BITS, PILANI - DUBAI CAMPUS

SECOND SEMESTER 2005-2006

COMPREHENSIVE EXAMINATION

COURSE NO: BIOUC111 **COURSE NAME: GENERAL BIOLOGY**

DATE: 25.05.2006 **DURATION: 3 HOURS** **MAX MARKS: 120**

Note: Attend 'Part A' in the Main Answer Sheet and 'Part B' in the Additional answer sheets separately.
Attempt all parts of the questions in sequence and together.
Your answers should be brief and to the point.

PART –A

(To be written in the Main Answer Sheet)

Q1 (a) What are phospholipids? How useful are these to our body? **(3)**
(b) What happens in Calvin's cycle? What is its significance? **(3)**

Q2 (a) What is enzyme competition? How can enzyme competition be used to regulate enzyme activity? **(5)**
(b) Half of the world's population's staple food is rice. But at the same time this leads to malnutrition. What are the reasons for the same? How can this be improved, so that the population gets adequate amount of nutrition and stays healthy ? **(6)**

Q3 (a) Give three types of cellular inclusions.
(b) List out functions of Lysosomes.
(c) What are prions? List out the diseases caused by them. **(1+2+2)**

Q4 (a) In what way Cytokinesis differ in plant and animals cells?
(b) In what way transcription differs in prokaryotes and eukaryotes?
(c) What is the difference between dominance and co-dominance? Explain with an example.
(d) What is unique about prophase-I? **(2+3+4+3)**

Q5 (a) What is the basic functional unit of human excretory organ? What are its various parts and list out their functions? **(0.5+1.5+2)**
(b) What is the difference between:
(i) Arteries and veins
(ii) Blood and lymph **(2+2)**
(c) Describe in two ways, how the functions of nervous system differ from the endocrine system. **(4)**

Q6 Label the figures (i) and (ii) and write the answers in the answer sheet along with the labeled numbers. **(1.5+3)**

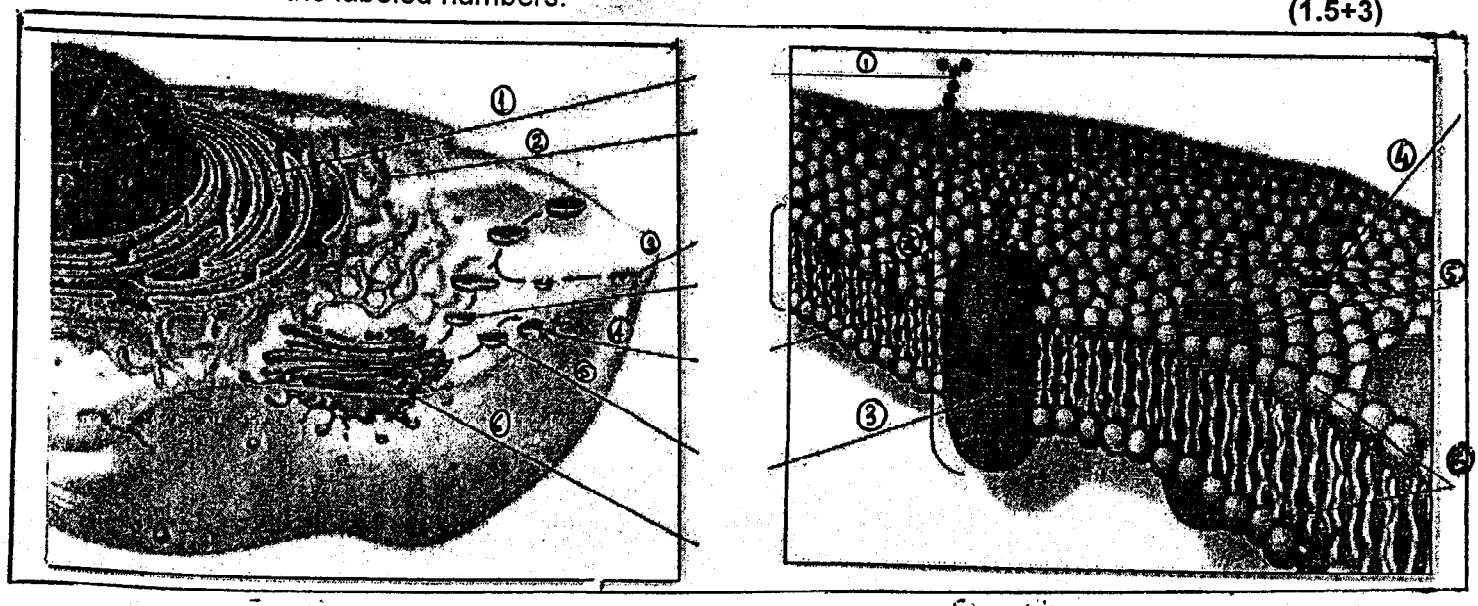


Fig - (ii)

PART B

(To be attempted on the Additional Answer Sheet separately)
Attempt Q7 carefully as per the directions given

Q1 (a) Why does adding salt to meat preserve it from spoilage? **(2.5)**

(b) Name the various stages of aerobic cellular respiration. For each stage list two main molecules that enter and two molecules that leave. **(1+4+4)**

(c) Why exact replication of DNA is required? How is it done? **(3)**

Q2 (a) What is frame shift mutation? Give an example. **(3)**
(b) How does the nerve cell differ from the skin cell with respect to **G0** phase of cell cycle? **(3)**

Q3 (a) If an offspring has genotype **Aa**, what possible combination of parental genotypes can exist? **(5)**

(b) The Hardy Weinberg's concept is only theoretical, what factors do not allow it to operate in a natural gene pool. Explain. **(5)**

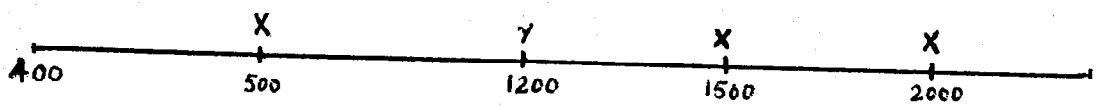
(c) The smaller the population, the more likely it is that the random changes may influence the gene frequency. Why is this true. Give an example. **(2)**

Q4 (a) How does absorption of fats different from carbohydrates and proteins? **(3)**

(b)How are blood **pH** and breathing inter related- explain? **(3)**

(c) How nervous system and endocrine system are interrelated. Explain with the help of an example **(4)**

Q5 Following is a segment of DNA (5600 base pair) which has restriction sites for two enzymes X and Y. How many fragments of DNA will be produced if you cut DNA with enzyme X only. **(4)**

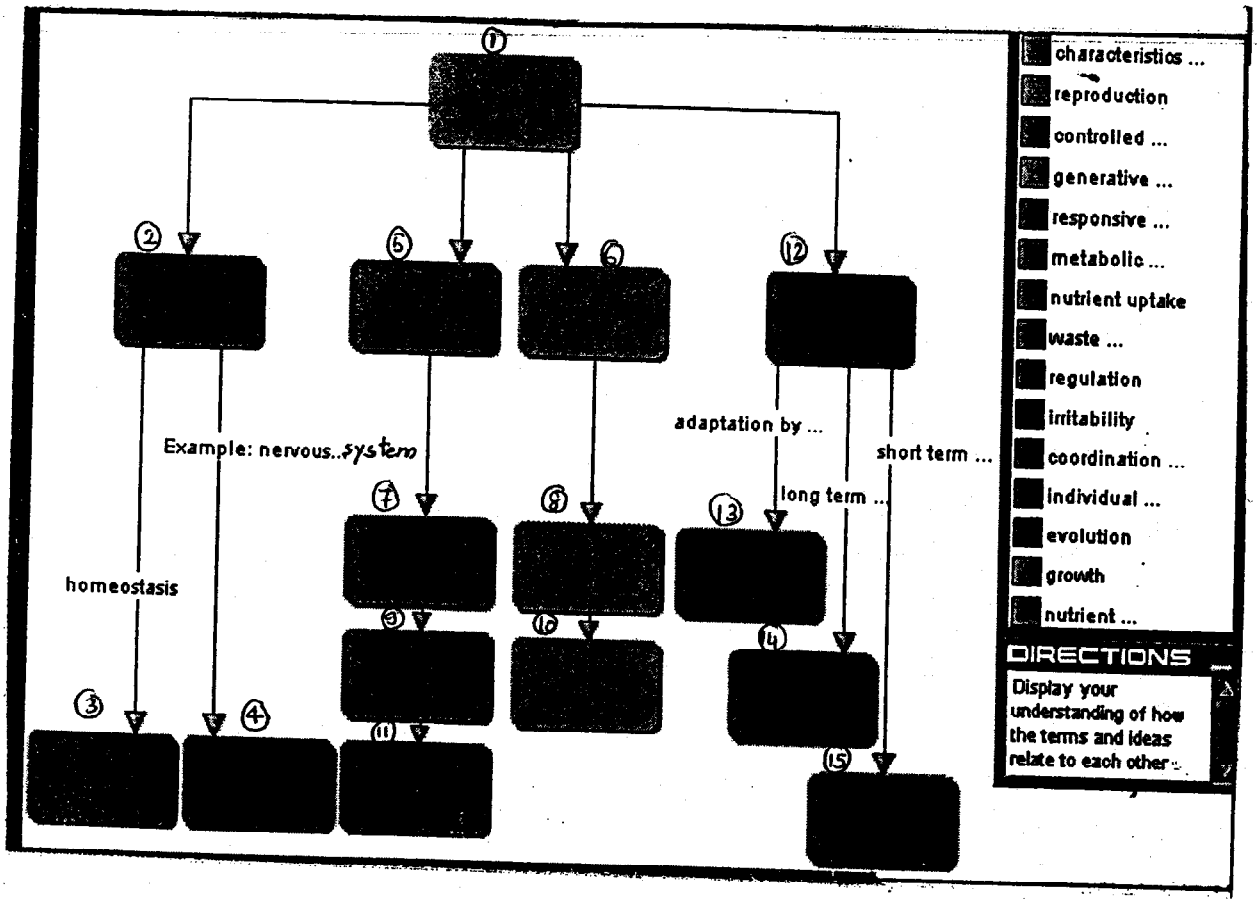


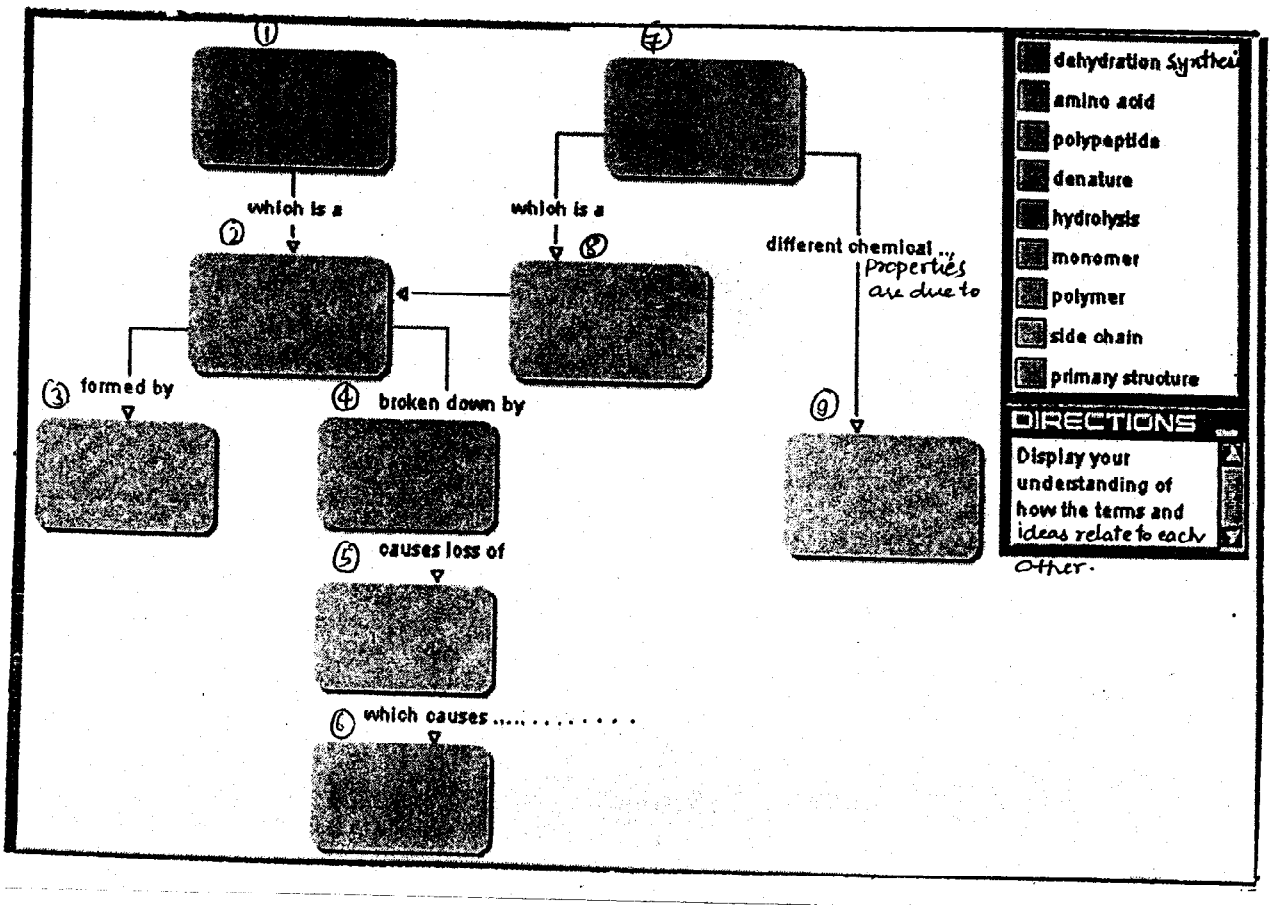
(DNA)

Q6 (a) Describe the role played by HLA or Major histocompatibility complex in your body **(4)**

(b) Differentiate between: **(2+4)**
(i) Active and Passive immunity.
(ii) B-Lymphocytes and T-Lymphocytes

Q7 (a) & (b) Complete the concept map by picking up the correct options and write the answers in the answer sheet along with the numbers mentioned in the schematic representation . **(8+5)**





BITS PILANI DUBAI CAMPUS

II SEMSTER 2005-06 **B**

QUIZ-I1

COURSE NO: BIO UC 111 **COURSE NAME: GENERAL BIOLOGY**

DATE: 9.05.2006 **WEIGHTAGE: 10 %** **MAX MARK: 30**

Name: **ID. No:** **Sec No:**

Q1.Fats are broken down through the action of _____ (1.0)

Q2.A probe is used to _____ (1.0)

Q3.The presence of inserted DNA is confirmed by _____ (1.0)

Q4. The structures of the following _____ provide examples in the human body in maximizing surface area for exchange of materials (1.0)

Q5 Cutting certain genes out of a molecule of DNA require _____ (1.0)

Q6 List out the requirements of a genetic engineering experiment/ recombinant DNA technique. (2.0)

Q7.The Central Nervous system consists of the ---------- (0.5)

Q8. Which statement is true about the white blood cells?

i) The lymphocytes produce antibodies and are involved in cell-mediated immunity

ii) When the white blood cells break up, they form platelets

iii) The white blood cells are responsible for transporting carbon dioxide

iv) All of the above (1.0)

Q9.Major difference between axons and dendrites is that (1.0)

Q10. At the base of brain where spinal cord enters the skull is a portion known as ---------- (1.0)

Q11.The fluid portion of blood that leaves the capillaries and surrounds the cells is_____ (1.0)

Q12. ----------is used as a vector for preparation of Subunit vaccine (1.0)

Q13.Acetylcholine is destroyed by---------- (0.5)

Q14. Write down the correct sequence / pathway when a drop of blood flows in Circulatory system (3.0)

Q15.What are the characteristic features of a plasmid to be used as a vector (list) (1.5)

Q16.The Vascular system that takes nutrients from the intestine to the liver includes_____ (1.0)

Q17.What happens when a nerve cell is stimulated ---------- (1.0)

Q18.What happens when you are thirsty_____ (1.0)

Q19.Name the muscle associated with movement of the air in and out of the lungs_____ (1.0)

Q20. Gene therapy can be applicable in curing ---------- ---------- (1.0)

Q21.Bile is produced in _____ and functions in _____ (1.0)

Q22.In the kidneys Glucose molecules are reabsorbed by_____ (1.0)

Q23.A typical pressure recorded in a large artery when the heart is contracting is known as _____ (0.5)

Q24.How does the two most commonly used **vectors** in recombinant DNA technology differ from each other? (3Points) (3.0)

Q25An abnormal condition of the lungs marked by decrease in no. of Alveoli is referred to as---------- (1.0)

Q26.**Gel Electrophoresis** is used for ---------- (1.0)

BITS PILANI DUBAI CAMPUS
SECOND SEMSTER 2005-2006
TEST- 2 (MAKE UP)

COURSE NO: BIOUC 111 **COURSE NAME: GENERAL BIOLOGY**
DATE: 26.4.2006 **DURATION: 50 min** **MAX MARKS: 60**

Q1.(a) How many molecules of ATP are yielded when?
(i) An RBC molecules undergo respiration
(ii) Nerve cells undergo respiration
(iii) 7 molecules of Stearic acid are oxidized (only ATP to be calculated here)
(b) Difference between Cyclic and non cyclic Phosphorylation. (12)

Q2. (a)Abnormalities in chromosome no. give rise to diseases of karyotype, how might these aberrations occur – justify with an example.
(b) Are there differences between Meiosis II and ordinary mitosis? Explain
(c)How might chemical mutagens and ionizing radiation lead to mutation? (5+4+5)

Q3. Given is a sequence of following bases (nucleotides):
GCTGGCTAGTACTTTAGAGGACCAGTAATTTTTAGA

(i)Show the sequence of bases you would expect to find the corresponding m-RNA
(ii)Work out the reading frame for the resulting peptide sequence
(iii) Write down the peptide sequence.
(iv)What are the consequences if a base A is added at 18^{th} position on the same base sequence? Explain.
(10)

Q4. a) A base deletion mutation may have greater effect than a base substitution – justify. (5)

b) If fruit flies with straight wing are crossed with the fruit flies with wrinkled wings, all the F1 generations will have straight wings. Using the Punnett Square, predict the phenotype of F2 progeny and their relative proportions
(6)

c) Consider father has the ability to roll the tongue and fold as well. But the mother can only roll her tongue but can not fold. What could be genotype of the parents and what will be the possible out come of this cross?
(13)

BITS PILANI DUBAI CAMPUS
II SEMESTER 2005-06
QUIZ-I (MAKE UP)

COURSE NO: BIO UC 111 **COURSE NAME: GENERAL BIOLOGY**
DATE: 3.4.2006 **WEIGHTAGE: 10 %** **MAX MARK: 30**

Name: **ID. No:** **Sec No:**

Q1. What is the balanced equation for complete cellular degradation of glucose?

Q2. One complete turn of DNA helix contains .....base pairs.
Q3. What are the different nitrogenous bases in DNA? How they are different?

Q4. Where does processing of the initial transcript occur in prokaryotic cells? (1.5)

Q5. The basic protein present in nucleosome is .....

Q6. What are the two properties of DNA polymerse?

Q7. What cellular compartment becomes acidic during mitochondrial electron transport? (1.5)

Q8. During respiration the primary purpose of Fermentation is.....

Q9. During Fat respiration the glycerol molecule first convert to .....

Q10. A vitamin sometimes works as.....

Q11. In enzyme-controlled reactions, an increase in temperature will usually .....

Q12. In negative-feedback inhibition, as the .....increases,results in .....

Q13. An inhibitor is a molecule that

a) Attaches itself to an enzyme and interferes with the formation of the enzyme-substrate complex

b) Attaches itself to a substrate and interferes with the formation of the enzyme-substrate complex

c) Binds to the enzyme-substrate complex and prevents the release of the end products

d) Binds to the cell's DNA and prevents the formation of an enzyme

Q14. In competitive inhibition, the competitor binds to .....

Q16. To increase the amount of end-product produced in an enzyme facilitated reaction, you could

Q17 One difference between preRNA and mature RNA is:

Q18. Which of the following is NOT a chromosomal aberration?

a) Inversion b) duplication c) deletion d) X-ray

Q19. Removing only one base in a DNA sequence will result in.....

Q20. What is the final electron acceptor in the electron transport system?

Q21. The difference between a heterotroph and an autotroph is .....

Q22. To transfer the right amount of chemical-bond energy from energy-releasing to energy-requiring reactions, cells use the .....molecule(s)

Q23. In chemiosmosis, the energy comes from.....

Q24. The complete breakdown of one molecule of pyruvic acid is called.....

Q25. What happens when a triglyceride undergoes catabolic oxidation? (2)

Q26. The end product of photosynthesis is .....

Q27. The hydrogen which eventually becomes a part of sugar manufactured in photosynthesis is acquired from:

(2)

BITS PILANI DUBAI CAMPUS
II SEMESTER 2005-06
TEST-2 (OPEN BOOK)

COURSE NO: BIO UC 111 **COURSE NAME: GENERAL BIOLOGY**
DATE: 16.4.2006 **WEIGHTAGE: 20 %** **MAX MARK: 60**

Q1 (a) If the sequence of mRNA is 5' AUG GCA UCC GGG 3' then what would be the sequence of
(i) Anticodon of t RNA molecules.
(ii) Non template strand
(iii) Template strand
(iv) Peptide chain.
(10)

(b) Four different types of Ryegrass plants have been developed by scientists and designated as P1, P2, P3 and P4.Each type of the plant is having the following defect, respectively.
P1: Chlorophyll molecules lost the ability to release the electron.
P2: Thylakoid membrane is damaged.
P3: system required for photolysis of water is damaged.
P4: RuBP is not available in stroma.
What would be the expected consequence in each type of plant? (12)

© How normal cells are prevented from being cancerous? (5)

Q2 (a) Calculate the number of possible chromosome combinations in gametes of organisms with following diploid chromosomes number:
(i) 8 (ii) 10 (iii) 16 (iv) 20.
(4)

(b)What is non disjunction? What is the difference if non disjunction occurs at meiosis 1 and meiosis II?
(5)

© A 12 year boy had a family history of diabetes and he develops the same at this very young age. The boy was very much fond of sweets, so his mother used to prepare sweet dishes at home by using nutra sweet very often and in milk and tea preparations as well. Doing so for quite a sometime it was found that normal growth of the boy was affected and also he showed some signs of mental retard ness .What could be the possible reason? Justify.
(5)

Q3 (a) Neither the father nor the mother had 'O' blood group. But their daughter happens to be the universal donor. What could be the genotype of her parents?
(4)

(b) One of the pea plants is heterozygous for both seed shape and seed color and the other one is homozygous for seed shape but heterozygous for the seed colour. What will be result/outcome of this cross? (S is the allele for the dominant, spherical shape characteristic; s is the allele for the recessive, dented shape characteristic. Y is the allele for the dominant, yellow color characteristic; y is the allele for the recessive, green color characteristic.
(15)

— GOOD LUCK —

B/A

BITS, PILANI - DUBAI CAMPUS
SECOND SEMESTER 2005-06
QUIZ-1

COURSE NO: BIO UC 111 **COURSE NAME: GENERAL BIOLOGY**
DATE: 28.3.2006 **DURATION: 30 min** **MAX MARKS: 30**

Name: **ID.No.** **Sec.No:**

Q1. Which of the following statements about mitochondria is false?
a) They contain an inner and an outer membrane.
b) The region enclosed by the inner membrane is termed the matrix.
c) They contain DNA and ribosomes.
d) They are an important site for energy production in cells
e) They contain stacked internal thylakoid membranes

Q2. What is the purpose of the electron transport chain during the last stage of oxidative phosphorylation?
a)To create a proton motive force
b)To harness the power of the electron to phosphorylate ADP to ATP
c)To get rid of excess electrons
d)This function of this step is still not known

Q3. As a result of glycolysis, pyruvate oxidation and the Krebs Cycle, only a small portion of the energy of glucose has been converted to ATP. At this point, the majority of the usable energy is contained in ..... (2.0)

Q4. According to which of the patterns below are most enzymes named
a) First the molecule involved; second the type of reaction; third the "-ase" ending.
b) First the type of reaction; second the molecule involved; third the "-ase" ending.
c) First the type of reaction; second some type of description; third the "-ase" ending.
d) The molecule involved and the reaction type are interchangeable - followed by the "-ase" ending.

Q5. At the end of glycolysis, each molecule of glucose has yielded 2 molecules of _____, 2 molecules of _____, and a net of 2 molecules of _____. (0.75)

Q6. Which is the correct genetic sequence?
a) Promoter, initiation code, gene, terminator code, terminator region
b) Promoter, initiation code, gene, terminator region, terminator code
c) Initiation code, promoter, gene, terminator code, terminator region
d) Initiation code, promoter, gene, terminator region, terminator code

Q7. An overall result of photosynthesis in plants is the use of electrons from water to reduce.....

Q8. Which of the following is NOT true of photo system II?

a) It is located in thylakoid membranes.

b) It is involved in the oxidation of water.

c) It has a special oxidizable chlorophyll, P680.

d) It has an associated antenna complex for light harvesting activity.

e) It is required for cyclic photophosphorylation.

Q9. If you isolate mitochondria and place them in buffer with a low pH they begin to manufacture ATP. Why? (1.5)

a) Low pH increases the concentration of base causing mitochondria to pump out H+ to the inter membrane space leading to ATP production.

b) The high external acid concentration causes an increase in H+ in the inter membrane space leading to increased ATP production by ATP synthetase.

c) Low pH increases the acid concentration in the mitochondrial matrix, a condition that normally causes ATP production.

d) Low pH increases the OH- concentration in the matrix resulting in ATP production by ATP synthetase.

Q10. Why in anaerobic cells the ratio of pyruvate / lactate is much less than 1 while under aerobic conditions the ratio of pyruvate/ lactate is much greater than 1. (1.25)

a) lactate is produced from pyruvate only under anaerobic conditions

b) under anaerobic conditions pyruvate is converted to carbon dioxide

c) in anaerobic conditions, pyruvate is converted to glucose using the energy of light

d) lactate is the terminal electron acceptor under aerobic conditions

e) pyruvate is transported into mitochondria under anaerobic conditions

Q11. NAD+ acts as

a) enzyme.

b) inhibitor.

c) coenzyme.

d) catalyst.

Q12 According to the induced-fit hyhypothesis

a) the presence of the substrate causes the enzyme to adjust itself to the substrate, this creates stress on substrate bonds.

b) enzymes and substrates fit perfectly together with "lock and key" precision.

c) coenzymes alter the shape of enzyme molecules.

d) inhibitors alter the shape of substrates

Q13. Which statement(s) is/are true?

a) Enzymes generally have a functional temperature range that is identical to its optimal temperature range.

b) When an enzyme is denatured, its spatial structure is permanently changed.

c) Most enzymes are more sensitive to low temperatures than to high temperatures.

d) All of the above.

Q14. Messengers that tell the cell to decrease the production of a certain protein are
a) Coenzymes.
b) Gene-repressor proteins.
c) Inhibitors.
d) Denatured enzymes.

Q15. DNA polymerase is the enzyme that
a) Unzips the DNA strands.
b) Adds new nucleotides to the growing DNA strand.
c) Keep the two strands of DNA separated.
d) Ties together new pieces of DNA.

Q16. Which statement(s) is/are true
a) The three-dimensional structure of a protein leaves side chains exposed and thus subject to fluctuations in pH.
b) The environmental pH is important in determining the shape of the enzyme.
c) Each enzyme has its own pH range of activity.
d) All of the above.

Q17. Which statement(s) about mutations is/are correct?
a) Any change in the nucleic acid (whether "good," "bad," or "indifferent") is called a mutation.
b) A point mutation involves a complete codon rather than a single nucleotide.
c) A nonsense mutation causes a change in the amino acid at a given location.
d) All of the above.

Q18. Which of the following is the equation for the light reaction of photosynthesis? (1.5)
a) $2\ H2O + 2\ NADP+ + nADP + nPi + hv \rightarrow O2 + 2\ NADPH + 2\ H+ + nATP$
b) $H2O + CO2 + hv \rightarrow C(H2O) + O2$
c) $2\ H2O + 2\ NADP+ + nATP + hv \rightarrow O2 + 2\ NADPH + 2\ H+ + nADP + nPi$
d) $O2 + 2\ NADP+ + nATP + hv \rightarrow 2\ H2O + 2\ NADPH + 2\ H+ + nADP + nPi$
e) $2\ H2O + 2\ NADPH + nADP + nP_i + hv \rightarrow O_2 + 2\ NADP^+ + 2\ H^+ + nATP$

Q19. Telomeres are
a) *Knots* in the center of the chromosome that seem to tie the chromatids together.
b) Starting points for DNA replication.
c) Molecules that bring new nucleotides to the replicating DNA strand.
d) Repetitive sequences of nucleotides found at ends of chromosomes.

Q20. The conversion of light energy to chemical energy during photosynthesis begins when an excited pigment molecule:
a) undergoes fluorescence b) loses energy as heat **c)** undergoes an oxidation reaction d) increases its molecular motion

Q21. Transposons are DNA segments that.....

Q22. The mRNA codon CAU will form temporary bonds with the
a) mRNA anticodon CAU.
b) mRNA codon GUA.
c) tRNA anticodon GUA.
d) tRNA codon CAU.

Q23. **UGG** is a triplet base sequence which represents amino acid Tryptophan , due to mutation this sequence changes to **UGA** , what will be the amino acid formed after this mutation ? Name the type of mutation? (2.0)

Q24. An enzyme is
a)A protein catalyst.
b)Under the direct control of the DNA.
c)A substance that lowers the activation energy.
d)All of the above.

Q25. Which statement is true?
a)Coiled eukaryotic DNA strands with attached proteins are called HU proteins.
b)DNA spirals around Histone clusters form nucleosomes.
c) The prokaryotic DNA strands should be referred to as chromatin fibers.
d)All of the above.

Q26. To be functional an enzyme must have
a) Have a specific three-dimensional shape.
b) Attach to a substrate, forming and enzyme-substrate complex.
c) Have a specific binding or attachment site.
d) All of the above.

Q27. Which out of the two strands of DNA is/are used as a template strand for replication .....

..... GOOD LUCK .....

BITS PILANI DUBAI CAMPUS
SECOND SEMESTER 2005-06
TEST -1

COURSE NO: BIO UC 111 COURSE NAME: GENERAL BIOLOGY
MAX MARKS: 60 WEIGHTAGE: 20%
DATE: 5.03.2006 TIME: 50 min.

NOTE:•Attempt all the questions in the given sequence only.

•All parts of the question should be answered together

•Be specific while answering

Q (i) Why do viruses invade/attack only specific types of cells? Explain with example (4)

(ii) What are the various levels of protein structure? Explain briefly (6)

(iii) Why do the freshwater fishes take water from their surroundings? How do they withstand this effect? (4)

Q2 (i) In an animal cell system, after a normal cell division, out of the two cells produced, one cell dies after few minutes of division .Analysis of this dead cell showed that one double membrane organelle which has its own DNA was absent .Name that organelle and write its structure and functions? (5)

(ii) What are the various characteristics of life? Explain briefly with example. (8)

Q3 Differentiate between the following:

(a) Phagocytosis and Pinocytosis

(b) Active transport and facilitated diffusion

(c) Lysosome and peroxisomes

(d) True fat and phospholipids (3+2+3+2)

Q4 (i) list out the various components of Cell membrane as per fluid mosaic model? Write about their functions in brief? (8)

(ii) What is the role of the following:

(a) Bacterial capsule (b) Fimbriae (c) Ribosome (d) fats (e) Different types of RNA. (1+1+1+3+3)

Q5 (i) Give a flow chart for various domains and kingdoms of life (4)

(ii) Name four essential amino acids required by our body? (2)

----------GOOD LUCK----------