

**COVENANT UNIVERSITY  
NIGERIA**

*TUTORIAL KIT  
OMEGA SEMESTER*

**PROGRAMME: BIOCHEMISTRY**

**COURSE: BCH 441**

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# **BCH 441: MEMBRANE AND HORMONAL BIOCHEMISTRY**

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## SECTION 1: PROF MADUAGWU

1. Most acceptable model of membrane structure is the fluid-mosaic model, consisting of a phospholipid bilayer with proteins partially or fully embedded
2. The functions of membranes proteins are:
  - a. Cell-recognition (self vs nonself)
  - b. Transport
  - c. Receptors
  - d. Enzymes
3. Membrane function consists of:
  - a. Formation of boundaries of organelles
  - b. Site of chemical reaction (enzymes)
  - c. Regulation of passage of molecules in and out of cell i.e. **SELECTIVE PERMEABILITY**
  - d. Passive transport
  - e. Active transport
  - f. Transport of vesicles
4. On hormones, identify statements as TRUE (T) or FALSE (F)
  - a. They can be classified according to the distance over which they act (T)
  - b. They can be classified as autocrine, paracrine and endocrine (T)
  - c. Endocrine hormones act on cells close to the cell that releases them (F), act on cells distant)
  - d. Autocrine hormones act on cells distant from the site of their release (F), (act on cells that produce them)
  - e. They can be classified as protein and non-protein hormones (T)
5. On G-proteins, identify statements as TRUE (T) or FALSE (F)
  - a. They consist of three different subunits (T)
  - b. All of the subunits of G-proteins can bind to GDP or GTP (F), (It is G- $\alpha$  that binds GDP or GTP)
  - c. GTP-binding decreases G-protein affinity for activated hormone receptor while increasing its affinity for adenylyclase (T)

- d. Several types of hormones receptors may activate the same G-protein (T)
  - e. G-proteins stimulate the opening of  $K^+$  channels in heart cells (T)
6. The dynamic function of the plasma membrane known as transmembrane signaling or signal transduction, allows hormone messages to be transmitted across membranes by the association and dissociation of membrane proteins
7. On hormonally active catecholamines, identify statements as either TRUE (T) or FALSE (F)
- a. They comprise a variety of steroids (T)
  - b. They are classified as glucocorticoids, mineralocorticoids, androgens and estrogens
  - c. Impaired adrenocortical functions results in Cushing's Syndrome (F),  
(answer is Addison's disease)
  - d. Adrenocorticoid hyperfunction gives rise to Addison's disease (F),  
(answer is Cushing's Syndrome)
  - e. They are transported in the blood in complex with transcortin and some albumin
8. With respect to hormones that influence  $Ca^{2+}$  are the following statements TRUE (T) or FALSE (F)
- a. PTH inhibits collagen synthesis by osteoblasts and stimulates bone resorption by osteoblasts (T)
  - b. PTH increases rate at which the kidneys excrete phosphate, the counterion of  $Ca^{2+}$  in bone (T)
  - c. Vitamin D prevents rickets (T)
  - d. Vitamin D deficiency in children results in osteomalacia (F)
  - e. Calcitonin inhibits the synthesis of cAMP (F)

## **SECTION 2: Prepared by Wisdom O. Iyanda-Joel**

1. Present an overview of the endocrine system with detailed description of the location, anatomy and function of the major glands.
2. Trace diagrammatically how signals originating in the central nervous system pass via a series of relays to the ultimate target tissues.
3. Discuss exhaustively the six (6) molecular mechanisms of signal transduction in living systems.

4. Discuss the similarities and differences between epinephrine and glucagon in their structures, biosynthesis, hormone action and mechanism.
5. Epinephrine and norepinephrine double as neurotransmitters and hormones in respective target tissues thereby transmitting their signals through a unique class of cell surface receptors. Identify and fully describe the significance of these receptors.
6. Gonadotropin releasing hormone (GnRH) from the hypothalamus signals through a cascade the ultimate release of two distinct hormones amongst others that are responsible for the development of male and female secondary sexual characteristics respectively. Discuss vividly.
7. (a) Trace the biosynthetic pathway of the six (6) classes of hormones based on structure.  
(b) Give at least an example of each of these six (6) classes of hormones and their respective biochemical effects in living systems.
8. Describe the hormones of the hypothalamus and discuss their main functions.
9. a. What do you understand by tropic and nontropic hormones? Give two examples of each.  
b. Outline all the pituitary gland hormones and discuss their specific role in metabolic activities and other physiological functions.  
c. Why is pituitary called the master gland?
10. Describe the detailed biochemical synthesis, control and functions of the parathyroid hormones.
11. Give a detailed explanation of diseases associated with hormone dysfunction.
12. Using two named examples, review critically the two main biochemical mechanisms of hormone action
13. a. A variety of stressors stimulate release of corticosteroid hormone, cortisol from the adrenal cortex; outline seven (7) of these stressors.  
b. Discuss the functions and mechanism of action of this steroid hormone on its three (3) target tissues.
14. Write short notes on the following:
  - (a) Parathyroid hormone related peptide (PTHrp)
  - (b) Pancreatic hormones
  - (c) Hormones of the posterior pituitary gland.
15. Write in detail on a named peptide hormone, highlighting its synthesis, mechanism of action and metabolic process or processes it regulates.