

※ 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。

Part I : 50%

A. Each question below contains five suggested answers. Choose the one best response to each question. (20%)

1. Which of the following hormones acts on its target tissues by a steroid hormone mechanism of action?
 - (A) Thyroid hormone
 - (B) Insulin
 - (C) Glucagon
 - (D) Parathyroid hormone
 - (E) β 1 adrenergic agonists

2. Which of the following is correct regarding the consumption of oxygen by the kidney?
 - (A) It decreases as blood flow increases
 - (B) It remains constant as blood flow increases
 - (C) It directly reflects the level of sodium transport
 - (D) It is regulated by erythropoietin
 - (E) It is greatest in the medulla

3. Which receptor mediates slowing of the heart?
 - (A) α 1 receptors
 - (B) α 2 receptors
 - (C) β 1 receptors
 - (D) β 2 receptors
 - (E) Muscarinic receptors

4. Which of the following organs has the highest arteriovenous O_2 difference under normal resting conditions?
 - (A) Heart
 - (B) Liver
 - (C) Kidney
 - (D) Brain
 - (E) Skeletal muscle

5. What percentage of the human genome is involved in the formation and function of the nervous system?
 - (A) 20
 - (B) 40
 - (C) 60
 - (D) 80
 - (E) >100

6. A 10-year-old girl with type 1 diabetes develops a neuropathy limited to sensory neurons with free nerve endings. Quantitative sensory testing will reveal higher-than-normal thresholds for the detection of which of the following?
 - (A) Muscle length
 - (B) Temperature
 - (C) Pressure
 - (D) Fine touch
 - (E) Vibration

7. Metabolic acidosis is caused by which of the following?
 - (A) Hypoventilation
 - (B) Hypovolemia
 - (C) Hypocalcemia
 - (D) Hypoaldosteronism
 - (E) Hypokalemia

8. Which of the following substances must be further digested before it can be absorbed by specific carriers in intestinal cells?
 - (A) Fructose
 - (B) Sucrose
 - (C) Dipeptides
 - (D) Tripeptides
 - (E) Alanine

9. Which of the following substances has the highest renal clearance?
 - (A) Para-aminohippuric acid (PAH)
 - (B) Insulin
 - (C) Glucose

- (D) Na^+
- (E) Cl^-

10. Which of the following is an inhibitory neurotransmitter in the central nervous system (CNS)?

- (A) Norepinephrine
- (B) Serotonin
- (C) Histamine
- (D) γ -Aminobutyric acid
- (E) Glutamate

B. Explain the following terms. (15%)

1. Autacoids
2. Dyslipidemia
3. Schwann cell
4. Parkinson's disease
5. Renin-angiotensin system

C. Answers the following question. (15%)

The major function of the kidneys is the formation of urine.

- (a). The urine formation begins with glomerular filtration, what is a normal value of glomerular filtration rate (GFR)? How to determine GFR?
- (b). List factors which cause the decrease of GFR?

Part II : 50%

1. Please define the following terms (or processes) in respective to the transduction of nerve electrical signals. Please also describe the molecular changes related to the causation (or maintenance) of the following processes.
 - a. Action potential (2.5 points)
 - b. Resting membrane potential (2.5 points)
 - c. Depolarization (2.5 points)
 - d. Repolarization (2.5 points)

2. Please define the following terms (or describe the processes) in respective to muscle contractions in details.
 - a. Isometric contraction (2.5 points)
 - b. Isotonic contraction (2.5 points)
 - c. Sliding Filament theory (2.5 points)
 - d. Load-Velocity relation and Length-Tension relation (2.5 points)

3. Please describe the production process of hydrochloric acid (HCl) in the gastric parietal cells of stomach in respective to the activity regulation of **histamine H₂ receptors** and **muscarinic M₃ receptors** in details. Also please indicate which pathways, histamine-stimulated H₂ receptor pathway or acetylcholine-stimulated M₃ receptor pathway, plays important role in the **nocturnal HCl secretion** in human body. (15 points)

4. Please describe both the biosynthesis of **thyroid hormones (T₃ and T₄)** and how T₃ and T₄ activate the **downstream protein synthesis process** in their target cells in details. (15 points)