UNIVERSITY OF BUEA
FIRST SEMESTER EXAMINATIONS

Faculty: Science	**Department:** Biochemistry & Microbiology
Course Code: BIO 201	**Course Title:** Cell Biology
Credit Value: 6	**Date:** 16/02/2010
Instructors: Tendongfor/Sallah/Apinjoh	**Time:** 08:00-11:00 (3 Hours)

Instructions: Answer all questions: answer questions to each section together

SECTION A

1. On of the results of the evolution of metabolic pathways in the cell evolution was the emergence of oxygen in the atmosphere. How did microorganisms cope with the accumulation of oxygen in the atmosphere? (5 mks)
2. What is the evolutionary relationship between mitochondria and anaerobic bacteria? What do you then understand by symbiotic theory? (10 mks)
3. Explain the principle of the light microscope. How do you calculate the total magnification of a specimen viewed under the light microscope? (7 mks)
4. State 3 differences between the Transmission Electron microscope and Scanning electron microscope. (3 mks)

SECTION B

1. (a) Describe the fluid properties of the cell membrane and explain how membrane fluidity is influenced by membrane composition (6 mks)
   (b) Using a diagram only in each case
   i) Illustrate the functional aspect of the endomembrane system (6 mks)
   ii) Show the ATP balance sheet of respiration (6 mks)
   iii) Demonstrate the functional relationship between the chloroplast and mitochondrion in the balancing act of metabolism (4 mks)
   (c) Explain the process of translation including the three major steps of initiation, elongation and termination (4 mks)

SECTION C

1. *Escherichia coli* cells that had been cultured in a heavy medium containing ^{15}N- ammonium chloride as the sole nitrogen source were transferred to a light medium containing ^{14}N – ammonium chloride. After 3 generations of growth in the light medium, what will be the proportion of the following double stranded DNA molecules (a) one with 2 light strands (b) one with 2 heavy strands (c) one with a light strand and a heavy strand. (3 mks)

2. (a) Give an illustrated description of (i) the secondary structure of DNA and (ii) the different levels of protein structure. (4.5 mks)
   (b) State the characteristics of the Genetic code (2 mks)

3. Using the structural formulae
   (a) Show how glycine can function as blood buffers (1 mk)
   (b) Illustrate the formation of a peptide bond between alanine and lysine (1 mk)
   (b) Determine the molecular weight and net charge of the peptide: E-C-A-K at neutral pH (2.5 mks)
   (c) Differentiate between (i) amylase and cellulose iii) Triacylglycerol and waxes (3 mks)

4. A hypothetical eukaryotic primary mRNA transcript having 2400 bases with an exon of 1800 bases undergoes maturation and translation, (a) deduce the number of amino acids in the resultant protein. (b) How many bases will be in the DNA strand that served as a template for the above primary mRNA transcript? (c) If some of the codons on the above mRNA are GUU and CAA, what are their anticodons on the tRNA. (3 mks)

5. ……

6. *2. a) Describe the fluid properties of the cell membrane and explain how membrane fluidity is influences by membrane composition (6 marks)*

7. ……
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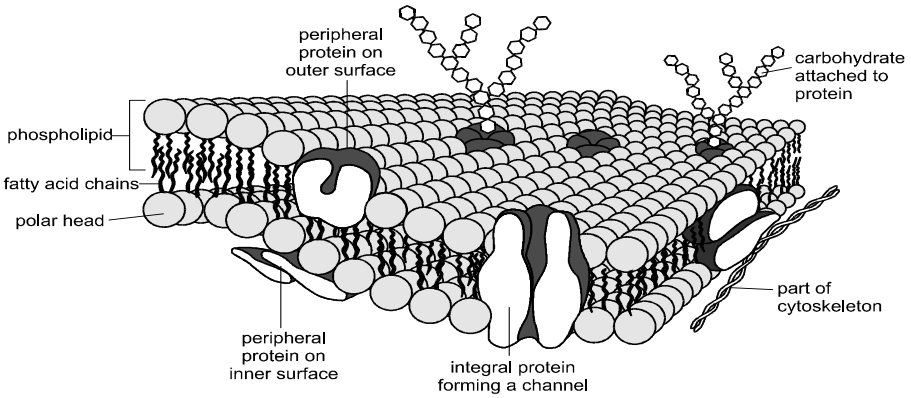
8. The plasma membrane separates internal metabolic events from the external environment and controls the movement of materials into and out of the cell.



9.

10. *Fig. Structure of the cell membrane (Fluid Mosaic Model)*

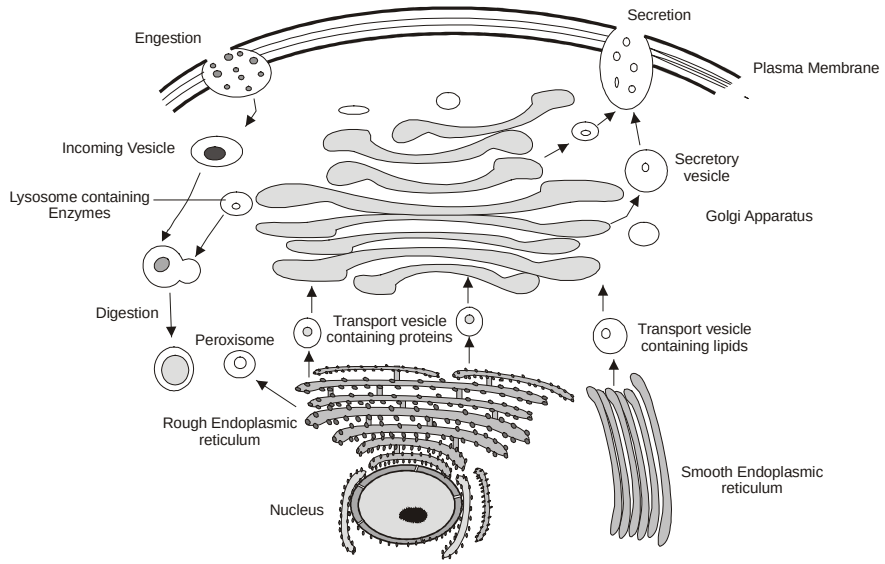
11. It is a double phospholipid membrane (lipid bilayer) with the nonpolar hydrophobic tails pointing toward the inside of the membrane and the polar hydrophilic heads forming the inner and outer faces of the Proteins and cholesterol molecules are scattered throughout the flexible phospholipid membrane. Proteins may attach loosely to the inner or outer surface of the plasma membrane (peripheral proteins), or they may lie across the membrane, extending from inside to outside (integral proteins). The mosaic nature of scattered proteins within a flexible matrix of phospholipid molecules describes the fluid mosaic model of the cell membrane. This explains how membrane fluidity is influences by membrane composition (6 marks)

12. ……

13. b) Using a diagram only in each case:

14. (i) illustrate the functional aspect of the endomembrane system (6 marks)

15.



16.

17. ……
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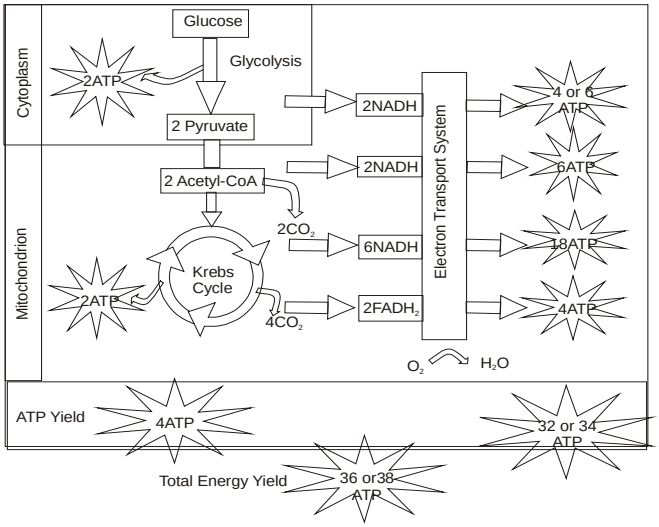
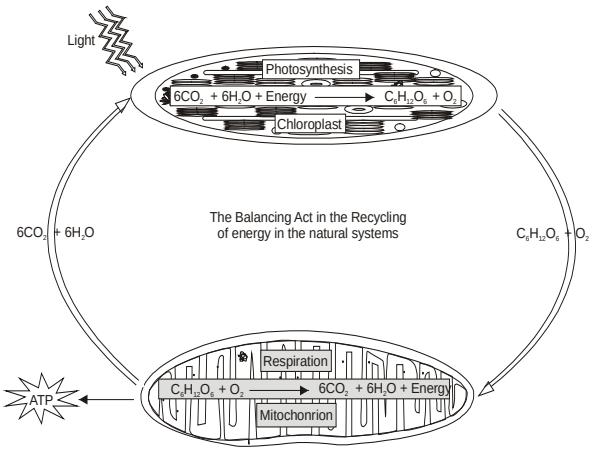
18. (ii) show the ATP balance sheet of respiration (6 marks)



19.

20. (iii) demonstrate the functional relationship of the mitochondrion and chloroplast in balancing act of metabolism (4 marks)



21.

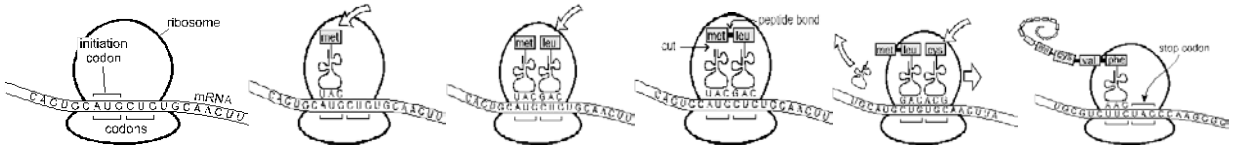
22. (c) Explain the process of translation including the three major steps of initiation, elongation and termination. (4 marks)

23. Translation is the synthesis of proteins and takes place in three steps initiation, elongation and termination.

24. Initiation is when the the initiation tRNA encounters the start codon AUG in the mRNA and binds to a P-site on a ribosome. This initiator codon AUG also code for methionine in eukaryotes.

25. Elongation is when the aminoacyl-tRNA arrives the nest codon in the A-site of the mRNA associated with an elongation factor and GTP as a source of energy. The in-coming amino acid link with a peptide bond and this continues until the initiator tRNA is released from the P-site. Elongation factor promotes the elongation of the peptide until it encounters a termination codon on the mRNA.

26. Termination occurs at stop codons (UAA, UAG, UGA) and the peptide is released from the ribosome by a releasing factor.



27.

28.

29. (Total Score ……./25 marks)

30.