

BITS, PILANI- DUBAI
DUBAI INTERNATIONAL ACADEMIC CITY
FIRST SEMESTER 2010-2011
COMPREHENSIVE EXAM (CLOSED BOOK)

COURSE NO.: BIO C111 **28.12.10** **MAXIMUM MARKS: 80**
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) Explain the B cell immune response by listing out a sequence of steps. [5]
(b) What are the four stages of a genetic engineering experiment? Also, explain how the preliminary screening of clones is done. [5]
(c) Why are the Archaea known as extremophiles? Name the three groups into which the Archaea are divided? [2]
(d) Classify proteins structurally and indicate the major bond that stabilizes each level of structure. [Tabular form] [3]
(e) Superman is homozygous for super strength and heterozygous for x-ray vision. He falls in love with Wonder Woman who is homozygous recessive for both traits. What is the probability that a child will inherit both super strength and x-ray vision? [Super strength and X-ray vision are dominant traits] [5]

- Q2. (a) Differentiate between [2 Major Points only] [5]
i) Phages and Plasmids
ii) Diffusion and Facilitated Diffusion
iii) Viruses and Prions
iv) RER and SER
v) Photosynthesis and Cellular Respiration
(b) Schematically express what happens during Glycolysis. [2]
(c) Polydactyly is a condition where those affected have more than five fingers / toes. It is a dominant disorder. If a man without polydactyly marries a woman who is heterozygous for the condition, what are the genotypes and phenotypes of the offspring? [3]

- Q3. (a) State the major function of:
i) Restriction Endonucleases ii) Atrial Peptides iii) nif genes iv) Interleukin-2 v) HLA
vi) Natural Killer Cells vii) Lysozyme viii) tRNA ix) Phospholipids x) Starch [5]
(b) Depict lactic acid fermentation and alcoholic fermentation schematically. [3]
(c) State True or False and Justify your answer:
(i) The oxygen produced in the light-dependent reactions moves from the grana to the stroma, where the light-independent reactions take place.
(ii) Glyceraldehyde-3-Phosphate is the actual product of the process of photosynthesis. [2]

P.T.O.

PART – B

- Q4. (a) Define i. Turnover number ii. Competitive inhibition iii. Metabolic processes
iv. Homeostasis [4]
(b) Name any 3 membranous organelles and mention each organelle's major function.
[Tabular form] [3]
(c) Explain how the concentration of the substrate influences the rate of the reaction. [2]
(d) i. What are Varicose veins? How are they developed? [4]
ii. List any four types of lymph organs. [2]
- Q5. (a) Explain in brief the process of DNA replication along with the enzymes involved
in it. [4]
(b) Justify: DNA and RNA are both required for making proteins. [3]
(c) Schematically explain the four stages of mitosis. [4]
(d) Justify: Down's syndrome is a genetic disorder. [3]
- Q6. (a) Fill in the most appropriate word: [2]
i. The sound that arrives at the ear is first funneled by the external ear to the
_____.
ii. _____ is the region of the brain that controls fundamental activities like blood
pressure, breathing and heart rate.
(b) Differentiate between (Tabulated form) [4]
i. Motor neurons and sensory neurons
ii. Rods and cone cells
(c) If 9% of an African population is born with a severe form of sickle-cell anemia (ss),
what percentage of the population will be more resistant to malaria because they are
heterozygous (Ss) for the sickle-cell gene? (Given: $p + q = 1$ or $A + a = 1$) [3]
(d) List out any four conditions necessary for gene frequencies to remain constant in a
population. [2]

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TEST – II (OPEN BOOK)

COURSE NO.: BIO C111

11.12.10

MAXIMUM MARKS: 40

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. (a) Sickle cell anemia (SCA) is a human genetic disorder caused by a recessive allele. A couple plans to marry and wants to know the probability that they will have an affected child. With your knowledge of Mendelian genetics, what can you tell them if

(i) The man has SCA and the woman is homozygous normal

(ii) The man and the woman are normal but both have one parent with SCA and the other parent is homozygous normal [6]

(b) A color blind man marries a woman with normal vision. Her mother was colour blind. What kind of children would you expect from this marriage? Please note that colorblindness is due to an X-linked recessive allele. [6]

Q2. (a) A mutation results in the codon ACU being altered to ACG. What kind of mutation is this? [2]

(b) Name two molecules that are produced during photosynthesis and serve as temporary sites for energy storage. [2]

(c) Does diet affect intelligence of a person? Why / Why not? [2]

(d) When a molecule gains an electron, the molecule has _____ (gained energy / lost energy / neither gained nor lost energy) [1]

(e) What is the source of oxygen that is released during photosynthesis? [1]

Q3. DNA Coding Strand: 5'-CCT GAT GTG AAG GAA AGG CCA TTA CAT -3' [10]

(a) Write the mRNA formed from transcription

(b) Write the polypeptide formed after translation of the mRNA.

(c) Write the possible tRNA anti-codons for the mRNA sequence.

(d) How does splicing differ between prokaryotic and eukaryotic cells?

(e) Why is the genetic code a triplet code?

Q4. (a) How many assortments for maternal and paternal chromosomes are possible in human gametes? [2]

(b) Why doesn't synapsis occur during Meiosis II? [2]

(c) Can a haploid cell undergo meiosis? Justify. [2]

(d) Differentiate between: [4]

i) Benign tumors and Metastatic tumors

ii) Mitosis in animal and plant cells

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TEST – I (CLOSED BOOK)

COURSE NO.: BIO C111

24.10.10

MAXIMUM MARKS: 50

COURSE TITLE: General Biology

DURATION: 50 Minutes

Answer to the point; Answer all questions in the given sequence

Q1. (a) Write the major function of the following in a tabular form:

i) Cytochrome enzymes ii) Flagella iii) Ribosomes iv) Histocompatibility antigens v) Microfilaments vi) FAD vii) Chloroplasts viii) Proton pump ix) Nuclear pore complexes x) Primary messengers [5]

(b) Differentiate between the following: [2 points each; tabular form] [5]

- (i) Facilitated transport and Osmosis
- (ii) Aerobic and Anaerobic cellular respiration
- (iii) NADH and FADH₂
- (iv) Mitochondria and Endoplasmic Reticulum
- (v) Viroids and Prions

(c) (i) What is conversion?

(ii) Mention any four unique characteristics of a virus particle.

(iii) List the lines of evidence used in phylogeny. [1+2+2]

Q2. (a) How many ATP molecules are produced when 9 molecules of glucose are metabolized through aerobic cellular respiration?

Also, give a schematic representation of how a molecule of fat enters the glycolysis-krebs cycle-ETS pathway. [6]

[Note: For the first part, calculating for one glucose molecule and then multiplying by 9 will not carry any marks]

(b) What is the fluid-mosaic model? Name the major molecules found in the cellular membranes and mention their functions. [4]

Q3. (a) Write a short note on the five characteristics that differentiate the living organisms from the non-living organisms. [5]

(b) Food can be preserved by storing in freezers or refrigerators. Justify. [2]

(c) Identify the type of monomer(s) or group(s) described below: [5]

- i. Molecule that would be attached to other monomers by a peptide bond
- ii. Molecules that would combine to form a DNA
- iii. Molecules that combine to form a glycogen
- iv. Molecules that combine to form a true fat
- v. Molecules that combine to form sucrose

Q4. (a) Explain the induced fit hypothesis. [3]

(b) What are the three main types of lipids? How are they different from each other? [3]

(c) What is feed back inhibition? Explain in brief with a schematic representation [5]

(d) Define (i) Denaturation and (ii) Base-pairing rules [2]

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QUIZ – II (CLOSED BOOK)

COURSE NO.: BIO C111

09.12.10

MAXIMUM MARKS: 14

COURSE TITLE: General Biology

DURATION: 20 Minutes

All the questions carry one mark, unless specified otherwise

1. _____ is the protein present in the RBCs.
2. The blood pressure recorded when the heart is relaxing is called _____
3. Bile is produced in _____ and stored in _____. [2]
4. The primary hormone involved in regulating the water loss from the body is _____.
5. _____ are the primary organs involved in regulating the level of toxic or unnecessary molecules in the body.
6. _____ present in the stomach contributes to the breakdown of food.
7. The message from the central nervous system to the muscles and glands is carried by _____.
8. _____ is the region of the brain involved in sleep and arousal.
9. _____ glands release their contents in the circulatory system, while _____ glands empty their contents through ducts. [2]
10. The pigment found in the eye cells called rods is _____.
11. _____ molecules are neurotransmitters manufactured in the soma.
12. The tiny sacs present in the lungs are called _____.

**BITS, PILANI –DUBAI
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QUIZ-1 [22.11.10] A

COURSE NO.: BIO C111
TITLE: GENERAL BIOLOGY

MAXIMUM MARKS: 16
DURATION: 20 minutes

NAME :

ID:

SECTION:

NOTE: Each question carries 1 mark, unless indicated otherwise.

Q1. _____ are specific DNA sequences that RNA polymerase uses to find a protein-coding region of DNA.

Q2. Carotenoids are examples of _____

Q3. DNA Replication occurs during the _____ phase of interphase.

Q4. Summarize the process of photosynthesis by means of a chemical equation:

Q5. Each nucleotide is composed of:

Q6. Name two of the stop codons: _____

Q7. **True or False:** RNA is made in the nucleus and then moves into the cytoplasm of the cell. _____

Q8. The light-independent reactions take place in the _____ of the _____

Q9. A _____ mutation causes the wrong amino acid to be used in making a protein.

Q10. Name two characteristic features of prophase: [2]

Q11. Name the two major enzymes involved in DNA Replication: [2]

Q12. Expand RuBisCo:

Q13. The _____ is a protein in the centromere that enables the movement of the chromatids.

Q14. _____ are the intervening non-coding sequences scattered throughout the protein-coding sequence of genes in eukaryotic cells.