Unit 1

→ explain the cell theory

→ define biogenesis and abiogenesis

→describe how the contributions of scientists lead to a better understanding of biogenesis and abiogenesis Include:
(i) Aristotle (ii) Redi (iii) Needham
(iv) Spallanzani (v) Pasteur

→ analyze and describe how scientific understanding was revised as a result of the invention of the microscope

→ explain how the invention of the microscope permitted scientists to discover the existence of cells

→ explain the contributions of
(i) Hooke (ii) Leeuwenhoek

→ describe how the contributions of scientists lead to the progressive development of the cell theory
(i) Brown (ii) Schleiden
(iii) Schwann (iv) Braun
(v) Virchow (vi) Pasteur

→ compile and display, using line diagrams and/or digital imagery, evidence and information collected
through the use of the microscope

– draw a biological drawing which includes the concept of field of view and calculation of specimen size
– define depth of field

• describe and evaluate the design of microscope technologies and the way they function (compound, scanning electron microscopes and transmission scopes)

– compare different microscopes in terms of illumination, magnification, and specimen preparation

→using different types of cells as examples, compare and contrast prokaryotic and eukaryotic cells

- describe the structural differences between prokaryotic and eukaryotic cells

- observe features of prokaryotic and eukaryotic cells using microscope technology

• describe the appearance of cell organelles visible with the light and electron microscopes

– examine and compare images of cell structure generated by both the light and electron microscopes

–describe the role of the following cellular parts:
(i) cell membrane (ii) cytoplasm (iii) nucleus
(iv) nucleolus (v) endoplasmic reticulum
(vi) ribosome (vii)mitochondria (viii)chloroplast
(ix) vacuole (x) vesicle (xi) golgi apparatus
(xii) microtubules/filaments (xiii)cilia
(xiv)lysosome (xv) flagella (xvi)cell wall

– compare plant and animal cells in terms of type of organelles present

→ describe how organelles manage various cell processes such as ingestion, digestion, transportation and excretion

– explain how materials are able to move into and out of cells through a selectively permeable membrane.

→ Include passive transport (osmosis, diffusion and facilitated diffusion), and active transport (exocytosis and endocytosis; pinocytosis, phagocytosis)

- define the terms hypotonic, hypertonic and isotonic

– describe the effects of osmosis on cells with and without cell walls

– investigate the relationship between membrane surface area and cell size, summarizing findings and formulating a conclusion

→ If a cell membrane were completely permeable, how would this effect the cell?

Photosynthesis and Respiration

• compare and contrast matter and energy transformations associated with the processes of
photosynthesis and aerobic respiration

→ explain the importance of the processes of photosynthesis and aerobic respiration for
individual organisms

– demonstrate, using equations, that photosynthesis and aerobic respiration are complementary
processes

– explain the importance of the processes of photosynthesis and aerobic respiration on a global
basis

→define anaerobic respiration

Unit 2 → develop a list of characteristics that differentiate living and nonliving things (cells, biogenesis, growth and development, metabolism, water requirement, organic compound production, reproduction with inheritance and adaptations) – explain how scientific classification systems have developed → describe and apply classification systems and nomenclatures used in the biological sciences → list and describe the seven major categories of Linnaeus' classification system (i) kingdom (ii) phylum (iii) class (iv) order (v) family (vi) genus (vii) species – explain the advantages of binomial nomenclature – demonstrate how to use a taxonomic key to group and identify an organism → identify limitations of a biological classification system and identify alternative ways of classifying to accommodate anomalies – examine the common names of some species of organisms and show the inadequacies and language problems associated with this method of identification – explain why a virus does not fit neatly into the existing classification system → identify new questions or problems that arise from what was learned – recognize the difficulties inherent in the categorization of some organisms into distinct groups and identify the limitations of a five-kingdom system that led to the six kingdom system	– explain how organisms are classified using: (i) radioactive dating (ii) biochemical information (DNA/protein comparisons) (iii) structural information (iv) comparative embryology (v) cellular structure (vi) behaviour → describe how classification systems improved as a result of the development of modern techniques → describe the anatomy and physiology of viruses and organisms from each kingdom – identify the general characteristics cell type, nutrition, body form, reproduction, locomotion) that distinguish the members of the six recognized kingdoms (Bacteria, Archaea, Protista, Fungi, Plantae, Animalia) from each other. – identify examples of members of each of the Kingdoms → describe the differences that exist between the major groups of plants (bryophytes, ferns, gymnosperms and angiosperms) – explain why angiosperms are the most diverse plant group → describe the differences that exist between the invertebrate phyla (symmetry, body cavity, reproduction, digestion) → explain why arthropods are the most successful phylum of animals → describe the differences that exist between the vertebrate taxa (symmetry, body cavity, circulation, respiration, reproduction, endoskeleton) → analyze and explain the life cycle of a sample organism from each kingdom, including a representative virus – Life cycle of: (i) Virus - "T4" (ii) Bacteria/Archaea - *"E. coli"* (iii) Protista - "Plasmodium" (iv) Fungi - "Rhizopus" (v) Plantae - "Fern" (vi) Animal - "Frog"

BIOLOGY 2201 - UNIT 3 -- MAINTAINING DYNAMIC EQUILIBRIUM I

Homeostasis

‘ explain the concept of homeostasis and its critical nature to living things (317-1)

‘ explain the importance of temperature regulation in maintaining homeostasis (317-3)

Circulatory System

‘ explain how the human circulatory system helps maintain homeostasis (317-1)

S explain the need for a transport system

S explain how the circulatory system contributes to the maintenance of equilibrium through its role in the transport of heat energy and matter

S describe the structure and function of an artery, a vein and a capillary

S relate this structure to the function of each in blood circulation

S identify the main components of the human heart and explain the role of each. Include:

atria ventricles valves (bicuspid, tricuspid, semilunar)
aorta pulmonary vein pulmonary artery septum

S trace the flow of blood through the heart and describe the pulmonary and systemic pathways

S identify the main components of blood and explain the role of each. Include:

erythrocytes leukocytes platelets plasma

‘ carry out an experiment to relate blood pressure and physical activity and identify the specific variables involved (212-6)

‘ compile and organize data, using appropriate formats and data treatments, to facilitate interpretation of blood pressure data (213-5, 214-3)

‘ identify the impact of circulatory diseases on the homeostasis of an organism (317-4)

S describe disorders linked to the circulatory system and their effect on the homeostasis of the system and the organism as a whole. Include:

hypertension atherosclerosis arteriosclerosis coronary blockage

‘ analyze why and how technology related to the treatment of circulatory disorders was developed and improved over time (115-5)

S describe the progress from bypass surgery to modern techniques such as shunts, angioplasty and clot busting drugs

Respiratory System

‘ explain how the human respiratory system helps maintain homeostasis (317-1)

S explain the need for a respiratory surface in humans

S identify and state the function of:

nasal cavity trachea bronchi bronchioles alveoli diaphragm

S investigate the mechanics of inhalation/exhalation and regulation of the breathing cycle

‘	carry out an experiment to collect data on respiratory function and identify the specific variables involved (212-6)
‘	compile and organize data, using appropriate formats and data treatments, to facilitate interpretation of a completed respiratory activity (213-5)
‘	identify how respiratory diseases affect the homeostasis of an organism (317-4) - investigate disorders; lung cancer, asthma, and pneumonia
‘	predict the impact of environmental factors, such as allergens, on homeostasis within an organism (317-6)
S	identify the impact of environmental factors on the respiratory system of an asthmatic cigarette smoke allergens (dust, mould, food) petrochemical fumes perfumes
Digestive System	
‘	explain how the human digestive system helps maintain homeostasis (317-1)
S	describe the purpose and functioning of the digestive systems
S	define and explain the relationship between mechanical and chemical digestion
S	identify the major organs and glands of digestion and investigate their role in the digestive process Include: salivary glands stomach liver pancreas gall bladder small intestine large intestine
S	trace the pathway of food through the human digestive tract and explain the efficiency of its structure. Include: teeth taste buds tongue mucous lining villi sphincters peristalsis
‘	identify chemical elements and compounds that are commonly found in living systems (314-1)
S	identify the six basic nutrients: carbohydrates, lipids, proteins, vitamins, mineral and water and determine the food sources of each of these nutrients
‘	identify the role of some compounds involved in digestion (314-2)
S	discuss the role of the six basic nutrients
S	discuss the general role of enzymes and secretions, and the role of these substances pertaining to the digestive system
‘	identify and describe the structure and function of the important biochemical compounds, carbohydrates, proteins and lipids (314-3)
S	explain the role of hydrolysis and dehydration reactions within the digestive process
S	discuss the basic structural units of carbohydrates, lipids, and proteins
S	discuss the basic structure of carbohydrates, lipids and proteins
S	describe the end products of digestion for carbohydrates, lipids and proteins
‘	explain the importance of fitness and nutrition in maintaining homeostasis
‘	carry out an experiment to investigate the effect of specified variables on the effectiveness of an enzyme (212-6)
‘	compile and organize data, using appropriate formats and data treatments, to facilitate interpretation of the data from a completed digestive activity (213-5)

‘ describe disorders and the treatment of disorders linked to organs of the digestive system and their effect on the homeostasis of the system and the organism as a whole (317-4) Include: ulcers , gall stones and Ileitis/Colitis
‘ propose alternative solutions to a given practical problem, identify the potential strengths and weaknesses of each, and select one as the basis for a plan (214-15) S investigate the value of vitamins, minerals and herbal supplements in support of a healthy lifestyle
‘ identify multiple perspectives that influence a science-related decision of issue (215-4) S evaluate how nutritional deficiency and starvation diets such as bulimia and anorexia nervosa can adversely affect the equilibrium S discuss whether the images portrayed through the media and advertising promote positive self image and a healthy lifestyle for men and women
Excretory System
‘explain how the excretory system, helps maintain homeostasis (317-1) S explain how the following act as organs of excretion include: lungs skin liver kidney Sexplain the role of the kidney as an excretory organ in removing metabolic wastes from the body Sidentify and describe the main structures of the human urinary system including kidney, ureter, bladder, and urethra Sidentify and describe the internal structure of the kidney, including the cortex, medulla and pelvis Sidentify and explain the function of the parts of a nephron. Include: glomerulus Bowman’s capsule loop of Henle tubules
‘ describe disorders linked to the excretory system and their effect on the homeostasis of the system and the organism as a whole (317-4) Include: kidney stones kidney infections bladder infections
‘ analyze and describe examples where technologies were developed to treat renal failure based on scientific understanding (116-4, 115-5) S briefly explain how the technology of dialysis works
‘ analyze natural and technological systems to interpret and explain their structure and dynamics (116-7) S compare the human system with that of kidney dialysis technology S briefly explain the eventual necessity of kidney transplant
‘ discuss the merits of funding kidney transplant therapy versus improvements in dialysis technology (117-4)
‘ identify multiple perspectives that influence a science-related decision or issue (215-4)
Immune System
‘ predict the impact of environmental factors such as allergens on homeostasis within an organism (317-6) S explain the meaning of the terms antigen (allergen), antibody, and their role in an allergic reaction
‘ explain how the immune system helps to maintain homeostasis (317-1) S explain the complete immune response

1st Line of defence (physical and chemical barriers)

2nd Line of defence (inflammatory response)

3rd Line of defence (immune response)

S compare the role of the various white blood cells in the defence process including phagocytes and lymphocytes
S compare the mechanism of various forms of acquired immunity including passive (breast milk) and active (actual exposure, vaccines)

‘identify how autoimmune disorders cause diseases such as rheumatoid arthritis

‘analyze why and how a particular technology was developed and improved over time (115-5)

‘analyze and describe examples where technologies were developed based on scientific understanding (116-4)

‘debate the merits of funding specific scientific or technological endeavors and not others (117-4)

‘identify in general terms the impact of viral, bacterial, genetic, and environmental diseases on the homeostasis of an organism (317-4)

Unit 4

• describe population growth and explain factors that influence it

– describe how population growth is dependent upon the difference between natality and mortality rates and a balance between emigration and immigration

– distinguish between density independent and dependent factors

– explain how biotic potential, environmental resistance and carrying capacity interact in

population dynamics

– examine and label the sections of an S-shaped (logistic) and Jshaped (exponential) growth curve

(i) lag

(ii) exponential

(iii) equilibrium

– compare how J & S curves describe the general population growth patterns observed in animal populations

→ Students should recognize that the shape of the "S" in the Sshaped curve varies depending on the growth strategy of the species (many offspring with little parental investment, few offspring with much parental investment).

• evaluate Earth's carrying capacity

→ considering human population growth and its demands on natural resources determine the current growth rate of the human population and the projected growth rate

– investigate the demands that will be placed upon Earth's natural resources by future population growth

– explain how technological developments have raised, and continue to raise, the carrying capacity of Earth

– describe the four phases of demographic transition

-- It can be argued that some third world regions have reached their carrying capacity. What factors do you think have contributed to this?

--How would other countries help increase their carrying capacity?

→ Students should recognize that there is no equilibrium section in a J-shaped curve. The J-shaped curve generally exists in a manipulated situation.

→ explain the predator-prey cycle with respect to

population growth curves describe the limiting factors within the human population

(i) space

(ii) war

(iii) disease

(iv) poverty
