Questions 1-30: Select **one best** answer to each question (2% each).

1. Which of the following statements about solutions of amino acids at physiologic pH is true?
(A) All amino acids contain both positive and negative charges
(B) All amino acids contain positively charged side chains
(C) Some amino acids contain only positive charges
(D) All amino acids contain negatively charged side chains
(E) Some amino acids contain only negative charges

2. Which of the following regulatory actions involves a reversible covalent modification of an enzyme ?
(A) allosteric modulation (B) competitive inhibition
(C) conversion of zymogen to active enzyme (D) affinity labeling
(E) phosphorylation of a serine residue on the enzyme

3. Enzymes catalize reactions by
(A) increasing entropy of a system (B) increasing substrate energy
(C) altering reaction equilibria (D) lowering total energy levels of reactants
(E) decreasing free energy of activation

4. The α-helix of proteins is
(A) a pleated structure
(B) made periodic by disulfide bridges
(C) a nonperiodic structure
(D) stabilized by hydrogen bonds between NH and CO groups of the main chain
(E) disrupted by β-mercaptoethanol

5. All of the following statements describing protein structure are true EXCEPT
(A) Many proteins have no quaternary structure
(B) Charged amino acid side chains tend to be on the outside of folded proteins
(C) Hydrophobic amino acids are usually found within the center of protein molecules
(D) Intrachain disulfide bonds are usually highly important in determining the folding of a newly synthesized protein
(E) Primary structure is one of the most important factors determining the higher order structure of proteins

6. Nucleic acids absorb radiation at 260 nm because of their
(A) proteins (B) purines & pyrimidines (C) ribose (D) deoxyribose (E) phosphate

7. Which one of the following statements correctly describes allosteric enzymes?
(A) Effectors may enhance or inhibit substrate binding
(B) They are not usually controlled by feedback inhibition
(C) The regulatory site may be the catalytic site
(D) Michaelis-Menten kinetics describe their activity
(E) Positive cooperativity occurs in all allosteric enzymes

(背面仍有題目,請繼續作答)

8. All of the following are true statements about translation EXCEPT
(A) the genetic code can be overlapping
(B) the last nucleotide in a codon has less specificity than the others
(C) more than one group of nucleotides may code for a single amino acid
(D) three nucleotide bases code for one amino acid
(E) specific nucleotide sequences signal termination of peptide chains

9. In protein biosynthesis,
(A) each amino acid recognizes its codon on the mRNA template because of its structural specificity
(B) fidelity of translation is assured by traces of DNA in the ribosomes
(C) each amino acid is first attached to an anticodon specific for the amino acid
(D) a given codon-anticodon pair must have identical base sequences to avoid translational errors
(E) each amino acid is matched to its codon through recognition nucleotides in its specific tRNA

10. Complementary DNA is synthesized
(A) from retroviral RNA (B) from messenger RNA (C) from plasmid DNA
(D) using oligo dG primer (E) using bacterial RNA

11. Following transcription, eukaryotic primary mRNAs are quickly modified to contain
(A) anticodons (B) 5' caps (C) 3' terminal polyadenylate tails
(D) common exons (E) common introns

12. Thermal denaturation of DNA is characterized by
(A) cleavage of the phosphodiester links between bases
(B) the formation of triple helix
(C) a broad (10°C) denaturation range for a homogeneous DNA
(D) a melting-point temperature that varies directly with guanine-cytocine base-pair content
(E) a decrease in light absorption at 260 nm

13. Prenatal diagnosis of sickle cell anemia is performed in a multistep procedure involving
(a) blotting onto nitrocellulose membrane
(b) digesting fetal DNA with a restriction endonuclease
(c) hybridization with a ^{32}P-β-globin gene, and
(d) electrophoresis.
The correct sequence of steps is
(A) abcd (B) bdac (C) cdab (D) dcab (E) dbac

14. DNA polymerase I
(A) makes errors that are later corrected by DNA polymerase II
(B) makes errors that it corrects after scanning completed sections of daughter DNA strand
(C) makes errors that it corrects by its 3' exonuclease activity
(D) makes errors that it corrects by its 5' exonuclease activity
(E) is remarkable in being errorless

15. Positive signals for glycogen breakdown include increases in all the following EXCEPT
(A) cyclic AMP (B) phosphorylated phosphorylase kinase
(C) epinephrine (D) Ca^{2+} (E) blood glucose

(背面仍有題目,請繼續作答)

16. Which of the following enzymes is common to both glycolysis and gluconeogenesis?
(A) pyruvate kinase (B) pyruvate carboxylase (C) hexokinase
(D) phosphoglycerate kinase (E) fructose-1,6-bisphosphatase

17. Which one of the following activities is simultaneously stimulated by epinephrine in muscle and inhibited by epinephrine in liver?
(A) fatty acid oxidation (B) glycogenolysis (C) cyclic AMP synthesis
(D) glycolysis (E) activation of phosphorylase

18. If all the enzymes, intermediates, and cofactors of the citric acid cycle as well as an excess of the starting substrate acetyl CoA were present and functional in an organelle-free solution at the appropriate pH, which of the following would be rate-limiting ?
(A) reduction of cofactors (B) half-life of enzymes (C) molecular oxygen
(D) turnover of intermediates (E) CoA

19. Synthesis of triacylglycerides in mammals
(A) requires acyl-carrier protein (B) uses glycerol phosphate as a precursor
(C) can utilize CDP-diacylglycerol as a precursor
(D) is stimulated by high levels of cyclic AMP
(E) esterifies only 20-carbon fatty acids

20. Pyruvate generated by glycolysis must enter the mitochondria to be oxidized
(A) because the mitochondria are impermeable to lactate
(B) so that the cytosol remains electrically neutral
(C) because pyruvate dehydrogenase is a mitochondrial enzyme
(D) by exchange with malate
(E) to generate malate in the malic enzyme reaction

21.The key regulatory enzyme of the pentose phosphate pathway is positively regulated by
(A) NADH (B) ADP (C) GTP (D) $NADP^+$ (E) FADH

22. The major source of extracellular cholesterol for human tissues is
(A) very low-density lipoprotein (B) low-density lipoprotein
(C) high-density lipoprotein (D) albumin (E) γ-globulin

23. All of the following lipids are major components of the plasma membrane EXCEPT
(A) glycolipids (B) phosphatidylcholine (C) cholesterol
(D) prostaglandins (E) phosphatidylethanolamine

24. A cup of strong coffee will be expected to
(A) interfere with the synthesis of prostaglandins
(B) decrease the effects of glucagon (C) enhance the effects of epinephrine
(D) provide the vitamin nicotinic acid (E) do none of the above

25. Coenzyme A is common to all the following pathways EXCEPT
(A) citric acid cycle (B) fatty acid β-oxidation (C) fatty acid synthesis
(D) ketone body synthesis (E) glycolysis

(背面仍有題目,請繼續作答)

26. ADP-ribosylation is the mode of action of
(A) cholera toxin (B) acetylcholine (C) adrenergic receptors (D) phospholipase
(E) adenylate cyclase

27. Some antibiotics act as ionophores, which means that they
(A) interfere directly with bacterial cell-wall synthesis
(B) have a detergent-like effect on membranes
(C) increase cell membrane permeability to specific ions
(D) inhibit both transcription and translation
(E) inhibit only translation

28. Adenosine triphosphatase (ATPase) activity needed for muscle contraction is a component of
(A) the amino-terminal globular head of myosin
(B) the carboxyl-terminal tail region of myosin
(C) actin (D) kinesin (E) troponin C

29. Generally accepted features of cell membranes include all of the following EXCEPT
(A) asymmetric arrangement of lipids (B) lateral diffusion of lipids
(C) rapid diffusion of inorganic ions across the lipid bilayer
(D) lateral diffusion of integral and peripheral proteins
(E) infrequent transverse movement of lipids from one face of the bilayer to the other

30. If an enzymatic reaction has a standard free-energy change ($\Delta G^{0'}$) of -5 kcal/mol, the equilibrium constant at 37°C is
(A) >1 (B) <1 (C) 0 (D) dependent upon enzyme concentration
(E) not determinable from the value of $\Delta G^{0'}$

Questions 31-38: Select **the best** answer (3% each).
Directions: **A**: a, b & c are correct **B**: a & c are correct **C**: b & d are correct
D: only d is correct **E**: all are correct

31. Proteins that span the plasma membrane are
(a) first inserted into the membrane of endoplasmic reticulum(ER) at the time of synthesis
(b) correctly disulfide-bridged and folded into the native conformation before passage to the Golgi apparatus
(c) N-glycosylated in those regions that had been exposed to the lumen of the ER
(d) glycosylated only in those regions that protrude into the cytosol

32. The hydrophobic forces that hold some proteins together are illustrated by
(a) clustering of nonpolar amino acid side chains in the interior of globular proteins
(b) heat denaturation of globular proteins
(c) the heat-dependent polymerization of tubulin
(d) the unfolding of proteins at high pH

33. A mutation of a protein that conserves a functional property is
(a) lysine for arginine (b) threonine for serine
(c) alanine for valine (d) phenylalanine for tryptophan

(背面仍有題目,請繼續作答)

34. The action of a hormone on a cell with α_1 adrenergic receptors is
(a) binding of GTP to the α subunit of a G protein
(b) stimulation of adenylate cyclase
(c) dissociation of GDP from the stimulated G protein
(d) enhanced binding of G protein subunits

35. Among the metabolic fates of arachidonic acid is
(a) incorporation into a phosphatidyl inositol
(b) conversion to prostaglandin $F_{2\alpha}$ by the cycloxygenase pathway
(c) conversion to a leukotriene by the lipoxygenase pathway
(d) conversion to prostaglandin G by the lipoxygenase pathway

36. Calmodulin
(a) is an extremely well conserved protein during evolution
(b) is an activator of myosin light chain kinase (when complexed with Ca^{2+})
(c) binds up to 4 Ca^{2+} per molecule
(d) has a K_d for Ca^{2+} of ~ 1 mM

37. Second messenger(s) that can be formed from membrane phosphatidylinositol bisphosphate is/are
(a) arachidonic acid (b) inositol trisphosphate
(c) cyclic AMP (d) diacylglycerol

38. Cellular ADP may be converted to ATP by the action of
(a) hexokinase (b) pyruvate kinase (c) thymidine kinase (d) creatine kinase

39-41. Match each parameter with the terms of measure used to describe it. Each lettered heading may be used **once, more than once, or not at all** (2% each).
(A) mmoles/liter (B) units/mg protein (C) μmoles/min (D) units/min

39. K_m (Michaelis constant)

40. Unit of enzymatic activity

41. Specific activity of enzyme

42-46. Select one lettered heading that is most closely associated with the following questions. Each lettered heading may be used **once, more than once, or not at all** (2% each).
(A) circular dichroism (B) polymerase chain reaction (C) ultraviolet spectroscopy
(D) sodium dodecyl sulfate (SDS) polyacrylamide gel electrophoresis
(E) nuclear magnetic resonance

42. Approximate RNA concentration

43. Approximate molecular weight

44. α-helix content

45. Trptophan and tyrosine content

46. Synthesis of a specific DNA sequence