

GU-RET 2016

GAUHATI UNIVERSITY RESEARCH ELIGIBILITY TEST

BIOENGINEERING AND TECHNOLOGY

Booklet Series : **Ⓒ**

Invigilator's Name and Signature

BOOKLET NO.

OMR SHEET NO.

ROLL NO.

--	--	--	--	--

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TIME : 2 HOURS 20 MINUTES

TOTAL MARKS : 80

Number of Pages in this Booklet : 13

Instructions for Candidates

1. Write your Roll No. and OMR Sheet No. in the boxes provided above.
2. This paper consists of two sections : **Section B** with 50 (fifty) multiple choice questions (MCQ) and **Section C** with 8 (eight) descriptive questions. Each MCQ has 4 (four) answers, out of which **ONLY** one is correct. You have to darken the circle (on the OMR Sheet) for the correct answer corresponding to the question given in this booklet.

Example : (A) (B) (C) (D)

where (C) is the correct answer. No marks will be given for markings made in this booklet. The descriptive questions in **Section C**, **MUST** be answered in the space provided in this booklet. **No extra pages will be provided in any case.**

3. Use a **BLACK** ball point pen in your OMR Sheet.
4. Read the instructions given inside this booklet before attempting to answer any questions.
5. **DO NOT** write your name, roll no, phone no, or anything, or put any marks anywhere in this booklet, otherwise your candidature will be disqualified.
6. If you are found to resort to any kind of unfair means such as carrying extra material other than pen, pencil, watch, eraser, and scale, or copying from somebody or from external material, your candidature will be disqualified.
7. Mobile phones, programmable calculators, log tables or any other tables, wearable smart devices such as smart Android watches or objects of similar nature **CAN NOT** be used inside the examination hall.
8. At the end of the examination, you have to return this booklet and the OMR Sheet back to the invigilator.
9. There is no negative marks for incorrect answer.

This page is left intentionally blank

GU-REF 2016

Section B (50 Marks)

- Shine-Dalgarno sequences of mRNA are complementary to a sequence of nucleotides found near
 - The 3' end of 16S rRNA in the small sub-unit of the ribosome
 - The 5' end of 16S rRNA in the small sub-unit of the ribosome
 - The 3' end of 16S rRNA in the big sub-unit of the ribosome
 - The 5' end of 16S rRNA in the big sub-unit of the ribosome
- Hidden Markov Model is a computational structure for describing the subtle patterns that define
 - Families of heterologous sequences
 - Families of homologous sequences
 - Families of homologous and heterologous sequences
 - None of them
- A critical liver function test (LFT) doesn't include
 - SGOT
 - SGPT
 - Bilirubin
 - Creatinine
- Which of techniques is not used for transcriptomics study
 - Semi-quantitative rt-PCR
 - Real-time PCR
 - LC-MS
 - Microarray
- In inducible operons
 - Transcription is normally on and must be turned off
 - Transcription is normally off and must be turned on
 - Translation is normally off and must be turned on
 - Translation is normally on and must be turned off
- Maximum number of peptide bonds that can be made from eight amino acids
 - Seven
 - Eight
 - Nine
 - Ten
- Verotoxin or shiga toxins (Stx) are produced by which group of *E. coli*
 - Enterotoxigenic *E. coli* (STEC)
 - Enteroinvasive *E. coli* (EIEC)
 - Enteropathogenic *E. coli* (EPEC)
 - Enterohemorrhagic *E. coli* (EHEC)
- In the absence of magnesium ion the DNA polymerase is referred to as
 - Holoenzyme
 - Apoenzyme
 - Primase
 - Klenow enzyme
- Which of the following is not required for an expression vector?
 - Polyadenylation tail
 - Minimal UTR length
 - Cos sequence
 - Kozak sequence
- Which amino acid residue is in abundance in histones?
 - Arginine
 - Aspartic acid
 - Tryptophan
 - Phenyl alanine
- Three subclasses of segmentation genes in *Drosophila* are
 - Gap genes, pair-rule genes, and segment polarity genes
 - Gap genes, pair-rule genes, and homeotic genes
 - Gap genes, maternal gene, and segment polarity genes
 - Gap genes, pair-rule genes, and maternal genes

12. 10^9 Flops are equal to
- (A) 1000 flop
 - (B) 1 terra flop
 - (C) 1 giga flop
 - (D) 1 mega flop
13. DNA methylation is associated with
- (A) CAT box
 - (B) CpG islands
 - (C) TATA box
 - (D) Increasing gene transcription
14. Which of the following subunits of the bacterial RNA polymerase is responsible for promoter recognition?
- (A) Alpha
 - (B) B
 - (C) B'
 - (D) Sigma
15. In a genetic test 9:7 ratio in F_2 generation represents
- (A) Co-dominance
 - (B) Incomplete dominance
 - (C) Complete dominance
 - (D) Epitasis
16. Severe acute respiratory syndrome (SARS) caused by
- (A) Coronavirus
 - (B) H5N1 viruses
 - (C) Herpes virus
 - (D) Epstein Barr virus
17. Alternative splicing enables exons to be spliced together in different combinations
- (A) to yield mRNAs that encode one protein
 - (B) to yield mRNAs of different length
 - (C) to yield mRNAs that encode different proteins
 - (D) to yield mRNAs of same length
18. Among the following which cannot act as an electrolyte when dissolved in water
- (A) $C_6H_{12}O_6$
 - (B) CH_3COOH
 - (C) $NaHCO_3$
 - (D) $NaCl$
19. If a bacteria double itself in 5 minutes. What would be number of bacteria at end of 20 minutes if you start with 4 bacteria?
- (A) 64
 - (B) 32
 - (C) 48
 - (D) 16
20. In positive control of gene regulation
- (A) a repressor protein binds to DNA and stimulate transcription
 - (B) a activator protein binds to DNA and inhibits transcription
 - (C) an activator protein binds to DNA and stimulates transcription
 - (D) a repressor protein binds to DNA and inhibits transcription
21. A reciprocal cross, between a male horse and a female donkey
- (A) produces a hinny
 - (B) produce a mule
 - (C) produce a colt
 - (D) produce a filly
22. BLASTX is used for search of database based on
- (A) amino acid sequences
 - (B) any nucleotide sequence
 - (C) Translated nucleotide sequence
 - (D) None of these
23. The molecular weight of a substance is defined as the ratio of the mass of a molecule of that substance to
- (A) one-twelfth the mass of carbon-12
 - (B) one-twelfth the mass of Oxygen-16
 - (C) one twelfth the mass of hydrogen-2
 - (D) one twelfth the mass of Nitrogen-14

24. CD8 α and CD8 β are co-receptor molecules that bind to
- MHC-class I
 - MHC-class II
 - MHC-class III
 - None of them
25. Toll-like receptors are molecules associated with
- Adaptive immune response
 - Innate immune response
 - Cell mediated immune response
 - Antibody mediated immune response
26. Which of the following is not a part or characteristic of innate immunity?
- Includes anatomic and physiologic barriers
 - Inflammatory barriers
 - Has memory and specificity
 - Endocytic and phagocytic nature
27. Lymphoid cells having no antigen-specific receptors
- Natural killer cells
 - Dendritic cells
 - T helper cells
 - Antibodies
28. Which bacteria has been shown to be associated with gastric (stomach) cancer
- Pseudomonas meningitis*
 - Helicobacter pylori*
 - Leptospira icterohaemorrhagiae*
 - Streptococcus agalactiae*
29. In what way does amylose differ from amylopectin?
- It is a linear chain molecule composed of glucose units linked by α -1,6 bonds
 - It is a branching molecule composed of glucose units linked by α -1,4 bonds
 - It does not have branching
 - It does have branching
30. The composition and linkage of lactose is
- αD -glucose and βD -glucose; β 1, 4 glycosidic linkage
 - αD -glucose and βD -fructose; α 1 β 2 glycosidic linkage
 - 2 αD -glucose and βD -glucose; α 1, 4 glycosidic linkage
 - βD -galactose and βD -glucose; β 1, 4 glycosidic linkage
31. If the dissociation constant for solute-adsorbent binding is K_D , the retention of solute in a chromatography column is
- independent of K_D
 - decreasing with increasing K_D
 - increasing with increasing K_D
 - None of the above
32. Gram-positive bacteria are generally resistant to complement mediated lysis because
- membrane attack complex is degraded by the proteases produced by the gram positive bacteria
 - gram positive bacteria is unable to activate the complement pathway
 - thick peptidoglycan layer of gram positive bacteria prevents insertion of membrane attack complex
 - gram positive bacteria import the membrane attack complex and inactivate it
33. A truncated polypeptide is synthesized due to a nonsense mutation. Where would you introduce another mutation to obtain a full length polypeptide?
- tRNA gene
 - DNA repair gene
 - Ribosomal protein gene
 - rRNA gene
34. Which of the following is correct for CD8 + T cells?
- CD8 + T cells only recognize virus-infected cells
 - CD8 + T cell receptor recognizes epitopes that are also commonly recognize by B cells
 - In the thymus, CD8 + T cells undergo positive selection only
 - CD8 + T cells can kill individual virus-infected cells in a contact dependent fashion

35. Which one of the following is not a derived protein structure database?
- (A) TOPSPAN
 - (B) SCOP
 - (C) GEO
 - (D) OPM
36. An open system in which the growth rate is maintained by adding a nutrient (present in limiting quantities) at the same rate as that medium containing micro-organisms is removed is called
- (A) manostat
 - (B) chemostat
 - (C) turbidostat
 - (D) culturostat
37. Which one of the following operation does not come under downstream processing?
- (A) Separation of cells
 - (B) Disintegration of cells
 - (C) Inoculum development
 - (D) Drying
38. The correlation often employed to correlate adsorption data for protein is (where Y_{\max} is the maximum amount of solute adsorbed per mass of adsorbent, X is the mass fraction of solute in the diluent phase in solute-free basis, K_L is a constant and Y is the equilibrium value of the mass of solute adsorbed per mass of adsorbent)
- (A) $Y = Y_{\max}X/(K_L + X)$
 - (B) $Y = Y_{\max}/(K_L + X)$
 - (C) $Y = Y_{\max}X/K_L$
 - (D) $Y = Y_{\max} - X/(K_L + X)$
39. Antibiotics are typically produced in fed batch reactors because
- (A) the precursors are often toxic to the cells
 - (B) antibiotic yields are generally higher when cell growth slows
 - (C) Both (A) and (B)
 - (D) Neither (A) nor (B)
40. Which one of the following is not an industrial product made by the fungus *Aspergillus niger*?
- (A) Lysine
 - (B) Galactosidase
 - (C) Gluconic acid
 - (D) Citric acid
41. Weil-Felix reaction is based on sharing of antigens between
- (A) rickettsial antigens and antigens of certain strains of *Proteus*
 - (B) mycoplasmas and human O group RBCs
 - (C) sheep RBCs and EB virus
 - (D) None of these
42. T cell receptors on CD4 + T cells
- (A) recognize peptides associated with MHC class I molecules
 - (B) recognize peptides not associated with MHC molecules
 - (C) recognize peptides associated with MHC class II molecules
 - (D) are secreted out to the environment to bind antigens
43. The role of M cells is to
- (A) propel mucus out of the small intestine by the use of cilia
 - (B) pass bacteria or virus to underlying macrophages for processing and presentation of antigens
 - (C) trap virus in mucus and prevent entry
 - (D) induce apoptosis in virus-infected small intestinal epithelial cells
44. In repressible operons
- (A) Transcription is normally off and must be turned on
 - (B) Translation is normally off and must be turned on
 - (C) Transcription is normally on and must be turned off
 - (D) Translation is normally on and must be turned of
45. Antibiotic not used as food preservative is
- (A) β lactum antibiotic
 - (B) Tylosin
 - (C) Nisin
 - (D) Pimaricin

46. By which of the following means antifungal chemotherapeutic agents may affect fungi?
- (A) Interfere with nuclear division by preventing the aggregation of microtubules needed for mitosis
 - (B) Interfere with ergosterol biosynthesis and thus alter the structure of the cytoplasmic membrane
 - (C) Interfere with normal nucleic acid synthesis
 - (D) All of these
47. One of the first enzyme produced by many bacteriophages is, an RNA dependent RNA polymerase
- (A) RNA polymerase
 - (B) RNA ligase
 - (C) RNA replicase
 - (D) RNA transcriptase
48. Which is the first cyclins involved in cell cycle regulation?
- (A) Cyclin A
 - (B) Cyclin B
 - (C) Cyclin D
 - (D) Cyclin E
49. Free retinol formed in the liver is transported to target cells by way of protein complex. This binary complex in liver is processed by
- (A) golgi complex
 - (B) endoplasmic reticulum
 - (C) cytoplasm
 - (D) All of the above
50. Under what conditions reaction will be exothermic at all temperature
- (A) $\Delta H < 0$ and $\Delta S > 0$
 - (B) $\Delta H > 0$ and $\Delta S > 0$
 - (C) $\Delta H > 0$ and $\Delta S < 0$
 - (D) $\Delta H < 0$ and $\Delta S < 0$

Section C (30 Marks)

Answer any 5 (five) from the following

1. What is the basic goal of fermentation scale-up? How does production efficiency can be measured? Name the factors that influences the fermentation system scale-up.
(Marks : 1 + 2 + 3 = 6)
2. Discuss briefly how does surface to volume ratio responsible for changing properties in nanoscale materials.
(Marks : 6)
3. What are the roles of adjuvants? Mention the selection criteria of adjuvant for use as vaccine. What are the safety issues in connection to adjuvants as vaccine?
(Marks : 2 + 2 + 2 = 6)
4. Describe the role of alternative splicing in regulating gene expression. (Marks : 6)
5. Describe 2D-gel electrophoresis technique. What are it advantage and disadvantage?
(Marks : 6)
6. What are the properties of genetic code? (Marks : 6)
7. Differentiate between DNA replication in prokaryote and eukaryotes. (Marks : 6)
8. Describe in detail shotgun proteomics strategy with a labeled diagram. (Marks : 6)

Space for Answers (Section C) : for Questions 1 to 8 (5 pages)

GU-RFET 2018

Space for Answers (Section C) : for Questions 1 to 8 (5 pages)

GU-RRET 2019

Space for Answers (Section C) : for Questions 1 to 8 (5 pages)

GU-RRET 2019

Space for Answers (Section C) : for Questions 1 to 8 (5 pages)

GU-RFET 2019

Space for Answers (Section C) : for Questions 1 to 8 (5 pages)

GU-RFET 2019