

UNIVERSITY OF BOTSWANA

2009/10 SEMESTER ONE EXAMINATIONS

FRONT PAGE

Course Code: BIO111	Duration: 2 hours	Date: November 2009
Title of Paper: Principles of Biology		
Subject: BIOLOGICAL SCIENCES		
Morning/ Afternoon		

INSTRUCTIONS:

Answer **ALL** questions in Sections A and B and **ONE** question from Section C. Use illustrations where necessary to supplement your answers.

NO. OF PAGES INCLUDING THIS ONE [14]

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

DEPARTMENT OF BIOLOGICAL SCIENCES

2009/10 SEMESTER ONE EXAMINATIONS

Course Code: BIO111
November 2009

Title of Paper : Principles of Biology

Duration: 2 hours

Total Marks = 90

Answer **ALL** questions in Sections A and B and **ONE** question from Section C. Use illustrations where necessary to supplement your answers.

SECTION A: Answer ALL questions in this Section. Choose only one answer that you consider the most appropriate for each question.

1. All proteins
 - a. are enzymes
 - b. consist of one or more polypeptide chains
 - c. are amino acids
 - d. have quaternary structures
 - e. Are more soluble in non polar solvents than in water
2. The major factor limiting cell size is the
 - a. Concentration of water in the cytoplasm
 - b. Need for energy
 - c. Presence of membrane-enclosed organelles
 - d. Ratio of surface area to volume
 - e. Composition of the plasma membrane
3. Facilitated diffusion and active transport both
 - a. Generate ATP
 - b. Carry solutes in one direction only
 - c. Require the use of proteins as carriers
 - d. Depend on the solubility of solute in lipids
 - e. Increase without limit as concentration gradient increases

4. Which statement about cytokinesis is true
 - a. In plants, it is initiated by furrowing of the membrane
 - b. In animals, a cell forms a plate
 - c. It follows mitosis
 - d. In plant cells, actin and myosin play an important part
 - e. It is the division of the nucleus

5. The 3' end of DNA strand is defined as the place where
 - a. DNA binds to begin replication
 - b. a phosphate group is not bound to another nucleotide
 - c. both DNA strands end opposite each other
 - d. there is a free -OH group at the 3' carbon of deoxyribose
 - e. Three A residues are present.

6. A transgenic animal is made by injecting a piece of foreign DNA into a fertilized embryo. As an adult, it can produce protein from this foreign DNA. Given what you just learned about transformation, which of the following statements is **NOT** supported by the existence of such an animal?
 - a. Insertion of DNA into a cell can produce a heritable change in that cell.
 - b. Insertion of protein into a cell can produce a heritable change in a cell.
 - d. DNA inserted into a cell must become part of that cell's DNA in order to be passed on.
 - e. RNA and DNA differ in a number of ways.

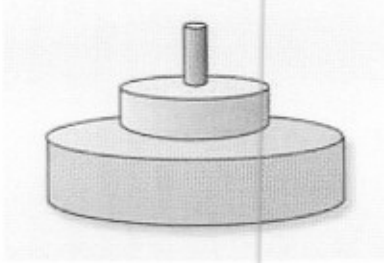
7. The Archea that live near volcanic vents in the ocean floor are examples of
 - a. nitrifiers
 - b. photoautotrophs
 - c. photoheterotrophs
 - d. chemoheterotrophs
 - e. chemolithotrophs

8. The division of the living world into three domains
 - a. was proposed by early microscopists
 - b. is strongly supported by data on rRNA sequences
 - c. is based on the morphological differences between Archea and bacteria
 - d. is strictly arbitrary
 - e. emphasizes the greater importance of eukaryotes

9. In semiconservative replication of DNA
 - a. polymerization is catalysed by RNA polymerase
 - b. The original double helix remains intact a new double helix forms
 - c. the strands of the double helix separate and act as templates for new strands
 - d. polymerization is catalysed by a double helical enzyme
 - e. DNA is synthesized from amino acids

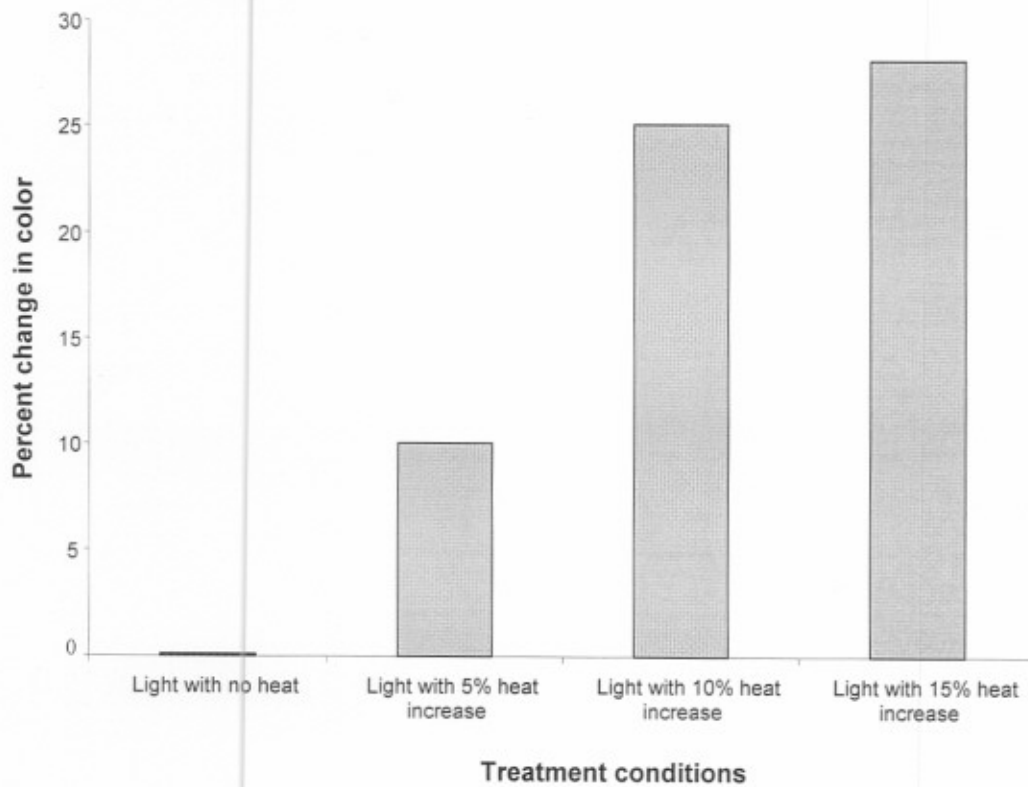
10. Which one of the following *IS NOT* a difference?
- RNA is a polynucleotide whereas DNA is not
 - RNA is primarily a single-stranded molecule
 - The type of sugar present is different between the two.
 - Single stranded RNA can fold into complex shapes whereas DNA does not
 - Uracil is utilized in RNA instead of thymine
11. Which of the following statements is true?
- Archaea are more closely related to bacteria than to eukaryotes.
 - Only eukaryotes replicate their DNA semiconservatively.
 - All three domains had a single common ancestor.
 - All prokaryotes require the presence of oxygen.
 - Chains of bacteria are multicellular.
12. Cell division is necessary for all of the following except
- repair
 - metabolism
 - development
 - reproduction
 - growth
13. Exchange of genetic material between homologous pairs of chromosomes is called
- crossing over
 - recoiling
 - recombination
 - translation
 - transcription
14. If a virus has an RNA genome, which of the following is required for its integration onto a human chromosome?
- RNA-dependent RNA polymerase (RNA - RNA)
 - RNA polymerase (DNA - RNA)
 - Reverse transcriptase (RNA - DNA)
 - DNA polymerase (DNA - DNA)
15. Organisms that receive their energy from several trophic levels are said to be
- detritivores.
 - herbivores.
 - primary consumers.
 - secondary consumers.
 - omnivores.

16. In this biomass pyramid for a grassland, what factor accounts for the producer biomass being greater than the herbivore biomass?



- a. The herbivores take in energy more slowly than the producers.
 - b. Much of the producer biomass does not go to the herbivores.
 - c. The herbivores live longer than the producers.
 - d. Grasses are low-quality producers of energy.
 - e. The grass is not palatable
17. A community ecologist would most likely be concerned with
- a. energy flow through an ecosystem.
 - b. population growth of a single species.
 - c. interactions among individuals of the same species living together in a small area.
 - d. interactions among individuals of different species living together in a small area.
 - e. the cycling of matter through biotic and abiotic components of an area.

18. You conduct an experiment to test the hypothesis that an increase in temperature results in a change in your chameleon's color. You expose the chameleon to light and heat, as shown in the graph below. Which condition is the control that allows you to interpret the rest of your data?



- a. Light with no heat
- b. Light with 5 percent heat increase
- c. Light with 10 percent heat increase
- d. Light with 15 percent heat increase
- e. none of the above

19. Cattle egrets follow cattle around because the cattle disturb insects as they walk, making the insects easier for the egrets catch. There is no cost or benefit to the cattle from this interaction. This interaction is an example of

- a. commensalism.
- b. amensalism.
- c. mutualism.
- d. parasitism.
- e. competition.

20. A key point in Darwin's explanation of evolution is that

- a. the biological structures most likely inherited are those that have become better suited to the environment through constant use.
- b. mutations that occur are those that will help future generations fit into their environments.
- c. any trait that confers even a small increase in the probability that its possessor will survive and reproduce will be strongly favored and will spread through the population.
- d. genes change in order to help organisms cope with problems encountered within their environments.
- e. extinction is nature's way of weeding out undeserving organisms.

SECTION B: Answer ALL questions in this Section. In the spaces provided'

21. Name four characteristics shared by all the domains of living organisms **4 marks**

- i. -----

- ii. -----

- iii. -----

- iv. -----

22. Name the two major parts found in most viruses and explain the function of each. **4 marks**

Part:-----

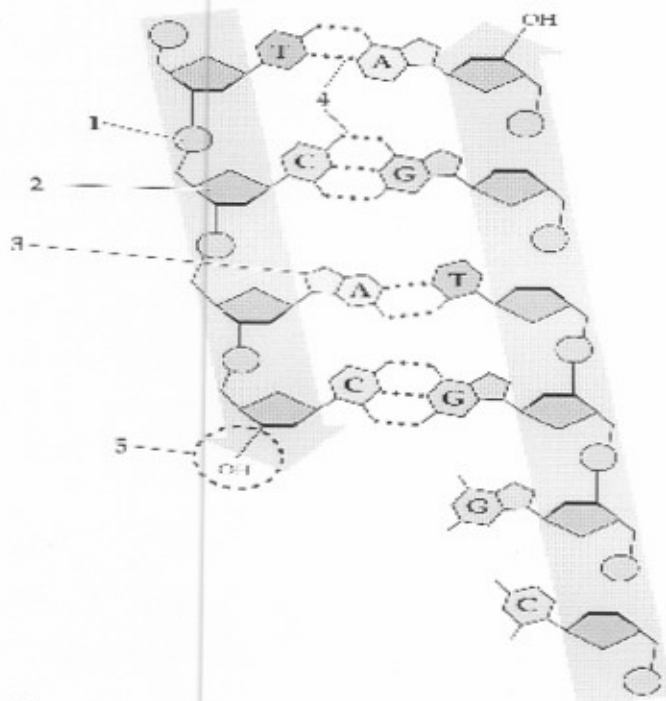
Function:-----

Part:-----

Function:-----

23. Label the figure of a macromolecule below

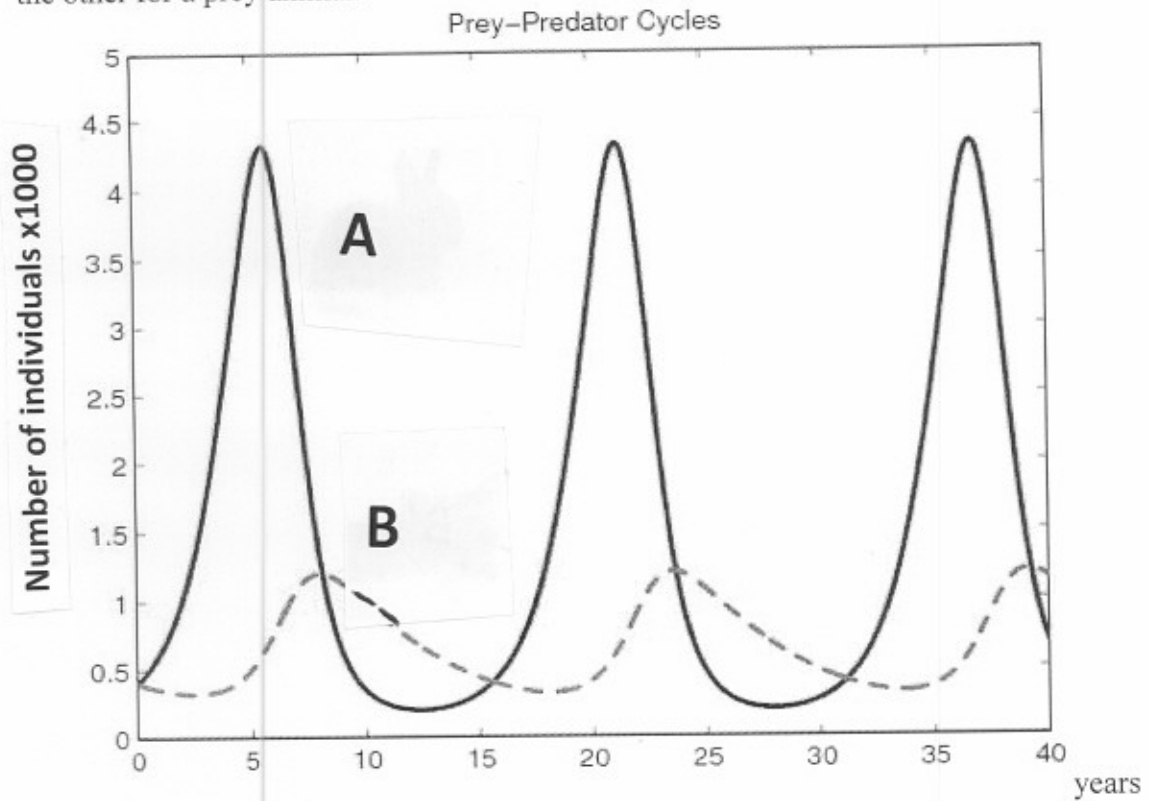
5 marks



- 1)
- 2)
- 3)
- 4)
- 5)

29. Explain (briefly) why biologists adopted the 5-kingdom classification instead of the 2-kingdom classification system. **5 marks**

30. Study the diagram below which shows two population curves, one for a predator and the other for a prey animal.



(i) Which curve represents the prey and which one the predator? **2 marks**

(ii) Explain your answer(s) to (i) above. **6 marks**
