

112 學年度學士後醫學系招生考試

普通生物及生化概論試題

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。

- Which of the following organs is found in bryophytes?
(A) Roots (B) Leaves (C) Seeds
(D) Flagellated sperm (E) Lignified cell walls
- Which evolutionary process has led to the development of analogous wings in both mammals and birds?
(A) Mutation (B) Convergent evolution (C) Divergent evolution
(D) Homology (E) Shared ancestry
- What phenomenon occurs when the electron transport chain in photosynthesis passes through protein complexes associated with photosystem I?
(A) Release of O₂ (B) Synthesis of ADP (C) Release of H₂O
(D) Release of CO₂ (E) Reduction of NADP⁺ to NADPH
- What is the role of DNA methylation in eukaryotes?
(A) To aid in silencing transcription.
(B) To protect the DNA from restriction endonucleases.
(C) To prevent nucleosome formation on that region of DNA.
(D) DNA methylation does not occur in eukaryotes, only histones are methylated.
(E) To distinguish the active X chromosome from the inactive X chromosome in counting.
- In next-generation sequencing (NGS), all of the following are true EXCEPT:
(A) NGS technologies use Sanger sequencing.
(B) It is cheaper to sequence a genome with NGS than using original sequencing technologies.
(C) Genomes are sequenced in very small snippets (“reads”).
(D) An *E. coli* genome can be sequenced overnight with NGS.
(E) Assemble sequences piece together (“assembly”) as final read.
- A low value of which of the following factors is an important predictive indicator for the development of coronary atherosclerosis and coronary heart disease?
(A) Total cholesterol (B) Triglycerides
(C) High-density lipoprotein (D) Low-density lipoprotein
(E) Mean corpuscular hemoglobin

7. The body's automatic tendency to maintain a constant internal environment is termed _____.
(A) torpor (B) physiological chance
(C) homeostasis (D) static equilibrium
(E) estivation
8. What does a frequency of recombination of 50% indicate?
(A) Independent assortment is hindered.
(B) All of the offspring have combinations of traits that match one of the two parents.
(C) The genes are located on sex chromosomes.
(D) Abnormal meiosis has occurred.
(E) The two genes are likely to be located on different chromosomes.
9. Which of the following brain structures serves as the biological clock?
(A) Pons (B) Hippocampus (C) Medulla oblongata
(D) Hypothalamus (E) Pituitary gland
10. Which of the following statements describes pepsin?
(A) It is manufactured by the pancreas.
(B) It helps stabilize fat-water emulsions.
(C) It splits maltose into monosaccharides.
(D) It begins the hydrolysis of proteins in the stomach.
(E) It is denatured and rendered inactive in solutions with low pH.
11. Which of the following cycles involves the weathering of rocks?
(A) Nitrogen cycle (B) Phosphorus cycle (C) Carbon cycle
(D) Oxygen cycle (E) Sulfur cycle
12. When your cat hears the sound of you opening a can, it runs toward you. Which mechanism could be causing this behavior?
(A) Classical conditioning (B) Imprinting (C) Operant conditioning
(D) Social learning (E) Spatial learning
13. _____ will develop into seeds, and _____ will develop into fruits.
(A) Ovaries, carpels (B) Carpels, ovules (C) Ovaries, ovules
(D) Ovules, ovaries (E) Ovules, carpels
14. Which of the following antibodies can cross from mother to fetus?
(A) IgM (B) IgD (C) IgG (D) IgA (E) IgE

15. There are 20 different amino acids. What makes one amino acid different from another?
- (A) Different carboxyl groups attached to an alpha (α) carbon
 - (B) Different amino groups attached to an alpha (α) carbon
 - (C) Different side chains (R groups) attached to an alpha (α) carbon
 - (D) Different alpha (α) carbons
 - (E) Different asymmetric carbons
16. When oxidative damage occurred in cell inside, which molecule in mitochondrion effluxes to cytosol and participates the apoptosis?
- (A) cytochrome a
 - (B) cytochrome a₃
 - (C) cytochrome b
 - (D) cytochrome b₁
 - (E) cytochrome c
17. Regarding to prion hypothesis, what kind of abnormal protein structures in misfolded prion protein molecules commonly lead to large protein aggregation?
- (A) α -helix
 - (B) β -sheet
 - (C) type II β turn
 - (D) loops
 - (E) triple helix
18. As a coenzyme, thiamin pyrophosphate can _____.
- (A) convert glucose to glucuronic acid
 - (B) convert pyruvate to oxaloacetate
 - (C) participate the transamination
 - (D) convert homocysteine to methionine
 - (E) participate the decarboxylation of α -keto acids
19. Which of the following biological molecules is NOT derived from tyrosine?
- (A) melanin
 - (B) serotonin
 - (C) dopamine
 - (D) epinephrine
 - (E) norepinephrine
20. Which amino acid residue must be tagged on by covalent linkage of ubiquitin when proteins are targeted for proteasomal degradation?
- (A) arginine
 - (B) lysine
 - (C) histidine
 - (D) methionine
 - (E) cysteine
21. The binding change mechanism of ATP synthesis predicts that each 360-degree rotation of the γ subunit can generate how many ATP molecules?
- (A) 1
 - (B) 2
 - (C) 3
 - (D) 4
 - (E) 5
22. What is the net charge of the following peptide at pH 7.0?
Tyr-Glu-Ser-Arg-Met-Thr-Asp-Asn-Tyr-His
- (A) +2
 - (B) +1
 - (C) 0
 - (D) -1
 - (E) -2

23. Which of the following molecules can generate the highest yield of ATP in the process from glycolysis to lactate?
- (A) sucrose (B) fructose
(C) glucose 6-phosphate (D) dihydroxyacetone phosphate
(E) glyceraldehyde 3-phosphate
24. Which method is used to predict the amino acid sequence of tryptic fragments by bioinformatic approaches?
- (A) sodium dodecyl sulfate polyacrylamide gel electrophoresis
(B) Edman degradation
(C) tandem mass spectrometry
(D) two-dimensional polyacrylamide gel electrophoresis
(E) gel-filtration chromatography
25. Which step of the mitochondrial electron transport chain does rotenone inhibit?
- (A) NADH → coenzyme Q (B) Cyt b → Cyt c1
(C) Cyt c1 → Cyt c (D) Cyt c → Cyt (a+a3)
(E) Cyt c → O₂
26. Regarding the chemiosmotic theory of the respiratory chain, which statement is TRUE?
- (A) Oxidative phosphorylation occurs in the outer mitochondrial membrane.
(B) The proton (H⁺) concentration is the same on both sides of the inner mitochondrial membrane.
(C) ATP synthase plays no role in the chemiosmotic theory.
(D) Mitochondrial inner membrane is permeable for proton.
(E) ATP synthesis is related to proton-motive force.
27. Which of the following sets of amino acids are directly involved in the biosynthesis of creatine?
- (A) tyrosine, glycine, and glutamine (B) glutamate, cysteine, and glycine
(C) glycine, arginine, and methionine (D) aspartate, glycine, and cysteine
(E) proline, alanine, and leucine
28. Hydropathy plot is commonly used for _____.
- (A) predicting the quaternary structure of membrane proteins
(B) measuring the water content of native proteins
(C) estimating the actual molecular weight of membrane proteins
(D) predicting whether a known protein amino acid sequence contains a membrane-spanning segment
(E) analyzing protein secondary structure

29. What substance(s) can affect the concentration of calcium ions inside the cell, an important secondary messenger?
- (A) Phosphatidylcholine and phospholipase A
 - (B) Phosphatidylcholine and phospholipase C
 - (C) Phosphatidylinositol and phospholipase A
 - (D) Phosphatidylinositol and phospholipase C
 - (E) Calmodulin
30. Which statement is TRUE?
- (A) A higher K_m value indicates a higher substrate specificity.
 - (B) A higher K_m value indicates a higher substrate affinity.
 - (C) The unit for K_m is $M^{-1}s^{-1}$.
 - (D) k_{cat} is the specificity constant.
 - (E) k_{cat}/K_m is a measure of enzyme efficiency.
- 【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 interaction between species is NOT true?
- (A) Predation: An individual of one species, the predator, kills and eats an individual of the other, the prey.
 - (B) Parasitism: The parasite obtains its nourishment from a second organism, its host.
 - (C) Competition: Individuals of different species each use a limited resource, reducing the survival or reproduction of both individuals.
 - (D) Commensalism: Members of both species benefit from the interaction.
 - (E) Herbivory: An herbivore eats part of a plant or alga.
32. Fungal cells can reproduce asexually by undergoing mitosis, followed by cytokinesis. Many fungi can also reproduce sexually by undergoing _____.
- (A) cytokinesis followed by karyokinesis
 - (B) binary fission followed by cytokinesis
 - (C) plasmolysis followed by karyotyping
 - (D) plasmogamy followed by karyogamy
 - (E) sporogenesis followed by gametogenesis
33. Which is a TRUE statement concerning genetic variation?
- (A) It is created by the direct action of natural selection.
 - (B) It arises in response to changes in the environment.
 - (C) It must be present in a population before natural selection can act upon the population.
 - (D) It tends to be reduced by the processes involved when diploid organisms produce gametes.
 - (E) A population that has a higher average heterozygosity has less genetic variation than one with a larger average heterozygosity.

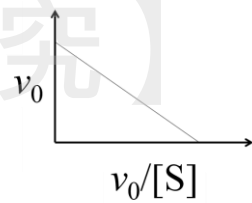
34. Why do RNA viruses appear to have higher rates of mutation?
- (A) RNA viruses are more sensitive to mutagens.
 - (B) RNA viruses can incorporate a variety of nonstandard bases.
 - (C) RNA viruses replicate faster.
 - (D) Replication of their genomes does not involve the proofreading steps of DNA replication.
 - (E) RNA nucleotides are more unstable than DNA nucleotides.
35. To prevent irreversible tragedies, the CDC urges the public not to use blood donation as a means of Human immunodeficiency virus (HIV) testing, as there is a _____ period for HIV infection.
- (A) prophase
 - (B) infectious
 - (C) latency
 - (D) anaphase
 - (E) telophase
36. Which of the following characters is NOT a terrestrial adaptation of plants?
- (A) Waxy stomata to reduce water loss
 - (B) Vascular tissue in most plants to transport water/sugar within the plant
 - (C) Specialization within the plant with root/shoot
 - (D) Spore/seed for dispersal
 - (E) Flagellated sperm
37. Which of the following genetic changes of K-Ras is detected in over 90% of human pancreatic cancers?
- (A) Translocation
 - (B) Mutation
 - (C) Promoter methylation
 - (D) Amplification
 - (E) Transposition
38. In the process of human gametogenesis, which cell is haploid?
- (A) Spermatogonium
 - (B) Primary spermatocyte
 - (C) Primary oocyte
 - (D) Early spermatid
 - (E) Oogonium
39. In humans, the phenylalanine hydroxylase gene is 90,000 bases (90 kb) long, yet the mRNA is only 2,400 bases (2.4 kb). What explains this difference?
- (A) RNA editing
 - (B) Code for poly A tail that is removed in mRNA
 - (C) Loss of stability without a 5' cap
 - (D) Removal of exons in the final mRNA
 - (E) Presence of introns in DNA
40. Which of the following organelles CANNOT be found in animal cells?
- (A) Lysosome
 - (B) Central vacuole
 - (C) Mitochondrion
 - (D) Peroxisome
 - (E) Centriole

41. Which is NOT a source of genetic variation that makes evolution possible?
- (A) Oxidative phosphorylation (B) Formation of new alleles
(C) Sexual reproduction (D) Altering gene number or position
(E) Rapid reproduction
42. Which of the following systems allow arthropods to propel the hemolymph into hemocoel?
- (A) Closed circulatory system (B) Open circulatory system
(C) Respiratory system (D) Reproductive system
(E) Digestive system
43. What is the evolutionary sequence that is believed to have given rise to the chloroplasts of land plants?
- (A) Cyanobacteria → brown algae → land plants
(B) Photosynthetic bacteria → brown algae → green algae → land plants
(C) Diatoms → green algae → land plants
(D) Cyanobacteria → diatoms → green algae → land plants
(E) Cyanobacteria → green algae → land plants
44. Which of the following statements about genetic drift is TRUE?
- (A) Genetic drift is significant in big populations.
(B) Genetic drift can cause allele frequencies to change at random.
(C) Genetic drift results in increased genetic variation within a population.
(D) In very big populations, genetic drift can also cause slightly harmful allele to become fixed.
(E) Genetic drift can preserve alleles in a population.
45. Regarding plant organ and its components, which of the following sets is NOT true?
- (A) Spores vs. sperms (B) Archegonia vs. eggs
(C) Antheridia vs. sperms (D) Ovules vs. eggs
(E) Seeds vs. embryos
46. Which of the following statements about reproductive system and embryonic development is TRUE?
- (A) The mesoderm of embryonic layer forms skeletal and muscular systems.
(B) The primary oocyte is arrested at metaphase of meiosis II.
(C) Follicle stimulating hormone (FSH) stimulates the remaining follicular tissue to form the corpus luteum.
(D) Luteinizing hormone (LH) causes sertoli cells to produce testosterone and other androgens.
(E) Prostaglandins make the uterus more sensitive to oxytocin to initiate labor.

47. The heterokaryotic phase of a fungal life cycle is _____.
- (A) a stage in which the hyphae contain only one type of haploid nucleus
 - (B) a stage in which the hyphae contain two, genetically different, diploid nuclei
 - (C) a stage in which the hyphae contain two, genetically different, haploid nuclei
 - (D) a stage that is diploid but functions as a gametophyte (like the body of an animal)
 - (E) a triploid stage formed by the fusion of a diploid nucleus with the haploid nucleus of a compatible hypha
48. Regarding the biogeographic factors affecting community diversity and related theories, which is NOT true?
- (A) Plant and animal life are generally more abundant and diverse in the tropics than in other parts of the globe.
 - (B) All other factors being equal, the larger the geographic area of a community, the more species it has.
 - (C) Small islands generally have higher immigration rate.
 - (D) The species richness of plants and animals correlates with measures of evapotranspiration.
 - (E) An island that is closer to the mainland generally has a higher immigration rate and a lower extinction rate than one farther away.
49. Which gene might be associated with the rapid appearance of a vast array of bilaterally symmetrical and structurally diverse animals during the Cambrian explosion?
- (A) BRCA genes
 - (B) Ubx genes
 - (C) Opsin genes
 - (D) STX16 genes
 - (E) Hox genes
50. Assuming that 40 leopard cats, weighing 5 kg each and feeding solely on herbivorous prey, live continuously with their prey in a given area, approximately how much total biomass of plant material would be required?
- (A) 2,222 kg
 - (B) 4,000 kg
 - (C) 20,000 kg
 - (D) 125,000 kg
 - (E) 500,000 kg
51. Which of the following statements about all cells is NOT true?
- (A) They have membrane transport proteins.
 - (B) They synthesize proteins on the ribosome.
 - (C) They replicate their genome by DNA polymerization.
 - (D) They transcribe their genetic information by RNA polymerization.
 - (E) They use RNA as a template for genomic DNA polymerization.
52. Which is NOT included in the key features of the angiosperm life cycle of plants?
- (A) Development of embryo sacs
 - (B) Development of male gametophytes
 - (C) Fruits
 - (D) Zygosporangium
 - (E) Double fertilization

53. Which of the following statements about photosynthesis is TRUE?
- (A) The light reaction in the thylakoids makes NADP^+ to the Calvin cycle.
 - (B) Phosphoenolpyruvate (PEP) carboxylase has a higher affinity for CO_2 than rubisco does.
 - (C) The oxygen is produced by the electron transfer system of photosystem I (PS I).
 - (D) Photosystem II (PS II) is called P700 because of its reaction-center chlorophyll that absorbs light with a wavelength of 700 nm.
 - (E) C4 plants only use rubisco for carbon fixation.
54. Which of the following statements about viruses is TRUE?
- (A) Prions replicate using host's translation machinery.
 - (B) Reverse transcriptase in retroviruses converts host cell RNA into viral DNA.
 - (C) A phage that reproduces only by the lytic cycle is called a temperate phage.
 - (D) Human immunodeficiency virus (HIV) are double-stranded DNA virus.
 - (E) Herpesvirus has single stranded RNA that acts as a template for DNA synthesis.
55. About the ABC hypothesis of flowering, which set(s) of organ and gene expression is NOT true?
- (A) Sepals – A gene activity
 - (B) Petals – A + B gene activity
 - (C) Loss of A gene results in mutation of sepals and petals
 - (D) Carpels – C gene activity
 - (E) Stamens – A + C gene activity
56. What would account for increased urine production as a result of drinking alcoholic beverages?
- (A) Increased aldosterone production
 - (B) Increased blood pressure
 - (C) Inhibition of antidiuretic hormone secretion (ADH)
 - (D) Increased reabsorption of water in the proximal tubule
 - (E) The osmoregulator cells of the brain increasing their activity
57. Which of the following statements about transport in vascular plants is TRUE?
- (A) The apoplast consists of everything internal to the plasma membranes of living cells.
 - (B) The symplastic route for water and solutes is from outside cells through cell walls and extracellular spaces.
 - (C) When K^+ leaves the guard cells, stomata becomes open.
 - (D) Na^+ is typically cotransported rather than H^+ for transport of sucrose in plant cells.
 - (E) The movement of fluid in phloem is multidirectional in plants.

58. When an individual is subject to short-term starvation, most available food is used to provide energy (metabolism) rather than building blocks (growth and repair). Which hormone would be particularly active during food shortage?
- (A) Epinephrine (B) Glucagon (C) Oxytocin
(D) Antidiuretic hormone (E) Insulin
59. The observation that the acetylcholine released into the junction between a motor neuron and a skeletal muscle binds to a sodium channel and opens it is an example of _____.
- (A) a voltage-gated sodium channel
(B) a voltage-gated potassium channel
(C) a ligand-gated sodium channel
(D) a second-messenger-gated sodium channel
(E) a chemical that inhibits action potential
60. Which statement below about mating behavior is NOT true?
- (A) Some aspects of courtship behavior may have evolved from agonistic interactions.
(B) Courtship interactions ensure that the participating individuals are non-threatening and of the proper species, sex, and physiological condition for mating.
(C) The degree to which evolution affects mating relationships depends on the degree of prenatal and postnatal input the parents are required to make.
(D) The mating relationship in most mammals is monogamous, to ensure the reproductive success of the pair.
(E) Polygamous relationships most often involve a single male and many females, but in some species, this is reversed.
61. Enzymes are classified into 7 different major classes. Which enzyme class does the following reaction belong to?
- Pyruvate + H⁺ → acetaldehyde + CO₂
- (A) Oxidoreductases (B) Transferases (C) Hydrolases
(D) Lyases (E) Ligases
62. Which of the following statements about the enzyme regulation by covalent-modification is NOT true?
- (A) Phosphorylation means the transfer of phosphate group from ATP to proteins.
(B) Adenylation means the transfer of an adenylate moiety from ATP to proteins.
(C) ADP-ribosylation means the transfer of an ADP-ribosyl moiety from ATP to proteins.
(D) Acetylation means the transfer of an acetyl group from acetyl-CoA to proteins.
(E) Phosphatases can remove phosphate group from proteins.

63. Which of following statements regarding glycogen metabolism is TRUE?
- (A) Glycogen degradation starts from reducing end to non-reducing end.
 (B) Amylo-(1,4 → 1,6)-transglycosylase is used in glycogen synthesis.
 (C) Glucose-1-phosphate is the substrate of glycogen synthase.
 (D) The regulation mechanism of glycogen phosphorylase *b* includes both allosteric control and covalent-modification.
 (E) Protein kinase C triggers the glycogen breakdown cascade.
64. Which of the followings is NOT required for the transportation of NADH from cytosol into mitochondria?
- (A) malate (B) α -ketoglutarate (C) citrate
 (D) oxaloacetate (E) aspartate
65. X uses a Y to link cofactor, Z. Which one of the followings is NOT true?
- (A) X: Pyruvate dehydrogenase; Y: lysine residue; Z: lipoamide
 (B) X: Aconitase; Y: cysteine residue; Z: iron-sulfur center
 (C) X: Pyruvate carboxylase; Y: lysine residue; Z: biotin
 (D) X: Acyl carrier protein; Y: cysteine residue; Z: pantothenate
 (E) X: Aminotransferase; Y: lysine residue; Z: pyridoxal phosphate
66. Which of following statements is NOT true regarding the lysozyme's Phillips mechanism?
- (A) Glu 35 acts as both "general acid" and "general base" catalysis.
 (B) The active site of lysozyme can take six residues of monosaccharides.
 (C) The D ring of monosaccharide is distorted into boat form conformation.
 (D) The oxonium ion transition state is stabilized by Asp 52.
 (E) The optimal pH of this reaction is between 4 and 6.
67. Enzyme X follows Michaelis-Menten kinetics. As shown in the figure, its value of V_{max} and K_m can also be obtained by using Eadie-Hofstee plot. The initial reaction rate is v_0 with the substrate concentration [S]. What is the intercept on $v_0/[S]$ axis?
- 
- (A) V_{max}/K_m (B) $1/K_m$ (C) K_m (D) V_{max} (E) $1/V_{max}$
68. Among 9 different molecules below, X of them can cleave disulfide bond, and Y of them can react with the amino group of L-amino acids. Therefore, $X + Y = \underline{\hspace{2cm}}$.
 cyanogen bromide; iodoacetate; phenylisothiocyanate; β -mercaptoethanol; performic acid;
 9-fluorenylmethoxycarbonyl chloride; dithiothreitol;; guanidinium hydrochloride; urea.
- (A) 2 (B) 3 (C) 4 (D) 5 (E) 6

69. How many of the followings are ketogenic amino acid in human?
Asp; Phe; Arg; Val; His; Thr; Lys.
(A) 2 (B) 3 (C) 4 (D) 5 (E) 6
70. How many items of the followings have the activity of proof-reading to reduce the error rate in biosynthesis?
DNA polymerase; RNA polymerase II; amino-acyl tRNA synthetase; Initiation Factor-1; polyketide synthase; Elongation Factor-Tu; Klenow fragment.
(A) 2 (B) 3 (C) 4 (D) 5 (E) 6
71. Which one of followings is NOT used for thymine dimer repair?
(A) Daughter strand gap repair (B) Base excision repair
(C) Nucleotide excision repair (D) Photolyase
(E) DNA polymerase Eta (Pol η)
72. The pentose phosphate pathway of glucose oxidation produces _____.
(A) coenzyme Q₁₀ (B) FADH₂ (C) glucose-1-phosphate
(D) NADH (E) ribose-5-phosphate
73. The thickness of endoplasmic reticulum membrane is about 37.5 Å. Which one of the followings is closest to this length?
(A) alpha-helix with 10 amino acid residues long
(B) alpha-helix with 40 amino acid residues long
(C) alpha-helix with 80 amino acid residues long
(D) B-DNA with 10 base pairs long
(E) B-DNA with 40 base pairs long
74. There are cholesterol and cholesterol esters in LDL. How and where are cholesterol esters generated in a human body?
(A) Cholesterol esters are generated by lecithin: cholesterol acyltransferase in endothelial cells.
(B) Cholesterol esters are produced by lecithin: cholesterol acyltransferase in macrophages.
(C) Cholesterol esters come from the reaction between free short-chain fatty acids and cholesterol.
(D) Cholesterol esters are generated from the reaction between free long-chain fatty acids and cholesterol.
(E) Cholesterol esters are produced by lecithin: cholesterol acyltransferase in the bloodstream.

75. Okazaki fragments are _____.
- (A) short DNA pieces that explain how DNA is synthesized on the lagging strand
 - (B) short DNA pieces that explain how DNA is synthesized on the leading strand
 - (C) the remnants of the original strands that are dispersed in the new double stranded DNA molecules
 - (D) RNA primers used for DNA replication
 - (E) Fragments of mRNA that are processed into mature mRNA molecules
76. Which of the followings describes the initial bond formation in the covalent intermediate in the reaction catalyzed by chymotrypsin?
- (A) Serine 195 and the carbonyl carbon in the peptide backbone
 - (B) Serine 195 and the nitrogen in the peptide backbone
 - (C) Histidine 57 and the carbonyl carbon in the peptide backbone
 - (D) Histidine 57 and the nitrogen in the peptide backbone
 - (E) Aspartate 102 and the carbonyl carbon in the peptide backbone
77. Which of the following statements about farnesyl-linked proteins and glycosylphosphatidylinositol (GPI)-linked proteins is TRUE?
- (A) Farnesyl-linked proteins and GPI-linked proteins are randomly distributed in the plasma membrane.
 - (B) Farnesyl-linked proteins and GPI-linked proteins are frequently associated with the outer leaflet of the plasma membrane.
 - (C) Farnesyl-linked proteins and GPI-linked proteins are frequently associated with the inner leaflet of the plasma membrane.
 - (D) Farnesyl-linked proteins are associated with the outer leaflet of the plasma membrane, and GPI-linked proteins are frequently associated with the inner leaflet of the plasma membrane.
 - (E) Farnesyl-linked proteins are associated with the inner leaflet of the plasma membrane, and GPI-linked proteins are frequently associated with the outer leaflet of the plasma membrane.
78. What is an important component(s) to transport ammonia from skeletal muscles and the other tissues to the liver?
- (A) Albumins
 - (B) Alanine from skeletal muscles and glutamine from most tissues
 - (C) Glutamates
 - (D) Alanine from skeletal muscles and glutamate from most tissues
 - (E) Glycine from skeletal muscles and glutamate from most tissues

79. Which statement about energy metabolism in patients with type I diabetes mellitus and poor blood glucose control is NOT true?
- (A) Ketone bodies are mainly derived from the metabolism of glucose-produced acetyl-CoA.
 - (B) Ketone bodies can replace glucose as a cellular energy source.
 - (C) Intermediate products of the Krebs cycle, such as oxaloacetate, are used in gluconeogenesis, leading to an increase in blood glucose.
 - (D) Due to the lack of oxaloacetate, acetyl-CoA cannot enter the Krebs cycle, resulting in its conversion into ketone bodies.
 - (E) Fatty acids are converted into ketone bodies as an alternative energy source in the absence of glucose.
80. A young boy is unusually tall and presents with joint laxity and retinal detachment. Examination reveals a mutation in the tripeptide repeat of type II collagen, affecting its quaternary structure. Which amino acid is most likely affected by this mutation?
- (A) hydroxylysine
 - (B) hydroxyproline
 - (C) glycine
 - (D) tryptophan
 - (E) proline
81. How is DNA recombination achieved during meiosis?
- (A) Double-strand break recombination
 - (B) Single-strand break recombination
 - (C) Telomere recombination
 - (D) Centromere recombination
 - (E) Homologous recombination
82. What is the main pharmacological action of benzoate and phenylbutyrate, which are used to treat urea cycle disorders?
- (A) It provides intermediates required for the urea cycle to enhance the efficiency of the entire urea cycle.
 - (B) It acts as allosteric activators of carbamoyl phosphate synthase I to enhance the efficiency of the urea cycle.
 - (C) Their metabolites combine with glycine and glutamine, respectively, to form derivatives that are excreted, reducing the burden on the urea cycle.
 - (D) It promotes the synthesis of arginine to prevent arginine deficiency.
 - (E) It increases the activity of ornithine transcarbamylase to facilitate urea synthesis.
83. Which statement about the chain elongation of vertebrate fatty acids is NOT true?
- (A) It occurs on the endoplasmic reticulum.
 - (B) It utilizes malonyl-CoA as a substrate.
 - (C) It elongates palmitoyl-CoA to stearoyl-CoA.
 - (D) It gives a saturated fatty acyl-CoA two carbons longer than the original substrate.
 - (E) It occurs in the cytoplasm.

84. P53 _____.
- (A) belongs to oncogene
 - (B) regulates the activity of E2F transcription factor
 - (C) cannot interact with DNA
 - (D) repairs DNA damage directly
 - (E) acts as a transcription factor to regulate cell cycle
85. Retinoid acid _____.
- (A) can be converted to retinal in the body
 - (B) participates in the synthesis of β -carotene
 - (C) combines with nuclear receptor that binds to specific DNA sequence
 - (D) can replace vitamin A in the diet
 - (E) acts as a chaperone at post-translational modification
86. What type of DNA will be formed if a DNA segment has one all-pyrimidine strand and one all-purine strand?
- (A) A-DNA formation
 - (B) B-DNA formation
 - (C) G-Quadruplexes
 - (D) H-DNA formation
 - (E) Z-DNA formation
87. How many of the following molecules act as second messengers?
GTP; calcium ion; cGMP; cAMP; inositol-1,4,5-triphosphate; diacylglycerol; ATP; insulin
- (A) 8
 - (B) 7
 - (C) 6
 - (D) 5
 - (E) 4
88. Which of the following endogenous DNA-damaging reactions occurs most frequently in cells?
- (A) depurination
 - (B) ROS oxidation
 - (C) methylation
 - (D) deamination
 - (E) depyrimidination
89. How many pairs in the following are TRUE?
- Iron-sulfur protein – electron flow from FMNH₂ to coenzyme Q
 - Coenzyme Q – lipid soluble electron carrier
 - Cytochrome c – accepts electrons from complex IV
 - Flavin mononucleotide – accepts electron from NADH in complex I
 - Q cycle – funnels electrons from a 2-electron carrier to a 1-electron carrier
 - Catalase – converts reactive oxygen species into hydrogen peroxide
 - Proton-motive force – hydrolysis of ATP
- (A) 3
 - (B) 4
 - (C) 5
 - (D) 6
 - (E) 7

90. The coupling oxidative phosphorylation means the joint of two reactions including

- ① glucose + ATP \rightarrow pyruvate + ADP + P_i
 ② NADH + 1/2 O₂ + H⁺ \rightarrow H₂O + NAD⁺
 ③ ADP + P_i + H⁺ \rightarrow ATP + H₂O
 ④ oxaloacetate + NADH \rightarrow NAD⁺ + malate + H⁺

(A) ①③

(B) ②③

(C) ①④

(D) ②④

(E) ③④

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後醫-普通生物及生化概論

題號	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
答案	D	B	E	A	A	C	C	E	D	D	B	A	D	C	C	E	B	E	B	B
題號	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
答案	C	D	A	C	A	E	C	D	D	E	D	D	C	D	C	E	B	D	E	B
題號	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
答案	A	B	E	B	A	A	C	C	E	C	E	D	B	A	E	C	E	B	C	D
題號	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
答案	D	C	D	C	D	C	A	D	B	C	B	E	D	E	A	A	E	B	A	C
題號	81	82	83	84	85	86	87	88	89	90										
答案	A	C	E	E	C	D	D	A	B	B										

高雄醫學大學 112 學年度學士後醫學系招生考試試題參考答案疑義釋疑公告

科目	題號	釋疑答覆	釋疑結果
普通生物學	2	The shared functionality of wings in mammals and birds are not because of their shared common ancestry, it's therefore a classic example of convergent evolution. The divergent evolution in the rebuttal is the divergent functionality of organs that shares a common ancestry.	維持原答案
	3	PSI 的電子可依環境選擇不同路徑，然其傳給 NADP+ 為選項之一。	維持原答案
	4	基因表現與否的因素相當多，Acetylation 為其中之一；反之，DNA acetylation 則可重大地改變基因表現。	維持原答案
	11	1. Carbon level dropped during Ordovician through the combination of calcium silicate is a working hypothesis that no conclusive evidence has arrived. Phosphorus cycle therefore is still the definite and most appropriate answer for this question.	維持原答案
	31	We agree with your opinion that competition can act on both intra- and interspecies level. Though “(C) Commensalism: Members of both species benefit from the interaction” is an absolute wrong description and therefore the most appropriate answer to this question.	維持原答案
	33	Variations (genetically or phenotypically) are the raw materials for natural selection to act on; or we should say any DNA synthesis is subject to error and mutation, even the most delicate one, and they confer variations in a population for natural selection later to act on. The context in rebuttal is describing the deductive process how Darwin formed and proposed his idea on Natural Selection.	維持原答案
	39	Alternative splicing for sure will result in different combinations of exons from the DNA that lead to length variations of mRNA. While the case used in this question is a 90kb to 2.4kb difference, which is MOST LIKELY a consequence of removal of introns from the pre-mRNA, rather than a result of alternative splicing.	維持原答案
	44	Harmful genes get fixed in a population by gene drift is primarily happen in small populations (either populations undergo founder effect or bottleneck effect). In the premise of “very big population”, it's less likely gene drift could play many roles. In addition, (B) is the definite answer compared to (D) by all mean	維持原答案
	46	中胚層為肌肉及骨骼的主要胚層為最佳解答。	維持原答案

科目	題號	釋疑答覆	釋疑結果
	52	The question want to highlight the breeding difference between higher plants and other organisms. Although gametophytes occur in angiosperm, too, but zygosporangium, that occur mostly in fungi, is the definite and the most appropriate answer for this question.	維持原答案
	54	在病毒各項生理現象，Prion 之複製行為與其相同，且其他選項皆明顯錯誤。	維持原答案
	57	The “multidirectional” in the question is meaning physical direction. The phloem can transport nutrients top-down or buttom-up, in contrast to the unidrection of xylem.	維持原答案

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高雄醫學大學 112 學年度學士後醫學系招生考試試題參考答案疑義釋疑公告

科目	題號	釋疑答覆	釋疑結果
生化概論	29	Ca ²⁺ 濃度由Phosphatidylinositol and phospholipase C 來調控，從ER釋出。Ca ²⁺ 進一步作為second messenger，與calmodulin及calmodulin-dependent protein kinases結合，進一步調控下游基因。	D
	63	(B)選項: Glycogen synthase的glycogen branching enzyme為Amylo-(1,4→1,6)-transglycosylase。	B、D
	65	(A)選項Pyruvate dehydrogenase (PDH)，並未指明是否為PDH complex其中dihydrolipoyl transacetylase (E2)利用Lysine與Lipoic acid 形成Amide linkage。	A、D
	66	選項 (B) lysozyme can take six residues of monosaccharides乃作用在其Substrate上之6個單醣。	C
	69	ketogenic amino acid: Phe; Thr; Lys 等3種。其中Thr屬於Ketogenic與Glucogenic均可。	B
	70	DNA polymerase、amino-acyl tRNA synthase, Elongation Factor-Tu、Klenow fragment 等4種具有proof-reading。雖然RNA polymerase II 有被討論，但在Lehninger 8 th edt 仍不認為。所以仍維持4種。	C
	71	參與Thymine dimer repair: A~E 選項均可。所以無選項。	送分
	74	Cholesterol esters 乃在 bloodstream 中利用 lecithin: cholesterol acyltransferase 從TG上轉移一個Acyl group至Cholesterol 來形成Cholesterol ester。	E
	76	本題在問: initial bond formation，因此維持(A)選項。	A
	78	Glutamate從肝外組織運送ammonium ion，必須先轉給Glutamine。	B
	79	Type I DM 產生Ketone bodies 的原因，明顯因為無法從glucose 來補充能量，轉由Lipid 代謝來源。而Ketone bodies 替代Glucose 做為能量來源之敘述並無不妥。	A
	80	從Collagen 結構每3個胺基酸便有一個Gly (佔35%)，其又是最小一個胺基酸，為形成triple helix 所必須，當突變發生在Gly，便導至Collagen disease。	C
81	Meiosis: (A) Double-strand break recombination 與 (E) Homologous recombination 均正確。	A、E	

科目	題號	釋疑答覆	釋疑結果
	83	因為 FA synthase 只能合成至 16C FA，本題 Chain elongation 指合成更長的 FA，此過程乃在 ER 及 Mitochondria 進行。	E
	84	P53角色: (B) regulates the activity of E2F transcription factor 與 (E) acts as a transcription factor to regulate cell cycle 均可。	B、E
	85	vitamin A與Retinoid acid為代謝上之上下游關係，但其各有其他功能。	C
	88	此題在問發生率最高的 DNA-damaging reaction，而非問最嚴重。根據 Mathews's Biochemistry 4 th edt 有一表列出 depurination 為最常發生的 DNA damage。	A

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生物學

張劍鴻(張芸潔)老師提供

高醫學士後醫 生物學 考題分析

課程大綱	112 高醫	111 高醫	110 高醫	109 高醫	小計	各單元 (%)
Unit 1 細胞生物學	2	1	1	4	8	4%
Unit 2 動物生理學	9	7	22	7	45	25%
Unit 3 巨分子及生物化學	2	3	2	2	9	5%
Unit 4 分子生物學	4	6	4	5	19	11%
Unit 5 DNA生物科技	1	2	1	4	8	4%
Unit 6 微生物免疫	4	5	3	4	16	9%
Unit 7 植物學	10	10	3	8	31	17%
Unit 8 演化學	7	9	6	6	28	16%
Unit 9 生態學	6	2	3	5	16	9%
總計	45	45	45	45	180	100%

高雄醫學大學 112 學年度 學士後醫學系 生物試題命題範疇分析

- ◆ 本年度高醫後醫的普通生物試題配分如下：
 - (1) 第 1 -15題，每題 1 分，共15分。
 - (2) 第31-60題，每題 2 分，共60分。
- ◆ 45 題的試題中，全數為生物學課本 Campbell 的生物領域概念，若能循正規的方式準備，確實熟悉Campbell生物學之概念，該75分要有60以上的表現並不困難。

生物各試題命題範疇分析

		第1-15題，一分題
1	Unit 7 植物學	Bryophytes，完全命中 正課講義：Chap30 植物多樣性， page 19 複習課程：Unit 7 Plant Biology, page 32
2	Unit 8 演化學	Convergent evolution，完全命中 正課講義：Chap33 演化機制， page 26 複習課程：Unit 8 Evolution, page 16
3	Unit 7 植物學	Photosystem，完全命中 正課講義：Chap 29 植物訊號和行為， page 134-137 複習課程：Unit 7 Plant Biology, page 26
4	Unit 4 分子生物學	DNA methylation，完全命中 正課講義：Chap 23 基因表現控制， page 46 複習課程：Unit 4 Molecular Biology, page 36
5	Unit 5 生物科技	Next generation sequencing，完全命中 正課講義：Chap25 基因體演化， page 5-8 複習課程：Unit 5 Biotechnology, page 8

		第1-15題，一分題
6	Unit 3 生物化學	Lipoproteins, 完全命中 正課講義: Chap 15 生物巨分子, page 122-124
7	Unit 2 動物生理學	Homeostasis, 完全命中 正課講義: Chap 4 身體構造和功能, page 33-34 複習課程: Unit 2 Animal Physiology, page 6
8	Unit 4 分子生物學	Recombination frequency, 完全命中 正課講義: Chap 20 染色體連鎖, page 47-49 複習課程: Unit 4 Molecular Biology, page 17
9	Unit 2 動物生理學	Biological clock, 完全命中 正課講義: Chap 6 神經系統, page 47-48 複習課程: Unit 2 Animal Physiology, page 11 and 16
10	Unit 2 動物生理學	Pepsin, 完全命中 正課講義: Chap11 消化系統, page 55-56 複習課程: Unit 2 Animal Physiology, page 37-38
11	Unit 9 生態學	Phosphorus cycle, 完全命中 正課講義: Chap38_生態系, page 24 複習課程: Unit 9 Ecosystems, page 12
12	Unit 9 生態學	Phosphorus cycle, 完全命中 正課講義: Chap38_生態系, page 81 and 89 複習課程: Unit 9 Ecosystems, page 13
13	Unit 7 植物學	Seed plants, 完全命中 正課講義: Chap30 植物多樣性, page 55 複習課程: Unit 7 Plant Biology, page 33
14	Unit 6 微生物免疫學	Immunoglobulin, 完全命中 正課講義: Chap26 感染之防禦, page 72 複習課程: Unit 6 Microbiology and Immunology, page 9
15	Unit 3 生物化學	Reproduction cycles of females, 完全命中 正課講義: Chap 15 生物巨分子, page 96 複習課程: Unit 3 Biochemistry, page 4

		第31-60題，二分題
31	Unit 9 生態學	Commensalism, 完全命中 正課講義: Chap37_多樣性和群落, page 17-18 複習課程: Unit 9 Ecosystems, page 8
32	Unit 8 演化學	Terrestrially adapted, 完全命中 正課講義: Chap 31 真菌, page 11 複習課程: Unit 8 Evolution, page 4
33	Unit 8 演化學	Alter allele frequencies, 完全命中 正課講義: Chap33 演化機制, page 76-82 複習課程: Unit 8 Evolution, page 17-18
34	Unit 6 微生物免疫學	RNA viruses- high mutation rates, 完全命中 正課講義: Chap27 微生物, page 105 複習課程: Unit 6 Microbiology and Immunology, page 24
35	Unit 6 微生物免疫學	Latency- HIV, 完全命中 正課講義: Chap27 微生物, page 120 複習課程: Unit 6 Microbiology and Immunology, page 14
36	Unit 7 植物學	Terrestrial adaptation, 完全命中 正課講義: Chap30 植物多樣性, page 11, 53 複習課程: Unit 7 Plant Biology, page 32
37	Unit 4 分子生物學	ras proto-oncogene, 完全命中 正課講義: Chap 23 基因表現控制, page 99-100 複習課程: Unit 4 Molecular Biology, page 38
38	Unit 2 動物生理學	Gametogenesis, 完全命中 正課講義: Chap 13 生殖系統, page 42 複習課程: Unit 2 Animal Physiology, page 50
39	Unit 4 分子生物學	RNA splicing- for split genes, 完全命中 正課講義: Chap 22 基因表現, page 40-45 複習課程: Unit 4 Molecular Biology, page 26-27
40	Unit 1 細胞生物學	Endomembrane system, 完全命中 正課講義: Chap 1 細胞構造和功能, page 30 複習課程: Unit 1 Cell Biology, page 2-3

		第31-60題，二分題
41	Unit 8 演化學	Evolution, 完全命中 正課講義: Chap33 演化機制, page 44-47 複習課程: Unit 8 Evolution, page 15-18
42	Unit 2 動物生理學	Open circulatory system, 完全命中 正課講義: Chap 9 運輸系統, page 18 複習課程: Unit 2 Animal Physiology, page 23
43	Unit 7 植物學	Land plants evolved from green algae, 完全命中 正課講義: Chap30 植物多樣性, page 8-9 複習課程: Unit 7 Plant Biology, page 30
44	Unit 8 演化學	Genetic drift, 完全命中 正課講義: Chap33 演化機制, page 80-81 複習課程: Unit 8 Evolution, page 17
45	Unit 7 植物學	Seed plants, 完全命中 正課講義: Chap30 植物多樣性, page 63 複習課程: Unit 7 Plant Biology, page 30
46	Unit 2 動物生理學	Three embryonic germ layers, 完全命中 正課講義: Chap 14 動物發育, page 66-68 複習課程: Unit 2 Animal Physiology, page 57
47	Unit 8 演化學	Sexual reproduction in fungi, 完全命中 正課講義: 31 真菌, page 11-12 複習課程: Unit 8 Evolution, page 4
48	Unit 9 生態學	Phosphorus cycle, 完全命中 正課講義: Chap37 多樣性和群落, page 43 複習課程: Unit 9 Ecosystems, page 10
49	Unit 8 演化學	Hox genes, 完全命中 正課講義: Chap32 動物多樣性, page 57 複習課程: Unit 8 Evolution, page 10
50	Unit 9 生態學	Biomass pyramid, 完全命中 正課講義: Chap38_生態系, page 15-16

		第31-60題，二分題
51	Unit 1 細胞生物學	Genetic information, 完全命中 正課講義: Chap 1 細胞構造和功能, page 18 Chap 22 基因表現, page 3 複習課程: Unit 4 Molecular Biology, page 23
52	Unit 7 植物學	Angiosperm, 完全命中 正課講義: Chap30 植物多樣性, page 74 複習課程: Unit 7 Plant Biology, page 35
53	Unit 7 植物學	Photosynthesis, 完全命中 正課講義: Chap29 植物訊號和行為, page 134-139 複習課程: Unit 7 Plant Biology, page 25-28
54	Unit 6 微生物免疫學	Prions, 完全命中 正課講義: Chap27 微生物, page 131-133 複習課程: Unit 6 Microbiology and Immunology, page 25
55	Unit 7 植物學	ABC hypothesis, 完全命中 正課講義: Chap28 植物構造和生長, page 67 複習課程: Unit 7 Plant Biology, page 10
56	Unit 2 動物生理學	Antidiuretic hormone, 完全命中 正課講義: Chap 12 排泄系統, page 94-95 複習課程: Unit 2 Animal Physiology, page 32 and 48
57	Unit 7 植物學	Phloem transports, 完全命中 正課講義: Chap28 植物構造和生長, page 97-99 複習課程: Unit 7 Plant Biology, page 12
58	Unit 2 動物生理學	Glucagon, 完全命中 正課講義: Chap10_內分泌, page 53-54 複習課程: Unit 2 Animal Physiology, page 33
59	Unit 2 動物生理學	Nicotinic acetylcholine receptor, 完全命中 正課講義: Chap 5 神經元和突觸, page 80-82 複習課程: Unit 2 Animal Physiology, page 8
60	Unit 9 生態學	Mating Behavior and Mate Choice, 完全命中 正課講義: Chap38_生態系, page 82-83 複習課程: Unit 9 Ecosystems, page 14

生化概論

莊老師(施政安)老師提供

16. Ans: E

[解析] Apoptosis signal: (1) **cytochrome c release**, (2) externalization of phosphatidylserine, (3) peroxidation of cardiolipin (4) scramblase activation by Ca^{2+}

18. Ans: E

[解析]

- 1) TPP in E2 of **X dehydrogenase complex**
- 2) **X = α -keto acids** (pyruvate, α -ketoglutarate, BCAA α -keto acid)

20. Ans: B

[解析] Target protein/**Lysine with ϵ -amino group** + C-ter Glycine of ubiquitin

22. Ans: D

[解析]

- 1) 建立直線式滴定圖 (下圖)
- 2)

pH 2	pH 3.8	pH 4.3	pH 6	pH 9.8
+3	→ +2	→ +1	→ 0	→ -1
				→ -2
			↑	
			At pH 7.0	

24. Ans: C

[解析] Tandem mass spectrometry: 分析 fragment Mr 來推測 protein sequence

26. Ans: E

[解析]

題號 _____ 修正部分 _____

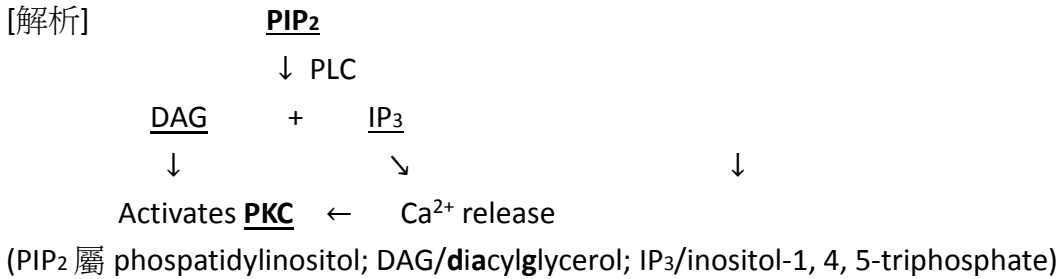
- (A) in **inner** mitochondrial membrane
- (B) $[\text{H}^+]$: **intramembran space > matrix**
- (C) **obey** the chemiosmotic theory
- (D) is **impermeable** to proton

28. Ans: D

[解析] Hydropathy plot: 預測 transmembrane protein 貫穿細胞膜次數 (spanning topology)

29. Ans: D

[解析]



63. Ans: B, D (釋疑後之解答)

[解析]

1)

題號	修正部分
----	------

- (A) from **nonreducing end to reducing end**
- (C) **UDP-glucose** as the substrate of glycogen synthase
- (E) **cAMP-dependent protein kinase (PKA)** triggers the glycogen breakdown

65. Ans: A, D (釋疑後之解答)

[解析]

1) (D) 修正: X/ACP, Y/serine, Z/4'-phosphopantethine

2)

Enzyme	Residue	Cofactor
--------	---------	----------

- | | | |
|---------------------------|-----------|---------------------|
| a. Pyruvate dehydrogenase | E2-lysine | Lipoic acid |
| b. Aconitase | Cysteine | Fe ²⁺ |
| c. Pyruvate carboxylase | Lysine | Biotin |
| d. Aminotransferase | Lysine | Pyridoxal phosphate |

3) 釋疑後, 認為 pyruvate dehydrogenase complex 未表明是 E2 故寫(A) 也給分. 但作者認為只有 E2 和 cofactor 有共價結合(link), 此題原解(D)並無不妥!

69. Ans: B

[解析]

- 1) 根據 ^aLehninger, or ^bvan Hold, or ^cGarrett 版:
Phe, Thr, Lys → acetyl-CoA (ketogenic), 解答為 B
- 2) 根據 ^dHarpper, or ^eStryer 版:
Phe, Lys → acetyl-CoA (ketogenic), 解答為 A
- 3) Threonine 有版本上之爭議

(^a Nelson and Cox, Lehninger's principles of biochemistry, 8th edition, 2021, p.640)

(^b van Hold *et al*, Biochemistry, 2012, 4th edition, p.841)

(^c Garrett and Grisham, Biochemistry, 2017, 6th edition, p.915)

(^d Rodwell *et al*, Harper/s illustrated biochemistry, 2018, 31th edition, p.281)

(^e Stryer *et al*, Biochemistry, 2012, 7th edition, p.714)

4) 作者根據最新期刊, 成人有兩條路線^f: (作者支持原解(B))

a. Threonine dehydratase pathway (~90%):

Thr → propionyl-CoA → glucose (gluconic pathway)

b. Threonine dehydrogenase pathway (7-10%):

Thr → glycine + acetyl-CoA → glucose or ketone

Bodies (gluconic and ketogenic pathways)

(^f Qi Tang *et al*, Physiological functions of threonine in animals: beyond nutrition metabolism, *Nutrients*, 2021, 13: 25920)

70. Ans: C (校方解答)

[解析]

1) Proofreading function in molecular biology:

a. DNA polymerase (多數具有 3'→5' exonuclease 修正功能)

b. RNA polymerase II (*back-tracking model)

c. Aminoacyl-tRNA synthetase (double-sieve mechanism)

d. EF-Tu (**GTP hydrolysis to enhance translation efficiency)

e. Klenow fragment(仍具有 3'→5' exonuclease 修正功能)

故應選(D)才對

(*Mo'men Abdekareem *et al*, Structural basis of transcription: RNA polymerase backtracking and its reactivation, *Molecular cell*, 2019, 75:298)

(**Jeffrey K. Noel *et al*, How EF-Tu can contribute to efficient proofreading of aa-tRNA by the ribosome, *Nature Communications*, 2016, Oct)

71. Ans: 釋疑後-送分

[解析]

1) 根據^aLehninger 版: 以上皆可修補 pyrimidine dimer

(^a Nelson and Cox, Lehninger's principles of biochemistry, 8th edition, 2021, p.1006, Table25-5)

2) 作者根據重要研究突變的經典書籍, 認同以上論述: 自然界有^bpyrimidine dimer-specific DNA glycosylase (in **base excision repair**)

(^bE. C. Friedberg *et al*, Textbook: DNA repair and mutagenesis, 2006, 2nd)

edition, p.192-196) 故此題無解

73. Ans: D

[解析]

- 1) $37.5 \text{ angstrom} = 3.75 \text{ nm}$
- 2) $[(3.75) \div (0.15 \text{ nm/residue})] = 25 \text{ residues in } \alpha\text{-helix to span into the plasma membrane.}$
- 3) **$[(3.75) \div (0.34 \text{ nm/bp})] \approx 11 \text{ bp in B-DNA}$** 故選(D)

74. Ans: E (校方解答)

[解析] (E): LCAT in the surface of HDL not in bloodstream
故應選無解才對

77. Ans: E

[解析] Membrane asymmetry:

- 1) Lipid asymmetry: PC in outer leaflet; PS in inner leaflet
- 2) Protein asymmetry: glycoprotein (例: **GPI-anchored protein in outer leaflet**)
(PC/phosphatidylcholine; PS/phosphatidylserine)

78. Ans: B

[解析] Ammonia transport by **NH₃ carrier**:

- 1) From skeletal muscle: **alanine**
- 2) From most tissue: **glutamine**

81. Ans: A, E (釋疑後之解答)

[解析] Meiotic homologous recombination 仍屬 homologous recombination:
都有 double-strand break 發生

84. Ans: B, E (釋疑後之解答)

[解析] p53:

- 1) **Tumor suppressor gene**
- 2) p53 protein is a transcription factor, **binding to DNA**
- 3) p53 protein can regulate **cell cycle** and DNA repair.
- 4) *Signaling of p53 protein:
p53 → increase p21 → inactivate the CDK2/cyclin E complex

↓

RB in the active state

↓

E2F is inhibited by RB protein

↓

Cells in G1 phase

(E2F: transcription factor for the genes of DNA replication)

(*Nelson and Cox, Lehninger's principles of biochemistry, 8th Edition, p.450)

85. Ans: C

[解析]

題號	修正
(A)	retinal → retinoic acid
(B)	β -carotene degradation → retinoic acid
(D)	With different functions (不能取代)
(E)	Not as a chaperone protein

88. Ans: A

[解析]

Damage type	*Number of lesion
Depurination	18000
Depyrimidination	600
Deamination (C → U)	100
7-methylation of G	6000
ROS oxidation	~2000

(*E. C. Friedberg *et al*, Textbook: DNA repair and mutagenesis, 2006, 2nd edition, p.16, Table 2-1)

90. Ans: B

[解析]

② NADH: oxidation

③ ATP formed: phosphorylation

Net reaction : oxidation coupling to phosphorylation