FACULTY OF SCIENCE

	DEPARTMENT OF ZOOLOGY
MODULE	**ZOO3B01/ZOO33B3** (COMPARATIVE ANIMAL PHYSIOLOGY)
YEAR	**2022 (SEMESTER 2)**
CAMPUS	**APK**
EXAM	**THEORY EXAM PAPER**

ASSESSOR(S)	**Dr M Bird**
INTERNAL MODERATOR:	**Prof R Greenfield**
EXTERNAL MODERATOR:	**Dr S Edwards**
DURATION:	**3 Hours**
MARKS:	**100**

NUMBER OF PAGES: THREE (including cover page)

INSTRUCTIONS: Answer ALL questions

Question 1

Explain how the climate control of a room via a machine with heating and cooling capabilities is similar to the process that governs antagonistic negative feedback control of mammalian body temperature. Include an explanation of what the 'sensor', 'integrator' and 'effector' is in both cases.

[12 marks]

Question 2

Explain the role of the various ions and proteins in establishing the resting membrane potential of a typical animal cell. Why is differential membrane permeability to the ions so important in the process and what is the role of the Na^+/K^+ pump in this process? Lastly, why is the membrane potential value closer to E_{K+} (-90 mV) than for E_{Na+} (+60 mV)?

[10 marks]

Question 3

Discuss the major differences between excitatory and inhibitory neuron-to-neuron synapses and the kinds of graded potentials they produce in the postsynaptic neuron. Include an explanation of the role of summation in determining the grand postsynaptic potential (GPSP) of the receiving postsynaptic neuron.

[10 marks]

Question 4

Explain the relationship between body mass and basal metabolic rate (total BMR and BMR per gram) for endothermic animals. What is the generally accepted mechanism underlying this relationship?

[6 marks]

Question 5

Explain how the endocrine and nervous systems work together to produce the hormone vasopressin (also sometimes called antidiuretic hormone) and how it ultimately reaches its target organs. What effect does this hormone have on its two major target organs?

[10 marks]

Question 6

Discuss the mechanics of asynchronous versus synchronous flight muscle and how they differ from each other. Which is capable of faster wing-beat frequency and why?

[10 marks]

Question 7

Discuss the digestion and absorption of protein by the vertebrate small intestine.

[10 marks]

Question 8

What is the plateau phase of cardiac muscle contractions and why is it so important? Discuss the series of ionic events that governs the physiology of an action potential in mammalian contractile cardiac muscle cells. Lastly, comment on which aspects of the process are the same as per action potentials in neurons and skeletal muscle fibres.

[18 marks]

Question 9

Citing examples, describe the differences between hypo-ionic osmoconformers and hypo-osmotic osmoregulators. Your answer should specify how each group attains osmotic balance.

[10 marks]

Question 10

Differentiate between the meaning of the terms ‘ectotherm’, ‘endotherm’, ‘poikilotherm’ and ‘homeotherm’?

[4 marks]

—100 MARKS—

TOTAL