

UNIVERSITY OF BOTSWANA

2007/2008 SEMESTER ONE EXAMS

FRONT PAGE

Course No	: BIO 111	Duration	: 2 hours
	Date	: November/December 2007	
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 [15]

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DEPARTMENT OF BIOLOGICAL SCIENCES

2007/2008 SEMESTER ONE EXAMINATIONS

Course Code: BIO 111

Course Name: PRINCIPLES OF BIOLOGY

November/December 2007

Duration: 2 hours

SECTION A: ANSWER ALL QUESTIONS IN THIS SECTION (0.5 mark for each question; Total 18 marks).

1. Which of the following states of development is defined by the three embryonic tissue layers (ectoderm, mesoderm, and endoderm)?
 - a. The gastrula
 - b. The zygote
 - c. The embryo
 - d. The blastula
 - e. The ovum

2. What is happening to a cell during differentiation?
 - a. It is taking on its specialized function by becoming a specific cell type.
 - b. It is dividing to produce a cell with one-half the number of original chromosomes
 - c. It is dividing to produce a cell with the same number of chromosomes.
 - d. Material is moving across the cell's membrane as it goes from a region of high concentration to a region of low concentration.
 - e. It is mutating.

3. Mangoes belong to the genus "mangifera" Species "indica", what is the correct binomial nomenclature for the mango?
 - a. *Mangifera indica*
 - b. *mangifera Indica*
 - c. *Mangifera Indica*
 - d. *mangifera indica*
 - e. *Indica mangifera*

4. Prokaryotes differ from eukaryotes by absence of:
 - a. Mitochondria
 - b. Chloroplasts
 - c. Golgi apparatus.
 - d. Endoplasmic reticulum
 - e. All the above.

5. Which of the following represent the correct order in stages of development?

- a. Fertilization → growth → determination → differentiation → morphogenesis
 - b. Fertilization → growth → differentiation → determination → morphogenesis
 - c. Fertilization → differentiation → growth → differentiation → morphogenesis
 - d. Fertilization → determination → differentiation → growth → morphogenesis
 - e. Fertilization → gastrulation → differentiation → growth → oogenesis
6. What is the most abundant polysaccharide on Earth?
- a. Starch
 - b. Peptidoglycan
 - c. Glycogen
 - d. Sucrose
 - e. Cellulose
7. Cells are small in order to:
- a. maintain osmotic balance
 - b. maximize surface area-volume ratio
 - c. maximize volume-surface area ratio
 - d. minimize surface area-volume ratio
 - e. reduce gas exchange
8. Which of the following statements best describes the logic of the scientific method?
- a. If I generate a testable hypothesis, tests and observations will support it.
 - b. If my prediction is correct, it will lead to a testable hypothesis.
 - c. If my observations are accurate, they will support my hypothesis.
 - d. If my hypothesis is correct, I can expect certain test results.
 - e. If my controlled experiments are set up right, I will be able to generate a testable hypothesis.
9. Anabolic reactions:
- a. generate free energy
 - b. break down complex molecules
 - c. convert nucleotides to amino acids
 - d. are energy-demanding
 - e. occur singly
10. Which of the following is *not* a function of polysaccharides in organisms:
- a. energy storage
 - b. storage of hereditary material
 - c. formation of cells walls
 - d. structural support
 - e. formation of exoskeletons
11. Proteins differ from one another because:

- a. the peptide bonds linking amino acids differ from protein to protein
 - b. the sequence of amino acids in the polypeptide chain differs from protein to protein
 - c. each protein molecule contains its own unique sequence of sugars
 - d. the number of nucleotides in each protein varies from molecule to molecule
 - e. the number of nitrogen atoms in each amino acid differs from the number on all the others
12. Which of the following information can we not derive from fossils?
- a. Radioisotope dating of major evolutionary events.
 - b. Changes in biodiversity with time.
 - c. Palaeoenvironments.
 - d. Interbreeding potential of the species.
 - e. a. and d.
13. The biological species concept is defined in terms of:
- a. morphology
 - b. binomial nomenclature
 - c. reproductive isolation
 - d. cladistic divergence
 - e. mode of speciation
14. The science of biological classification is known as _____.
- a. nomenclature
 - b. classification
 - c. systematics
 - d. taxonomy
15. Biodiversity is highest in ecosystems:
- a. with deep fertile soils
 - b. with marked seasonality
 - c. with few predators
 - d. on the equator
 - e. at higher latitudes
16. Okazaki fragments are joined by
- a. DNA ligase
 - b. nucleotide synthase
 - c. DNA helicase
 - d. RNA primase

17. Which of these biomes has been increased in area by human activities?
- Temperate rain forests
 - Tropical rain forests
 - Grasslands
 - Deserts
 - Savannah
18. Which of the following are true?
- Heterotrophs are organisms which require preformed inorganic compounds as a source of carbon
 - Heterotrophs are organisms which require preformed organic compounds as a source of carbon and light as a source of energy
 - Heterotrophs are organisms which require preformed organic compounds as a source of energy
 - Heterotrophs are organisms which require preformed organic compounds as a source of carbon but not energy
 - a. and b.
19. Which of the following is a bacterial disease?
- Influenza
 - Anthrax
 - AIDS
 - Malaria
 - None of these.
20. The cytoskeleton is found in
- all plant cells
 - all eukaryotic cells
 - prokaryotic cells
 - in all bacteria
 - in all animal cells
21. Which of the following is *not* a function of proteins in organisms?
- composition of ribosomes
 - supporting structures for DNA
 - supporting material for plant cell walls
 - components of the cell membrane
 - enzymes
22. β -sheets contribute to the _____ structure of proteins.
- primary
 - secondary
 - tertiary
 - quaternary
 - prosthetic

23. Any two structures derived from a common ancestral trait are said to be

- a) homologous
- b) analogous
- c) homeostasis
- d) homoplastic

24. Aneuploidy is usually caused by:

- a. Nondisjunction
- b. Segregation distortion
- c. Linkage
- d. Errors during crossing over
- e. Frameshift mutations

25. Pattern formation is necessary for

- a) differentiation
- b) morphogenesis
- c) metamorphosis
- d) development
- e) fertilization

26. Lysosomes originate from _____ and contain _____.

- a) endoplasmic reticulum/protein targeting ribosomes
- b) nucleus/help mRNA to move to the cytoplasm
- c) golgi apparatus/digestive enzymes
- d) cell membrane/a piece of DNA

27. The molecules which are responsible for DNA replication in the cell are

- a) RNA polymerases
- b) DNAses
- c) DNA polymerases
- d) nucleoside polymerases

28. One of the following is NOT a function of carotinoids

- a) serve as vitamins
- b) help plants capture light energy
- c) serve as energy source
- d) contribute to colour of some plants

29. _____ leads to genetic constancy and _____ to genetic diversity.
- meiosis/mitosis
 - cytokinesis/mitosis
 - mitosis/meiosis
 - mitosis/cytokinesis
30. A sequence of DNA with the following bases 5'ACCGTGAATCG3' will have a transcription template of base sequences in mRNA as
- 5'-ATCCGTTUCGC-3'
 - 5'-CGAUUCACGGU-3'
 - 5'-UGGCACUUAGC-3'
 - 5'-TGGCAUUAGC-3'
31. The cell wall of fungi mainly consists of
- peptidoglycan
 - chitin
 - cellulose
 - collagen
32. The enzyme known as ribulose biphosphate carboxylase/oxygenase (rubisco)
- brings about fixation of carbon dioxide in plants
 - brings about condensation of amino acids
 - is the most common protein found only in microorganisms
 - is catalytically activated by zinc
33. Which of the following compounds have functional groups?
- alkanes and ethane
 - ethanol and aldehyde
 - methane and nitrogen
 - carbon and hydrogen
34. Evolution leads to _____ and _____
- constancy/maintenance of organism
 - growth/development
 - biodiversity/speciation
 - formation of species/stability of the organism

35. Protistan fungi differ from eumycota (true moulds) by
- True fungi spores are motile while protistan fungi spores are not
 - Protistan fungal spores are motile while true fungi spores are not
 - Protistan fungi lack a cell wall
 - True fungi are eukaryotic while protistan fungi are not
36. The elements found in chlorophyll and haemoglobin, respectively, are
- magnesium and sulphur
 - iron and magnesium
 - magnesium and iron
 - molybdenum and cobalt

**SECTION B. FILL IN BLANKS. ANSWER ALL QUESTIONS
(Total 45 marks)**

37. A virion consists of a central core of either DNA or RNA surrounded by a _____ . **(1 mark)**
38. The enzyme RNA polymerase uses a single-stranded _____ template to synthesize a complementary strand of _____. **(2 marks)**
39. _____ is an ecological interaction in which both participants benefit. **(1 mark)**
40. Some autotrophs can derive energy from elements; these are termed _____. **(1 mark)**
41. The end products of meiosis are _____ . **(1 mark)**
42. The only force bringing about adaptation is _____. **(1 mark)**

43. List 5 attributes to life. **(5 marks)**

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

44. List 3 main characteristics of DNA: **(3 marks)**

- a. _____
- b. _____
- c. _____

45. List four ways in which microorganisms are beneficial to humans? **(4 marks)**

- a. _____

- b. _____

- c. _____

- d. _____

46. What happens during prophase 1 of meiosis 1? **(1 mark)**

47. Name three biological macromolecules. What are their components and functions in nature? **(9 marks)**

Macromolecule	Components	Function
a) _____	_____	_____
b) _____	_____	_____
c) _____	_____	_____

48. Describe 2 post zygotic barriers which operate after mating. **(2 marks)**

a. _____

b. _____

49. Give three major differences between DNA and RNA? **(3 marks)**

a. _____

b. _____

c _____

50. _____ and _____ have
diploid chromosomes while _____ and
_____ have haploid chromosomes. **(4 marks)**

51. _____ speciation is the development of reproductive isolation among
members of a continuous population in the absence of geographic barrier while
_____ is the result of polyploidy. **(2 marks)**

52. The _____ and _____ are equal in terms of nucleus
contribution but unequal in terms of _____ of the
_____. **(4 marks)**

**SECTION C. SHORT ANSWER QUESTIONS. ANSWER ALL
QUESTIONS (Total 23 marks).**

53. What are triglycerides composed of? **(3 marks)**

54. What is totipotency? **(2 marks)**

55. What type of virus is HIV and how does it integrate its genome into its host's DNA? **(4 marks)**

56. What is the advantage of aerobic respiration over anaerobic respiration or fermentation? **(2 marks)**

57. If the base composition of double stranded DNA was 15% Thymine (T) how much Cytosine (C) in percent does the double stranded DNA contain? Give reasons.

(2 marks)

58. Compare the function of meiosis and mitosis. **(3 marks)**

59. Describe the four events which occur before and during cell division.

(4 marks)

60. How do bacteria exchange genetic material? **(3 marks)**

SECTION D. ESSAY. ANSWER ONLY ONE QUESTION FROM THIS SECTION (15 MARKS)

- 61. Suggest a hypothesis to explain the observation that female long-tailed widow-birds prefer to mate with the males that have the longest tails. How could you test the hypothesis?

- 62. Water has a unique structure and special properties. Discuss any 5 (five) of these properties.

- 63. Discuss the outstanding problems encountered by the “biological species concept”.
