Note: Answer all the following questions **(150 M)**

Candidate Name:
Candidate Signture :

Choose the correct answer:

1. **Which hormone is classified chemically as an amine hormone but functionally behaves like a steroid hormone?**
   A. Epinephrine B. Norepinephrine C. Thyroxine (T4) D. Insulin
2. **Which group of hormones primarily uses intracellular receptors?**
   A. Peptide hormones and glycoproteins B. Catecholamines and peptides
   C. Steroid hormones, thyroxine, and vitamin D3 D. Prostaglandins and catecholamines
3. **The action of lipophilic hormones is mainly mediated through:**
   A. Activation of ion channels B. Second messenger systems C. Allosteric modulation of transcription factors D. Direct stimulation of protein synthesis in ribosomes
4. **Which of the following hormone classes typically acts through second messenger systems?**
   A. Steroid hormones B. Thyroid hormones C. Vitamin D3
   D. Peptide hormones
5. **A hormone that is water-soluble is most likely to:**
   A. Diffuse through the plasma membrane B. Bind to intracellular receptors
   C. Bind to receptors on the cell surface D. Directly interact with DNA
6. **Which statement regarding prostaglandins is correct?**
   A. They are hydrophilic hormones B. They bind intracellular receptors
   C. They are lipophilic hormones with plasma membrane receptors
   D. They act directly on DNA.
7. **The "first messenger" in hormone signaling refers to:**
   A. cAMP B. Calcium ions C. The hormone itself D. Protein kinase A
8. **The hydrophilic nature of peptide hormones is mainly due to:**
   A. Cholesterol groups B. Numerous polar groups C. Lipid side chains
   D. Steroid nuclei
9. **The transmembrane domain of many hormone receptors typically crosses the membrane:**
   A. Once B. Three times C. Five times D. Seven times
10. **In a typical plasma membrane receptor, the C-terminal region projects into the:**
    A. Extracellular space B. Nucleus C. Cytosol D. Golgi apparatus

11. Which combination consists entirely of hormones that generally bind cell-surface receptors?

A. Cortisol, thyroxine, vitamin D3 B. Insulin, catecholamines, glycoproteins
C. Testosterone, cortisol, aldosterone D. Thyroxine, prostaglandins, cortisol

12. Intracellular hormone receptors are generally composed of:

A. Multiple membrane-spanning polypeptides B. A single polypeptide chain containing a DNA-binding domain C. Two identical subunits connected by disulfide bonds D. A catalytic kinase and a regulatory subunit

13. Which hormone-receptor pair is correctly matched?

A. Insulin — Nuclear receptor B. Cortisol — Cytoplasmic/nuclear receptor
C. Epinephrine — Intracellular receptor D. Glucagon — Nuclear receptor

14. Which of the following is a major function of hormones?

A. Production of antibodies B. Regulation of metabolic processes C. Formation of red blood cells only D. Digestion of proteins

15. Protein hormones differ from steroid hormones because protein hormones:

A. Are derived from cholesterol B. Can diffuse through cell membranes
C. Are composed of amino acids joined by peptide bonds D. Require protein transporters in blood

16. Steroid hormones are transported in the blood mainly:

A. Attached to protein transporters B. Bound to DNA
C. As secondary messengers D. Through exocytosis

17. Which event occurs first in the general hormone action pathway?

A. Hormone reaches target cells B. Hormone diffuses into capillaries
C. Hormone synthesis by an endocrine gland D. Hormone binds receptors

18. Insulin increases glucose entry into muscle cells primarily by:

A. Stimulating DNA replication B. Increasing cell membrane permeability to glucose C. Increasing melanin production
D. Activating cortisol secretion

19. Which molecule is considered the most common secondary messenger?

A. ATP B. DNA C. cAMP D. RNA

20. Up-regulation refers to:

A. Decreased hormone secretion B. Increased receptor production due to hormone deficiency C. Increased hormone degradation
D. Decreased receptor sensitivity

21. Which hormone requires a membrane receptor and cAMP as a second messenger?

A. Testosterone B. Cortisol C. Aldosterone D. Growth hormone

22. Which hormone is considered a tropic hormone?

A. ACTH B. ADH C. Oxytocin D. Calcitonin

23.Antidiuretic hormone (ADH) primarily functions to:
A. Increase blood glucose levels B. Stimulate ovulation C. Promote water reabsorption in kidneys D. Increase calcium absorption

24.Epinephrine and norepinephrine are secreted by:
A. Thyroid follicles B. Adrenal cortex C. Adrenal medulla
D. Pancreatic islets

25.The anterior pituitary is connected functionally to the hypothalamus mainly through:
A. Nerve fibers only B. Blood vessels carrying releasing hormones
C. Lymphatic vessels D. Direct diffusion

26.Calcitonin primarily:
A. Raises blood calcium levels B. Lowers blood calcium levels
C. Raises blood glucose levels D. Increases blood pressure

27.Parathyroid hormone (PTH) causes:
A. Decreased blood calcium B. Increased blood calcium C. Increased blood glucose D. Decreased sodium

28.Estrogen is secreted mainly by:
A. Corpus luteum B. Follicular cells of the ovary C. Leydig cells
D. Adrenal medulla

29.Progesterone is primarily secreted by:
A. Follicular cells B. Thyroid follicles C. Corpus luteum
D. Alpha cells

30.A hormone that enters the nucleus and directly influences mRNA synthesis is most likely:
A. Insulin B. Glucagon C. Cortisol D. Epinephrine

31.A patient has a hormone deficiency that causes target cells to increase receptor numbers on their membranes. This adaptation is known as:
A. Negative feedback B. Down-regulation C. Up-regulation
D. Hormonal inhibition

32.A hormone secreted by one endocrine gland that stimulates another endocrine gland is called:
A. Local hormone B. Tropic hormone C. Steroid hormone
D. Paracrine hormone

33.Which pancreatic cells secrete insulin?
A. Alpha cells B. Beta cells C. Delta cells D. Acinar cells

34.Which pancreatic cells secrete glucagon?
A. Alpha cells B. Beta cells C. Delta cells D. Acinar cells

35.The endocrine portion of the pancreas consists of:
A. Acini B. Pancreatic ducts C. Islets of Langerhans D. Hepatocytes

36.The high-pressure distribution circuit in the cardiovascular system is:
A. the main arteries and their branches B. the main veins and their branches C. elastic tissues D. the lymphatic system

37.The fetus receives oxygenated blood from the placenta via:
A. the ductus arteriosus B.the foramen ovale C. the ductus venosus D.the capillaries

38.A decrease in renal blood flow leads to:
A. inhibition of intrarenal baroreceptors with the release of the renin-angiotensin system B. stimulation of intrarenal baroreceptors and no release of the renin-angiotensin system C. stimulation of intrarenal baroreceptors with the release of the renin-angiotensin system D. inhibition of intrarenal baroreceptors and no release of the renin-angiotensin system

39.The placental circulation is
A. high-resistance, high-flow system B. low-resistance, low-flow system C. low-resistance, high-flow system D. high-resistance, low-flow system

40.Which of the following substances dilates blood vessels and regulates blood pressure? These are:
A. catecholamines B. nitric oxide C. endothelin D. calcitonin.

41. The foramen ovale is functionally closed as a result of:
A. increased left atrial pressure and size B. increased right atrial pressure and size C. increased ventricular pressure D. decreased atrial pressure

42.Blood volume can be controlled by volume sensors such as:
A. Low-pressure receptors - Venous lateral dilation receptors B. Cardiopulmonary receptors C. Carotid receptors D. Pulmonary receptors

43.Rapid blood loss of one liter leads to:
A. Decreased venous return and decreased cardiac output B.Inhibition of the immediate-pressure receptor reflex C.Increased receptor discharge rates in the carotid sinus D. Increased venous return and cardiac output

44.Decreased blood flow to the aorta and carotid bodies with decreased oxygenation in peripheral chemoreceptor tissues leads to:
A. Hyperventilation B. Dyspnea C.Rapid and shallow breathing D. Apnea

45.Pulse pressure increases with age due to:
A. Decreased compliance in venous vessels B.Decreased compliance in capillaries C. Decreased compliance in arteries D. Decreased compliance in both venous and arterial vessels

46.The percentage of blood distributed to the heart in the systemic circulation is:
A. 12% B. 18% C. 15% D. 8%

47.One of the humoral mechanisms for regulating renal sodium excretion into extracellular fluid volume is:
A. Prostaglandins B.The kinin-kallikrin system C. Vasopressin D. All of the above

48.The cardiomedullary center reduces:
A. Sympathetic nervous system activity B. Parasympathetic nervous system activity C. Myocardial activity D. Arterial muscle activity

49.Arterial blood pressure is related to cardiac output and total peripheral resistance through
A. arterial diameter and blood viscosity B. capillary diameter C. arteriole and arterial diameter and blood viscosity D. blood viscosity only

50.Which of the following are local neurotransmitters that affect arterial diameter?
A.Nitric oxide B. Angiotensin-aldosterone C. Renin D. Aldosterone

51.Pulse pressure equals
A.systolic pressure plus diastolic pressure B. systolic pressure minus diastolic pressure C.systolic pressure multiplied by diastolic pressure D. systolic pressure divided by diastolic pressure

52.Hypertension under physiological conditions
A.increases the spark rate B. decreases the spark rate C. does not affect the spark rate D. inhibits baroreceptors in the carotid sinus

53.The strongest known vasoconstrictor is
A.renin B.angiotensin C.endothelin D. Nitric oxide

54.Direct methods for measuring blood pressure:
A.Auscultation B. Insertion of a catheter into the artery
C.Renin-angiotensin system D.Oscillation method

55.Cardiac output depends on:
A.peripheral resistance B. heart rate C. blood fluidity D. nervous pressure

56.Terminal ventricular diastolic volume depends on:
A.filling volume and factors that inhibit lumen expansion B. ventricular wall thinness C. atrial wall thickness D. viscosity

57.One of the cardiac reserve mechanisms that primarily increases cardiac output is:
A.an increase in heart rate B. an increase in stroke volume C. redistribution of cardiac output with differential organ perfusion D. all of the above

58.One of the functions of blood plasma proteins is to maintain colloidal osmotic pressure across capillary walls at approximately:
A.30 mmHg B. 35 mmHg C. 25 mmHg D. 20 mmHg

59.The percentage of lymphocytes in the total number of white blood cells is:
A. 63% B. 4% C. 30% D. 2%

60.The average number of platelets in one milliliter of blood is estimated to be approximately:
A.50,000/cm³ blood B. 250,000/cm³ blood C. 500,000/cm³ blood D.600,000/cm³ blood

61.Which of the following are hormone-binding proteins in the blood?
A. Albumins B. Globulins C. Lipoproteins D. Ceruloplasmin

62.Which of the following are metal-binding proteins in the blood?
A. Transferrin B. Gamma globulin C. Macroglobulin D. C- Reactive protein

63.C- Reactive protein functions to:
A. Bind to the polysaccharides of bacteria, fungi, and parasites B. Activate complement C. Act as a marker to facilitate phagocytosis D. All of the above

64.Cytokines are glycoproteins that act on:
A. Cell proliferation B. Immunity and inflammation C. Regulate the amplitude and duration of the systemic inflammatory response D. All of the above

65.Interleukins 1-13 are classified as:
A.Globulins B. Cytokines C. Albumins D. Chemokines

66.The lipoproteins that transport dietary triglycerides in the blood are:
A.VLDL B. LDL C. Chylomicron D. HDL

67.Hemoglobin is composed of four polypeptide chains of the following types:
A.Alpha and gamma B. Beta and gamma C. Gamma only D. Alpha and Beta

68.The type of iron found in the hemoglobin molecule is:
A.Ferrous B. Ferric C. Histidine D. Not one of the three types mentioned above

69.Factors that affect the binding of oxygen to hemoglobin include:
A.Temperature B. Acidity C. DPG2,3 D. All of these factors

70.Blood pressures differ in the four chambers of the heart depending on:
A. The size of each chamber B. The thickness of the walls of each chamber

C. The difference in the type of valves between them D. The difference in the transmission time

71. The resting membrane potential of most neurons is primarily determined by:

A. Sodium equilibrium potential B. Calcium equilibrium potential
C. Potassium permeability of the membrane D. Chloride transport only

72. Saltatory conduction occurs because:

A. Action potentials are generated only at the soma B. Myelin increases membrane capacitance C. Action potentials jump between nodes of Ranvier D. Sodium channels are absent in myelinated fibers

73. The neurotransmitter released by most postganglionic sympathetic neurons is:

A.Acetylcholine B.Norepinephrine C. Dopamine D. Serotonin

74. Which ion is mainly responsible for the depolarization phase of a neuronal action potential?

A. K^+ B. Cl^- C. Na^+ D. Ca^{2+}

75. The principal inhibitory neurotransmitter in the adult central nervous system is:

A. Glutamate B. Aspartate C. Glycine D. GABA

76. A lesion of the cerebellum is most likely to cause:

A. Paralysis B. Ataxia C. Hyperalgesia D. Aphasia

77. The threshold for generation of an action potential is reached when:

A. Potassium channels close completely B. Membrane depolarization activates sufficient voltage-gated Na^+ channels C. Chloride conductance increases D. Calcium leaves the cell

78. Which structure is the primary relay station for sensory information reaching the cerebral cortex?

A. Hypothalamus B. Medulla oblongata C. Thalamus D. Basal ganglia

79. During the absolute refractory period:

A. A stronger stimulus can initiate another action potential B. No action potential can be generated regardless of stimulus strength C. Potassium channels are closed D. Membrane potential is at rest

80. The autonomic center primarily responsible for regulation of cardiovascular reflexes is located in the:

A.Cerebellum B. Medulla oblongata C. Frontal cortex D. Hippocampus

81. Which receptor is responsible for detecting muscle stretch?

A. Golgi tendon organ B. Pacinian corpuscle
C. Muscle spindle D. Merkel receptor

82. Long-term potentiation (LTP), a mechanism involved in learning and memory, is strongly associated with activation of:

A. Nicotinic receptors B. NMDA receptors C. GABA-A receptors D. Glycine receptors

83.The neurotransmitter released at the neuromuscular junction is:

A. Acetylcholine B. Norepinephrine C. Dopamine D. Glutamate

84.Which division of the autonomic nervous system is primarily responsible for "fight-or-flight" responses?

A. Parasympathetic B. Enteric C. Sympathetic D. Somatic

85.The Golgi tendon organ primarily functions to monitor:

A. Muscle length B. Joint position C. Muscle tension D. Skin pressure

86.The anterior pituitary hormone that directly stimulates ovulation is:

A. FSH B. Prolactin C. LH D. Oxytocin

87.Testosterone is primarily produced by:

A. Sertoli cells B. Leydig cells C. Spermatogonia D. Epididymal cells

88.The hormone responsible for maintenance of the corpus luteum during early pregnancy is:

A. FSH B. Estrogen C. hCG D. Relaxin

89.Spermatogenesis occurs within the:

A. Epididymis B. Seminiferous tubules C. Vas deferens D. Prostate gland

90.Which cells provide nutritional and structural support to developing sperm cells?

A. Leydig cells B. Theca cells C. Granulosa cells D. Sertoli cells

91.The surge of LH during the ovarian cycle is primarily triggered by:

A. Progesterone negative feedback B. Positive feedback of estrogen on the hypothalamic-pituitary axis C. Decreased GnRH secretion D. Increased inhibin secretion

92.Inhibin primarily acts to suppress secretion of:

A. LH B. ACTH C. FSH D. TSH

93.Capacitation of spermatozoa normally occurs in the:

A. Testis B. Epididymis C. Female reproductive tract D. Seminal vesicle

94.Which hormone is primarily responsible for development of the male internal genital ducts during fetal life?

A. Testosterone B. Estrogen C. Progesterone D. Oxytocin

95.The major source of progesterone during the luteal phase is the:

A. Developing follicle B. Corpus luteum C. Anterior pituitary D. Placenta

96. The blood-testis barrier is formed mainly by:

A. Leydig cells B. Spermatids C. Sertoli cells D. Peritubular cells

97. Which hormone stimulates milk ejection (let-down reflex)?

A. Prolactin B. Oxytocin C. Estrogen D. Progesterone

98. The acrosomal reaction is essential for:

A. Sperm maturation B. Testosterone synthesis C. Penetration of the zona pellucida D. Sperm transport in the epididymis

99. Which stage of the ovarian cycle immediately follows ovulation?

A. Follicular phase B. Menstrual phase C. Luteal phase D. Proestrus

100. The principal physiological role of FSH in males is to:

A. Stimulate testosterone secretion directly B. Promote spermatogenesis through Sertoli cells C. Stimulate ejaculation D. Increase seminal fluid production

101. hormone is secreted by pancreatic α-cells?

A. Insulin B. Glucagon C. Cortisol D. Growth hormone

102. Enzymes accelerate reactions by:

A.Increasing ΔG B. Lowering activation energy C. Changing reaction products D. Increasing equilibrium constant

103. Which hormone stimulates gluconeogenesis in the liver?

A. Insulin B. Glucagon C. Calcitonin D. Oxytocin

104. An enzyme with sigmoidal kinetics is usually:

A. Allosteric B. Irreversible C. Denatured D. Inactive

105. The major storage form of glucose in animals is:

A. Starch B. Cellulose C. Glycogen D. Lactose

106. Which of the following is considered a coenzyme?

A. Mg^{2+} B.Zn^{2+} C. NAD^{+} D. Ca^{2+}

107. During fasting, blood glucose is initially maintained mainly by:

A.Glycogenolysis B.Lipogenesis C. Ketogenesis D. Protein synthesis

108. Which type of inhibition cannot be overcome by increasing substrate concentration?

A. Competitive inhibition B. Noncompetitive inhibition
C. Reversible inhibition D. Product inhibition

109. The liver responds strongly to glucagon because:

A. It contains glucagon receptors B.It stores insulin C. It lacks glycogen
D. It produces glucagon

110. Enzyme specificity is mainly due to:
A. Substrate concentration B.Active-site structure C. Product formation D.Temperature

111. Which hormone promotes glucose uptake in adipose tissue?
A. Glucagon B. Epinephrine C. Insulin D. Cortisol

112. The binding of substrate to an enzyme often follows the:
A. Lock-and-key or induced-fit model B. Osmosis model C. Fluid mosaic model D. Operon model

113. Which metabolic pathway is inhibited by insulin?
A. Glycolysis B. Glycogen synthesis C. Gluconeogenesis D. Glucose uptake

114. A prosthetic group is:
A. A loosely bound coenzyme B. A tightly bound cofactor C. A hormone receptor D. A substrate analog

115. Which hormone level rises after a protein-rich meal?
A. Glucagon B. Calcitonin C. Thyroxine D. Aldosterone

116. Enzyme denaturation most directly affects:
A. Primary structure only B. Active-site conformation C. Peptide bond formation D. Amino acid sequence

117. Which hormone activates hormone-sensitive lipase in adipose tissue?
A. Insulin B. Glucagon C. Growth hormone only D. Calcitonin

118. Reversible phosphorylation is a common mechanism for:
A. Hormonal regulation of enzymes B. DNA replication C. Protein digestion D. RNA synthesis

119. Which organ is the major target of insulin for glycogen synthesis?
A. Lung B. Spleen C. Liver D. Skin

120. The main purpose of metabolic regulation is to:
A. Increase body temperature only B. Maintain energy homeostasis
C. Stop enzyme activity D. Eliminate hormones

121. Pharmacokinetics is:
A. The study of biological and therapeutic effects of drugs B. The study of absorption, distribution, metabolism and excretion of drugs
C. The study of mechanisms of drug action D. The study of methods of new drug development

122. A hydrophilic medicinal agent has the following property:

A. Low ability to penetrate through the cell membrane lipids B. Penetrate through membranes by means of endocytosis C. Easy permeation through the blood-brain barrier D. High reabsorption in renal tubules

123. What is implied by «active transport»?

A. Transport of drugs trough a membrane by means of diffusion B. Transport without energy consumption C. Engulf of drug by a cell membrane with a new vesicle formation D. Transport against concentration gradient

124. What does the term "bioavailability" mean?

A. Plasma protein binding degree of substance B. Permeability through the brain-blood barrier C. Fraction of an uncharged drug reaching the systemic circulation following any route administration D. Amount of a substance in urine relative to the initial doze

125. What is characteristic of the oral route?

A. Fast onset of effect B. Absorption depends on GI tract secretion and motor function C. A drug reaches the blood passing the liver
D. The sterilization of medicinal forms is obligatory

126. The volume of distribution (Vd) relates:

A.Single to a daily dose of an administrated drug B.An administrated dose to a body weight C.An uncharged drug reaching the systemic circulation D.The amount of a drug in the body to the concentration of a drug in plasma

127. Conjugation is:

A. Process of drug reduction by special enzymes B. Process of drug oxidation by special oxidases C. Coupling of a drug with an endogenous substrate
D. Solubilization in lipids

128. Half life (t ½) doesn't depend on:

A. Biotransformation B. Time of drug absorption C. Concentration of a drug in plasma D. Rate of drug elimination

129. Elimination is expressed as follows:

A.Rate of renal tubular reabsorption B.Clearance speed of some volume of blood from substance C.Time required to decrease the amount of drug in plasma by one-half D.Clearance of an organism from a xenobiotic

130. Elimination rate constant (Kelim) is defined by the following parameter:

A.Rate of absorption B. Maximal concentration of a substance in plasma
C. Highest single dose D. Half life (t ½)

131. Systemic clearance (CLs) is related with:

A.Only the concentration of substances in plasma B.Only the elimination rate constant C.Volume of distribution, half life and elimination rate constant
D.Bioavailability and half life

132. Biotransformation of drugs is primarily directed to

A.Activate the drug B.Inactivate the drug C.Convert lipid soluble drugs into nonlipid soluble metabolites D.Convert nonlipid soluble drugs into lipid soluble metabolites

133. Redistribution is a feature of:

A.Highly plasma protein bound drugs B.Depot preparations
C.Poorly lipid soluble drugs D.Highly lipid soluble drugs

134. The most important factor which governs diffusion of drugs across capillaries other than those in the brain is

A.Blood flow through the capillary B.Lipid solubility of the drug
C.pKa value of the drug D.pH of the medium

135. Which of the following drug metabolizing reactions is entirely nonmicrosomal

A.Glucuronide conjugation B. Acetylation C. Oxidation D. Reduction

136. Receptor downregulation occurs with:

A.Chronic agonist exposure B. Acute antagonist exposure
C. Acute overdose only D. Enzyme inhibition

137. The therapeutic index is:

A. ED50/LD50 B. LD50/ED50 C. Emax/ED50
D. Clearance/Volume

138. Which receptor is intracellular?

A. Insulin receptor B. Steroid receptor C. Muscarinic receptor
D. Adrenergic receptor

139. First-pass metabolism occurs in:

A. Kidney B. Liver C. Brain D. Lungs

140. Which decreases drug absorption?

A. High lipid solubility B. High blood flow C. GI motility decreases
D. Poor lipid solubility

141. Antagonist effect is:

A. Activation of receptor B. Blockade of receptor C. Enzyme activation
D. Gene expression increase

142. The affinity of a drug refers to:

A. Ability to produce effect B. Strength of binding to receptor
C. Toxicity level D. Clearance rate

143. Which statement is true about agonists?

A. They only bind but do not activate B. They always block receptors
C. They bind and activate receptors D. They destroy receptors

144. Drug receptor interaction is mainly governed by:

A. Covalent binding B. Ionic, hydrogen, hydrophobic bonds C. DNA replication D. Enzyme degradation

145. Which drug has the highest efficacy?

A. Partial agonist B. Full agonist C. Antagonist D. Inverse agonist

146. Which is NOT a phase II reaction?

A. Glucuronidation B. Acetylation C. Hydrolysis D. Methylation

147. Clearance of drug is defined as:

A. Amount of drug absorbed B. Volume of plasma cleared per unit time
C. Drug toxicity D. Bioavailability

148. First order kinetics means:

A. Constant amount eliminated B. Constant fraction eliminated
C. No elimination D. Saturation

149. Which of the following receptors is an example of a ligand-gated ion channel?

A. β_1-Adrenergic receptor B. Insulin receptor C. Nicotinic acetylcholine receptor D. Glucocorticoid receptor

150. The concentration of a drug producing 50% of its maximal effect is known as:

A. LD_{50} B. TD_{50} C. EC_{50} D. ED_{90}

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