PART 4. BIOCHEMISTRY OF PROTEINS AND NUCLEIC ACIDS

1. ***Which of the following proteolytic enzymes has the greatest effect on the activity of other proteolytic enzymes involved in digestion?***

a) pepsin;
b) trypsin;
c) chymotrypsin;
d) carboxypeptidase A;
e) aminopeptidase.

2. ***The compound shown NH_2-CO-CH_2-CH_2-CH(NH_2)-COOH:***

a) is an intermediate in the urea cycle;
b) releases two moles of ammonia when converted to one mole of α-ketoglutarate;
c) is formed by transamination of oxaloacetate;
d) is the amino acid lysine;
e) contains two amino groups.

3. ***In the urea cycle:***

a) carbamoyl phosphate is derived directly from glutamine and CO_2;
b) ornithine reacts with aspartate to generate argininosuccinate;
c) ornithine directly reacts with carbamoyl phosphate to form citrulline;
d) the α-amino group of arginine forms one of the nitrogens of urea;
e) N-acetylglutamate is a positive allosteric effector of ornithine transcarbamoylase.

4. ***Each of the following enzymes is involved in the synthesis of serine from glucose EXCEPT:***

a) aldolase;
b) phosphofructokinase;
c) pyruvate kinase;
d) phosphoserine phosphatase;
e) glyceraldehyde 3-phosphate dehydrogenase.

5. ***A common intermediate on the synthesis of arginine, serine, and aspartate from glucose is…***

a) oxaloacetate;
b) pyruvate;
c) α-ketoglutarate;
d) glyceraldehyde 3-phosphate;
e) ornithine.

6. ***Via enzymes of the urea cycle, aspartate...***

a) provides nitrogen for synthesis of arginine;
b) provides carbon for the synthesis of arginine;
c) is decarboxylated;
d) is converted to malate;
e) is converted to oxaloacetate.

7. ***Which of the following statements concerning glutamate is TRUE?***

a) It is produced in a transamination reaction in which aspartate reacts with oxaloacetate;
b) It undergoes a series of reactions in which is cyclizes to produce histidine;
c) It can be converted to arginine by a series of reactions, some of which require urea cycle enzymes;
d) It is produced by the action of glutamate dehydrogenase, an enzyme that requires NH_4^+ and FAD;

e) It is essential amino acid.

8. ***Each of the following statements about serine is correct EXCEPT:***

a) It is converted to pyruvate and ammonia by a dehydratase;
b) It is the only amino acid that contains a hydroxyl group;
c) It may be synthesized from glucose via a glycolytic intermediate;
d) It is converted to glycine by a reaction requiring tetrahydrofolate;
e) It is a nonessential amino acid.

9. ***Pyridoxal phosphate is required for the enzymes catalyzing the reaction:***

a) pyruvate + glutamate → alanine + α-ketoglutarate;
b) glutamate + NAD^+ → α-ketoglutarate + NH_4^+ + NADH + H^+;
c) glutamate + NH_3 + ATP → glutamine + ADP + P_i;
d) glutamine + H_2O → glutamate + NH_3;
e) pyruvate + NADH+H^+ → lactate + NAD^+.

10. ***The carbons of cysteine are derived from:***

a) leucine;
b) tryptophan;
c) serine;
d) threonine;
e) tyrosine.

11. ***Isocitrate dehydrogenase is required for the synthesis from glucose of the amino acid…***

a) alanine;
b) aspartate;
c) cysteine;
d) glutamate;
e) serine.

12. ***During the metabolism of the branched-chain amino acids…***

a) leucine is converted to acetoacetate only;
b) isoleucine is converted to acetoacetate only;
c) lipoic acid is not required;
d) none of the carbons of isoleucine is converted to succinyl-CoA;
e) valine is deaminated rather than transaminated.

13. ***The major amino acid that is released from muscle and converted to glucose in liver is:***

a) aspartate;
b) glutamate;
c) glutamine;
d) valine;
e) alanine.

14. ***Each of the following statements about the kidney metabolism is correct EXCEPT:***

a) it converts glutamine to α-ketoglutarate;
b) it synthesizes most of the urea that is excreted into the urine;
c) it produces glucose from serine and alanine;
d) it uses ammonia released from glutamine to buffer acids in the urine;

e) it converts aspartate to glucose.

15. ***De novo pyrimidine synthesis requires:***

a) both carbon and nitrogen of aspartate to form the ring;
b) glycine as the source of two nitrogens in the ring;
c) NH_4^+ as a substrate for carbamoyl phosphate synthetase II;
d) phosphoribosyl pyrophosphate (PRPP) for the initial step;
e) tetrahydrofolate for the incorporation of carbons 2 and 8.

16. ***The principal nitrogenous urinary excretion product in humans resulting from the catabolism of AMP is:***

a) creatinine;
b) thiamine;
c) thymine;
d) urea;
e) uric acid.

17. ***The conversion of propionyl CoA to succinyl CoA requires:***

a) biotin;
b) vitamin B_{12};
c) tetrahydrofolate;
d) biotin and vitamin B_{12};
e) biotin, vitamin B_{12}, and tetrahydrofolate.

18. ***S-Adenosylmethionine (SAM) serves as the methylating agent for each of the following EXCEPT:***

a) the conversion of dUMP to dTMP;
b) the synthesis of phosphatidylcholine from phosphatidylethanolamine;
c) the conversion of norepinephrine to epinephrine;
d) the synthesis of creatine from guanidinoacetate;
e) the conversion of ADP to ATP.

19. ***Glycine is an important precursor in the pathway for the biosynthesis of each of the following EXCEPT:***

a) creatine;
b) guanine;
c) valine;
d) heme;
e) lysine.

20. ***Each of the following statements about nitrogen metabolism is correct EXCEPT:***

a) creatine phosphate contains a high energy bond;
b) creatine requires glycine, arginine, and methionine for synthesis of its carbon skeleton;
c) uric acid is the final excretion product from purines;
d) choline is derived from serine;
e) formiminoglutamate (FIGLU) is an intermediate in glutamine degradation.

21. ***Pregnant women frequently suffer from folate deficiencies. A deficiency of folate would decrease the production of…***

a) all of the pyrimidines required for RNA synthesis;
b) the thymine nucleotide required for DNA synthesis;

c) creatine phosphate from creatine;
d) phosphatidyl choline from diacylglycerol and CDP-choline;
e) lysine and arginine, required for histone synthesis.

22. ***Compared to a healthy person, a person with pernicious anemia…***

a) excretes less methylmalonic acid in the urine;
b) requires less methionine in the diet;
c) has a higher rate of purine biosynthesis;
d) produces less intrinsic factor;
e) has lower blood levels of formiminoglutamate (FIGLU).

23. ***Decreased excretion of creatinine could be caused by...***

a) kidney failure;
b) decreased dietary intake of creatine;
c) a higher than normal muscle mass resulting from weight lifting;
d) a genetic defect in the enzyme that converts creatine phosphate to creatinine;
e) low creatinine in the diet.

24. ***A genetic defect in the ability to synthesize tetrahydrobiopterin would affect each of the following conversions EXCEPT:***

a) phenylalanine to tyrosine;
b) tryptophan to serotonin;
c) tyrosine to dopamine;
d) DOPA to melanin;
e) serotonin formationn from triptophan.

25. ***Phenylketonuria, alcaptonuria, and albinism are caused by deficiencies in enzymes involved in the metabolism of...***

a) histidine;
b) tyrosine;
c) lysine;
d) tryptophan;
e) valine.

26. ***The plasma and urine of patients with maple syrup urine disease (MSUD) contain elevated levels of each of the following amino acids EXCEPT:***

a) isoleucine;
b) leucine;
c) lysine;
d) valine;
e) valine and leucine.

27. ***The most likely elevated component in the blood in gout:***

a) bilirubin;
b) uric acid;
c) creatine kinase;
d) blood urea nitrogen (BUN);
e) serotonin.

28. ***The most likely elevated component in the blood in kidney disease:***

a) bilirubin;
b) uric acid;
c) creatine kinase;
d) blood urea nitrogen (BUN);
e) serotonin.

29. ***Is synthesized by intestinal cells:***

a) enteropeptidase;
b) pepsin;
c) trypsin;
d) carboxypeptidase A;
e) chymotripsin.

30. ***Cleaves bonds at the carboxyl end of the arginine and lysine residues within a polypeptide chain:***

a) pepsin;
b) carboxypeptidase A;
c) enteropeptidase;
d) chymotrypsin;
e) trypsin.

31. ***Acts as an exopeptidase:***

a) pepsin;
b) trypsin;
c) carboxypeptidase A;
d) enteropeptidase;
e) chymotrypsin.

32. ***Is produced by the action of HCl on its precursor:***

a) pepsin;
b) trypsin;
c) carboxypeptidase A;
d) enteropeptidase;
e) chymotrypsin.

33. ***Is produced by cleavage of cystathionine:***

a) serine;
b) threonine;
c) methionine;
d) cysteine;
e) glycine.

34. ***Contains a carbon skeleton that can be converted to pyruvate by a single enzyme:***

a) cysteine;
b) threonine;
c) methionine;
d) alanine;
e) arginine.

35. ***Can be converted to glycine in a single reaction that requires tetrahydrofolate:***

a) serine;

b) cysteine;
c) threonine;
d) methionine;
e) arginine.

36. ***Contains a carbon skeleton that can be converted to homocysteine:***

a) serine;
b) methionine;
c) cysteine;
d) threonine;
e) arginine.

37. ***Required for the decarboxylation of the transamination product of valine:***

a) vitamin B_{12};
b) tetrahydrofolate (FH4);
c) biotin;
d) pyridoxal phosphate;
e) thiamine.

38. ***Required for the synthesis of deoxythymidylate from deoxyuridylate:***

a) vitamin B_{12};
b) biotin;
c) thiamine;
d) tetrahydrofolate (FH4);
e) pyridoxal phosphate.

39. ***Directly required for the synthesis of serine from glycine:***

a) tetrahydrofolate (FH4);
b) vitamin B_{12};
c) biotin;
d) thiamine;
e) pyridoxal phosphate.

40. ***Directly required for the conversion of methylmalonyl CoA to succinyl CoA:***

a) tetrahydrofolate (FH4);
b) biotin;
c) thiamine;
d) vitamin B_{12};
e) pyridoxal phosphate.

41. ***Required for the conversion of histidine to histamine:***

a) pyridoxal phosphate;
b) vitamin B_{12};
c) tetrahydrofolate (FH4);
d) biotin;
e) thiamine.

42. ***Can be converted to epinephrine:***

a) tyrosine;

a) tryptophan;
b) threonine;
c) thymine;
d) glycine.

43. ***Contains non-ring carbons that can be cleaved from the ring structure to form alanine:***

a) tyrosine;
b) threonine;
c) thymine;
d) glycine;
e) tryptophan.

44. ***Is synthesized by hydroxylation of an essential amino acid:***

a) tryptophan;
b) threonine;
c) thymine;
d) tyrosine;
e) glycine.

45. ***May be converted to serotonin by reactions requiring tetrahydrobiopterin and molecular oxygen:***

a) tyrosine;
b) tryptophan;
c) threonine;
d) thymine;
e) glycine.

46. ***May be converted to the moiety of NAD^+ that may also be derived from niacin:***

a) tyrosine;
b) threonine;
c) thymine;
d) glycine;
e) tryptophan.

47. ***May be produced from uracil:***

a) tyrosine;
b) tryptophan;
c) thymine;
d) threonine;
e) glycine.

48. ***May be catabolized to oxalic acid:***

a) glycine;
b) tyrosine;
c) tryptophan;
d) threonine;
e) thymine.

49. ***The compound related to NAD^+:***

a) leucine;

b) homocysteine;
c) glutamate;
d) tryptophan;
e) arginine.

50. ***The compound related to HMG CoA:***

a) homocysteine;
b) glutamate;
c) leucine;
d) tryptophan;
e) arginine.

51. ***The compound related to proline:***

a) leucine;
b) glutamate;
c) homocysteine;
d) tryptophan;
e) arginine.

52. ***The compound related to methionine:***

a) leucine;
b) glutamate;
c) homocysteine;
d) tryptophan;
e) arginine.

53. ***Serotonin is derived from…***

a) glutamate;
b) tyrosine;
c) histidine;
d) tryptophan;
e) arginine.

54. ***γ-aminobutyric acid (GABA) is derived from…***

a) glutamate;
b) tyrosine;
c) histidine;
d) tryptophan;
e) arginine.

55. ***Histamine is derived from…***

a) glutamate;
b) tyrosine;
c) tryptophan;
d) arginine;
e) histidine.

56. ***Epinephrine is derived from:***

a) glutamate;

b) histidine;
c) tryptophan;
d) tyrosine;
e) arginine.

57. ***In DNA the molar amount of...***

a) adenine equals to uracil;
b) adenine equals to thymine;
c) guanine equals to adenine;
d) cytosine equals to thymine;
e) cytosine equals to uracil.

58. ***Which of the following sequences is complementary to the DNA sequence 5'-AAGTCCGA-3'?***

a) 3'-TTCAGGCT-5';
b) 5'-AAGUCCGA-3';
c) 5'-TTCAGGCT-3';
d) 3'-TCGGACTT-5';
e) 5'-AAGTCCGA-3'.

59. ***Which statement about DNA is true?***

a) nitrogenous bases joined by phosphodiester bonds;
b) negatively charged phosphate groups in the interior of the molecule;
c) base pairs stacked along the central axis of the molecule;
d) two strands that run in the same direction;
e) contains ribose.

60. ***Which RNA contains 7-methylguanine at the 5' end?***

a) 5S RNA;
b) rRNA;
c) tRNA;
d) hnRNA;
e) snRNA.

61. ***Thymine is present in which type of RNA?***

a) mRNA;
b) rRNA;
c) hnRNA;
d) snRNA;
e) tRNA.

62. ***The action of DNA polymerases requires…***

a) a 5'-hydroxyl group;
b) a 3'-hydroxyl group;
c) dUTP;
d) NAD^+ as a cofactor;
e) CTP.

63. ***Which of the following statements concerning replication of DNA is TRUE?***

a) it requires a DNA template that is copied in its 5' to 3' direction;

b) it occurs during the M phase of the cell cycle;
c) it progresses in both directions away from each point of origin on the chromosome;
d) it produces one newly synthesized double helix and one composed of the two parental strands;
e) it occurs in the cytosol.

64. ***When base-pairing occurs in loops of RNA, adenine is hydrogen-bonded to...***

a) guanine;
b) thymine;
c) cytosine;
d) uracil;
e) adenine.

65. ***Which of the following statements concerning Okazaki fragments is TRUE?***

a) they are relatively short polydeoxyribonucleotides with a few ribonucleotide residues at the 5' end;
b) they are produced by restriction enzymes;
c) they are synthesized on the leading strand during replication;
d) they are regions of DNA that do not code for the amino acids in a protein;
e) they are products of the action of RNase on hnRNA.

66. ***A bacterial mutant grows normally at 32-C but at 42-C accumulates short segments of newly synthesized DNA. Which of the following enzymes is most likely to be defective in this mutant?***

a) endonuclease;
b) DNA polymerase;
c) exonuclease;
d) polynucleotide ligase;
e) unwinding enzyme (helicase).

67. ***Which of the following phrases describes nucleosomes?***

a) single ribosomes attached to mRNA;
b) complexes of DNA and all the histones except H4;
c) structures that contain DNA in the core with histones wrapped around the surface;
d) complexes of protein and the 45S rRNA precursors found in the nucleolus;
e) subunits of chromatin.

68. ***In an embryo that lacked nucleoli, the synthesis of which type of RNA would be most directly affected?***

a) tRNA;
b) mRNA;
c) 5S RNA;
d) hnRNA;
e) rRNA.

69. ***Eukaryotic genes that produce mRNA…***

a) contain a TATA box downstream from the start site of transcription;
b) are transcribed by RNA polymerase III;
c) contain long stretches of thymine nucleotides that produce the poly(A) tail of mRNA;
d) may contain a CAAT box in the 5' flanking region;
e) do not contain intervening sequences or introns.

70. ***If a fragment of DNA containing the sequence 5'-AGCCAATT-3' serves as the template for transcription, the RNA that is produced will have the sequence…***

a) 5'-AAUUGGCU-3';
b) 5'-AGCCAAUU-3';
c) 5'-UCGGUUAA-3';
d) 5'-UUAACCGA-3';
e) 5'-AGCCAATT-3'.

71. ***A person ate mushrooms picked in a wooded area. Shortly thereafter, he was rushed to the hospital, where he died. He had no previous medical problems. The cause of his death was most likely the RNA polymerase inhibitor...***

a) rifampicin;
b) α-amanitin;
c) streptolydigin;
d) actinomycin D;
e) aflatoxin.

72. ***When benzopyrene (a carcinogen in cigarette smoke) binds to DNA, it forms a bulky covalent adduct on guanine residues. The consequence is that...***

a) cells are rapidly transformed into cancer cells;
b) glycosylases remove the benzopyrene residues;
c) UV light cleaves the benzopyrene from the guanine residue;
d) a repair process usually removes and replaces the damaged region of DNA;
e) all of the mentioned.

73. ***Patients with xeroderma pigmentosum suffer DNA damage when they are exposed to UV light because UV light causes the formation of...***

a) purine dimers in DNA;
b) deoxyribose dimers in DNA;
c) anhydride bonds between phosphate groups in DNA;
d) pyrimidine dimers in DNA;
e) DNA adducts with unclear structure.

74. ***Patients with xeroderma pigmentosum develop skin cancer when they are exposed to sunlight because they have a deficiency in...***

a) primase;
b) recombinase;
c) glycosylase;
d) an enzyme essential to repair mismatched bases;
e) an enzyme that acts early in the excision repair pathway.

75. ***A common mutagenic event is the deamination of cytosine in DNA to form uracil. If the damaged strand is replicated, a CG base pair in DNA will be converted to a…***

a) GC base pair;
b) GG base pair;
c) TA base pair;
d) UG base pair;
e) CA base pair.

76. ***If cytosine in DNA is deaminated, the uracil residue that results may be removed by…***

a) endonuclease;
b) glycosylase;
c) exonuclease;
d) polynucleotide ligase;
e) DNA-polymerase reparation.

77. ***An aminoacyl-tRNA exhibits which one of the following characteristics?***

a) it contains an anticodon that is complementary to the codon for the amino acid;
b) it is produced by a synthetase that is specific for the amino acid, but not the tRNA;
c) it is composed of an amino acid esterified to the 5' end of the tRNA;
d) it requires GTP for its synthesis from an amino acid and a tRNA;
e) 3'-end is polyadenylated.

78. ***Which one of the following point mutations would NOT produce a change in the protein translated from an mRNA?***

a) UCA->UCU;
b) UCA->UAA;
c) UCA->CCA;
d) UCA->ACA;
e) UCA->GCA.

79. ***Which of the following statements about methionine is TRUE?***

a) it is generally found at the N-terminus of proteins isolated from cells;
b) it requires a codon other than AUG to be added to growing polypeptide chains;
c) it is formylated when it is bound to tRNA in eukaryotic cells;
d) it is the amino acid used for initiation of the synthesis of proteins;
e) it is the only sulfur-containing amino acid.

80. ***Which of the following statements about translation in bacteria is correct?***

a) they contain 80S ribosomes;
b) they initiate protein synthesis with methionyl-tRNA;
c) they are insensitive to chloramphenicol;
d) they needs no GTP during translation;
e) they synthesize proteins on mRNA that is in the process of being transcribed.

81. ***Which of the following is NOT required for initiation of protein synthesis in the cytoplasm of eukaryotic cells?***

a) a 40S ribosomal subunit;
b) EF-2;
c) eIF-2;
d) methionyl-tRNA-iMet;
e) GTP.

82. ***Which of the following is NOT required for the elongation reactions of protein synthesis in eukaryotes?***

a) peptidyl transferase;
b) GTP;
c) formylmethionyl-tRNA;

d) elongation factor 2 (EF-2);
e) mRNA.

83. ***The mechanism for termination of protein synthesis in eukaryotes requires...***

a) a peptidyl-tRNA that cannot bind at the P site;
b) the codon UGA, UAG, or AUG in the A site;
c) nuclease cleavage of mRNA;
d) chaperones and chaperonines;
e) release factors.

84. ***Proteins that are secreted from cells…***

a) contain methionine as the N-terminal amino acid;
b) are produced from translation products that have a signal sequence at the C-terminal end;
c) contain a hydrophobic sequence at the C-terminal end that is embedded in the membrane of secretory vesicles;
d) contain carbohydrate residues that bind to receptors on the interior of lysosomal membranes;
e) are synthesized on ribosomes that bind to proteins on the endoplasmic reticulum.

85. ***Tetracycline, streptomycin, and erythromycin are effective antibiotics because they inhibit...***

a) RNA synthesis in prokaryotes;
b) RNA synthesis in eukaryotes;
c) protein synthesis in prokaryotes;
d) protein synthesis on cytoplasmic ribosomes in eukaryotes;
e) protein synthesis on mitochondrial ribosomes in eukaryotes.

86. ***DNA fragments formed by the action of restriction endonucleases are separated by...***

a) agarose gel electrophoresis;
b) paper chromatography;
c) gel electrophoresis;
d) high pressure liquid chromatography;
e) heating.

PART 5. BIOCHEMISTRY OF VITAMINS AND HORMONES

87. ***What vitamin protects the ascorbic acid from oxidation?***

a) P;
b) folic acid;
c) B_{12};
d) K;
e) D.

88. ***What vitamin is most widely applied in complex therapy of neuritis and polyneuritis?***

a) K;
b) B_1;
c) B_6;
d) C;
e) D.

89. ***What vitamin participates in transketolase reactions of nonoxidative part of pentose phosphate pathway?***

a) B_6;
b) B_1;
c) B_{12};
d) C;
e) folic acid.

90. ***Derivative of what vitamin participates in transporting of protons and electrons through mitochondrial ETC, but is absent in microsomal ETC?***

a) B_6;
b) B_1;
c) B_2;
d) PP;
e) E;

91. ***Biotin takes part in what type of reactions:***

a) transamination;
b) carboxylation;
c) decarboxylation;
d) deamination;
e) methylation.

92. ***What vitamin is necessary for dehydrogenase reactions by peroxidase pathway?***

a) B_6;
b) B_1;
c) B_2;
d) B_{12};
e) H.

93. ***Specify coenzyme forms of vitamin B_{12}:***

a) cyanocobalamine;
b) hydroxycobalamine;
c) 5-deoxyadenosylcobalamine;
d) none of these;
e) all of these.

94. ***What vitamin is necessary for histidine to histamine transformation?***

a) B_1;
b) B_2;
c) C;
d) H;
e) B_6.

95. ***What vitamin prevents the degradation of acetylcholine?***

a) C;
b) B_1;
c) B_2;
d) B_6;

e) PP.

96. ***What vitamin is needed for propionyl-CoA to methylmalonyl-CoA transformation?***

a) H;
b) C;
c) B_6;
d) B_1;
e) B_2.

97. ***What vitamin participate methyltransferase reactions?***

a) B_1;
b) folic acid;
c) B_6;
d) C;
e) H.

98. ***What substance IS NOT vitamin-like substances?***

a) inositol;
b) carnitine;
c) creatine;
d) orotic acid;
e) lipoic acid.

99. ***What vitamin is anti-seborrhean factor?***

a) B_6;
b) B_2;
c) H;
d) E;
e) B_1.

100. ***Vitamin riboflavin is…***

a) anti-neuritic;
b) anti-anemic;
c) anti-dermatitic;
d) growth vitamin;
e) anti-xerophtalmic.

101. ***Lack of which vitamins result in anemia?***

a) vitamin B_1;
b) folic acid and vitamin B_1;
c) folic acid and vitamin B_{12};
d) folic acid;
e) vitamin B_{12}.

102. ***What vitamin would be in great demand while excess protein intake?***

a) B_6;
b) B_1;
c) D;
d) PP;

e) C.

103. ***11-cis-retinal is bound to which of the amino acid residues in opsin?***

a) arginine;
b) lysine;
c) tryptophan;
d) leucine;
e) glutamate.

104. ***Retinoid X receptors also form dimers with nuclear receptor of...?***

a) vitamin E;
b) vitamin K;
c) vitamin B_6;
d) vitamin C;
e) vitamin D.

105. ***Produced in the skin by specific dehydrogenase:***

a) cholecalciferol;
b) 25-OH-cholecalciferol;
c) 1,25-$(OH)_2$-cholecalciferol;
d) 7-dehydrocholesterol;
e) 24,25-$(OH)_2$-cholecalciferol.

106. ***Formed in the step requiring UV-light:***

a) cholecalciferol;
b) 7-dehydrocholesterol;
c) 25-OH-cholecalciferol;
d) 1,25-$(OH)_2$-cholecalciferol;
e) 24,25-$(OH)_2$-cholecalciferol.

107. ***Produced in the liver:***

a) 7-dehydrocholesterol;
b) 25-OH-cholecalciferol;
c) cholecalciferol;
d) 1,25-$(OH)_2$-cholecalciferol;
e) 24,25-$(OH)_2$-cholecalciferol.

108. ***Active form of the vitamin D, produced in kidney:***

a) 7-dehydrocholesterol;
b) cholecalciferol;
c) 25-OH-cholecalciferol;
d) 1,25-$(OH)_2$-cholecalciferol;
e) 24,25-(OH)2-cholecalciferol.

109. ***Non-active form of the vitamin D, produced in kidney:***

a) 7-dehydrocholesterol;
b) cholecalciferol;
c) 25-OH-cholecalciferol;
d) 24,25-$(OH)_2$-cholecalciferol;

e) 1,25-$(OH)_2$-cholecalciferol.

110. ***What element is a synergist with vitamin E?***

a) Fe;
b) Cu;
c) Co;
d) Mo;
e) Se.

111. ***Which conversion requires vitamin of quinonic nature?***

a) glu → gly;
b) glu → gln;
c) gln → glu;
d) glu --> gla;
e) gly --> glu.

112. ***This vitamin can scavenge two peroxy free radicals and then be conjugated to glucuronate for excretion in the bile:***

a) ascorbic acid;
b) α-tocopherol;
c) thiamine;
d) biotin;
e) pyridoxal.

113. ***Synthesis of which blood-coagulation factors is not inhibited in hypovitaminosis K?***

a) III;
b) II;
c) VII;
d) IX;
e) X.

114. ***What vitamin is needed for THFA formation?***

a) B_{12};
b) H;
c) P;
d) C;
e) PP.

115. ***Which of the following acts to increase the release of Ca^{2+} from the endoplasmic reticulum?***

a) diacylglycerol (DAG);
b) parathyroid hormone (PTH);
c) 1,25-dihydroxycholecalciferol (1,25-$(OH)_2$-D_3);
d) inositol trisphosphate (IP_3);
e) 3',5'-cAMP.

116. ***A dietary deficiency of iodine would...***

a) result in increased secretion of thyroid stimulating hormone (TSH);
b) directly affect the synthesis of thyroglobulin on ribosomes;
c) result in decreased production of thyrotropin releasing hormone (TRH);

d) result in increased heat production;
e) result in the manifestation of irritability, anxiety, loss of weight, exophthalmia.

117. ***Which of the following is true of testosterone?***

a) acts by binding to receptors on the cell surface;
b) is produced from estradiol (E_2);
c) stimulates the synthesis of gonadotropin releasing hormone (GnRH) by the hypothalamus;
d) requires aromatase for its synthesis;
e) may be converted to a more active androgen in its target cells.

118. ***Which of the following is true of epinephrine?***

a) acts only by phosphatidylinositol bisphosphate mechanism;
b) causes the level of cAMP in liver cells to decrease;
c) is synthesized from tyrosine;
d) functions like a steroid hormone;
e) inhibits catabolism.

119. ***GnRH stimulates the release of…***

a) GH;
b) LH and FSH;
c) T_3 and T_4;
d) prolactin;
e) IGF.

120. ***A key intermediate for the synthesis of both testosterone and cortisol from cholesterol is…***

a) 7-hydroxycholesterol;
b) aldosterone;
c) pregnenolone;
d) retinoic acid;
e) 5-α-reductase.

121. ***In the synthesis of 1,25-$(OH)_2$-D_3 from 7-dehydrocholesterol…***

a) the steroid ring structure remains intact;
b) ultraviolet light is required;
c) cholesterol is an intermediate;
d) three hydroxylations occur;
e) carboxylation reaction are necessary.

122. ***Has its release inhibited by thyroxine:***

a) luteinizing hormone (LH);
b) thyroid stimulating hormone (TSH);
c) prolactin (PRL);
d) growth hormone (GH);
e) follicle stimulating hormone (FSH).

123. ***Binds to receptors on Leydig cells:***

a) prolactin (PRL);
b) thyroid stimulating hormone (TSH);
c) luteinizing hormone (LH);

d) growth hormone (GH);
e) follicle stimulating hormone (FSH).

124. ***Stimulates production of insulin-like growth factor (IGF):***

a) growth hormone (GH);
b) luteinizing hormone (LH);
c) prolactin (PRL);
d) thyroid stimulating hormone (TSH);
e) follicle stimulating hormone (FSH).

125. ***Stimulates the synthesis of milk proteins:***

a) luteinizing hormone (LH);
b) thyroid stimulating hormone (TSH);
c) growth hormone (GH);
d) prolactin (PRL);
e) follicle stimulating hormone (FSH).

126. ***Stimulates the production of progesterone by the corpus luteum:***

a) prolactin (PRL);
b) thyroid stimulating hormone (TSH);
c) growth hormone (GH);
d) follicle stimulating hormone (FSH);
e) luteinizing hormone (LH).

127. ***Stimulates the production of estradiol by the immature ovarian follicle:***

a) luteinizing hormone (LH);
b) prolactin (PRL);
c) thyroid stimulating hormone (TSH);
d) growth hormone (GH);
e) follicle stimulating hormone (FSH).

128. ***Action is mediated by intracellular second messenger formation:***

a) cortisol;
b) aldosterone;
c) neither cortisol nor aldosterone;
d) both cortisol and aldosterone;
e) testosterone.

129. ***Synthesized from cholesterol by cells of the adrenal cortex:***

a) cortisol;
b) aldosterone;
c) neither cortisol nor aldosterone;
d) both cortisol and aldosterone;
e) epinephrine.

130. ***Receptors that have a DNA binding domain:***

a) cortisol;
b) aldosterone;
c) neither cortisol nor aldosterone;

d) epinephrine;
e) both cortisol and aldosterone.

131. ***Associated with induction of phosphoenolpyruvate carboxykinase (PEPCK):***

a) cortisol;
b) aldosterone;
c) both cortisol and aldosterone;
d) neither cortisol nor aldosterone;
e) insulin.

132. ***Secreted in response to angiotensin II:***

a) cortisol;
b) both cortisol and aldosterone;
c) aldosterone;
d) neither cortisol nor aldosterone;
e) insulin.

133. ***Produced by the anterior pituitary:***

a) neither oxytocin nor vasopressin;
b) oxytocin;
c) vasopressin;
d) both oxytocin and vasopressin;
e) insulin.

134. ***Found associated with neurophysin in secretory granules:***

a) oxytocin;
b) vasopressin;
c) neither oxytocin nor vasopressin;
d) both oxytocin and vasopressin;
e) insulin.

135. ***Associated with diuresis (acts as diuretic):***

a) oxytocin;
b) vasopressin;
c) both oxytocin and vasopressin;
d) epinephrine;
e) neither oxytocin nor vasopressin.

136. ***Produced from the proopiomelanocortin (POMC) gene:***

a) oxytocin;
b) neither oxytocin nor vasopressin;
c) vasopressin;
d) both oxytocin and vasopressin;
e) epinephrine.

137. ***Each of the following statements concerning pyruvate dehydrogenase is true EXCEPT:***

a) it is an example of a multienzyme complex;
b) it requires thiamine pyrophosphate as a cofactor;
c) it is converted to an inactive form by phosphorylation;

d) it is inhibited when NADH levels increase;
e) it produces oxaloacetate from pyruvate.

138. ***Each of the following is the part of coenzyme A EXEPT:***

a) pantothenic acid;
b) β-mercaptoethylamine;
c) adenosine-3',5'-bisphosphate;
d) α-alanine;
e) para-aminobenzoate.

139. ***The cofactor for transketolase is derived from…***

a) ascorbate;
b) thiamine;
c) retinol;
d) biotin;
e) ubiquinone.

140. ***In the tricarboxylic acid cycle, thiamine pyrophosphate:***

a) accepts electrons from the oxidation of pyruvate and α-ketoglutarate;
b) accepts electrons from the oxidation of isocitrate;
c) forms a covalent intermediate with the α-carbon of α-ketoglutarate;
d) forms a thioester with the sulfhydryl group of CoA-SH;
e) forms a thioester with the sulfhydryl group of lipoic acid.

141. ***Each of the following vitamins is required for reactions in the oxidation of pyruvate to CO_2 and H_2O EXCEPT:***

a) pantothenate;
b) niacin;
c) biotin;
d) thiamine;
e) riboflavin.

PART 6. BIOCHEMISTRY OF ORGANS AND SYSTEMS

142. ***The fraction of γ-globulins encounters:***

a) fibrinogen;
b) immunoglobulin G;
c) lipoproteins;
d) transferring;
e) α-2-macroglobulin.

143. ***Determination the α-fetoprotein has diagnostic value at:***

a) primary cancer of liver;
b) infectious hepatitis;
c) carcinoma of the stomach;
d) the complicated myocardial infarction;
e) all of these.

144. ***γ-globulins producing cells are:***

a) monocytes;

b) basophiles;
c) plasma cells;
d) macrophages;
e) thrombocytes.

145. ***The content of γ-globulins is decreased at:***

a) ischemic heart disease;
b) gastritis;
c) appendicitis;
d) radiation disease;
e) pseudo rheumatism.

146. ***The cause of paraproteinemia can be:***

a) multiple myeloma;
b) hemorrhagic diatheses;
c) hyperglycemia;
d) dysproteinemia;
e) malnutrition.

147. ***The blood fibrinogen decreases in:***

a) chronic liver diseases;
b) myocardial infarction;
c) rheumatic disease;
d) uremia;
e) acute inflammation.

148. ***The decreased blood haptoglobin can be observed at:***

a) hypokalemia;
b) hyperbilirubinemia;
c) azotemia;
d) hemoglobinemia;
e) diabetes type I.

149. ***To determine the rest nitrogen proteins had to be precipitated by:***

a) sodium carbonate;
b) phosphoric acid;
c) nitric acid;
d) sulfuric acid;
e) trichloroacetic acid.

150. ***Retention azotemia DOES NOT OCCUR at:***

a) pneumonias;
b) acute nephritis;
c) chronic nephritis;
d) pyelonephritis;
e) urolithiasis.

151. ***Extrarenal retention azotemia can be at:***

a) gastritis;

b) peptic ulcer;
c) extensive burns;
d) otitis;
e) pneumonias.

152. ***Production azotemia arises at:***

a) dehydration;
b) thyrotoxicosis;
c) acute nephritis;
d) chronic nephritis;
e) pyelonephritis.

153. ***The rest nitrogen increases due to urea at:***

a) acute hepatitis;
b) ischemic disease of heart;
c) acute chronic renal failure;
d) hepatic cirrhosis;
e) acute yellow atrophy of liver.

154. ***The source of creatine in the organism:***

a) synthesis in erythrocytes;
b) enters the organism with nutrition;
c) synthesis in the central nervous system;
d) synthesis in liver;
e) synthesis in the muscles.

155. ***The causes of hyperproteinemia are:***

a) overhydration;
b) decreased absorption of proteins in the intestines;
c) increased permeability of vascular membranes;
d) liver cirrhosis;
e) dehydration of the organism.

156. ***The physiological roles of haptoglobin:***

a) takes part in reaction of immunity;
b) takes part in blood clotting;
c) binding of the hemoglobin;
d) bnding of the iron;
e) binding of the bilirubin.

157. ***Concentration of ammonia in blood grows at:***

a) diabetes mellitus type I;
b) carbamoylphosphate synthetase deficiency;
c) diabetes mellitus type II;
d) heart failure;
e) phosphoenol pyruvate carboxykinase deficiency.

158. ***The following blood protein reveals antiprotease activity:***

a) prekallikrein;

b) immunoglobulin E;
c) α1-antitrypsin;
d) the plasma blood clotting factor IV;
e) haptoglobin.

159. ***Protein, which transport steroid hormones:***

a) transcortin;
b) chondroproteid;
c) C-reactive protein;
d) transferrin;
e) haptoglobin.

160. ***The acute phase protein detected in blood signals in inflammation:***

a) chondroproteid;
b) transcortin;
c) C-reactive protein;
d) albumin;
e) insulin.

161. ***A symptom of porphyria:***

a) myoglobinuria;
b) methemoglobinemia;
c) bilirubinemia;
d) bilirubinuria;
e) photosensitization.

162. ***Methemoglobin in the organism can be reduced with the enzyme:***

a) reductase;
b) catalase;
c) cytochrome;
d) pepsin;
e) asparaginase.

163. ***Which jaundice result in the increased secretion of urobilinogen (stercobilinogen) with urine?***

a) hepatocellular;
b) obstructive;
c) neonatal jaundice;
d) congenital icterus;
e) hemolytic.

164. ***The properties of conjugated bilirubin***

a) water-soluble;
b) toxic;
c) mainly water-insoluble;
d) impermeable through the renal barrier;
e) transported in complex with albumin.

165. ***Which component transports haptoglobin?***

a) iron;

b) copper;
c) hemoglobin;
d) albumin;
e) hormones.

166. ***The lack of which protein promotes Konovalov-Wilson disease (liver and spleen dystrophy)?***

a) transcortin;
b) ceruloplasmin;
c) keratansulfate;
d) thyrotropin;
e) haptoglobin.

167. ***The factor protecting the organism from the loss of endogenic iron:***

a) ceruloplasmin;
b) transcortin;
c) haptoglobin;
d) keratansulfate;
e) thyrotropin.

168. ***Patients with stomach peptic ulcer have their mucous mucoproteid degraded, because there is the superactivity of the enzyme:***

a) neuroamidinase;
b) hyaluronidase;
c) catalase;
d) urease;
e) pepsin.

169. ***What is the function of transferrin?***

a) binding of copper ions;
b) hormone transport;
c) iron transport;
d) hemoglobin transports;
e) steroid hormone transport.

170. ***Which blood component will be increased in connective tissue disorders (rheumatic disease, systemic lesions of skin, tuberculosis)?***

a) fucose;
b) aminosugars;
c) uroglycoproteins;
d) sialic acids;
e) hyaluronate.

171. ***What makes the prosthetic part of hemoglobin?***

a) protoporphyrin;
b) coproporphyrin;
c) uroporphyrin;
d) porphin;
e) casein.

172. ***The molecular defect in hemoglobin S is:***

a) glutamic acid substitutes valine;
b) α-chains substitutes β-chains;
c) β-chains substitutes α-chains;
d) valine substitutes glutamic acid;
e) valine substitutes aspartic acid.

173. ***What is the volume ratio of plasma and forming elements of blood?***

a) plasma - 40-45 %, forming elements - 55-60 %;
b) plasma - 45-50 %, forming elements - 50-55 %;
c) plasma - 50-55 %, forming elements - 45-50 %;
d) plasma - 55-60 %, forming elements - 40-45 %;
e) plasma - 60-65 %, forming elements - 35-40 %.

174. ***What is the total of blood in organism of adult person in norm related to the mass of the body?***

a) 2-4 %;
b) 6-8 %;
c) 10-12 %;
d) 14-16 %;
e) 16-20 %.

175. ***Choose the buffer system, which is 2/3 of the buffering capacities of blood:***

a) plasma proteins;
b) bicarbonate;
c) phosphate;
d) hemoglobin;
e) chloride.

176. ***Erythrocytes:***

a) have 50 days lifetime;
b) are degraded in spleen and liver;
c) contains nucleus;
d) contains mitochondria;
e) metabolize glucose by aerobic pathway.

177. ***Normal hemoglobin concentration in adult person:***

a) men - 130 g/l, women - 145 g/l;
b) men - 120 g/l, women - 100 g/l;
c) men - 170 g/l, women - 160 g/l;
d) men - 100 g/l, women - 90 g/l;
e) men - 145 g/l, women - 130 g/l.

178. ***The physiological type of hemoglobin:***

a) hemoglobin C;
b) fetal;
c) methemoglobin;
d) oxyhemoglobin;
e) carboxyhemoglobin.

179. ***The hemoglobin-gase compound:***

a) carboxyhemoglobin;
b) methemoglobin;
c) primitive hemoglobin;
d) fetal hemoglobin;
e) hemoglobin of adults.

180. ***Methemoglobin is…***

a) the hemoglobin oxidized by the strong oxidants;
b) hemoglobin with oxygen;
c) mutated hemoglobin;
d) hemoglobin with carbon monoxide;
e) hemoglobin with carbon dioxide.

181. ***The hemoglobin is synthesized…***

a) by Ito cells in the liver;
b) by the erythroblasts of the bone marrow;
c) in the spleen and lymph nodes;
d) in the spleen;
e) in the lymph nodes.

182. ***The biological hemolysis follows:***

a) freezing and thawing of blood;
b) the influence of the substances blasting protein-lipid environment of erythrocytes;
c) the strong shaking of the blood;
d) the transfusion of the incompatible blood group;
e) all of these.

183. ***What is the oxyhemoglobin without oxygen?***

a) carbhemoglobin;
b) carboxyhemoglobin;
c) deoxyhemoglobin;
d) methemoglobin;
e) myoglobin;

184. ***The pathological type of hemoglobin:***

a) carbhemoglobin;
b) deoxyhemoglobin;
c) glycosylated hemoglobin;
d) myoglobin;
e) all of these.

185. ***Na^+ concentration in blood serum, mmol/l:***

a) 0.2-0.3;
b) 0.6-1.0;
c) 2.1-2.6;
d) 3.5-5.0;
e) 136-145.

186. ***K^+ concentration in blood serum, mmol/l:***

a) 0.2-0.3;
b) 0.6-1.0;
c) 2.1-2.6;
d) 3.5-5.0;
e) 136-145.

187. ***Ca^{2+} concentration in blood serum, mmol/l:***

a) 136-145;
b) 3.5-5.0;
c) 0.6-1.0;
d) 0.2-0.3;
e) 2.1-2.6.

188. ***Mg^{2+} concentration in blood serum, mmol/l:***

a) 0.6-1.0;
b) 3.5-5.0;
c) 2.1-2.6;
d) 0.2-0.3;
e) 136-145.

189. ***HCO_3^- concentration in blood serum, mmol/l:***

a) 100-110;
b) 1.1-1.5;
c) 24-28;
d) 0.3-0.6;
e) 0.2-0.3.

190. ***Cl^- concentration in blood serum, mmol/l:***

a) 100-110;
b) 24-28;
c) 1.1-1.5;
d) 0.3-0.6;
e) 0.2-0.3.

191. ***HPO_4^{2-} concentration in blood serum, mmol/l:***

a) 24-28;
b) 100-110;
c) 1.1-1.5;
d) 0.3-0.6;
e) 0.2-0.3.

192. ***SO_4^{2-} concentration in blood serum, mmol/l:***

a) 24-28;
b) 100-110;
c) 1.1-1.5;
d) 0.3-0.6;
e) 0.1-0.2.

193. ***Buffering capacity of protein buffer in plasma is:***

a) 75%;
b) 24%;
c) 10%;
d) 1%;
e) 0.5%.

194. ***Buffering capacity of bicarbonate buffer in plasma is:***

a) 75%;
b) 24%;
c) 10%;
d) 1%;
e) 0.5%.

195. ***Buffering capacity of phosphate buffer in plasma is:***

a) 75%;
b) 24%;
c) 10%;
d) 1%;
e) 0.5%.

196. ***Reaction catalyzed by δ-aminolevulinic acid synthase:***

a) δ-aminolevulinic acid → porphobilinogen;
b) succinyl-CoA + glycine → δ-aminolevulinic acid;
c) porphobilinogen → hydroxymethylbilane;
d) uroporphyrinogen III → coproporphyrinogen III;
e) protoporphyrin IX → heme.

197. ***Reaction catalyzed by uroporphyrinogen decarboxylase:***

a) uroporphyrinogen III → coproporphyrinogen III;
b) succinyl-CoA + glycine → δ-aminolevulinic acid;
c) δ-aminolevulinic acid → porphobilinogen;
d) hydroxymethylbilane → uroporphyrinogen III;
e) protoporphyrin IX → heme.

198. ***Reaction catalyzed by ferrochelatase:***

a) hydroxymethylbilane → uroporphyrinogen III;
b) porphobilinogen → hydroxymethylbilane;
c) protoporphyrin IX → heme;
d) succinyl-CoA + glycine → δ-aminolevulinic acid;
e) δ-aminolevulinic acid → porphobilinogen.

199. ***Which steps of heme catabolism occurs in blood:***

a) bilirubin → bilirubin-albumin;
b) bilirubin diglucuronide → bile;
c) biliverdin → bilirubin;
d) heme → verdoglobin;
e) verdoglobin → biliverdin.

200. ***Which step of heme catabolism occurs in liver:***

a) bilirubin → bilirubin diglucuronide;
b) bilirubin → bilirubin-albumin;
c) heme → verdoglobin;
d) hemoglobin → heme;
e) verdoglobin → biliverdin.

201. ***Normal process for H^+ in kidney is:***

a) electrophoresis;
b) resorption;
c) secretion;
d) solution;
e) ultrafiltration.

202. ***Normal process for uric acid in kidney is:***

a) electrophoresis;
b) resorption;
c) secretion;
d) solution;
e) ultrafiltration.

203. ***Normal process for creatinine in kidney is:***

a) electrophoresis;
b) resorption;
c) secretion;
d) solution;
e) ultrafiltration.

204. ***Normal process for lactate in kidney is:***

a) electrophoresis;
b) resorption;
c) secretion;
d) solution;
e) ultrafiltration.

205. ***Normal process for glucose in kidney is:***

a) electrophoresis;
b) resorption;
c) secretion;
d) solution;
e) ultrafiltration.

206. ***Normal process for amino acids in kidney is:***

a) electrophoresis;
b) resorption;
c) secretion;
d) solution;
e) ultrafiltration.

207. ***Normal process for 2-oxoacids in kidney is:***

a) electrophoresis;
b) resorption;
c) secretion;
d) solution;
e) ultrafiltration.

208. ***Normal process for the solute plasma components smaller than 15 kDa in kidney is:***

a) electrophoresis;
b) resorption;
c) secretion;
d) solution;
e) ultrafiltration.

209. ***Ca^{2+} resorption in kidney is inhibited by:***

a) aldosterone;
b) Ca^{2+} ATPase;
c) calcitonin;
d) calcitriol;
e) Na^{+}/K^{+} ATPase.

210. ***Water resorption in kidney is stimulated by:***

a) Ca^{2+} ATPase;
b) calcitonin;
c) calcitriol;
d) Na^{+}/K^{+} ATPase;
e) vasopressin.

211. ***K^{+}-Na^{+}-$2Cl^{-}$ cotransporter in kidney is stimulated by:***

a) aldosterone;
b) Ca^{2+} ATPase;
c) calcitriol;
d) Na^{+}/K^{+} ATPase;
e) parathyrin.

212. ***Neurons need energy for:***

a) electrogenesis;
b) gluconeogenesis;
c) synthesis of ATP;
d) synthesis of creatine;
e) synthesis of phospholipids.

213. ***Neurotransmitters with the ionotropic action:***

a) acetylcholine;
b) cholecystokinin;
c) dopamine;
d) norepinephrine;
e) opioids.

214. ***Neurotransmitters with the metabotropic action:***

a) calcitonin;
b) calcitriol;
c) GABA;
d) glycine;
e) opioids.

215. ***Blood does not perform the following functions:***

a) buffer;
b) homeostatic;
c) immunological;
d) excretory;
e) transport.

216. ***Neutralizing function of blood is carried out as a result of:***

a) actions blood protein buffer;
b) albumin binding toxic substances;
c) conjugation of bilirubin;
d) hydroxylation of xenobiotics;
e) the action of blood bicarbonate buffer.

217. ***What is the volume ratio of plasma and blood cells?***

a) plasma - 40-45% formed elements - 55-60%;
b) plasma - 45-50% formed elements - 50-55%;
c) plasma - 50-55% formed elements - 45-50%;
d) plasma - 55-60% formed elements - 40-45%;
e) plasma - 60-65% formed elements - 35-40%.

218. ***For the fractionation of blood proteins using all methods, EXCEPT:***

a) chromatography;
b) electrophoresis;
c) immunoelectrophoresis;
d) titration;
e) salting-out.

219. ***By electrophoresis on paper fractions there can be identified following plasma proteins:***

a) albumin, globulins, fibrinogen;
b) albumin, α1-globulins, α-2-globulins, β-globulins, γ-globulins;
c) albumins, α-1-globulins, α-2-globulins, fibrinogen;
d) albumins, α-1-globulins, α-2-globulins, α-3-globulins, fibrinogen;
e) albumins, α-1-globulins, α-2-globulins, β-globulins.

220. ***By salting-out method there can identified the following fractions of blood plasma proteins:***

a) albumin, globulins, fibrinogen;
b) albumin, α-1-globulins, α-2-globulins, β-globulins, γ-globulins;
c) albumins, α-1-globulins, α-2-globulins, fibrinogen;
d) albumins, α-1-globulins, α-2-globulins, α-3-globulins, fibrinogen;
e) albumins, α-1-globulins, α-2-globulins, β-globulins.

221. ***By protein electrophoresis method there can be identified:***

a) dysproteinemia;
b) hypoalbuminemia;
c) hypogammaglobulinemia;
d) paraproteinemia;
e) all of the above.

222. ***The magnitude of the serum oncotic pressure is determined by:***

a) carbohydrates;
b) ions;
c) lipids;
d) protein;
e) all of the above.

223. ***Plasma proteins has the following functions except:***

a) homeostatic;
b) keeping unchanged the colloid osmotic pressure;
c) participate in the immune response;
d) receptor;
e) transporting.

224. ***Mostly which proteins determines oncotic blood pressure?***

a) albumin;
b) fibrinogen;
c) globulins;
d) hemoglobin;
e) myoglobin.

225. ***Plasma proteins do not include:***

a) ceruloplasmin;
b) globulins;
c) haptoglobin;
d) myoglobin;
e) transcortin.

226. ***Albumin is not involved in:***

a) the regulation of hormone concentrations;
b) transport of bilirubin;
c) transport of copper;
d) transport of fatty acids;
e) transport of iron.

227. ***The composition of γ-globulins fraction include:***

a) fibrinogen;
b) immunoglobulin G;
c) lipoproteins;
d) transferrin;
e) α2-macroglobulin.

228. ***The main physiological role of transferrin:***

a) lipid transport;
b) participation in blood coagulation;
c) binding of hemoglobin;
d) transport of copper ions;
e) transport of iron ions.

229. ***The physiological role of haptoglobin:***

a) binding of heme;
b) binding of the hemoglobin;
c) serves as a cofactor for hemoglobin synthesis;
d) takes part in blood clotting;
e) takes part in reaction of immunity.

230. ***The main physiological role of ceruloplasmin:***

a) lipid transport;
b) participation in blood coagulation;
c) binding of hemoglobin;
d) transport of iron ions;
e) transport of copper ions.

231. ***Haptoglobin is involved in...***

a) acute phase reactions of inflammation;
b) binding of copper ions;
c) blood coagulation;
d) reactions of immunity;
e) binding of iron ions.

232. ***Steroid hormones transporting protein:***

a) cholesterol;
b) chondroproteid;
c) C-reactive protein;
d) transcortin;
e) transferrin.

233. ***Acute phase protein blood signaling a worsening of chronic process:***

a) chondroproteid;
b) C-reactive protein;
c) immunoglobulin G;
d) myoglobin;
e) transcortin.

234. ***Factor that protects the body from endogenous iron loss:***

a) ceruloplasmin;
b) haptoglobin;
c) hemoglobin;
d) myoglobin;
e) transcortin.

235. ***In acute inflammatory diseases there will be an increases in the blood of:***

a) albumins and α2-globulins;
b) albumins and β-globulins;
c) α1-globulins and α2-globulins;
d) α2-globulins and γ-globulins;
e) γ-globulins.

236. ***In decreased blood haptoglobin there can be observed:***

a) atherosclerosis;
b) azotemia;
c) hemoglobinuria;
d) hyperbilirubinemia;
e) hypokalemia.

237. ***The main physiological role of fibrinogen:***

a) blood coagulation;
b) lipid transport;
c) binding of hemoglobin;
d) transport of iron ions;
e) transport of copper ions.

238. ***The content of fibrinogen in the blood may decrease when:***

a) chronic liver disease;
b) diarrhea;
c) myocardial infarction;
d) rheumatoid arthritis;
e) the acute inflammation.

239. ***The anticoagulant system includes:***

a) heparin;
b) plasma clotting factors;
c) platelets;
d) prothrombin;
e) all of these.

240. ***Prothrombin activation occurs by the mechanism of...***

a) allosteric activation;
b) cofactor attachment;
c) partial (limited) proteolysis;
d) phosphorylation-dephosphorylation;
e) protein inhibitors dissociation.

241. ***Acute phase proteins include everything EXCEPT:***

a) albumin;
b) celuroplasmin;
c) C-reactive protein;
d) fibrinogen;
e) haptoglobin.

242. ***Reference level of blood serum total protein is:***

a) 35-65 g/l;
b) 65-80 g/l;
c) 85-95 g/l;
d) 3.3-6.1 g/l;
e) 3.9-7.2 g/l.

243. ***Reference level of serum glucose is:***

a) 0.5-1.5 mmol/l;
b) 2.5-5.5 mmol/l;
c) 3.3-5.5 mmol/l;
d) 3.9-6.8 mmol/l;
e) 5.5-7.2 mmol/l.

244. ***Reference level of blood serum cholesterol is less than...***

a) 6.1 mmol/l;
b) 5.2 mmol/l;
c) 7.2 mmol/l;
d) 1.5 mmol/l;
e) 5.5 mmol/l.

245. ***Reference level of blood serum urea is:***

a) 0.24-0.29 mmol/l;
b) 2.5-5.5 mmol/l;
c) 2.5-8.3 mmol/l;
d) 3.5-7.0 mmol/l;
e) 3.9-7.2 mmol/l.

246. ***Reference level of plasma uric acid for males (m) and females (f) is:***

a) m: 137-393 mmol/l f: 262-452 mmol/l;
b) m: 255-553 mmol/l f: 262-452 mmol/l;
c) m: 262-452 mmol/l f: 137-393 mmol/l;
d) m: 262-452 mmol/l f: 235-370 mmol/l;
e) m: 390-472 mmol/l f: 137-393 pmol/l.

247. ***Reference level of plasma ketone bodies is:***

a) 0.2-0.5 mmol/l;
b) 0.24-0.29 mmol/l;
c) 3.5-5.5 mmol/l;
d) 3.5-7.0 mmol/l;
e) 3.9-7.2 mmol/l.

248. ***Reference level of plasma bilirubin is:***

a) 0.2-0.6 mcmol/l;
b) 12-22 mcmol/l;
c) 3.5-7.0 mcmol/l;
d) 4.9-7.2 mcmol/l;
e) 8.5-20.5 mcmol/l.

249. ***Reference level of plasma total calcium is:***

a) 0.2-0.6 mmol/l;
b) 12-22 mmol/l;
c) 2.2-2.75 mmol/l;
d) 3.5-7.0 mmol/l;
e) 4.9-7.2 mmol/l.

250. ***Reference level of iron in plasma is:***

a) 0.2-0.6 mcmol/l;
b) 12-22 mcmol/l;
c) 3.5-7.0 mcmol/l;
d) 8-20.5 mcmol/l;
e) 9-31 mcmol/l.

251. ***Extreme pH range compatible with life:***

a) 6.5-7.0;
b) 6.8-8.8;
c) 7.0-7.8;
d) 7.0-8.0;
e) 7.0-8.2.

252. ***The source of plasma iron is:***

a) deposited iron;
b) hemoglobin iron;
c) iron from destroyed erythrocytes;
d) iron, absorbed in the gastrointestinal tract;
e) all of these.

253. ***With increasing demand of iron in the body is primarily used:***

a) deposited iron;
b) hemoglobin iron;
c) iron enzymes;
d) iron myoglobin;
e) transferrin iron.

254. ***Paraproteinemia is...***

a) an increase in the total protein concentration;
b) reduction of the fibrinogen level;
c) reduction of the total protein concentration;
d) the appearance in blood of unusual proteins;
e) disproportion of plasma protein fractions.

255. ***Paraprotein in the blood DOES NOT appear when:***

a) exacerbation of chronic process;
b) heavy chain disease;
c) multiple myeloma;
d) some forms of leukemia;
e) Waldenstrom's disease.

256. ***Paraproteinemia could be because of...***

a) diabetes;
b) diarrhea;
c) hyperglycemia;
d) multiple myeloma;
e) nephritis.

257. ***Paraproteinemia consequence can be everything EXCEPT:***

a) cryoglobulinemia;
b) hyperalbuminemia;
c) macroglobulinemia;
d) paraamiloidosis;
e) all of these.

258. ***Dysproteinemia is...***

a) disproportion of plasma protein fractions;
b) increase in the total protein concentration;
c) reduction of the fibrinogen level;
d) reduction of the total protein concentration;
e) the appearance in blood of "unusual" proteins.

259. ***Hyperproteinemia takes place at:***

a) malnutrition;
b) nephritis;
c) severe diarrhea;
d) severe liver disease;
e) all of these.

260. ***Hyperproteinemia may NOT be caused by...***

a) dehydration;
b) hyperhydration;
c) infectious disease;
d) macroglobulinemia;
e) multiple myeloma.

261. ***Hyperproteinemia may be caused by...***

a) hyperhydration;
b) increased paraproteins synthesis;
c) nephritis;
d) reduction of protein absorption in the intestine;
e) severe liver disease.

262. ***One reason for the relative hyperproteinemia is:***

a) acute inflammatory response;
b) increased formation of γ-globulins;
c) multiple myeloma;
d) vomiting;
e) all of these.

263. ***One of the reasons of the absolute hyperproteinemia is:***

a) acute inflammatory response;
b) diarrhea;
c) extensive burns;
d) vomiting;
e) all of these.

264. ***Hyperproteinemia develops by increasing blood:***

a) albumin;
b) fibrinogen;
c) globulin;
d) hemoglobin;
e) myoglobin.

265. ***Hypoproteinemia develops due to decrease the blood:***

a) albumin;
b) fibrinogen;
c) globulin;
d) hemoglobin;
e) myoglobin.

266. ***Hypoproteinemia occurs when:***

a) acute respiratory infections;
b) diarrhea;
c) macroglobulinemia;
d) nephritis;
e) all of the above.

267. ***Nitrogen-free organic blood components include:***

a) amino acids;
b) bilirubin;
c) ketones;
d) urea;
e) uric acid.

268. ***Blood nitrogen-containing organic components include:***

a) cholesterol;
b) fatty acid;
c) glucose;
d) ketones;
e) urea.

269. ***"Residual nitrogen" DOES NOT include:***

a) ammonia;
b) amino acid;
c) cholesterol;
d) creatinine;
e) urea.

270. ***The main product of residual nitrogen quantitatively is:***

a) ammonia;
b) amino acid;
c) bilirubin;
d) creatinine;
e) urea.

271. ***Urea is a final metabolism product of...***

a) hemoglobin;
b) lipids and carbohydrates;
c) proteins and pyrimidines;
d) purines and lipids;
e) uric acid.

272. ***Uric acid is the end metabolism product of...***

a) hemoglobin;
b) lipids;
c) proteins;
d) purines;
e) pyrimidines.

273. ***Bilirubin is the final metabolism product of...***

a) hemoglobin;
b) lipids;
c) proteins;
d) purines;
e) pyrimidines.

274. ***Source of creatine in the body:***

a) enters with food;
b) produced in the central nervous system;
c) synthesis in liver;
d) synthesis in erythrocytes;
e) all of these.

275. ***Retention azotemia DOES NOT OCCUR when:***

a) acute nephritis;
b) chronic nephritis;
c) pneumonia;
d) pyelonephritis;
e) all of these.

276. ***Extrarenal retention azotemia can occur when:***

a) gastritis;
b) malnutrition;
c) pneumonia;
d) acute hypotonia;
e) ulcer disease.

277. ***The production azotemia occurs when:***

a) extensive inflammation;
b) hypotonia;
c) malnutrition;
d) pneumonia;
e) ulcer disease.

278. ***The content of blood urea increases when:***

a) acute appendicitis;
b) chronic renal failure;
c) malnutrition;
d) peptic ulcer disease;
e) all of these.

279. ***Sources of hydrogen ions in the body can be:***

a) carbonic acid;
b) cholesterol synthesis;
c) glutamine synthesis;
d) reaction of transamination;
e) synthesis of fatty acids.

280. ***By physical and chemical mechanisms of regulation of acid-base balance refers:***

a) diluting and buffering systems;
b) hyperventilation;
c) hypoventilation;
d) renal function;
e) the function of the digestive tract.

281. ***The primary blood buffers not applicable...***

a) acetate;
b) bicarbonate;
c) hemoglobin;
d) phosphate;
e) protein.

282. ***Bicarbonate buffer:***

a) maintains osmotic pressure;
b) major intracellular;
c) produces phosphorus ions;
d) refers to the closed buffer systems;
e) refers to the open buffer systems.

283. ***Open urine buffer system is:***

a) acetate;
b) bicarbonate;
c) hemoglobin;
d) phosphate;
e) protein.

284. ***Open lung buffer system is:***

a) acetate;
b) bicarbonate;
c) hemoglobin;
d) phosphate;
e) protein.

285. ***Buffer system, which accounts for 2/3 of the buffer capacity of the blood:***

a) acetate;
b) bicarbonate;
c) hemoglobin;
d) phosphate;
e) protein.

286. ***By what mechanisms kidney IS NOT involved in the regulation of acid-base balance?***

a) maintaining pCO_2 level;
b) phosphate secretion;
c) regeneration of bicarbonate ions;
d) removing of hydrogen ions;
e) the reabsorption of bicarbonate ions.

287. ***When acidosis occurs:***

a) decreased lactate levels in the blood;
b) decreased level of ketone bodies in the blood;
c) increasing of blood pH;
d) increasing of H^+ concentration in the blood;
e) increasing of OH^- concentration in blood.

288. ***Characteristic of alkalosis:***

a) decreased blood pH;
b) decreased OH^- concentration in blood;
c) increased blood pH;
d) increased ketone bodies in the blood;
e) increased lactate in the blood.

289. ***The main causes of ketoacidosis are NOT:***

a) alcoholism;
b) diabetes mellitus;
c) hypoxia;
d) starvation;
e) all of these.

290. ***The causes of metabolic acidosis may include:***

a) diabetes mellitus;
b) impaired protons excretion in kidneys;
c) loss of bicarbonate in diarrhea;
d) prolonged fasting;
e) all of these.

291. ***Respiratory alkalosis is observed at:***

a) diabetes;
b) hyperventilation;
c) hypoglycemia;
d) lung disease;
e) pulmonary hypoventilation.

292. ***Respiratory acidosis occurs when:***

a) diabetes;
b) febrile states;
c) hyperventilation;
d) hypoglycemia;
e) lung disease.

293. ***Compensation of metabolic acidosis can be done by:***

a) forced bicarbonate excretion by kidneys;
b) hyperventilation;
c) increased synthesis of hydrochloric acid;
d) retention of carbon dioxide emission with lungs;
e) all of these.

294. ***The kidneys are involved in ABB regulating by:***

a) activation of GNG in acidosis;
b) buffer systems synthesis;
c) CO_2 excretion;
d) hydrochloric acid excretion;
e) all of these.

295. ***The stomach is involved in ABB regulation by:***

a) activation of GNG with acidosis;
b) bicarbonate excretion;
c) buffer systems synthesis;
d) hydrochloric acid excretion;
e) all of these.

296. ***The pancreas is involved in ABB regulation by:***

a) activation of GNG with acidosis;
b) bicarbonate excretion;
c) buffer systems synthesis;
d) hydrochloric acid excretion;
e) all of these.

297. ***IT IS NOT characteristic of red blood cells:***

a) destroyed in the spleen and liver;
b) do not contain nucleus;
c) formed in the cells of the bone marrow;
d) high content of mitochondria;
e) life expectancy - 120 days.

298. ***Red blood cell metabolism IS NOT characterized by:***

a) aerobic glycolysis;
b) anaerobic glycolysis;
c) antioxidant protection;
d) PPP;
e) all of these.

299. ***Which erythrocyte pathway ATP is formed:***

a) aerobic glycolysis;
b) anaerobic glycolysis;
c) β-oxidation of fatty acids;
d) PPP;
e) TCA.

300. ***ATP is used in red blood cells for:***

a) Na^+/K^+-ATPase functioning;
b) prevent agglutination;
c) preventing adhesion to the vascular wall;
d) transport of glucose into the cell;
e) all of these.

301. ***$NADPH^+$ H^+ antioxidant protection for the erythrocyte is formed by:***

a) catalase;
b) glutathione;
c) peroxidase;
d) PPP;
e) rudimental TCA enzymes.

302. ***$NADH^+$ H^+ for erythrocyte antioxidant protection is formed by:***

a) catalase;
b) glutathione;
c) glycolysis;
d) peroxidase;
e) PPP.

303. ***Heme proteins DOES NOT include:***

a) catalase;
b) cytochromes;
c) ferritin;
d) hemoglobin;
e) myoglobin.

304. ***Heme is bound to the globin by...***

a) arginine;
b) histidine;
c) lysine;
d) praline;
e) valine.

305. ***Porphyrins ARE NOT involved in the synthesis of:***

a) cytochromes;
b) globin;
c) heme;
d) hemoglobin;
e) myoglobin.

306. ***Hemoglobin:***

a) consists of one subunit;
b) consists of two subunits;
c) has no quaternary structure;
d) saturation curve is hyperbolic;
e) S-shaped oxygen saturation curve.

307. ***Hemoglobin iron IS NOT associated with:***

a) carbon dioxide (IV);
b) carbon monoxide (II);
c) cyanide;
d) histidine of globin;
e) oxygen.

308. ***Oxyhemoglobin dissociation curve shows:***

a) influence of pH on the amount of oxyhemoglobin;
b) relationship between bound oxygen and carbon dioxide in the hemoglobin molecule;
c) relationship between partial pressure of oxygen and the amount of hemoglobin;
d) relationship of the amount of oxyhemoglobin carbon dioxide tension;
e) relationship of the oxygen saturation of hemoglobin on oxygen partial pressure.

309. ***Myoglobin:***

a) consists of 2 subunits;
b) consists of 4 subunits;
c) has quaternary structure;
d) saturation curve of oxygen is hyperbolic;
e) saturation curve of oxygen is S-shaped.

310. ***Physiological variation of hemoglobin is NOT:***

a) adult;
b) fetal;
c) oxyhemoglobin;
d) primitive;
e) all of these.

311. ***HbF is characterized by:***

a) adult hemoglobin;
b) easily gives oxygen to HbA;
c) greater affinity to oxygen compared to HbA;
d) saturation curve is hyperbolic;
e) all of these.

312. ***Characteristic of HbA:***

a) fetal hemoglobin;
b) greater affinity to oxygen as compared to myoglobin;
c) minimal affinity for oxygen compared with HbF;
d) saturation curve is hyperbolic;
e) all of these.

313. ***What substance is formed during oxygen binding in the lung:***

a) carbhemoglobin;
b) carboxyhemoglobin;
c) fetal hemoglobin;
d) methemoglobin;
e) oxyhemoglobin.

314. ***What substance is formed by binding carbon dioxide into the tissues:***

a) carbhemoglobin;
b) carboxyhemoglobin;
c) fetal hemoglobin;
d) methemoglobin;
e) oxyhemoglobin.

315. ***What substance comprises trivalent iron ion instead of the divalent:***

a) carbhemoglobin;
b) carboxyhemoglobin;
c) fetal hemoglobin;
d) methemoglobin;
e) oxyhemoglobin.

316. ***What substance is formed in the presence of CO in the breathed air:***

a) carbhemoglobin;
b) carboxyhemoglobin;
c) fetal hemoglobin;
d) methemoglobin;
e) oxyhemoglobin.

317. ***What substance appears after 12 weeks of fetal development:***

a) carbhemoglobin;
b) carboxyhemoglobin;
c) fetal hemoglobin;
d) methemoglobin;
e) oxyhemoglobin.

318. ***Methemoglobin is a ...***

a) compound of hemoglobin with oxygen;
b) compound of the hemoglobin with carbon dioxide;
c) compound of the hemoglobin with carbon monoxide;
d) oxidized hemoglobin produced by the action of strong oxidants;
e) all is wrong.

319. ***Methemoglobin in the human body can be reduced by the enzyme:***

a) catalase;
b) cytochromes;
c) ferrochelatase;
d) pepsin;
e) reductase.

320. ***The molecular defect in hemoglobin S is:***

a) replacing in the β-globin chain of glutamic acid to valine;
b) replacing in the β-globin chain of valine to glutamic acid;
c) replacing the β-globin chains to α-globin chains;
d) the replacement of α-globin chains to β-globin chains;
e) all is wrong.

321. ***Required for the synthesis of heme:***

a) acetyl-CoA;
b) arginine;
c) glutamate;
d) glycine;
e) histidine.

322. ***TCA metabolite necessary for heme synthesis:***

a) acetyl-CoA;
b) citrate;
c) malate;
d) succinate;
e) succinyl-CoA.

323. ***δ-aminolevulinic acid is synthesized from:***

a) acetyl-CoA and oxaloacetate;
b) aspartate and carbamoyl phosphate;
c) aspartate and glycine;
d) glutamate and glycine;
e) succinyl-CoA and glycine.

324. ***What is included in the prosthetic part of hemoglobin?***

a) casein;
b) coproporphyrin;
c) porphine;
d) protoporphyrin;
e) uroporphyrin.

325. ***Hemoglobin is synthesized in:***

a) liver;
b) lymph nodes;
c) muscle;
d) normoblasts, erythroblasts in red bone marrow;
e) spleen.

326. ***That IS NOT a symptom of porphyria:***

a) anemia;
b) myoglobinuria;
c) photosensitization;
d) red urine;
e) all of these.

327. ***Bilirubin conversion stages:***

a) bilirubin diglucuronyl, bilirubin, hemoglobin;
b) bilirubin diglucuronyl, bilirubin, urobilinogen;
c) bilirubin, bilirubin diglucuronyl, urobilinogen;
d) bilirubin, hemoglobin, urobilin;
e) bilirubin, stercobilin, urobilinogen.

328. ***Indirect bilirubin is...***

a) associated with glucuronic acid;
b) associated with the globulins;
c) bound to albumin;
d) gives a color reaction with Ehrlich diazoreagent;
e) non-free.

329. ***Direct bilirubin is...***

a) associated with glucuronic acid;
b) associated with the globulins;
c) bound to albumin;
d) gives a color reaction with Ehrlich diazoreagent;
e) non-free.

330. ***Direct bilirubin is formed by:***

a) binding of bilirubin to glucuronic acid;
b) breaking the porphyrin ring;
c) loss of heme iron atom;
d) oxidation of heme;
e) the effect of heme oxidase onto heme.

331. ***Conjugated bilirubin is synonymous with:***

a) direct;
b) free;
c) indirect;
d) total;
e) toxic.

332. ***Unconjugated bilirubin is synonymous with:***

a) direct;
b) indirect;
c) non-free;
d) non-toxic;
e) total.

333. ***Free bilirubin is:***

a) all of these;
b) low-toxic;
c) not penetrating kidney barrier;
d) penetrating kidney barrier;
e) soluble in water.

334. ***Conjugated bilirubin is:***

a) almost insoluble in water;
b) nontoxic;
c) not penetrating kidney barrier;
d) penetrating kidney barrier;
e) all of these.

335. ***Hemolytic jaundice is caused by:***

a) blockage of the bile duct by gallstones;
b) blockage of the bile duct by tumors;
c) enzymopathies of glycolysis, PPP;
d) hepatitis;
e) impaired bilirubin conjugation.

336. ***Obstructive jaundice is caused by:***

a) blockage of the bile duct by gallstones;
b) enzymopathies of glycolysis, PPP;
c) hepatitis;
d) impaired bilirubin conjugation;
e) sepsis.

337. ***Parenchymal (hepatic) jaundice is caused by:***

a) blockage of the bile duct by gallstones;
b) blockage of the bile duct by tumors;
c) enzymopathies of glycolysis, PPP;
d) hepatitis;
e) sepsis.

338. ***Which form of jaundice is manifested by increased excretion of urobilinogen (stercobilinogen) with urine?***

a) hemolytic;
b) hereditary;
c) mechanical;
d) neonatal;
e) parenchymal.

339. ***Obstructive jaundice symptoms include all EXCEPT:***

a) acholic stool;
b) bilirubinuria;
c) hyperbilirubinemia;
d) urobilinogenuria;
e) all of these.

340. ***Parenchymal jaundice symptoms include all EXCEPT:***

a) acholic stool;
b) bilirubinuria;
c) hyperbilirubinemia;
d) stercobilinogenuria;
e) all of these.

Book #2 Test answers

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

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