

高雄醫學大學 109 學年度學士後醫學系招生考試試題

科目：普通生物學及生化概論

考試時間：100 分鐘

說明：一、選擇題用 2B 鉛筆在「答案卡」上作答，修正時應以橡皮擦擦拭，不得使用修正液(帶)，未遵照正確作答方法而致電腦無法判讀者，考生自行負責。
二、試題及答案卡必須繳回，不得攜出試場。

I. 【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 題為普通生物學，16~30 題為生化概論。

1. In evolution, which academic term is defined as changes in allele frequency that can be observed within a population?
(A) Microevolution (B) Speciation (C) Genetic evolution
(D) Phenotypic evolution (E) Hybridization
2. What kind of neurotransmitter is used in the vertebrate neuromuscular junction?
(A) Glutamate (B) Dopamine (C) Acetylcholine (D) Serotonin (E) GABA
3. Which one of the following hypothesis explains why multiple codon can code for a single amino acid?
(A) Crick (B) Franklin (C) Mendelian (D) Watson (E) Wobble
4. What is the major difference between Gram-positive and Gram-negative bacteria?
(A) Genome size (B) Lipid composition of membrane (C) Cell wall structure
(D) Protein composition (E) Cell shape
5. Which one of the following structure is not observed in eukaryotic cells?
(A) Ribosome (B) Plasma membrane (C) Nuclear envelope
(D) Chromosome (E) Plasmid
6. _____ are gene copies resulted from gene duplication events in the same species.
(A) Twin (B) Analogs (C) Orthologs (D) Paralogs (E) Dialogs
7. Which one of the following human cell in the reproductive system is not diploid?
(A) Oogonium (B) Primary oocyte (C) Spermatogonium (D) Polar body (E) Zygote
8. Which one of the following mechanism is not required for the control of eukaryotic gene expression?
(A) Histone modification (B) RNA splicing (C) Operon regulation
(D) Protein processing (E) DNA methylation
9. Which one of the following nutrient cycle is important for photosynthetic organisms?
(A) Water cycle (B) Nitrogen cycle (C) Carbon cycle
(D) Phosphorus cycle (E) Sulfur cycle
10. Which one of the following DNA technology could be used to edit genes in living cells?
(A) Next generation sequencing (B) CRISPR-Cas9 system (C) DNA microarray
(D) *In situ* hybridization (E) Reverse transcriptase PCR
11. The site of the thickest musculature in the heart is _____.
(A) left atrium (B) aorta (C) left ventricle (D) right ventricle (E) right atrium
12. Which one of the following is caused by excessive nutrient runoff into lakes?
(A) Biomanipulation (B) Biological magnification (C) Global warming
(D) Top-down control (E) Eutrophication
13. The cells in the human body are in contact with an internal environment consisting of _____.
(A) blood (B) connective tissue (C) matrix
(D) interstitial fluid (E) mucous membranes
14. Which one of the following is not a part of the vertebrate innate defense system?
(A) Natural killer cell (B) Interferon (C) Antibody
(D) Complement system (E) Inflammation
15. Which one of the following signal molecule is specific to animals?
(A) Pheromone (B) Cytokinin (C) Ethylene
(D) Strigolactone (E) Nitric oxide
16. Which of the following amino acid side chains has the highest pK_a value?
(A) Asp (B) Tyr (C) Cys (D) His (E) Glu

17. In the active site of chymotrypsin, which of the following is the amino acid residue arrangement order of the catalytic triad?
 (A) Asn...Lys...His (B) Asp...His...Ser (C) His...Asp...Tyr (D) Asn...Ser...Cys (E) His...Cys...Asp
18. Which of the following is a DNA sequence?
 (A) Coactivator (B) Corepressor (C) Enhancer (D) Inducer (E) Transactivator
19. Poly-lysine exhibits a random coil structure at neutral pH. What kind of interaction can cause its formation of a random coil structure?
 (A) Covalent bond (B) Hydrogen bond (C) van der Waals interaction
 (D) Electrostatic interaction (E) Hydrophobic interaction
20. Which one can not bind to the origin of replication of *E. coli* (*oriC*)?
 (A) DnaA (B) DnaB (C) Integration host factor (IHF)
 (D) Histone-like protein (HU) (E) Tus
21. Which type of damage to DNA structure is most likely to be caused by UV light?
 (A) Deamination (B) Pyrimidine dimers (C) Depurination
 (D) Depyrimidination (E) Hydrolysis of the phosphodiester bond
22. Which compound is an intermediate of the β -oxidation of fatty acids?
 (A) $\text{CH}_3\text{---}(\text{CH}_2)_{20}\text{---CO---COOH}$
 (B) $\text{CH}_3\text{---CH}_2\text{---CO---CH}_2\text{---CO---OPO}_3^{2-}$
 (C) $\text{CH}_3\text{---CH}_2\text{---CO---CH}_2\text{---OH}$
 (D) $\text{CH}_3\text{---CH}_2\text{---CO---CO---S---CoA}$
 (E) $\text{CH}_3\text{---CO---CH---CO---S---CoA}$
23. Which of the following enzymes requires coenzyme B₁ as cofactor?
 (A) Pyruvate decarboxylase (B) Malic enzyme (C) Alcohol dehydrogenase
 (D) Citrate synthase (E) Pyruvate carboxylase
24. Which of the following statements is not correct?
 (A) Bacterial peptidoglycan contains (β 1 \rightarrow 4) glycosidic linkage.
 (B) Cellulose contains (β 1 \rightarrow 4) glycosidic linkage.
 (C) Starch contains (α 1 \rightarrow 6) glycosidic linkage.
 (D) Glycogen contains (α 1 \rightarrow 4) glycosidic linkage.
 (E) Lactose contains (α 1 \rightarrow 4) glycosidic linkage.
25. For each molecule of acetyl-CoA that enters the citric acid cycle, which of the following sets represents the net products of the cycle?
 (A) 2 CO₂, 2 NADH, 2 FADH₂, 1 GTP, 1 oxaloacetate
 (B) 2 CO₂, 3 NADH, 1 FADH₂, 2 GTP, 1 oxaloacetate
 (C) 2 CO₂, 2 NADH, 1 FADH₂, 2 GTP, 0 oxaloacetate
 (D) 2 CO₂, 3 NADH, 1 FADH₂, 1 GTP, 1 oxaloacetate
 (E) 2 CO₂, 3 NADH, 1 FADH₂, 1 GTP, 0 oxaloacetate
26. Fatty acids are activated to acyl-CoA, however, why the acyl group is further transferred to carnitine for β -oxidation?
 (A) Carnitine is required to oxidize NAD⁺ to NADH.
 (B) Acyl- CoAs easily cross the mitochondrial membrane, but the fatty acids themselves will not.
 (C) Acyl-carnitines readily cross the mitochondrial inner membrane, but acyl-CoAs do not.
 (D) Fatty acids cannot be oxidized by FAD unless they are in the acyl-carnitine form.
 (E) Carnitine can be oxidized to provide additional energy in mitochondria.
27. Which of the following is the building block for the biosynthesis of phenylalanine, tyrosine, and tryptophan?
 (A) Pyruvate (B) Phosphoenolpyruvate (C) Acetyl-CoA (D) α -Ketoglutarate (E) Ribose-5-phosphate
28. The reactions of citric acid cycle where CO₂ is produced are catalyzed by _____ and _____, respectively.
 (A) Isocitrate dehydrogenase; Malate dehydrogenase
 (B) Isocitrate dehydrogenase; α -ketoglutarate dehydrogenase
 (C) α -ketoglutarate dehydrogenase; Succinate dehydrogenase
 (D) α -ketoglutarate dehydrogenase; Malate dehydrogenase
 (E) Succinate dehydrogenase; Malate dehydrogenase
29. Which of the following is false regarding the oxidation of 1 mole of palmitate (16:0) by the β -oxidation pathway?
 (A) 1 mole of ATP is needed. (B) 8 moles of acetyl-CoA are formed. (C) 8 moles of FADH₂ are formed.
 (D) AMP and PPi are formed. (E) The reactions occur in the mitochondria.
30. What is the source of the polar head group in the formation of sphingomyelin?
 (A) CDP-choline (B) Phosphocholine (C) Cardiolipin (D) Phosphoserine (E) Phosphatidylcholine

II. 【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 題為普通生物學，61~90 題為生化概論。

31. Which one of the following is one kind of interspecific interaction along a food chain?
(A) Competition (B) Predation (C) Parasitism
(D) Mutualism (E) Positive interaction
32. Which sequence of structures through which water passes into a root is correct?
(A) Guard cell, endodermis, cortex, xylem
(B) Epidermis, cortex, endodermis, xylem
(C) Root hair, cortex, xylem, endodermis
(D) Root hair, xylem, endodermis, phloem
(E) Root hair, endodermis, cortex, xylem
33. Which one of the following is most likely to produce an Taiwanese butterfly species in the wild whose members have one of two strikingly different color patterns?
(A) Artificial selection (B) Directional selection (C) Stabilizing selection
(D) Disruptive selection (E) Sexual selection
34. The plant growth response to touch is known as _____.
(A) gravitropism (B) geotropism (C) thigmotropism
(D) phototropism (E) circadian rhythm
35. Which one of the following is mismatched with its function?
(A) Most B vitamins vs coenzymes
(B) Vitamin E vs antioxidant
(C) Vitamin K vs blood clotting
(D) Phosphorus vs bone formation, nucleotide synthesis
(E) Iron vs component of thyroid hormones
36. If blood was supplied to all of the body's capillaries at the same time, _____.
(A) resistance to blood flow would increase
(B) blood pressure would fall dramatically
(C) blood would move too rapidly through the capillaries
(D) the amount of blood returning to the heart would increase
(E) the increased gas exchange in the lungs and in the supply of O₂ to muscles would allow for strenuous exercise
37. Which one of the following will control the activity of the others mentioned below?
(A) Thyroid gland (B) Pituitary gland (C) Adrenal cortex
(D) Ovary (E) Hypothalamus
38. Some human males have three sex chromosomes (XXY) and suffer from a genetic disease known as Klinefelter's syndrome. The symptoms include a failure to develop sexually and an impairment of intelligence. This is an example of a disease of _____.
(A) point mutation (B) karyotype (C) homeostasis
(D) bacterial origin (E) old age
39. Which one of the following could provide the best data for determining the phylogeny of very closely related species?
(A) The fossil record
(B) A comparison of embryological development
(C) An analysis of their morphological differences and similarities
(D) A comparison of their ribosomal DNA sequences
(E) A comparison of nucleotide sequences in homologous genes and mitochondrial DNA
40. Which one of the following plant could be more likely to adapt hot and arid environments?
1. Arabidopsis
2. Rice
3. Sugarcane
4. Pineapple
5. Cactus
(A) 1,2 (B) 1,2,3 (C) 1,2,5 (D) 3,4,5 (E) 1,2,3,4,5
41. Which one of the following statement is correct between glycogen and cellulose?
(A) Basic subunits are both glucose.
(B) Location in the cellular level is the same.
(C) The linkage between each subunits is the same.
(D) Function in organisms are both for storage.
(E) Both are structurally branched.

42. Which one of the following is not related to paternity test?
- (A) Short tandem repeats (STRs) of DNA
 - (B) Reverse transcription
 - (C) Primer
 - (D) DNA polymerase
 - (E) PCR
43. Which one of the following organelle is not included in the endomembrane system?
- (A) Golgi apparatus
 - (B) Endoplasmic reticulum
 - (C) Proteasome
 - (D) Lysosome
 - (E) Nuclear envelope
44. Which are the three people awarded for Nobel Prize to the discovery of how the cells sense and adapt to oxygen availability?
- (A) James E. Rothman, Randy W. Schekman, and Thomas C. Südhof
 - (B) John O'Keefe, May-Britt Moser, and Edvard I. Moser
 - (C) William C. Campbell, Satoshi Ōmura, and Youyou Tu
 - (D) William G. Kaelin Jr, Sir Peter J. Ratcliffe, and Gregg L. Semenza
 - (E) Jeffrey C. Hall, Michael Rosbash, and Michael W. Young
45. In temperate regions, which pigment is responsible for the red-yellow coloration seen in leaves during the color change in autumn?
- (A) Chlorophyll *a*
 - (B) Chlorophyll *b*
 - (C) Carotenoids
 - (D) Porphyrin
 - (E) Anthocyanin
46. If we use $^{14}\text{CO}_2$ as a radioactive tracer to track the carbon transition, which one of the following molecule could be incorporated in the last reaction of Calvin cycle?
- (A) Glyceraldehyde-3-phosphate (G3P)
 - (B) Ribulose biphosphate (RuBP)
 - (C) 1,3-biphosphoglycerate (1,3-BPG)
 - (D) 3-phosphoglycerate (3PG)
 - (E) Glucose
47. Compare to the function of plasmodesmata in plant cells, which structure serve the same function in animal cells?
- (A) Gap junctions
 - (B) Middle lamella
 - (C) Hemidesmosomes
 - (D) Tight junctions
 - (E) Basal lamina
48. If the genus *Oryza* is monophyletic, which one of the following is correct?
- (A) *Oryza* all have nearly identical appearance.
 - (B) *Oryza* cannot be classified in a single family or order.
 - (C) All species of *Oryza* are descended from a common ancestor.
 - (D) All species of plant are classified as being in a single order.
 - (E) All species of *Oryza* grow in similar habitats.
49. Nitrogen fixation is observed in some plant species. Which one of the following statement is correct about nitrogen fixation?
- (A) N_2 will be converted to NO_3^- .
 - (B) Nitrifying bacteria are able to fix nitrogen gas.
 - (C) This occurs in aerobic environment.
 - (D) This may produce hydrogen gas.
 - (E) This is catalyzed by nitrate reductase.
50. A circular 3518 bp plasmid DNA has EcoRI restriction sites at position 86 and 1435; PstI sites at position 1108 and 2950; and a BamHI site at position 2623. Which one of the following choices is not correct?
- (A) EcoRI digestion yields two bands in agarose gel.
 - (B) When digestion with EcoRI and BamHI, three bands will be observed in agarose gel.
 - (C) After digestion with EcoRI, PstI and BamHI, five bands will be observed in agarose gel.
 - (D) When digestion with EcoRV and PstI, only two bands will be observed in agarose gel.
 - (E) BamHI digestion yields only one band in agarose gel.

51. Endosymbiotic events had occurred multiple times during evolution. Which one of the following organism contain endosymbiont organelles?
1. Green algae
 2. Red algae
 3. Chlorarachniophytes
 4. Euglenids
 5. Arabidopsis
 6. Rice
 7. Mouse
 8. Human
- (A) 1,2 (B) 3,4 (C) 1,2,3,4 (D) 1,2,3,4,5,6 (E) 1,2,3,4,5,6,7,8
52. Which one of the following statement about the immune system is correct?
- (A) The innate immunity is found in all animals and plants.
 - (B) The adaptive immune response is activated before the innate response and develops quickly.
 - (C) The helper T cells recognize peptide antigens in major histocompatibility complex MHC class I molecules on dendritic cells.
 - (D) Perforin triggers blood vessels to dilate and become more permeable.
 - (E) The complement system provides innate defense by interfering with viruses and helping activate macrophages.
53. In Australia, marsupials fill the niches that placental mammals fill in other parts of the world because _____.
- (A) after Pangaea broke up, they diversified in physical isolation from placental mammals
 - (B) they originated in Australia
 - (C) they evolved from monotremes that migrated to Australia about 50 million years ago
 - (D) human-caused environmental changes have favored the success of marsupials
 - (E) they are better adapted and have outcompeted placental mammals (eutherians)
54. What is the function of the cilia in the trachea and bronchi?
- (A) To sweep mucus with trapped particles up and out of the respiratory tract.
 - (B) To increase the surface area for gas exchange.
 - (C) To vibrate when air is exhaled to produce sounds.
 - (D) To dislodge food that may have slipped past the epiglottis.
 - (E) To sweep air into and out of the lungs.
55. Which one of the following statement is correct description about the COVID-19 virus?
- (A) During COVID-19 virus reproduction, spike glycoproteins are assembled into the virus along with reverse transcriptase.
 - (B) Successful entry of a virus into a cell depends on the inactivation of envelope glycoproteins by host cell proteases.
 - (C) COVID-19 virus replication entails ribosome frameshifting during genome translation, and the synthesis of both genomic and multiple subgenomic RNA species.
 - (D) COVID-19 virus are enveloped DNA viruses that are spherical in shape and characterized by crown-like spikes on the surface.
 - (E) Persons often die of opportunistic diseases because COVID-19 virus destroys T cells.
56. Which one of the following statement about nervous system is correct?
- (A) Parasympathetic nervous system is activated when the person feels nervous.
 - (B) The hallmark of Parkinson's disease is the neurofibrillary tangles surrounding amyloid plaques.
 - (C) The occipital lobe plays the role in biological clock regulation.
 - (D) The parietal lobe of the cerebral cortex play the role in comprehending language.
 - (E) The cerebellum helps coordinate motor, perceptual, and cognitive functions.
57. In flowering plant, which one of the following is reflected to be an important plant hormone that helps plants adapt with environmental stresses?
- (A) Auxin (B) Cytokinin (C) Ethylene (D) Abscisic acid (E) Prostaglandin
58. In gene therapy, _____ can be used as a vector to deliver normal genes directly into the cells of the body.
- (A) transposons (B) mutagens (C) amniocentesis (D) bacteria (E) viruses
59. Female Pheasant-tailed Jacanas (水雉) aggressively court males and, after mating, leave the clutch of young for the male to incubate. This sequence may be repeated several times with different males until no available males remain. Which one of the following term will best describe this behavior?
- (A) Monogamy (B) Polygyny (C) Polyandry (D) Promiscuity (E) Paternity
60. What is the effective population size (N_e) for a population of Black Bears with 500 males and 300 females?
- (A) 300 (B) 400 (C) 500 (D) 750 (E) 800

61. If a drug that specifically prevents the interaction of cytochrome *c* with other proteins is added to respiring mitochondria in a test tube, what effects would be observed?
- (A) ATP synthesis would be immediately stopped.
 (B) Oxygen consumption would increase.
 (C) Reduced cofactors (NADH/FADH₂) would be accumulated.
 (D) Coenzyme Q would be oxidized.
 (E) Proton export from the matrix would increase.
62. If glucose is labeled with ¹⁴C at C-5, which of the following compounds can be found in TCA cycle first?
- (A) Malate labeled with ¹⁴C at C-2.
 (B) Isocitrate labeled with ¹⁴C at C-2.
 (C) α-Ketoglutarate labeled with ¹⁴C at C-5.
 (D) Citrate labeled with ¹⁴C at C-3.
 (E) Succinyl-CoA labeled with ¹⁴C at C-1.
63. Which of the following can not transport proton across mitochondria inner membrane?
- (A) 2,4-Dinitrophenol (B) Thermogenin (C) ATPase
 (D) NADH dehydrogenase complex (E) QH₂ oxidase
64. Which complex in the electron-transport chain contains copper ions?
- (A) Complex I (B) Complex II (C) Complex III
 (D) Complex IV (E) None of these complexes contains copper ions.
65. Pyruvate is oxidized to produce _____, which further reacts with _____ to produce _____ during the citric acid cycle.
- (A) citrate; fumarate; α-ketoglutarate (B) citrate; isocitrate; α-ketoglutarate
 (C) acetyl-CoA; oxaloacetate; citrate (D) acetyl-CoA; malate; oxaloacetate
 (E) malate; citrate; acetyl-CoA
66. Phosphate (Pi) is transported into the mitochondria from the cytosol by a phosphate carrier which is driven by the _____.
- (A) hydrolysis of ATP
 (B) simultaneous transport of H⁺ into the mitochondrion
 (C) simultaneous transport of ADP into the mitochondrion
 (D) simultaneous transport of H⁺ out of the mitochondrion
 (E) simultaneous transport of ATP out of the mitochondrion
67. When monosaccharide dissolves in water at 40°C, it can undergo interconversion between α and β forms automatically. Which of the following regarding the amount of each form is correct after equilibrium?
- (A) β-D-Ribofuranose > β-D-Ribopyranose
 (B) α-D-Fructofuranose > β-D-Fructofuranose
 (C) β-D-Fructofuranose > β-D-Fructopyranose
 (D) β-D-Glucopyranose > α-D-Glucopyranose
 (E) None of the above
68. Phospholipase C hydrolyzes phosphatidylinositol 4,5-bisphosphate (PIP₂) to form which signaling molecule that triggers Ca²⁺ release from the endoplasmic reticulum?
- (A) Diacylglycerolphosphate (DAGP) (B) Inositol 5-monophosphate (IP1) (C) Diacylglycerol (DAG)
 (D) Inositol 1,4,5-triphosphate (IP3) (E) Inositol 4,5-bisphosphate (IP2)
69. Topoisomerases:
- (A) can change the linking number in increments of 1 or 2.
 (B) can act on single-stranded DNA circles.
 (C) change the degree of supercoiling of a DNA molecule but not its linking number of DNA.
 (D) occur in bacteria, but not in eukaryotes.
 (E) always require energy from ATP.
70. The ion channel that opens in response to acetylcholine is an example of a _____ signal transduction system.
- (A) G-protein (B) ligand-gated (C) receptor-enzyme
 (D) serpentine receptor (E) voltage-gated
71. The energy of a photon absorbed by an antenna molecule of the photosystem finds its way to a chlorophyll molecule in the reaction center of a light-harvesting complex by a process of _____. Which of the following is the best choice?
- (A) electron transfer
 (B) fluorescence re-radiation
 (C) resonance transfer
 (D) resonance transfer and electron transfer
 (E) electron transfer and fluorescence re-radiation

72. In the erythrocyte, glycolysis produces _____ that is further metabolized to _____.
- (A) lactate; acetyl-CoA (B) lactate; pyruvate (C) pyruvate; acetyl-CoA
(D) pyruvate; lactate (E) pyruvate; oxaloacetate
73. What role does AP endonuclease have in the base-excision repair system?
- (A) It removes the damaged base from the nucleic acid.
(B) It cleaves the phosphodiester backbone after base removal.
(C) It removes nucleotides from the broken strand of the nucleic acid.
(D) It adds new nucleotides to replace the excised ones.
(E) It creates a new phosphodiester bond to repair the backbone.
74. Restriction-modification systems:
- (A) exist in all organisms as a protection against foreign DNA invasion.
(B) include a site-specific exonuclease to degrade foreign DNA.
(C) modify DNA by acetylation.
(D) include a DNA methylase and an endonuclease.
(E) include three types of endonuclease all of which cleave within a specific DNA target sequence.
75. DNA polymerase I synthesizes new DNA with very high fidelity, due to its _____.
- (A) high processivity
(B) 3'→5' exonuclease activity
(C) helicase association with the primase
(D) 5'→3' exonuclease activity
(E) all of the above
76. Which of the following is related to the function of proofreading step?
- (A) Riboswitch (B) EF-G in protein synthesis (C) Synthesis of aminoacyl-tRNA
(D) RNA polymerase (E) None of the above
77. Which of the following is least related with RNA interference?
- (A) RISC (B) Drosha (C) Dicer (D) miRNA (E) snRNA
78. What acts as the nucleophile in the mechanism of nucleotide addition by RNA polymerase?
- (A) The 5' phosphate of an incoming nucleotide
(B) A water molecule
(C) A 5' hydroxyl of the template DNA
(D) A 3' hydroxyl from the RNA being extended
(E) An aspartate in the active site
79. What type of mutation causes conditions such as Huntington's disease and Fragile X syndrome?
- (A) An excess of trinucleotide repeats in a protein-coding gene
(B) A mutation in the p53 tumor suppressor
(C) A mutation in a cyclin-dependent protein kinase
(D) A mutation in the retinoblastoma gene
(E) A mutation in caspase-activated DNase
80. The photosynthetic electron transport system includes the transmembrane complexes PSI, PSII and _____.
- (A) PSIII (B) cytochrome a_3 (C) cytochrome b_6f
(D) cytochrome c (E) proton translocating ATP synthase
81. The analysis of enzyme kinetics using steady-state methods:
- (A) assumes $d[ES]/dt = 0$.
(B) provides an accurate description of the reactions at all times.
(C) can only be used if the product does not inhibit the enzyme.
(D) cannot be applied when inhibitors are present.
(E) can only be used if the substrate does not inhibit the enzyme.
82. Which of these statements about enzyme-catalyzed reactions is false?
- (A) The V_{max} of a reaction can be attained at saturated concentration of substrate, even in the presence of a competitive inhibitor.
(B) At saturating levels of substrate, the rate of an enzyme-catalyzed reaction is proportional to the enzyme concentration.
(C) The rate of a reaction decreases steadily with time as substrate is depleted.
(D) The Michaelis-Menten constant K_m equals the $[S]$ at which $v = 1/2 V_{max}$.
(E) The activation energy for the catalyzed reaction is the same as for the uncatalyzed reaction, but the equilibrium constant is more favorable in the enzyme-catalyzed reaction.
83. Which of the polypeptide is most likely to form a collagen structure?
- (A) IQEVERDIQEVERDIQEVERD (B) SRAGNRKIVLETW (C) TEDNFPAGKSILF
(D) GAPGSPGPSGAP (E) NKASVEMAIRNGS

84. Which of the following is false regarding 2,3-bisphosphoglycerate (BPG)?
 (A) It binds at a distance from the heme groups of hemoglobin.
 (B) It binds with lower affinity to fetal hemoglobin than to adult hemoglobin.
 (C) It increases the affinity of hemoglobin for oxygen.
 (D) It is an allosteric modulator of hemoglobin.
 (E) It is normally found associated with the hemoglobin extracted from red blood cells.
85. Proline residues are infrequently found in _____ due to their _____.
 (A) helices; decreased ability to serve as hydrogen-bond donors
 (B) helices; large positive charge that disrupts the repeating structure
 (C) sheets; decreased ability to serve as hydrogen-bond donors
 (D) sheets; large positive charge that disrupts the repeating structure
 (E) turns; decreased flexibility as an amino acid
86. When oxygen is bound to myoglobin, the amino acid _____ is complexed to the iron ion of the heme group while _____ forms a hydrogen bond to the oxygen.
 (A) cysteine; serine (B) cysteine; histidine (C) serine; cysteine
 (D) histidine; histidine (E) histidine; cysteine
87. Which of the following is associated for determining the dihedral angle (ϕ) of the peptide bonds?
 (A) $C_O-N_H-C_\alpha-C_O$ (B) $N_H-C_\alpha-C_O-N_H$ (C) $C_\alpha-C_O-N_H-C_\alpha$ (D) $H_N-C_\alpha-C_O-N_H$ (E) $H_\alpha-C_O-N_H-H_\alpha$
88. The PCR reaction mixture does not include _____.
 (A) all four deoxynucleoside triphosphates
 (B) DNA containing the sequence to be amplified
 (C) heat-stable DNA polymerase
 (D) DNA ligase
 (E) oligonucleotide primer(s)
89. Which of the following nuclear-encoded protein does not require signal peptide?
 (A) Secreted protein (B) Mitochondrial protein (C) Cytosolic protein
 (D) Plasma membrane protein (E) All of the above require signal peptide
90. Which of the following techniques is the best to quantify protein-protein interactions?
 (A) Co-immunoprecipitation (B) Affinity chromatography (C) Chemical cross-linking
 (D) Surface plasmon resonance (E) The two-hybrid system