# Medical Doctor Examination: Biomedical Scientific Principles

Program ID: 1

Competency ID: 1

1. Which of the following is NOT a function of the plasma membrane?

A. Selective permeability

B. Cell signaling

C. Energy production

D. Structural support

E. Endocytosis

Correct Answer: C

2. In DNA replication, which enzyme is responsible for joining Okazaki fragments?

A. DNA polymerase III

B. DNA ligase

C. Helicase

D. Primase

E. Topoisomerase

Correct Answer: B

3. Which of the following best describes the function of mitochondria in cells?

A. Protein synthesis

B. Lipid storage

C. Energy production

D. Cell division

E. Waste elimination

Correct Answer: C

4. What is the primary role of T cells in the immune system?

A. Antibody production

B. Phagocytosis

C. Cell-mediated immunity

D. Complement activation

E. Histamine release

Correct Answer: C

5. Which of the following hormones is NOT produced by the anterior pituitary gland?

A. Growth hormone

B. Prolactin

C. Thyroid-stimulating hormone

D. Antidiuretic hormone

E. Adrenocorticotropic hormone

Correct Answer: D

6. In which phase of the cardiac cycle does ventricular filling occur?

A. Isovolumetric contraction

B. Ventricular ejection

C. Isovolumetric relaxation

D. Rapid ventricular filling

E. Atrial systole

Correct Answer: D

7. Which of the following is the correct order of the layers of the gastrointestinal tract, from innermost to outermost?

A. Mucosa, submucosa, muscularis, serosa

B. Submucosa, mucosa, muscularis, serosa

C. Mucosa, muscularis, submucosa, serosa

D. Serosa, muscularis, submucosa, mucosa

E. Muscularis, mucosa, submucosa, serosa

Correct Answer: A

8. Which neurotransmitter is primarily responsible for the "fight or flight" response in the sympathetic nervous system?

A. Acetylcholine

B. Norepinephrine

C. Dopamine

D. Serotonin

E. GABA

Correct Answer: B

9. What is the primary function of the Golgi apparatus?

A. Protein synthesis

B. Lipid synthesis

C. Energy production

D. Protein modification and sorting

E. DNA replication

Correct Answer: D

10. Which of the following is NOT a component of the extracellular matrix?

A. Collagen

B. Elastin

C. Proteoglycans

D. Ribosomes

E. Fibronectin

Correct Answer: D

11. Which of the following best describes the function of nephrons in the kidney?

A. Blood cell production

B. Hormone secretion

C. Filtration and reabsorption

D. Bile production

E. Glucose storage

Correct Answer: C

12. What is the primary function of surfactant in the lungs?

A. Increase surface tension

B. Decrease surface tension

C. Facilitate gas exchange

D. Produce mucus

E. Filter air particles

Correct Answer: B

13. Which of the following is NOT a function of the liver?

A. Protein synthesis

B. Bile production

C. Glycogen storage

D. Hormone secretion

E. Insulin production

Correct Answer: E

14. In which phase of mitosis do the chromosomes align at the metaphase plate?

A. Prophase

B. Metaphase

C. Anaphase

D. Telophase

E. Interphase

Correct Answer: B

15. Which of the following is the primary site of erythropoiesis in adults?

A. Liver

B. Spleen

C. Lymph nodes

D. Red bone marrow

E. Yellow bone marrow

Correct Answer: D

16. What is the function of calmodulin in muscle contraction?

A. ATP production

B. Calcium binding and signaling

C. Actin-myosin cross-bridge formation

D. Troponin binding

E. Membrane depolarization

Correct Answer: B

17. Which of the following is NOT a component of the complement system?

A. C3

B. C5

C. Factor H

D. Immunoglobulin G

E. Membrane attack complex

Correct Answer: D

18. What is the primary function of the zona pellucida?

A. Sperm capacitation

B. Oocyte maturation

C. Prevention of polyspermy

D. Follicle stimulation

E. Corpus luteum formation

Correct Answer: C

19. Which of the following best describes the function of tight junctions in epithelial cells?

A. Cell-to-cell communication

B. Mechanical support

C. Selective permeability barrier

D. Cell movement

E. Intracellular transport

Correct Answer: C

20. What is the role of vitamin K in the body?

A. Antioxidant protection

B. Calcium absorption

C. Blood clotting

D. Energy metabolism

E. Immune system regulation

Correct Answer: C

21. Which of the following is the correct sequence of events in synaptic transmission?

A. Neurotransmitter release, action potential, receptor binding

B. Action potential, neurotransmitter release, receptor binding

C. Receptor binding, action potential, neurotransmitter release

D. Action potential, receptor binding, neurotransmitter release

E. Neurotransmitter release, receptor binding, action potential

Correct Answer: B

22. What is the primary function of the Krebs cycle (citric acid cycle)?

A. Glucose oxidation

B. Fatty acid synthesis

C. ATP production

D. Electron transport

E. Oxidative phosphorylation

Correct Answer: C

23. Which of the following is NOT a function of the spleen?

A. Blood filtration

B. Erythrocyte storage

C. Lymphocyte production

D. Insulin secretion

E. Antibody production

Correct Answer: D

24. What is the role of telomeres in cellular aging?

A. DNA repair

B. Chromosome protection

C. Cell cycle regulation

D. Protein synthesis

E. Energy production

Correct Answer: B

25. Which of the following best describes the function of antigen-presenting cells?

A. Antibody production

B. Phagocytosis of pathogens

C. Activation of T cells

D. Complement activation

E. Histamine release

Correct Answer: C

26. Which of the following is the primary site of bile production?

A. Gallbladder

B. Pancreas

C. Liver

D. Duodenum

E. Stomach

Correct Answer: C

27. What is the function of carbonic anhydrase in red blood cells?

A. Oxygen transport

B. Carbon dioxide transport

C. Iron metabolism

D. Hemoglobin synthesis

E. Cell membrane stability

Correct Answer: B

28. Which of the following is NOT a function of the hypothalamus?

A. Temperature regulation

B. Control of pituitary gland

C. Regulation of sleep-wake cycles

D. Long-term memory storage

E. Appetite control

Correct Answer: D

29. What is the primary function of the Bowman's capsule in the kidney?

A. Urine concentration

B. Blood filtration

C. Hormone secretion

D. Electrolyte reabsorption

E. Acid-base balance

Correct Answer: B

30. Which of the following best describes the function of helper T cells?

A. Direct killing of infected cells

B. Antibody production

C. Activation of other immune cells

D. Antigen presentation

E. Complement activation

Correct Answer: C

31. What is the role of calcitonin in calcium homeostasis?

A. Increases blood calcium levels

B. Decreases blood calcium levels

C. Increases calcium absorption in the intestines

D. Increases calcium reabsorption in the kidneys

E. Stimulates vitamin D production

Correct Answer: B

32. Which of the following is the correct order of the phases of the menstrual cycle?

A. Follicular, ovulatory, luteal

B. Luteal, follicular, ovulatory

C. Ovulatory, luteal, follicular

D. Follicular, luteal, ovulatory

E. Luteal, ovulatory, follicular

Correct Answer: A

33. What is the primary function of the Purkinje fibers in the heart?

A. Initiation of heartbeat

B. Contraction of atrial muscles

C. Rapid conduction of electrical impulses

D. Production of cardiac hormones

E. Regulation of heart rate

Correct Answer: C

34. Which of the following is NOT a component of the extracellular matrix?

A. Collagen

B. Elastin

C. Fibronectin

D. Laminin

E. Actin

Correct Answer: E

35. What is the primary function of the enzyme telomerase?

A. DNA repair

B. RNA splicing

C. Protein folding

D. Telomere maintenance

E. Lipid synthesis

Correct Answer: D

36. Which of the following best describes the function of natural killer cells?

A. Antibody production

B. Phagocytosis

C. Antigen presentation

D. Cytokine production

E. Direct killing of virus-infected and tumor cells

Correct Answer: E

37. What is the role of the enzyme pepsin in digestion?

A. Carbohydrate breakdown

B. Lipid emulsification

C. Protein denaturation

D. Nucleic acid hydrolysis

E. Mineral absorption

Correct Answer: C

38. Which of the following is the primary site of vitamin B12 absorption?

A. Stomach

B. Duodenum

C. Jejunum

D. Ileum

E. Colon

Correct Answer: D

39. What is the function of the enzyme reverse transcriptase?

A. DNA replication

B. RNA transcription

C. Protein synthesis

D. DNA repair

E. RNA-dependent DNA synthesis

Correct Answer: E

40. Which of the following is NOT a function of the placenta?

A. Hormone production

B. Nutrient exchange

C. Waste removal

D. Gas exchange

E. Antibody production

Correct Answer: E

41. What is the primary function of the Sertoli cells in the testes?

A. Testosterone production

B. Sperm production

C. Support and nourishment of developing sperm

D. Secretion of inhibin

E. Production of seminal fluid

Correct Answer: C

42. Which of the following best describes the function of the zona glomerulosa in the adrenal cortex?

A. Glucocorticoid production

B. Androgen production

C. Mineralocorticoid production

D. Catecholamine production

E. Estrogen production

Correct Answer: C

43. What is the primary function of heparin?

A. Blood clotting

B. Anticoagulation

C. Platelet activation

D. Fibrinolysis

E. Vasoconstriction

Correct Answer: B

44. Which of the following is the correct sequence of events in the complement cascade?

A. C3 activation, C5 activation, membrane attack complex formation

B. Antibody binding, C1 activation, C3 activation

C. Membrane attack complex formation, C3 activation, C5 activation

D. C1 activation, C4 activation, C2 activation

E. C5 activation, C3 activation, antibody binding

Correct Answer: D

45. What is the primary function of the enzyme lactate dehydrogenase (LDH)?

A. Glucose metabolism

B. Fatty acid oxidation

C. Amino acid degradation

D. Interconversion of pyruvate and lactate

E. Nucleotide synthesis

Correct Answer: D

46. Which of the following is NOT a function of the thymus gland?

A. T cell maturation

B. Negative selection of self-reactive T cells

C. Production of thymosin

D. B cell maturation

E. Positive selection of functional T cells

Correct Answer: D

47. What is the role of prostaglandins in inflammation?

A. Vasoconstriction

B. Pain reduction

C. Fever induction

D. Leukocyte inhibition

E. Platelet aggregation

Correct Answer: C

48. Which of the following best describes the function of podocytes in the kidney?

A. Urine concentration

B. Filtration barrier formation

C. Hormone secretion

D. Electrolyte reabsorption

E. Acid-base balance regulation

Correct Answer: B

49. What is the primary function of the enzyme DNA ligase in DNA replication?

A. Unwinding the DNA helix

B. Synthesizing RNA primers

C. Joining Okazaki fragments

D. Proofreading newly synthesized DNA

E. Removing RNA primers

Correct Answer: C

50. Which of the following is the correct order of the layers of the epidermis, from deepest to most superficial?

A. Stratum corneum, stratum lucidum, stratum granulosum, stratum spinosum, stratum basale

B. Stratum basale, stratum spinosum, stratum granulosum, stratum lucidum, stratum corneum

C. Stratum lucidum, stratum basale, stratum spinosum, stratum granulosum, stratum corneum

D. Stratum spinosum, stratum basale, stratum granulosum, stratum lucidum, stratum corneum

E. Stratum granulosum, stratum spinosum, stratum basale, stratum lucidum, stratum corneum

Correct Answer: B

51. Which of the following is the primary function of the enzyme carbonic anhydrase in the kidneys?

A. Sodium reabsorption

B. Potassium secretion

C. Acid-base balance regulation

D. Glucose filtration

E. Urea excretion

Correct Answer: C

52. What is the role of the protein clathrin in cellular processes?

A. DNA repair

B. Protein synthesis

C. Endocytosis

D. ATP production

E. Cell adhesion

Correct Answer: C

53. Which of the following best describes the function of the Islets of Langerhans in the pancreas?

A. Exocrine secretion

B. Endocrine secretion

C. Bicarbonate production

D. Fat digestion

E. Protein digestion

Correct Answer: B

54. What is the primary function of the enzyme HMG-CoA reductase?

A. Fatty acid synthesis

B. Cholesterol synthesis

C. Glucose metabolism

D. Amino acid degradation

E. Nucleotide synthesis

Correct Answer: B

55. Which of the following is NOT a function of the corpus luteum?

A. Progesterone production

B. Estrogen production

C. Inhibin production

D. Oxytocin production

E. Relaxin production

Correct Answer: D

56. What is the primary function of the enzyme acetylcholinesterase?

A. Synthesis of acetylcholine

B. Transport of acetylcholine

C. Degradation of acetylcholine

D. Storage of acetylcholine

E. Release of acetylcholine

Correct Answer: C

57. Which of the following best describes the function of the macula densa in the kidney?

A. Urine concentration

B. Filtration of blood

C. Regulation of renin secretion

D. Reabsorption of sodium

E. Secretion of erythropoietin

Correct Answer: C

58. What is the role of the protein dystrophin in muscle cells?

A. Muscle contraction

B. Energy production

C. Structural support

D. Calcium sequestration

E. Neurotransmitter release

Correct Answer: C

59. Which of the following is the primary site of erythropoietin production in adults?

A. Liver

B. Spleen

C. Kidney

D. Bone marrow

E. Lungs

Correct Answer: C

60. What is the function of the enzyme topoisomerase in DNA replication?

A. Unwinding the DNA helix

B. Synthesizing RNA primers

C. Joining Okazaki fragments

D. Relieving supercoiling

E. Removing RNA primers

Correct Answer: D

61. Which of the following best describes the function of the Kupffer cells in the liver?

A. Bile production

B. Glycogen storage

C. Phagocytosis

D. Protein synthesis

E. Hormone secretion

Correct Answer: C

62. What is the primary function of the enzyme pepsin in the stomach?

A. Carbohydrate digestion

B. Lipid digestion

C. Protein digestion

D. Nucleic acid digestion

E. Mineral absorption

Correct Answer: C

63. Which of the following is NOT a function of the thalamus?

A. Sensory relay

B. Motor control

C. Emotional processing

D. Long-term memory storage

E. Sleep regulation

Correct Answer: D

64. What is the role of the protein collagen in connective tissue?

A. Energy storage

B. Structural support

C. Hormone production

D. Enzyme catalysis

E. Ion transport

Correct Answer: B

65. Which of the following best describes the function of the zona fasciculata in the adrenal cortex?

A. Aldosterone production

B. Cortisol production

C. Epinephrine production

D. Androgen production

E. Estrogen production

Correct Answer: B

66. What is the primary function of the enzyme telomerase in cancer cells?

A. DNA repair

B. Apoptosis induction

C. Cell cycle arrest

D. Telomere maintenance

E. Metastasis promotion

Correct Answer: D

67. Which of the following is the correct sequence of events in the coagulation cascade?

A. Fibrin formation, thrombin activation, factor X activation

B. Factor X activation, prothrombin activation, fibrinogen cleavage

C. Thrombin activation, factor X activation, fibrin formation

D. Fibrinogen cleavage, factor X activation, thrombin activation

E. Prothrombin activation, fibrinogen cleavage, fibrin cross-linking

Correct Answer: B

68. What is the primary function of the enzyme lactase in the small intestine?

A. Protein digestion

B. Fat emulsification

C. Starch breakdown

D. Lactose hydrolysis

E. Nucleotide absorption

Correct Answer: D

69. Which of the following is NOT a function of the cerebellum?

A. Motor coordination

B. Balance maintenance

C. Fine movement control

D. Speech production

E. Posture regulation

Correct Answer: D

70. What is the role of the protein troponin in muscle contraction?

A. ATP hydrolysis

B. Calcium binding

C. Actin-myosin cross-bridge formation

D. Muscle relaxation

E. Neurotransmitter release

Correct Answer: B

71. Which of the following is the primary function of hepcidin in iron metabolism?

A. Iron absorption

B. Iron storage

C. Iron transport

D. Iron regulation

E. Iron excretion

Correct Answer: D

72. What is the role of the protein claudin in epithelial tissues?

A. Cell adhesion

B. Tight junction formation

C. Signal transduction

D. Apoptosis regulation

E. Hormone secretion

Correct Answer: B

73. Which of the following best describes the function of the macula in the eye?

A. Light refraction

B. Color vision

C. Central visual acuity

D. Peripheral vision

E. Dark adaptation

Correct Answer: C

74. What is the primary function of the enzyme lipoprotein lipase?

A. Cholesterol synthesis

B. Triglyceride hydrolysis

C. Phospholipid formation

D. Fatty acid oxidation

E. Ketone body production

Correct Answer: B

75. Which of the following is NOT a function of the parathyroid hormone?

A. Increasing blood calcium levels

B. Decreasing blood phosphate levels

C. Stimulating bone resorption

D. Increasing calcium reabsorption in kidneys

E. Increasing insulin secretion

Correct Answer: E

76. What is the role of the protein spectrin in red blood cells?

A. Oxygen transport

B. Cell membrane stability

C. Hemoglobin synthesis

D. Carbon dioxide transport

E. Iron storage

Correct Answer: B

77. Which of the following best describes the function of the Brunner's glands in the duodenum?

A. Hydrochloric acid secretion

B. Bicarbonate-rich mucus secretion

C. Pepsinogen production

D. Cholecystokinin release

E. Intrinsic factor secretion

Correct Answer: B

78. What is the primary function of the enzyme phosphofructokinase-1 in glycolysis?

A. Rate-limiting step regulation

B. Glucose phosphorylation

C. Pyruvate formation

D. ATP production

E. NADH generation

Correct Answer: A

79. Which of the following is the correct order of the phases of the cardiac action potential?

A. Depolarization, repolarization, hyperpolarization

B. Hyperpolarization, depolarization, repolarization

C. Repolarization, depolarization, hyperpolarization

D. Depolarization, plateau, repolarization

E. Plateau, depolarization, repolarization

Correct Answer: D

80. What is the function of the enzyme renin in the renin-angiotensin-aldosterone system?

A. Sodium reabsorption

B. Potassium excretion

C. Angiotensinogen cleavage

D. Aldosterone production

E. Vasodilation

Correct Answer: C

81. Which of the following is NOT a function of the liver?

A. Bile production

B. Glucose storage

C. Plasma protein synthesis

D. Erythropoiesis in adults

E. Drug detoxification

Correct Answer: D

82. What is the primary role of surfactant in the lungs?

A. Gas exchange

B. Mucus production

C. Reducing surface tension

D. Pathogen defense

E. Alveolar cell regeneration

Correct Answer: C

83. Which of the following best describes the function of the loop of Henle in the kidney?

A. Glomerular filtration

B. Urine concentration

C. Hormone production

D. Glucose reabsorption

E. Acid-base balance

Correct Answer: B

84. What is the role of the protein calsequestrin in muscle cells?

A. Calcium storage

B. Actin-myosin cross-bridge formation

C. ATP production

D. Membrane depolarization

E. Neurotransmitter release

Correct Answer: A

85. Which of the following is the primary site of vitamin K absorption?

A. Stomach

B. Duodenum

C. Jejunum

D. Ileum

E. Colon

Correct Answer: D

86. What is the function of the enzyme aminoacyl-tRNA synthetase in protein synthesis?

A. mRNA transcription

B. tRNA activation

C. Peptide bond formation

D. Ribosome assembly

E. Protein folding

Correct Answer: B

87. Which of the following best describes the function of the fovea centralis in the retina?

A. Peripheral vision

B. Color perception

C. Light/dark adaptation

D. Highest visual acuity

E. Motion detection

Correct Answer: D

88. What is the primary function of the enzyme sucrase in the small intestine?

A. Protein digestion

B. Fat emulsification

C. Starch breakdown

D. Sucrose hydrolysis

E. Nucleotide absorption

Correct Answer: D

89. Which of the following is NOT a function of the spleen?

A. Blood filtration

B. Platelet storage

C. Lymphocyte production

D. Hematopoiesis in adults

E. Removal of old erythrocytes

Correct Answer: D

90. What is the role of the protein fibronectin in the extracellular matrix?

A. Structural support

B. Cell adhesion

C. Enzyme catalysis

D. Hormone signaling

E. Ion transport

Correct Answer: B

91. Which of the following best describes the function of the Schwann cells in the peripheral nervous system?

A. Neurotransmitter production

B. Myelin sheath formation

C. Neuron cell body support

D. Synaptic transmission

E. Cerebrospinal fluid production

Correct Answer: B

92. What is the primary function of the enzyme carbonic anhydrase in red blood cells?

A. Oxygen transport

B. Carbon dioxide transport

C. Hemoglobin synthesis

D. Iron metabolism

E. Cell membrane stability

Correct Answer: B

93. Which of the following is the correct sequence of events in neurotransmitter release at a synapse?

A. Vesicle fusion, calcium influx, neurotransmitter diffusion

B. Calcium influx, vesicle fusion, neurotransmitter diffusion

C. Neurotransmitter diffusion, calcium influx, vesicle fusion

D. Vesicle fusion, neurotransmitter diffusion, calcium influx

E. Calcium influx, neurotransmitter diffusion, vesicle fusion

Correct Answer: B

94. What is the role of the protein elastin in connective tissue?

A. Strength

B. Elasticity

C. Lubrication

D. Mineralization

E. Immune defense

Correct Answer: B

95. Which of the following is NOT a function of the hypothalamus?

A. Body temperature regulation

B. Hunger and thirst control

C. Sleep-wake cycle regulation

D. Long-term memory formation

E. Endocrine system regulation

Correct Answer: D

96. What is the primary function of the enzyme chymotrypsin in the small intestine?

A. Carbohydrate digestion

B. Lipid emulsification

C. Protein digestion

D. Nucleic acid breakdown

E. Mineral absorption

Correct Answer: C

97. Which of the following best describes the function of the juxtaglomerular cells in the kidney?

A. Urine concentration

B. Renin secretion

C. Erythropoietin production

D. Vitamin D activation

E. Glucose reabsorption

Correct Answer: B

98. What is the role of the protein kinase C in cell signaling?

A. DNA repair

B. Protein phosphorylation

C. mRNA splicing

D. Lipid synthesis

E. Ion channel formation

Correct Answer: B

99. Which of the following is the primary site of leptin production?

A. Hypothalamus

B. Pancreas

C. Liver

D. Adipose tissue

E. Skeletal muscle

Correct Answer: D

100. What is the function of the enzyme delta-aminolevulinic acid synthase in heme synthesis?

A. Iron incorporation

B. Porphyrin ring formation

C. Globin chain synthesis

D. Heme degradation

E. Bilirubin conjugation

Correct Answer: B

101. Which of the following best describes the function of the spiral organ of Corti?

A. Balance maintenance

B. Sound transduction

C. Olfactory sensation

D. Visual processing

E. Taste perception

Correct Answer: B

102. What is the primary role of the protein clathrin in cellular processes?

A. DNA replication

B. Protein synthesis

C. Endocytosis

D. ATP production

E. Cell adhesion

Correct Answer: C

103. Which of the following is NOT a function of the gallbladder?

A. Bile storage

B. Bile concentration

C. Cholesterol synthesis

D. Bile release

E. Mucus secretion

Correct Answer: C

104. What is the function of the enzyme pyruvate dehydrogenase in metabolism?

A. Glycolysis regulation

B. Fatty acid synthesis

C. Amino acid degradation

D. Linking glycolysis to the citric acid cycle

E. Gluconeogenesis

Correct Answer: D

105. Which of the following best describes the function of the ciliary body in the eye?

A. Light focusing

B. Color perception

C. Aqueous humor production

D. Tear production

E. Pupil constriction

Correct Answer: C

106. What is the role of the protein dystrophin in muscle cells?

A. Contractile force generation

B. Calcium sequestration

C. Energy production

D. Structural support and membrane stability

E. Neurotransmitter receptor

Correct Answer: D

107. Which of the following is the primary function of the enzyme catalase?

A. Protein degradation

B. Lipid synthesis

C. Carbohydrate metabolism

D. Hydrogen peroxide decomposition

E. DNA repair

Correct Answer: D

108. What is the main role of the protein albumin in blood?

A. Oxygen transport

B. Immune defense

C. Blood clotting

D. Maintaining oncotic pressure

E. Hormone transport

Correct Answer: D

109. Which of the following best describes the function of the Paneth cells in the small intestine?

A. Hormone secretion

B. Nutrient absorption

C. Antimicrobial peptide secretion

D. Mucus production

E. Peristalsis regulation

Correct Answer: C

110. What is the primary function of the enzyme phospholipase C in cell signaling?

A. Protein phosphorylation

B. Lipid hydrolysis

C. DNA methylation

D. RNA splicing

E. Carbohydrate metabolism

Correct Answer: B

111. Which of the following is NOT a function of the thymus gland?

A. T lymphocyte maturation

B. Negative selection of self-reactive T cells

C. Production of thymosin

D. B lymphocyte maturation

E. Positive selection of functional T cells

Correct Answer: D

112. What is the role of the protein ferritin in iron metabolism?

A. Iron absorption

B. Iron storage

C. Iron transport in blood

D. Iron incorporation into heme

E. Iron excretion

Correct Answer: B

113. Which of the following best describes the function of the calcitonin-producing C cells in the thyroid gland?

A. Regulation of metabolism

B. Calcium homeostasis

C. Iodine uptake

D. Thyroid hormone production

E. Regulation of blood pressure

Correct Answer: B

114. What is the primary function of the enzyme DNA polymerase III in DNA replication?

A. Primer synthesis

B. Template unwinding

C. Leading strand synthesis

D. Okazaki fragment joining

E. Telomere maintenance

Correct Answer: C

115. Which of the following is the correct order of the layers of the gastrointestinal tract, from innermost to outermost?

A. Mucosa, submucosa, muscularis, serosa

B. Submucosa, mucosa, muscularis, serosa

C. Mucosa, muscularis, submucosa, serosa

D. Serosa, muscularis, submucosa, mucosa

E. Muscularis, mucosa, submucosa, serosa

Correct Answer: A

116. What is the function of the enzyme glutamine synthetase in the brain?

A. Neurotransmitter synthesis

B. Energy production

C. Ammonia detoxification

D. Protein degradation

E. Lipid metabolism

Correct Answer: C

117. Which of the following best describes the function of the macula densa in the kidney?

A. Urine concentration

B. Glomerular filtration

C. Tubuloglomerular feedback

D. Erythropoietin production

E. Vitamin D activation

Correct Answer: C

118. What is the role of the protein fibrillin in connective tissue?

A. Collagen cross-linking

B. Elastic fiber formation

C. Proteoglycan synthesis

D. Cell adhesion

E. Wound healing

Correct Answer: B

119. Which of the following is NOT a function of the placenta during pregnancy?

A. Hormone production

B. Nutrient transfer

C. Gas exchange

D. Waste removal

E. Antibody production

Correct Answer: E

120. What is the primary function of the enzyme succinyl-CoA synthetase in the citric acid cycle?

A. ATP production

B. CO2 generation

C. NADH production

D. Oxaloacetate formation

E. Acetyl-CoA production

Correct Answer: A

121. Which of the following is the primary function of the enzyme telomerase in cell biology?

A. DNA repair

B. RNA splicing

C. Protein folding

D. Telomere maintenance

E. Apoptosis induction

Correct Answer: D

122. What is the role of the protein caveolin in cell membranes?

A. Ion channel formation

B. Lipid raft organization

C. Protein degradation

D. Glucose transport

E. Cell adhesion

Correct Answer: B

123. Which of the following best describes the function of the zona pellucida?

A. Sperm capacitation

B. Oocyte maturation

C. Prevention of polyspermy

D. Hormone production

E. Embryo implantation

Correct Answer: C

124. What is the primary function of the enzyme phospholipase A2 in inflammation?

A. Prostaglandin synthesis

B. Histamine release

C. Antibody production

D. Neutrophil activation

E. Complement activation

Correct Answer: A

125. Which of the following is NOT a function of the Golgi apparatus?

A. Protein modification

B. Protein sorting

C. Lipid synthesis

D. Vesicle formation

E. ATP production

Correct Answer: E

126. What is the role of the protein collagen IV in basement membranes?

A. Tensile strength

B. Elasticity

C. Structural support

D. Cell signaling

E. Filtration

Correct Answer: C

127. Which of the following best describes the function of the enzyme carnitine palmitoyltransferase I (CPT I) in metabolism?

A. Glycolysis regulation

B. Fatty acid oxidation

C. Amino acid synthesis

D. Ketone body production

E. Gluconeogenesis

Correct Answer: B

128. What is the primary function of the enzyme glutathione peroxidase?

A. Protein degradation

B. Lipid synthesis

C. Carbohydrate metabolism

D. Antioxidant defense

E. DNA methylation

Correct Answer: D

129. Which of the following is the correct sequence of events in the complement cascade?

A. C3 activation, C5 activation, membrane attack complex formation

B. C1 activation, C4 activation, C2 activation

C. Membrane attack complex formation, C3 activation, C5 activation

D. C5 activation, C3 activation, C1 activation

E. C4 activation, C2 activation, C3 activation

Correct Answer: B

130. What is the role of the protein occludin in epithelial tissues?

A. Cell adhesion

B. Tight junction formation

C. Ion transport

D. Hormone secretion

E. Cell division

Correct Answer: B

131. Which of the following is NOT a function of the parathyroid hormone?

A. Increasing bone resorption

B. Increasing calcium reabsorption in kidneys

C. Decreasing phosphate reabsorption in kidneys

D. Increasing calcium absorption in intestines

E. Decreasing calcium levels in blood

Correct Answer: E

132. What is the primary function of the enzyme pyruvate carboxylase in metabolism?

A. Glycolysis

B. Gluconeogenesis

C. Fatty acid synthesis

D. Amino acid degradation

E. Ketone body formation

Correct Answer: B

133. Which of the following best describes the function of the protein dystrophin in muscle cells?

A. Contractile force generation

B. Energy production

C. Calcium sequestration

D. Structural support and membrane stability

E. Neurotransmitter receptor

Correct Answer: D

134. What is the role of the enzyme topoisomerase II in DNA replication?

A. Primer synthesis

B. Template unwinding

C. Okazaki fragment joining

D. Relieving DNA supercoiling

E. Telomere maintenance

Correct Answer: D

135. Which of the following is the primary site of erythropoietin production in adults?

A. Liver

B. Spleen

C. Kidney

D. Bone marrow

E. Lungs

Correct Answer: C

136. What is the function of the enzyme choline acetyltransferase in neurotransmission?

A. Acetylcholine synthesis

B. Acetylcholine degradation

C. Dopamine synthesis

D. Serotonin synthesis

E. GABA synthesis

Correct Answer: A

137. Which of the following best describes the function of the protein clathrin in cellular processes?

A. DNA replication

B. Protein synthesis

C. Endocytosis

D. ATP production

E. Cell adhesion

Correct Answer: C

138. What is the primary role of the enzyme lipoprotein lipase in lipid metabolism?

A. Cholesterol synthesis

B. Triglyceride hydrolysis

C. Phospholipid formation

D. Fatty acid oxidation

E. Ketone body production

Correct Answer: B

139. Which of the following is NOT a function of the thymus gland?

A. T cell maturation

B. Negative selection of self-reactive T cells

C. Production of thymosin

D. B cell maturation

E. Positive selection of functional T cells

Correct Answer: D

140. What is the role of the protein spectrin in red blood cells?

A. Oxygen transport

B. Cell membrane stability

C. Hemoglobin synthesis

D. Carbon dioxide transport

E. Iron storage

Correct Answer: B

141. Which of the following best describes the function of the enzyme renin in the kidney?

A. Sodium reabsorption

B. Potassium secretion

C. Angiotensinogen cleavage

D. Aldosterone production

E. Urea excretion

Correct Answer: C

142. What is the primary function of the enzyme hexokinase in glucose metabolism?

A. Glucose phosphorylation

B. Glucose isomerization

C. Glucose oxidation

D. Glucose transport

E. Glycogen synthesis

Correct Answer: A

143. Which of the following is the correct order of the phases of mitosis?

A. Prophase, Metaphase, Anaphase, Telophase

B. Metaphase, Anaphase, Telophase, Prophase

C. Anaphase, Telophase, Prophase, Metaphase

D. Telophase, Prophase, Metaphase, Anaphase

E. Prophase, Anaphase, Metaphase, Telophase

Correct Answer: A

144. What is the role of the protein calmodulin in cellular processes?

A. DNA repair

B. Protein degradation

C. Calcium-mediated signaling

D. Lipid synthesis

E. RNA splicing

Correct Answer: C

145. Which of the following is NOT a function of the liver?

A. Bile production

B. Glycogen storage

C. Plasma protein synthesis

D. Hematopoiesis in adults

E. Drug detoxification

Correct Answer: D

146. What is the primary function of the enzyme catalase in cellular metabolism?

A. Protein degradation

B. Lipid synthesis

C. Carbohydrate metabolism

D. Hydrogen peroxide decomposition

E. DNA repair

Correct Answer: D

147. Which of the following best describes the function of the protein fibrinogen in blood?

A. Oxygen transport

B. Immune defense

C. Blood clotting

D. pH regulation

E. Hormone transport

Correct Answer: C

148. What is the role of the enzyme DNA ligase in DNA replication?

A. Primer synthesis

B. Template unwinding

C. Okazaki fragment joining

D. Proofreading

E. Telomere maintenance

Correct Answer: C

149. Which of the following is the primary site of vitamin B12 absorption?

A. Stomach

B. Duodenum

C. Jejunum

D. Ileum

E. Colon

Correct Answer: D

150. What is the function of the enzyme aminoacyl-tRNA synthetase in protein synthesis?

A. mRNA transcription

B. tRNA activation

C. Peptide bond formation

D. Ribosome assembly

E. Protein folding

Correct Answer: B

151. Which of the following best describes the function of the Schwann cells in the peripheral nervous system?

A. Neurotransmitter production

B. Myelin sheath formation

C. Neuron cell body support

D. Synaptic transmission

E. Cerebrospinal fluid production

Correct Answer: B

152. What is the primary role of the protein fibronectin in the extracellular matrix?

A. Structural support

B. Cell adhesion

C. Enzyme catalysis

D. Hormone signaling

E. Ion transport

Correct Answer: B

153. Which of the following is NOT a function of the spleen?

A. Blood filtration

B. Platelet storage

C. Lymphocyte production

D. Hematopoiesis in adults

E. Removal of old erythrocytes

Correct Answer: D

154. What is the role of the enzyme phosphofructokinase-1 in glycolysis?

A. Rate-limiting step regulation

B. Glucose phosphorylation

C. Pyruvate formation

D. ATP production

E. NADH generation

Correct Answer: A

155. Which of the following best describes the function of the juxtaglomerular cells in the kidney?

A. Urine concentration

B. Renin secretion

C. Erythropoietin production

D. Vitamin D activation

E. Glucose reabsorption

Correct Answer: B

156. What is the primary function of the enzyme chymotrypsin in the small intestine?

A. Carbohydrate digestion

B. Lipid emulsification

C. Protein digestion

D. Nucleic acid breakdown

E. Mineral absorption

Correct Answer: C

157. Which of the following is the correct sequence of events in neurotransmitter release at a synapse?

A. Vesicle fusion, calcium influx, neurotransmitter diffusion

B. Calcium influx, vesicle fusion, neurotransmitter diffusion

C. Neurotransmitter diffusion, calcium influx, vesicle fusion

D. Vesicle fusion, neurotransmitter diffusion, calcium influx

E. Calcium influx, neurotransmitter diffusion, vesicle fusion

Correct Answer: B

158. What is the role of the protein elastin in connective tissue?

A. Strength

B. Elasticity

C. Lubrication

D. Mineralization

E. Immune defense

Correct Answer: B

159. Which of the following is the primary function of the enzyme carbonic anhydrase in red blood cells?

A. Oxygen transport

B. Carbon dioxide transport

C. Hemoglobin synthesis

D. Iron metabolism

E. Cell membrane stability

Correct Answer: B

160. What is the main role of the protein albumin in blood?

A. Oxygen transport

B. Immune defense

C. Blood clotting

D. Maintaining oncotic pressure

E. Hormone transport

Correct Answer: D

161. Which of the following best describes the function of the Paneth cells in the small intestine?

A. Hormone secretion

B. Nutrient absorption

C. Antimicrobial peptide secretion

D. Mucus production

E. Peristalsis regulation

Correct Answer: C

162. What is the primary function of the enzyme sucrase in the small intestine?

A. Protein digestion

B. Fat emulsification

C. Starch breakdown

D. Sucrose hydrolysis

E. Nucleotide absorption

Correct Answer: D

163. Which of the following is NOT a function of the hypothalamus?

A. Body temperature regulation

B. Hunger and thirst control

C. Sleep-wake cycle regulation

D. Long-term memory formation

E. Endocrine system regulation

Correct Answer: D

164. What is the role of the protein kinase C in cell signaling?

A. DNA repair

B. Protein phosphorylation

C. mRNA splicing

D. Lipid synthesis

E. Ion channel formation

Correct Answer: B

165. Which of the following is the primary site of leptin production?

A. Hypothalamus

B. Pancreas

C. Liver

D. Adipose tissue

E. Skeletal muscle

Correct Answer: D

166. What is the function of the enzyme delta-aminolevulinic acid synthase in heme synthesis?

A. Iron incorporation

B. Porphyrin ring formation

C. Globin chain synthesis

D. Heme degradation

E. Bilirubin conjugation

Correct Answer: B

167. Which of the following best describes the function of the spiral organ of Corti?

A. Balance maintenance

B. Sound transduction

C. Olfactory sensation

D. Visual processing

E. Taste perception

Correct Answer: B

168. What is the primary role of the protein clathrin in cellular processes?

A. DNA replication

B. Protein synthesis

C. Endocytosis

D. ATP production

E. Cell adhesion

Correct Answer: C

169. Which of the following is NOT a function of the gallbladder?

A. Bile storage

B. Bile concentration

C. Cholesterol synthesis

D. Bile release

E. Mucus secretion

Correct Answer: C

170. What is the function of the enzyme pyruvate dehydrogenase in metabolism?

A. Glycolysis regulation

B. Fatty acid synthesis

C. Amino acid degradation

D. Linking glycolysis to the citric acid cycle

E. Gluconeogenesis

Correct Answer: D