BITS, PILANI- DUBAI
DUBAI INTERNATIONAL ACADEMIC CITY
SECOND SEMESTER 2009-2010
COMPREHENSIVE EXAM (CLOSED BOOK)

COURSE NO.: BIO C111 **25.05.10** **MAXIMUM MARKS: 120**
COURSE TITLE: GENERAL BIOLOGY **DURATION: 3 Hours**

Answer Part A and Part B in separate answer sheets
Answer to the point; Answer all questions in the given sequence
Marks will be allotted for step-wise solution to problems

PART - A

Q1. (a) Define:
i) Irritability ii) Organ iii) Essential fatty acid [3]
(b) What is the induced fit hypothesis? [2]
(c) What is a disaccharide? Give two examples. [3]
(d) How is cell division different in plant and animal cells? [2]
(e) Assume that in horses black hair color and white hair color are co-dominant. A cross between a black and a white horse produces a grey colored horse. Cross a white-haired and grey-haired horse. What are the genotypic and phenotypic ratios of offspring? [5]

Q2. (a) State the major function of:
i) Inhibitor ii) Coenzyme iii) DNA Ligase iv) Tissue plasminogen activator v) MHC Proteins vi) Interferon vii) Antimetabolites viii) p53 gene ix) Gene-repressor proteins x) Phospholipids [10]
(b) What are subunit vaccines? [2]
(c) Name the three basic kinds of defending WBCs and name their method of killing microbes. [3]
(d) In man, normal pigmentation is due to a dominant allele (C), and aibinism due to its recessive allele (c). A normal man marries an albino woman. Their first child is albino. What are the genotypes of these three people? [5]

Q3. (a) Differentiate between mitosis and meiosis. [4 major points in a tabular form] [4]
(b) Explain the concept behind genetic screening and genetic selection using an example for each. [5]
(c) How does temperature affect enzyme action? [2]
(d) Explain the T cell immune defense by listing out the sequence of steps. [4]

Q4. (a) List the four stages of a genetic engineering experiment. [4]
(b) Explain crossing-over schematically. [By means of a diagram] [2]
(c) State True or False: [2]
i) Secondary immune response is weaker than the primary immune response.
ii) Interleukin – 2 direct the neurons in the hypothalamus to raise the body's temperature above the normal value of 37°C.
(d) What is metabolism? Name the three essential aspects of metabolism. [2]

P.T.O.

PART - B

Q5. (a) Name any 4 nonmembranous organelles and mention each organelle's major function. [Tabular form] [4]
(b) Give the generalized reaction that summarizes the events of glycolysis. [2]
(c) If a population of dogs has the following genotype frequencies: AA = 40%, Aa = 45% and aa = 15% -- what will be the allele frequencies? [4]

Q6. (a) If we start the glycolytic pathway with glyceraldehyde-3-phosphate, what is the net gain of ATP in an anaerobic process, ending at pyruvic acid? [4]
(b) Name the four regions of the gene that contribute to its expression. [2]
(c) Give the significance of hypothalamus. [2]
(d) Differentiate between Endocrine and Exocrine glands [2]

Q7. (a) Describe the interdependency of the three important events in the photosynthetic pathway. [4]
(b) Define the following: [4]
i) Homeostasis ii) Frameshift mutation iii) Stimulus iv) Diffusion
(c) Diagrammatically explain the life cycle of viral infection in a bacterial cell. [5]
(d) Give two examples of the hormones secreted by the pituitary gland. [2]

Q8. (a) Name the factors that affect the selective permeability of a membrane. Give one example for each factor. [3]
(b) Briefly describe the three steps involved in translation of mRNA to proteins. [6]
(c) What is the role of bile in digestion? Name the organs that secrete and store bile. [4]
(d) Why is the genetic code a triplet code? [2]

Q9. (a) How is pH of blood interrelated with heavy breathing? [3]
(b) Classify proteins functionally, giving one example for each category. [3]
(c) List out any four factors that make the Hardy Weinberg concept a purely theoretical one in a natural gene pool. [4]

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TEST – II (OPEN BOOK)

COURSE NO.: BIO C111 **02.05.10** **MAXIMUM MARKS: 60**
COURSE TITLE: GENERAL BIOLOGY **DURATION: 50 Minutes**

Answer to the point; Answer all questions in the given sequence
Marks will be allotted for step-wise solution to problems

Q1. In man, assume that spotted skin (S) is dominant over non-spotted skin (s) and that wavy hair (W) is dominant over non-wavy hair (w). Cross a marriage between a spotted (heterozygous), non-wavy haired man with a wavy-haired (homozygous), non-spotted woman. What are the phenotypes and genotypes of the offspring? [8]

Q2. A woman has a daughter. There are two men whom she claims might have been the father of the child. The judge in the paternity court orders that the two men, the child, and the mother have blood tests. The results are: [12]

Mr. X: Type B
Mr. Y: Type O
Mother: Type A
Child: Type O

The mother claims that this proves that Mr. Y must be the little girl's father.

i) Is the mother correct? Why or why not?

ii) The judge isn't satisfied, so he asks for the medical records of the people involved. He discovers that the little girl is colorblind. Mr. X is colorblind; Mr. Y and the mother have normal vision. (NOTE: Colorblindness is X-linked and recessive.) Assuming that one of these two men must be the father; can you now determine which of the two it is?

Q3. (a) Which contains more energy: one molecule of NADP or one molecule of NADP-H? Why?

(b) Chlorophyll is green because it _____ (absorbs, reflects, or transmits) green wave lengths of light.

(c) The alcohol content of most wines is about 12%. The alcohol is produced by the fermentation of the natural sugar in grape juice by yeast. Why is the alcohol content not higher?

(d) Name the molecule that is taken from the air and that provides the carbon for the production of carbohydrates during the dark reactions?

(e) When a person goes on a "no carbohydrate" diet, where does his / her body get energy from? [10]

P.T.O

Q4. DNA Coding Strand: 5'-**GGT CAT ATG CCA GAT AGC CCA TAA CAT** -3
Write down – [14]

(a) mRNA formed after transcription
(b) tRNA anti-codons
(c) Peptide (protein) sequence formed after translation
(d) If a mutation occurs in the DNA –

5'-**GGT CAT ATG CCA GA<u>A</u> TAG CCC ATA ACAT** -3'

What kind of mutation is this?
(e) How is the protein affected?
(f) Sickle cell anemia is caused due to which type of mutation?
(g) Lysergic acid diethylamide is known to be a mutagenic agent. By what name is this chemical more commonly known?

Q5. (a) Define metastatic cancer.
(b) What are the differences between Anaphase I and Anaphase II?
(c) During which stage of the mitotic cell cycle is the DNA replicated?
(d) Even when both parents do not have diabetes [assume that diabetes is caused by a recessive allele], their child may have diabetes. Name this source of variation.
(e) What is kinetochore? [10]

Q6. What is trisomy of 21st chromosome [indicate cause also] and what is its clinical significance? [6]

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TEST – I (CLOSED BOOK)

COURSE NO.: BIO C111 **21.03.10** **MAXIMUM MARKS: 75**
COURSE TITLE: GENERAL BIOLOGY **DURATION: 50 Minutes**
Answer to the point; Answer all questions in the given sequence

Q1. (a) How do viruses replicate? [4]

(b) Write the equation for Krebs cycle. Where does it occur and which coenzyme is utilized in the cycle? [4]

(c) What are peroxisomes? What is their function? [4]

(d) Explain negative feedback inhibition with an example. [4]

(e) Mention two similarities and differences between facilitated diffusion and active transport. [4]

Q2. (a) Calculate the number of ATPs produced when 7 molecules of glucose are metabolized through aerobic cellular respiration. What would be the ATP yield if respiration occurred in a prokaryote? [Marks will be allotted for step-wise calculation] [8]

(b) Define: (i) Catabolism (ii) Signal Transduction (iii) Active Site (iv) Chemosynthesis (v) Osmosis (vi) Dehydration synthesis reaction [12]

Q3. (a) Name the different levels / degrees of protein structure along with the type of bonds that stabilize each level. Also, give an example for each level. [Tabular form] [8]

(b) Differentiate between: [2 major points only in a tabular form] [12]
i) Phospholipids and true fats
ii) Cellulose and glycogen
iii) Phagocytosis and Pinocytosis
iv) Enzymatic competition and competitive inhibition

Q4. (a) How would you differentiate living things from non-living things? Explain individual adaptation with an example. [5]

(b) Name the three groups in Domain Archae and mention each group's characteristic feature.[4]

(c) For a tiger, the genus name is panthera and the specific epithet is tigris. Write the scientific name for the tiger. [2]

(d) Will salivary enzymes work in the stomach? Why / Why not? [4]

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QUIZ-2 [04.04.10] **A**

COURSE NO.: BIO C111 MAXIMUM MARKS: 21
TITLE: GENERAL BIOLOGY DURATION: 20 min.

Q1. Valves in the aorta and the pulmonary artery are known as _____ [1]

Q2. An enzyme called _____ destroys acetylcholine. [1]

Q3. _____ are very sensitive to light; the other receptor cells, called _____ are not as sensitive to light, but they can detect different wavelengths of light. [2]

Q4. Platelets are important in _____ [1]

Q5. What are curare and strychnine? [1]

Q6. _____ separates the chest cavity and the lungs from the abdominal cavity. [1]

Q7. A _____ is released by one organ and transported to another organ where it triggers a change in the other organ's activity. [1]

Q8. Chyme eventually leaves the stomach through a valve known as _____ [1]

Q9. Immunogens are also known as _____ [1]

Q10. _____ result when veins contain faulty valves that do not allow efficient return of blood to the heart. [1]

Q11. The _____ is the region of the brain that controls fundamental activities such as blood pressure, breathing and heart rate. [1]

Q12. ADH is an abbreviation for _____;
TSH _____ [2]

Q13. When an _____ reaches the synapse, a _____ is released into the synapse from the axon. [2]

Q14. How are systolic blood pressure and diastolic blood pressure different? [1]

Q15. Aminopeptidase is a digestive enzyme. True / False [1]

Q16. Hemoglobin is an _____ containing molecule to which _____ readily binds. [1]

Q17. The central nervous system consists of the _____ and _____ [1]

Q18. The watery matrix of blood is called _____ [1]

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QUIZ-1 [25.02.10] **B**

COURSE NO.: BIO C111 MAXIMUM MARKS: 24
TITLE: GENERAL BIOLOGY DURATION: 20 min.

Q1. Cilia and flagella possess the _____ arrangement of _____ [1]

Q2. Give one example of a prion infection: _____ [1]

Q3. According to the_____ model, the plasma membrane is a lipid bilayer and interspersed with proteins. [1]

Q4. Linoleic acid is an example of _____ [1]

Q5. Cholesterol is a steroid. TRUE / FALSE [1]

Q6. Chlorophyll is present in the _____ (grana / stroma) [1]

Q7. _____ moves using the mechanism of facilitated diffusion, whereas sodium ions move through _____. [2]

Q8. Give one example of a carrier protein and name the molecule that they carry. [1]

Q9. Our body can recognize disease causing organisms because the organisms have _____ different from our own. [1]

Q10. Name the three categories of responsive processes: [1.5]

Q11. Groups of populations that interact with the physical world in a particular place constitute the _____. [1]

Q12. _____stabilize the quaternary structure of proteins; give one example of a molecule that displays quaternary structure_____ [2]

Q13. An individual organism is an _____ [1]

Q14. The nucleic acids have a hexose sugar in their backbone composition.
TRUE / FALSE [1]

Q15. List the functions of [4]

a) SER --

b) Mitochondria --

c) Microtubules --

d) Nucleolus --

Q16. Define Dialysis: [1]

Q17. Galactose is a _____; whereas glycogen is an example of a _____ [2]

Q18. Accumulation of DDT in birds resulted in _____ in population (rise / fall / no change) [0.5]