UNIVERSITY OF BOTSWANA

2006/2007 SEMESTER ONE EXAMS

FRONT PAGE

Course No:	**BIO 111**	Duration:	**2 hours**
Date:		**November/December 2006**	
Title of Paper:	**PRINCIPLES OF BIOLOGY**		
Subject:	**BIOLOGICAL SCIENCES**		
Morning/ Afternoon			

INSTRUCTIONS:

Answer ALL questions in sections A, B and C and ONE question from Section D.

NO. OF PAGES INCLUDING THIS ONE [12]

DO NOT OPEN THIS PAPER UNTIL YOU HAVE BEEN TOLD TO DO SO BY THE INVIGILATOR

DEPARTMENT OF BIOLOGICAL SCIENCES

2006/2007 SEMESTER ONE EXAMINATIONS

Course Code: BIO 111 **Course Name: PRINCIPLES OF BIOLOGY**

November/December 2006 **Duration: 2 hours**

Answer ALL questions in sections A, B and C and ONE question from Section D.

Total marks available = 100

ID Number:_____ **Tutorial Group:**_____

SECTION A: Multiple choice (10 marks available, ½ mark per question). Circle the letter corresponding to the correct answer.

1. The best way to measure genetic variation is by studying the
   A) cell
   B) individual
   C) population
   D) ecosystem

2. Which of the following types of speciation occurs as a result of polyploidy?
   A) geogaphic
   B) sympatric
   C) allopatric
   D) physical barrier

3. Which of the following characteristics is unique to prokaryotes?
   A) lack of membrane enclosed organelles
   B) presence of cell wall
   C) presence of cell membrane
   D) presence of vacuoles

4. The mitochondria of eukaryotes were derived from _____ by endosymbiosis.
   A) chemotrophs
   B) autotrophs
   C) bacteria
   D) archaea

5. In eukaryotes, transcription occurs in _____ and translation in _____.
   A) cytoplasm/nucleus
   B) nucleus/cytoplasm
   C) golgi apparatus/endoplsmic reticulum
   D) cytoplasm/mitochondria

6. Which of the following nutritional categories of bacteria can exist independently of other organisms?
   A) chemoheterotrophs
   B) photoheterotrophs
   C) photoautotrophs
   D) chemoorganotrophs

7. The following is not found in DNA:
   A) phosphate
   B) ribose
   C) adenine
   D) thymine

8. Homologous traits are
   A) similar in structure
   B) derived from a common ancestor
   C) similar in function but not in structure
   D) similar to having double stranded DNA

9. Researchers testing new drugs usually give the drug to one group of people and give placebos, *sugar pills*, to another group. The group receiving the sugar pills
   A) constitutes the experimental group.
   B) is needed so that the test will be repeated enough times.
   C) is the control group.
   D) is a backup group.
   E) is the experimental variable.

10. A rainforest primate called an aye-aye has a long middle finger that it uses to probe for insects in cracks and crevices in tree bark. This connection between structure and function developed gradually as a result of
   A) reproduction.
   B) population growth.

C) natural selection.
D) DNA replication.
E) energy exchange.

11. Deductive reasoning is used to
A) develop a hypothesis.
B) make a prediction.
C) test a prediction.
D) make a general statement.
E) prove the validity of a hypothesis

12. Substances must pass through_____ to enter or leave a cell.
A) a microtubule.
B) the Golgi apparatus.
C) a ribosome.
D) the nucleus.
E) the plasma membrane.

13. Organelles involved in energy conversion are the
A) rough ER and Golgi apparatus.
B) nucleus and smooth ER.
C) nucleus and chloroplast.
D) lysosome and ribosome.
E) mitochondrion and chloroplast

14. The maximum size of a cell is limited by the
A) surface area for exchange with its environment.
B) number of organelles that can be packed inside.
C) materials needed to build it.
D) amount of flexibility it needs to be able to move.
E) amount of food it needs to survive.

15. The bonobo, an ape closely related to the chimpanzee, displays behaviors very similar to those of humans. Some anthropologists have suggested that the bonobo is the living primate most closely related to humans. Which of the following would be the easiest to substantiate this idea?
A) look for fossils of bonobos, chimps, and humans
B) study the DNA of bonobos and chimps
C) determine which of the species are anthropoids
D) compare the DNA of bonobos and humans
E) compare the DNA of bonobos, chimps, and humans

16. The electron microscope has been particularly useful in studying bacteria, because
A) electrons can penetrate tough bacterial cell walls.
B) bacteria are very tiny

C) bacteria move so quickly they are hard to photograph.
D) they aren't really alive, so it doesn't hurt to kill them for viewing.
E) their organelles are small and tightly packed together.

17. A plant cell was grown in a test tube containing radioactive nucleotides, the building blocks of DNA. Later examination of the cell showed the radioactivity to be concentrated in the
A) rough ER.
B) Golgi apparatus.
C) smooth ER.
D) central vacuole.
E) nucleus.

18. Which of the following is thought to have been the first step in the origin of life?
A) cooperation among molecules
B) formation of polypeptide spheres
C) formation of organic monomers
D) replication of primitive *genes*
E) formation of organic polymers

19. *E. coli*, bacteria that live in human intestines, are shaped like tiny, straight sausages. They are
A) bacilli.
B) vibrios.
C) spirochetes.
D) cocci.
E) spirilla.

20. Alternative forms of genes for a particular trait are called
A) homologous chromosomes.
B) alleles.
C) linked genes.
D) genotypes.
E) phenotypes

SECTION B: **Fill in the blanks Answer all questions (60 marks available).**

21. Water moves from a _____ solution across a membrane to a _____ solution.

22. Mitochondria are enclosed by an _____ membrane and an _____ membrane that folds inwards to form _____.

23. Peroxisomes and _____ Contain special enzymes and carry out specialized chemical reactions inside the cell.

24. The _____ is the basic unit of life.

25. To maintain adequate exchanges with its environment, a cell's _____ must be large compared to its _____.

26. The rough ER has _____ attached that synthesize proteins.

27. Biology can be visualized as a hierarchy of units that include the following:

a) atoms. _____ and _____.

b) tissues. _____ and _____.

c) populations. _____ and _____.

28. Give four major types of biological macromolecules and **AN EXAMPLE** of each.

a) _____ Example _____

b) _____ Example _____

c) _____ Example _____

d) _____ Example _____

29. The four functional parts of an amino acid are _____, _____, _____ *and* _____.

Differences in amino acid residues come from the _____ found attached to the α-carbon. An example of an amino acid is _____.

30. Give two examples of structural adaptation

a) _____

b) _____

31. Give the four levels of protein structure and types of bond that is/are responsible at each level:

a. _____ bond(s):

b. _____ bond(s):

c _____ bond(s):

d _____ bond(s):

32. In gene expression the information in the DNA is first _____ _____ _____into _____ _____ _____and then _____ into amino acid sequence to make the protein required.

33. Three of the distinguishing characteristics of DNA are _____ _____ _____ _____ _____. _____ _____ _____ _____ _____and _____ _____ _____ _____. It is made of three components i.e., _____ _____ _____ _____ _____. _____ _____ _____ _____ _____and _____ _____ _____ .

34. Unlike DNA, RNA is _____ _____ _____ _____ _____ and consists of the sugar _____ _____ _____ _____ and the bases _ _____ _____ _____, _____ _____ _____, and _____ _____ _____ _____ _____ _____ .

35. In complementary base pairing in DNA Adenine pairs with _____ _____ _____ _____ Guanine pairs with _____ _____ _____ _____ _____.

36. Cell membranes are made of

a) _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

b) _____ _____ _____ _____ _____ _____ _____ _____ _____

c) _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

SECTION C. Short questions. Answer all questions (15 marks available).

37. What function do thyllakoids play in plants?

38. Describe 2 processes of facilitated diffusion.

a)

b)

39. Name 2 factors that affect the rate of diffusion across membranes.

a)

b)

40. Which parts of phospholipids make up the hydrophilic and hydrophobic regions of a membrane?

41. Name one role of cytoskeleton of a cell.

42. Name and list functions of 2 plastids other than chloroplasts.

a)

b)

43. Name two functions of the Golgi apparatus.

a)

b)

44. What do you understand by the word "species"

45. Give two limitations of the species definition you have given above.

a)

b)

46. What do you understand by 'biodiversity' ?

SECTION D: Essay questions: Answer only ONE of the following questions (15 marks available).

47. Underlying all scientific research is the hypothetico-deductive (H-D) or the scientific approach. Discuss the five parts of the H-D system.

48. Water has a unique structure and special properties. Briefly outline five of these properties.

49. Based on your recent field and laboratory practicals. discuss species diversity and its relevance.

END OF EXAMINATION