

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

單選題 (50題，每題2分，共100分):

(1) Homeostasis refers to

- A. The unwavering control of a physiological set point
- B. Maintaining a stable internal environment
- C. Maintaining a stable external environment
- D. Both the unwavering control of a physiological set point and maintaining a stable internal environment are correct
- E. Both the unwavering control of a physiological set point and maintaining a stable external environment are correct

(2) Which of the following is not true of a polar chemical bond?

- A. It is covalent
- B. It is ionized
- C. It has opposite electrical charge at each end
- D. It has no net electrical charge
- E. None of the choices are false

(3) Protein conformation is

- A. Independent of the sequence of subunits forming the protein
- B. Dependent upon a combination of covalent and noncovalent bonds
- C. Affected by interactions with water molecules
- D. Independent of the sequence of subunits forming the protein and affected by interactions with water molecules
- E. Dependent upon a combination of covalent and noncovalent bonds and affected by interactions with water molecules

(4) Which of the following is a feature that distinguishes primary active transport from facilitated diffusion?

- A. Saturability
- B. Requirement for a carrier molecule
- C. Specificity
- D. Presence of a transport maximum
- E. Requirement for metabolic energy

(5) Which of the following statements about the Na, K pump is false?

- A. It transports Na^+ out of cells and K^+ into cells
- B. It binds to and hydrolyzes ATP
- C. It is constantly active in all cells
- D. Its activity requires the expenditure of metabolic energy
- E. It transports Na^+ and K^+ in a 1:1 ratio

(6) The hormones secreted by the posterior pituitary include

- A. Vasopressin
- B. Corticotropin
- C. Oxytocin
- D. Vasopressin and corticotropin
- E. Vasopressin and oxytocin

(7) What is the major function of oxytocin ?

- A. Tropic for the adrenal cortex
- B. Is controlled by an amine-derived hormone of the hypothalamus
- C. Stimulation of uterine contraction during labor
- D. Stimulation of testosterone production
- E. Antidiuresis

(8) The concentration of a hormone in plasma is determined by

- A. Its secretion and clearance rates
- B. Whether or not it binds to carriers and/or other plasma proteins
- C. The kind of receptor to which it binds
- D. Its secretion and clearance rates and whether or not it binds to carriers and/or other plasma proteins
- E. Whether or not it binds to carriers and/or other plasma proteins and the kind of receptor to which it binds

(9) At very low concentrations, epinephrine causes an artery to vasodilate. At higher concentrations epinephrine causes the same artery to constrict. How can these different effects be explained?

- A. There is one type of epinephrine receptor that uses two second messenger systems
- B. There are two types of epinephrine receptors with different affinities for epinephrine that use two different second messenger systems
- C. There are two types of receptors for epinephrine that use the same second messenger system
- D. At higher concentrations epinephrine can pass through the plasma membrane and directly stimulate contraction within the cell

(10) Which is not true of myelin?

- A. Is a fatty membranous sheath
- B. Is formed by glial cells
- C. Influences the rate of conduction of the electrical signal down an axon
- D. Myelin covers all parts of the neuron: axon, cell body and dendrites
- E. None of the choices are true

(11) When an axon is stimulated to threshold, the voltage-gated

- A. K^+ channels open before the voltage-gated Na^+ channels
- B. Na^+ channels are activated and then inactivated
- C. K^+ channels open at the same time as the voltage-gated Na^+ channels
- D. K^+ channels are opened when Na^+ binds to the channel
- E. All of the choices are correct

(12) The neural code that signals stimulus strength is

- A. The size of action potentials
- B. The frequency of action potentials
- C. The duration of action potentials
- D. Both the size of action potentials and the frequency of action potentials
- E. All of the choices are correct

(13) The role of calcium ion at chemical synapses is to

- A. Depolarize the axon terminal of the presynaptic cell
- B. Bind to neurotransmitter receptors on the postsynaptic cell
- C. Cause fusion of synaptic vesicles with the plasma membrane of the axon terminal
- D. Interfere with IPSPs in the postsynaptic cell
- E. All of the choices are correct

(14) The region of the brain most closely associated with homeostasis and survival of the individual is

- A. The thalamus
- B. The hippocampus
- C. The cerebrum
- D. The cerebellum
- E. The hypothalamus

(15) In _____ photoreceptors infoldings of the plasma membranes contribute to the bright light sensitivity and ability to accomplish color vision

- A. Bipolar cell
- B. Rod cell
- C. Ganglion cell
- D. Cone cell
- E. Pigment cell

(16) The ossicles in the middle ear

- A. Serve to keep the pressure on the two sides of the tympanic membrane equal
- B. Are part of the vestibular apparatus
- C. Are in direct contact with both the tympanic membrane and the round window
- D. Serve to amplify the pressure of sound vibrations from the air in the outer ear to the fluid in the inner ear
- E. Are easily damaged by loud sounds

(17) A sensory unit is

- A. All of the sensory receptors in a given area of the body that respond to the same stimulus
- B. A single receptor ending and its afferent nerve fiber
- C. A single afferent neuron and all its receptor endings
- D. An afferent neuron and its postsynaptic interneurons
- E. None of the choices are correct

(18) The plasma membranes of rod and cone cells are

- A. At their resting potential in the dark and depolarized in the light
- B. At their resting potential in the dark and hyperpolarized in the light
- C. Depolarized in the dark and hyperpolarized in the light
- D. Hyperpolarized in the dark and at their resting potential in the light
- E. Hyperpolarized in the dark and depolarized in the light

(19) The actual receptors for hearing are called

- A. Baroreceptors
- B. Nociceptors
- C. Hair cells
- D. Pacinian corpuscles
- E. Somatic receptors

(20) Receptors for the chemical senses are located in the

- A. Organ of Corti and the saccule
- B. Cochlea and lateral geniculate nucleus
- C. Skin and tendons
- D. Tongue and nose
- E. Fovea and the semicircular canals

(21) The alpha rhythm is the most prominent EEG pattern when an adult is

- A. In REM sleep
- B. In non-REM sleep
- C. Awake and relaxed with eyes close
- D. Awake and thinking hard about something

(22) Which of the following is *not* descriptive of REM sleep?

- A. It is the period when dreaming occurs
- B. It normally occurs only once per night, usually just before waking up
- C. Postural muscles are virtually paralyzed during REM sleep
- D. EEG waves that resemble the awake state can be recorded during REM sleep
- E. Eyes move rapidly back and forth beneath closed lids

(23) Drugs that are used to treat depression increase the levels of this neurotransmitter in the brain

- A. Glutamate
- B. Serotonin
- C. GABA
- D. Acetylcholine
- E. Dopamine

(24) It is believed that the EEG most likely originate from this structure in the brain

- A. Hypothalamus
- B. Cortex
- C. Basal ganglia
- D. Cerebellum
- E. Hippocampus

(25) A person with bilateral damage to the substantia nigra region of the brain will probably

- A. Be unable to speak
- B. Have difficulty understanding language
- C. Have difficulty consolidating declarative memories
- D. Develop resting tremors, rigidity, or akinesia
- E. Develop complete amnesia

(26) Golgi tendon organs

- A. Are located in the tendons joining muscle and bone
- B. Monitor the strength of muscle contractions
- C. Are associated with monosynaptic reflexes
- D. Both are located in the tendons joining muscle and bone and monitor the strength of muscle contractions are correct
- E. All of the choices are correct

(27) The cerebellum

- A. Helps to coordinate body movements
- B. Is important in maintaining posture
- C. Receives no input from sensory pathways
- D. Both helps to coordinate body movements and is important in maintaining posture are correct
- E. All of the choices are correct

(28) The corticospinal pathways

- A. Are descending motor pathways
- B. Begin in the cortex of the cerebellum
- C. Consist of many interneurons linked synaptically
- D. Both are descending motor pathways and begin in the cortex of the cerebellum are correct
- E. All of the choices are correct

(29) Which of the following statements regarding pulmonary surfactant is true?

- A. It is secreted by type I alveolar cells
- B. It increases the compliance of the lungs
- C. It decreases airway resistance
- D. Both it is secreted by type I alveolar cells and it increases the compliance of the lungs are true
- E. Both it increases the compliance of the lungs and it decreases airway resistance are true

(30) Most of the CO₂ that is transported in blood is

- A. Dissolved in the plasma
- B. Bound to hemoglobin
- C. In carbonic acid
- D. In bicarbonate ion
- E. In carbonic anhydrase

(31) During a physical examination, Joe learns that his resting tidal volume is 500 ml; his average resting respiratory rate is 12 breaths per minute; his total lung capacity is 6000 ml; and his anatomic dead space is 150 ml. Joe's resting alveolar ventilation is

- A. 72.0 L/min
- B. 6.0 L/min
- C. 4.2 L/min
- D. 1.8 L/min
- E. 0.5 L/min

(32) The affinity of hemoglobin for oxygen is decreased by

- A. Decreased H^+ ion concentration
- B. Decreased PCO_2
- C. Increased temperature
- D. Decreased diphosphoglycerate concentration
- E. Both decreased H^+ ion concentration and decreased PCO_2

(33) The juxtaglomerular apparatus is

- A. Composed of parts of the ascending limb of the loop of Henle and the efferent arteriole
- B. Composed of juxtaglomerular cells and the macula densa
- C. The site of renin secretion
- D. Composed of parts of the ascending limb of the loop of Henle and the efferent arteriole and composed of juxtaglomerular cells and the macula densa
- E. Composed of juxtaglomerular cells and the macula densa and the site of renin secretion

(34) The countercurrent multiplier system of the kidney

- A. Allows the kidneys to form hypertonic urine
- B. Requires that the collecting ducts be near the loops of Henle
- C. Requires active transport of sodium and chloride out of the ascending limb of the loop of Henle
- D. Would not function if the ascending limb of the loop of Henle were freely permeable to water
- E. Is described by all of these choice

(35) Which of the following drugs is not likely to decrease blood pressure?

- A. Drug that interferes with aldosterone synthesis
- B. Drug that is an agonist of atrial natriuretic factor
- C. Drug that decreases sympathetic stimulation of renal arterioles
- D. Drug that enhances the activity of angiotensin-converting enzyme
- E. Drug that decreases liver production of angiotensinogen

(36) A decrease in plasma calcium ion levels in an otherwise normal person will lead to

- A. An increase in plasma parathyroid hormone levels
- B. An increase in plasma 1,25-dihydroxyvitamin D3 levels
- C. An increase in nerve and muscle excitability
- D. An increase in plasma parathyroid hormone levels and an increase in plasma 1,25-dihydroxyvitamin D3 levels
- E. All of the choices are correct

(37) Spermatogenesis

- A. Begins with the mitotic division of a single spermatogonium
- B. Results in four primary spermatocytes for every spermatogonium
- C. Results in four spermatozoa for every primary spermatocyte
- D. Both begins with the mitotic division of a single spermatogonium and results in four spermatozoa for every primary spermatocyte are correct
- E. All of the choices are correct

(38) The dominant follicle

- A. Undergoes atresia
- B. Continues to develop after other antral follicles have begun to degenerate
- C. Undergoes ovulation
- D. Both undergoes atresia and undergoes ovulation are correct
- E. Both continues to develop after other antral follicles have begun to degenerate and undergoes ovulation are correct

(39) Which of the following organs can produce androgens?

- A. Testes
- B. Ovaries
- C. Adrenal cortices
- D. Both testes and ovaries are correct
- E. All of the choices are correct

(40) Beginning on the first day of the menstrual cycle, the order of events in the uterus is

- A. Proliferative, secretory, menstrual phases
- B. Secretory, proliferative, menstrual phases
- C. Menstrual, secretory, proliferative phases
- D. Menstrual, proliferative, secretory phases
- E. Secretory, menstrual, proliferative phases

(41) Oxytocin is a hormone that

- A. Is secreted by the posterior pituitary and stimulates uterine contractions
- B. Is synthesized by the hypothalamus and promotes contraction of myoepithelial cells
- C. Facilitates the birth process
- D. Both is secreted by the posterior pituitary and stimulates uterine contractions and is synthesized by the hypothalamus and promotes contraction of myoepithelial cells are correct
- E. Does all of these things

(42) Which of the following statements regarding phagocytosis is true?

- A. Macrophages are the only phagocytes in the tissues
- B. The microbe engulfed by the phagocyte is killed by lysosomal enzymes and hydrogen peroxide
- C. Phagocytosis is controlled by a negative feedback mechanism whereby phagocytes release chemicals that inhibit further phagocytosis
- D. The microbe engulfed by the phagocyte is killed by the membrane attack complex (MAC)
- E. None of these statements are true

(43) Antibodies

- A. Are secreted by plasma cells
- B. Protect against viruses by binding to them and presenting them to phagocytes
- C. Protect against viruses by binding to them and neutralizing them
- D. Activate complement
- E. Are described by all of these choices

(44) Consider as a whole, the body's capillaries have

- A. Smaller cross-sectional area than the arteries
- B. Less total blood flow than in the veins
- C. Greater total resistance than the arterioles
- D. Slower blood velocity than in the arteries
- E. Greater total blood flow than in the arteries

(45) Helper T cells

- A. Are activated by antigen presented with MHC II proteins
- B. Secrete interferon-gamma when activated
- C. Secrete perforin when activated
- D. Both are activated by antigen presented with MHC II proteins and secrete interferon-gamma when activated are correct
- E. All of the choices are correct

(46) Interferon

- A. Is a family of protein mediators
- B. Interferes with viral replication in cells
- C. Enters cells and directly affects their protein-assembly functions
- D. Both is a family of protein mediators and interferes with viral replication in cells are correct
- E. All of the choices are correct

(47) Autoimmune diseases

- A. Include multiple sclerosis and AIDS
- B. Can be treated by drugs that suppress the immune system
- C. Are diseases in which the immune system is damaged by microbes that kill leukocytes
- D. Both include multiple sclerosis and AIDS and can be treated by drugs that suppress the immune system are correct
- E. Both include multiple sclerosis and AIDS and are diseases in which the immune system is damaged by microbes that kill leukocytes are correct

(48) Dietary requirements for optimal erythrocyte production and function include

- A. Iron
- B. Vitamin B12
- C. Erythropoietin
- D. Iron and vitamin B12
- E. All of these things

(49) Movement of blood in veins is determined by

- A. The blood pressure difference between veins and atria
- B. The skeletal pump
- C. The decrease of thoracic pressure and increase of abdominal pressure due to diaphragm movement
- D. Valves in the veins
- E. All of the choices are correct

(50) Allergic reactions are the result of

- A. Inappropriate responses by the immune system to stimuli that are not antigens
- B. Mast cells and IgE activity
- C. Parasite infestation
- D. Mast cells and IgE activity and parasite infestation
- E. All of the choices are correct