cooperative.
(D) Hemoglobin also binds H^+ and CO_2 to lessen the affinity for O_2.
(E) Oxygen binding is also regulated by 2,3-bisphosphoglycerate, which stabilizes R state.

66. For treatment of AIDS, which is **NOT** a target for the approved drugs?
(A) CD4 (B) reverse transcriptase (C) neuraminidase
(D) protease (E) integrase

67. Which of the following receptors and their types does **NOT** match?
(A) Insulin receptor is a G-protein-coupled receptor.
(B) Epidermal growth factor receptor is a receptor tyrosine kinase.
(C) Acetylcholine receptor is a gated ion channel.
(D) Integrin receptor is an adhesion receptor.
(E) Steroid receptor is a nuclear receptor.

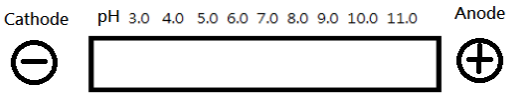
68. Which of the following compounds has the highest (the most negative) standard free energy of hydrolysis?
(A) ATP (to ADP) (B) ADP (to AMP)
(C) AMP (to adenosine) (D) Glucose 6-phosphate (to glucose)
(E) Acetyl-CoA (to acetate)

69. Which of the following enzymatic cofactors and enzymes is **NOT** matched?
(A) Biotin for pyruvate carboxylase
(B) NAD^+ for glucose 6-phosphate dehydrogenase
(C) Pyridoxal phosphate (PLP) for aminotransferases
(D) Thiamine pyrophosphate (TPP) for pyruvate decarboxylase
(E) Vitamin B12 for methylmalonyl-CoA mutase

70. How many ATP can be net produced in a 14-carbon fatty acid degradation to CO_2 and H_2O?
(A) 88 (B) 92 (C) 94 (D) 96 (E) 98

71. Fatty acids are carboxylic acids with hydrocarbon chains ranging from _____ carbons long.
(A) 12 to 24 (B) 4 to 36 (C) 6 to 24 (D) 6 to 36 (E) 12 to 32

72. The molecular weight of Protein A (*pI* = 4.0), B (*pI* = 6.8), and C (*pI* = 8.5) is 14 kDa, 24 kDa, and 30 kDa, respectively. All of them are monomer proteins. Which of the following statements is **CORRECT**?
    (A) Protein A elutes out first, when you use gel filtration column to separate the mixture of those three proteins.
    (B) Protein C is the one that moves fastest, when you separate the mixture of those three proteins by SDS-PAGE.
    (C) As shown in the right figure, you can use this isoelectric focusing apparatus to separate those three proteins.



    (D) When you use a DEAE ion exchange column and 10 mM Tris-Cl, pH 7.0 buffer to separate these three proteins, Protein A will be bound by this column.
    (E) None of the above

73. Which of the following is **NOT** related to RNA-RNA interaction?
    (A) guide RNA (B) Wobble
    (C) Shine-Dalgarno sequence (D) snRNA
    (E) None of the above

74. (1) Arg; (2) Asp; (3) Gly; (4) Cys; (5) His; (6) Ser; (7) Thr. Which of the followings does **NOT** appear in the preceding seven amino acid residues?
    (A) The amino acid residue in zinc finger to coordinate zinc atom
    (B) The amino acid residue in O-link glycoprotein to link protein and oligosaccharide
    (C) The amino acid residue in Type I topoisomerase to act as a nucleophile to cut DNA
    (D) The amino acid residue in terminal proteins of adenovirus to link nucleotides and protein
    (E) None of the above

75. Which of the following compounds is the substrate of ribonucleotide reductase?
    (A) AMP (B) TDP (C) GTP (D) CDP (E) dAMP

76. (1) Ribozyme; (2) Okazaki fragment; (3) DNA polymerase needs an RNA primer but RNA polymerase doesn't; (4) *de novo* biosynthesis of purine and pyrimidine; (5) retrovirus; (6) thermostable DNA polymerase. How many of the preceding items support the hypothesis that RNA appears before DNA?
    (A) 2 (B) 3 (C) 4 (D) 5 (E) 6

77. (1) release of acetyl-CoA; (2) release of CO_2; (3) release of NADH. Pyruvate dehydrogenase can convert pyruvate into acetyl-CoA, NADH, and CO_2. What is its reaction order of preceding three steps?
(A) (1) → (2) → (3) (B) (1) → (3) → (2) (C) (2) → (1) → (3)
(D) (2) → (3) → (1) (E) (3) → (1) → (2)

78. Xeroderma pigmentosum is caused by a defect in which DNA repair pathway.
(A) Repair of oxidative damage (B) Daughter-strand gap repair
(C) Base excision repair (D) Mismatch repair
(E) Nucleotide excision repair

79. The reverse transcriptases possess the function of ① RNA-directed DNA polymerase activity ② Primase ③ DNA-directed DNA polymerase activity ④ RNase H activity ⑤ Helicase
(A) ①②③ (B) ①②④ (C) ①②⑤ (D) ①③④ (E) ①③⑤

80. Which of the following statements about the catabolism of free pyrimidines in the human body is **CORRECT**? ① Free cytosine and uracil are not salvaged ② Degradation of free cytosine produces β-alanine, CO_2, and NH_4^+ ③ Degradation of free uridine produces β-aminoisobutyric acid, CO_2, and NH_4^+ ④ Free thymine are recycled for synthesizing nucleosides
(A) ①②③ (B) ①②④ (C) ①② (D) ①③ (E) ①③④

81. Which of the following statements about allosteric regulation is **TRUE**?
(A) An allosteric inhibitor of an enzyme can be a competitive inhibitor.
(B) An allosteric activator of an enzyme may reduce the apparent Vmax.
(C) An allosteric activator cannot be substrate of allosteric enzymes.
(D) An allosteric activator reduces the apparent Km.
(E) An allosteric effector is a transition state analogue.

82. Which of the following products are produced by the β-oxidation of fatty acid? ① $FADH_2$ ② NAD^+ ③ NADH ④ NADPH ⑤Acetyl-CoA
(A) ①②⑤ (B) ①③⑤ (C) ①④⑤ (D) ②③⑤ (E) ②④⑤

83. Lesch-Nyhan Syndrome is due to a deficient in _____ activity.
(A) Adenosine deaminase
(B) Adenine phosphoribosyltransferase
(C) Guanine deaminase
(D) Hypoxathine-guanine phosphoribosyltransferase
(E) AMP deaminase

84. Eukaryotic mRNAs may be modified after synthesis via the following reactions ***except***:
    (A) Remove noncoding regions (introns) and joining the coding regions (exon) by spliceosome
    (B) Self-splicing of mitochondrial or chloroplast mRNA
    (C) Cleavage at the 3' end of the primary transcript
    (D) Addition of a string A residues at the 3' end
    (E) Addition of a methyl-cytosine residue at the 5' end

85. An enzyme is found that catalyzes the reaction S → P. Researchers find that the K_m for the substrate S is 4 μM, and the k_{cat} is 20 min^{-1}. In an experiment, [S]=6 mM, and V_o=480 nM min^{-1}. What was the enzyme concentration [E_t] used in the experiment?
    (A) 24 nM (B) 24 μM (C) 120 nM (D) 120 μM (E) 80 nM

86. Which pair of enzymes is involved in glycolysis but **NOT** in gluconeogenesis?
    (A) Hexokinase and phosphohexose isomerase
    (B) Phosphofructokinase and pyruvate kinase
    (C) Phosphofructokinase and phosphoglycerate kinase
    (D) Phosphoglycerate kinase and pyruvate kinase
    (E) Phosphoglycerate mutase and enolase

87. Amino acids can be classified into different groups based on the R-group structure. Which class of amino acids contains only nonessential amino acids?
    (A) Hydrophobic (B) Aromatic
    (C) Polar, uncharged (D) Positively charged
    (E) Negatively charged

88. The functions of cholesterol include all the following ***except***:
    (A) A precursor of bile
    (B) A precursor of vitamin D
    (C) As an intracellular energy source
    (D) Sustain cell membrane structure
    (E) Essential for producing steroid hormone

89. The following statements about lipid transport are all correct ***except***:
(A) Dietary triacylglycerols and cholesterol from intestine is carried by chylomicrons to muscle and adipose tissues.
(B) VLDL carries triacylglycerols and cholesterol from liver to muscle and adipose tissues.
(C) LDL carries mainly triacylglycerol from liver to muscle and adipose tissues.
(D) HDL synthesized from liver picks up cholesterol in the bloodstream and transported back to liver.
(E) The loss of triacylglycerols converts VLDL to LDL.

90. Which of the following posttranslational modifications is applied to produce active insulin molecules in pancreatic β cells:
① Phosphorylation of Ser residues
② Glycosylation of Asn residues
③ Cleavage of a signal sequence
④ Proteolytic cleavage of internal sequences
⑤ Formation of disulfide bonds
(A) ③④⑤ (B) ②③④ (C) ②⑤ (D) ①②④⑤ (E) ①②③⑤