BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE (PILANI), HYDERABAD CAMPUS

COMPREHENSIVE EXAMINATION, 1ST SEMESTER, 2022-23

BIO F313; ANIMAL PHYSIOLOGY

CLOSED BOOK, *TOTAL MARKS 40*

DATE: 24.12.22 TIME: 2:00-5:00 P.M.(AN) CB + OB = 180MIN

NOTE: NO MARKS WILL BE GIVEN WITHOUT JUSTIFICATION WHEREVER ASKED IN THE BELOW GIVEN QUESTIONS. PLEASE MENTION THE QUESTION NUMBER AND SUBSECTION CORRECTLY:

Q1. JUSTIFY IN A MAXIMUM OF A WORD OR 2-3 SENTENCES (10 * 2 = 20M)

I. Mention **two major reasons** why the bulk transport mechanism instead of diffusion evolved for animals that need to transport molecules like oxygen and hormones. 2M

II. Consider a hypothetical situation where the concentration of Na+ ions got doubled in blood plasma. Predict the effect of this change on the composition of brain cerebrospinal fluid. 2M

III. Mention the endocrine effect behind the practice of having a glass of warm milk before going to bed at night. 2M

IV. Calculate the stroke volume in mL per beat if a 4-week-old chick gives a cardiac output of 253 mL/min and its heart rate is 362 beats/min. 2M

V. Justify why animals treated with the synthetic form of the hormone, glucocorticoids have limited ability to resist infection. 2M

VI. Justify the reason behind the difficulty in opening of eyes and visualizing your surrounding for a couple of minutes when you come out of the movie theater on a bright hot summer afternoon. 3M

VII. Justify **two reasons** why the backflow of blood from the atria into the veins usually is not considered a significant problem. 2M

VIII. Mr. Keithson happens to suffer from severe mental/neural trauma for the last 10 years. Even in his case of several neural trauma and neuronal dysfunction, the blood circulation to the heart and his heart rate remained unaffected. Justify. 2M

IX. Name the glucose transporter which does not require the actions of insulin and is important for the transportation of glucose into the nervous system. 1M

X. In a normal ECG, why no separate wave is detected during atrial repolarization? 2M

Q2. A boy named Thomas happens to lose his weight abnormally in a span of 2 weeks (his weight drops from 60 kg to 30 kg in two weeks) in spite of increased appetite and food intake. He also suffers excessive perspiration and skeletal muscle weakness. People noticed he get abnormally tensed for simple activities like going to school, was overanxious, and irritable all the time. Solely from the above description: (2 +3 + 3 = 8M)

I. Mention the major endocrine disorder/gland affected and the major/primary hormone responsible for his abnormal weight loss.
II. If you were his physiologist, mention three methods of treatment you would recommend for Thomas.
III. Briefly explain the reason for excessive perspiration, skeletal muscle weakness, and weight loss.

Q3. A divalent cation in the mammalian physiological system has important functions like maintenance of bone growth, neurotransmitter secretion from presynaptic terminals, hormone secretion, muscle contraction, acting as a secondary messenger, and maintenance of neuronal activity. From the above description answer the following questions: (1+ 3 + 4 + 4 =12M)

I. Identify the divalent cation.
II. Mention **three hormones** that regulate the plasma concentration (or ECF) of this divalent cation.
III. Assume a freshly isolated heart (usually can be kept alive under in-vitro conditions for some time in presence of physiologically relevant ECF and ICF) from the mouse was kept in an ECF that lacked this divalent cation and the heart contractions stopped. Why? Describe in detail the chain of events that caused this stoppage due to the loss of divalent cation in ECF.
IV. A freshly prepared mouse thigh muscle was kept under the microscope to study muscle physiology and contraction. The preparation was kept in an ECF that lacked this divalent cation and muscle continued to contract. Why? Also, describe in detail the chain of events that caused this contraction, assuming rest conditions and ICF were unchanged and were maintained at physiological concentration.