30/4/23 (30)

ARKA JAIN University, Jharkhand — NAAC GRADE A, ACCREDITED UNIVERSITY	END SEM EXAMINATION School of Health & Allied Science

Program	Bachelor of Science (Biotechnology)		
Subject Name	Molecular Diagnostics	Semester	IV
		Year	April 2024
Time: 3 Hour Max. Marks : 60	• Start writing from 2nd page onwards; don't Write on the 1st Page Backside • Answer all Questions of Section A (Compulsory) • Answer Any Four out of Six of Section B • Answer Any Two out of Four of Section C • Possession of Mobile Phones or any kind of Written Material, Arguments with the Invigilator or Discussing with Co-Student will comes under Unfair Means and will Result in the Cancellation of the Papers.		

Section A (Each question Carry 01 Marks from Q1- i to Q1-x) – 10 Marks

Q. No. 1	QUESTIONS	Marks	COs
i	Which of the following molecule(s) can be detected by ELISA? a) Proteins b) Hormones c) Antibodies d) all of the above	01	CO6
ii	The technology used for the production of monoclonal antibodies is a) Mass culture technology b) Hybridoma technology c) Suspension culture d) None of these	01	CO3
iii	Western blotting is the technique for the detection of a) Specific DNA in a Sample b) Specific RNA in a Sample c) Specific Protein in a Sample d) Specific glycolipid in a Sample	01	CO2
iv	Which method of antibiotic susceptibility testing involves measuring diameters of zones of inhibition and interpreting them via standardized tables? a) Broth micro dilution method b) Kirby Bauer method c) Agar micro dilution method d) E-test method	01	CO5

v	At what temperature does annealing of DNA and primer take place? a) 54°C b) 96°C c) 42°C d) 74°C	01	CO4
vi	Variation between individuals due to single base change is called as a) SNPs b) ESTs c) Contigs d) None of these	01	CO4
vii	The concentration of antibiotic which show no visible growth of bacteria is called a) Minimum inhibitory concentration b) Maximum inhibitory concentration c) Maximum bactericidal concentration d) All of these	01	CO5
viii	Which of the following is the first step in immunohistochemistry? a) Treating samples with fixative b) Blocking binding sites with low-fat milk c) Antigen retrieval d) Applying the primary antibody	01	CO2
ix	The PCR cycle have following steps a) Annealing, Denaturation, Elongation b) Denaturation, Annealing, Elongation c) Elongation, Annealing, Denaturat d) Denaturation, Elongation, Annealing	01	CO4
x	Which fluorescent dye can be used for red fluorescence? a) Rhodamine b) Fluorescein c) Carmine d) DAPI	01	CO1

Section B (Answer any FOUR out of SIX) – 20 Marks
(Each question Carry 5 Marks)

Q. No.	QUESTIONS	Marks	COs
2	Define Nanotechnology. Discus its various applications.	05	CO5
3	List advantages and disadvantages of enzyme Immunohistochemistry.	05	CO1
4	Discuss application of GLC.	05	CO8
5	What is nucleic acid hybridisation? List the types of nucleic acid hypbridisation	05	CO8
6	Discuss Principle of Flow cytometry.	05	CO8
7	Write a note on plasmid curing.	05	CO2

Section C (Answer any Two out of Four) – 30 Marks-
(Each question Carry 15 Marks)

Q. No.	QUESTIONS	Marks	COs
8	Explain principle and instrumentation for gas liquid chromatography.	15	CO8
9	What is Biosensor? What are its components? Discuss their application in diagnostics.	15	CO6
10	What is nucleic acid hybridisation? Discuss the steps involved in nucleic acid hybridization. List different types of nucleic acid hybridisation.	15	CO2
11	Explain Immunohistochemistry .What are the factors which affects Immunohistochemistry? Discuss applications of Immunohistochemistry.	15	CO1

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School of Health & Allied Science

Program	Bachelor of Science (Biotechnology)		
Subject Name	Molecular Biology	Semester	IV
		Year	April 2024
Time: 3 Hour Max. Marks : 60	• Start writing from 2nd page onwards; don't Write on the 1st Page Backside • Answer all Questions of Section A (Compulsory) • Answer Any Four out of Six of Section B • Answer Any Two out of Four of Section C • Possession of Mobile Phones or any kind of Written Material, Arguments with the Invigilator or Discussing with Co-Student will comes under Unfair Means and will Result in the Cancellation of the Papers.		

Section A (Each question Carry 01 Marks from Q1- i to Q1-x) – 10 Marks

Q. No. 1	QUESTIONS	Marks	COs
i	The mRNA codon of valine is a) GUC b) UGG c) CCA d) TTG	01	CO1
ii	Which of the following processes does not occur in prokaryotes? a)Transcription b) Splicing c) Translation d) Replication	01	CO1
iii	Which of the following will form a palindromic sequence? a) AGTCCTGA b) GTTCCAAG c) ATTGCAAT d) GTTGGAAC	01	CO2
iv	Which of the following is not involved in the post transcriptional processing of t-RNA? a) Base modulation b) Attachment of CCA arm c) Splicing d) Attachment of poly-A tail	01	CO2

v	Which of the following is used in DNA replication studies? a) Neurospora crassa b) Drosophila melanogaster c) Escherichia coli d) Pneumococcus	01	CO3
vi	The 3′ – 5′ phosphodiester linkage joins a) two DNA strands b) two nucleotides c) a nitrogenous base with pentose sugar d) two nucleosides	01	CO3
vii	Which of the following mechanisms will remove uracil and incorporate the correct base? a) Direct repair b) Base excision repair c) Mismatch repair d)Nucleotide excision repair	01	CO3
viii	Which of the following function of DNA is necessary for the purpose of evolution? a) Mutation b) Replication c) Translation d) Transcription	01	CO4
ix	Which of the following parts of the mRNA determines the specificity of the amino acid attached? a) Acceptor stem b) D loop c) ΨU loop d) Variable loop	01	CO4
x	Which of the following base-pairing rule is correct? a) Adenine with guanine and thymine with cytosine b) DNA base pairing is non-specific c) Adenine with cytosine and guanine with thymine d) Adenine with thymine and guanine with cytosine	01	CO4

Section B (Answer any FOUR out of SIX) – 20 Marks
(Each question Carry 5 Marks)

Q. No.	QUESTIONS	Marks	COs
2	Write the difference between A, B and Z form of DNA.	05	CO4
3	Explain the role of following in the process of translation a) T-RNA b) Ribosome	05	CO4
4	With the help of Hershey and Chase Experiment, prove that DNA is the genetic material.	05	CO5
5	Define the structure of prokaryotic RNA polymerase enzyme. Write the function of each subunit.	05	CO5
6	What do you understand by Wobble hypothesis? Explain its importance in codon-anticodon pairing.	05	CO5
7	Name the methyl group donor required for 5′ Cap formation in m-RNA. Write the step by step process of 5′ cap formation in m-RNA.	05	CO3

Section C (Answer any Two out of Four) – 30 Marks
(Each question Carry 15 Marks)

Q. No.	QUESTIONS	Marks	COs
8	What is DNA Damage? Write the step by step process nucleotide excision repair.	15	CO2
9	Differentiate the process of initiation of replication in Prokaryote and Eukaryote.	15	CO3
10	Draw a well labelled diagram of Prokaryotic RNA Polymerase. Explain the process of Initiation of transcription in E.coli.	15	CO4
11	What is Operon? Explain the process of regulation of gene expression by Lac Operon.	15	CO3

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School of Health & Allied Science

Program	Bachelor of Science (Biotechnology)		
Subject Name	Biostatistics	Semester	IV
		Year	April 2024
Time: 3 Hour Max. Marks : 60	• Start writing from 2nd page onwards; don't Write on the 1st Page Backside • Answer all Questions of Section A (Compulsory) • Answer Any Four out of Six of Section B • Answer Any Two out of Four of Section C • Possession of Mobile Phones or any kind of Written Material, Arguments with the Invigilator or Discussing with Co-Student will comes under Unfair Means and will Result in the Cancellation of the Papers.		

Section A (Each question Carry 01 Marks from Q1-i to Q1-x) – 10 Marks

Q. No. 1	QUESTIONS	Marks	COs
i	The median of a data is a) positional average b) most frequent value c) algebraic average d) none of these	01	CO2
ii	The mean of first ten natural numbers is a) 5 b) 10 c) 5.5 d) none of these	01	CO2
iii	The average of absolute values of deviations of values from their mode is taken as a) standard deviation about mode b) mean deviation about mode c) mode deviation about mode d) none of these	01	CO2
iv	Correlation coefficient is a) always positive b) always greater than one c) numerically less than unity d) none of these	01	CO2
v	Rank correlation can be measured by a) Karl Pearson's formula only b) Spearman's formula only c) Karl Pearson's formula or Spearman's formula d) none of these	01	CO2

vi	The probability of getting a sum of 8 points when two dice are thrown together is a) 1/6 b) 5/36 c) 2/9 d) none of these	01	CO3
vii	N and P are the parameters of a) normal distribution b) Poisson's distribution c) binomial distribution d) none of these	01	CO3
viii	Systematic sampling is a case of a) purposive sampling b) probability sampling c) non-probability sampling d) none of these	01	CO3
ix	t – test is a case of a) Chi-square test b) large sample test c) small sample test d) none of these	01	CO4
x	Analysis of variance with one assignable factor together with chance factor is a case of a) one-way classification b) two-way classification c) no-way classification d) none of these	01	CO4

Section B (Answer any FOUR out of SIX) – 20 Marks
(Each question Carry 5 Marks)

Q. No.	QUESTIONS	Marks	Cos
2	Find median age of persons from the following data: Age (in years): 0 – 5 | 5 – 10 | 10 – 15 | 15 – 20 | 20 – 25 | 25 – 30 | 30 – 35 | 35 – 40 | 40 – 45 No. of persons: 3 | 8 | 12 | 25 | 32 | 22 | 15 | 9 | 4	05	CO2
3	Write a note on Histogram.	05	CO2
4	Use Spearman's formula to find correlation coefficient for the following data: Rank in honesty: 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 Rank in intelligence: 3 | 1 | 8 | 4 | 6 | 5 | 9 | 7 | 10 | 2	05	CO2
5	Distinguish between 'Probability sampling' and 'Non-probability sampling'. Name any two of each of these types of sampling.	05	CO2
6	The probability that a problem will be solved by Rahim, Karim and Juliet are respectively 1/2, 1/3 and 3/5. Find the probability that the problem will be solved, if they all try independently.	05	CO2
7	Explain Analysis of Variance.	05	CO3

Section C (Answer any Two out of Four) – 30 Marks-
(Each question Carry 15 Marks)

Q. No.	QUESTIONS	Marks	Cos
8	Find mean deviation about mode for the following data: Class intervals: 0 – 10 | 10 – 20 | 20 – 30 | 30 – 40 | 40 – 50 | 50 – 60 | 60 – 70 Frequency: 5 | 12 | 22 | 35 | 25 | 16 | 5	15	CO2
9	For the following bivariate data, find the regression line of Y on X: X: 12 | 15 | 15 | 18 | 20 | 22 | 23 | 25 Y: 18 | 20 | 22 | 23 | 22 | 25 | 28 | 30 Also find approximate value of Y, when X = 16.	15	CO2
10	Write an essay on t-tests.	15	CO4
11	In experiments on pea breading, the following frequencies of seeds were obtained: Round and yellow: 315 | Wrinkled and yellow: 101 | Round and green: 108 | Wrinkled and green: 32 | Total: 556 Theory predicts that the frequencies should be in proportions 9 : 3 : 3 : 1. Examine the correspondence between theory and experiment. [Given that the value of χ^2-statistic at 5 level for 3 d. f. is 7.815 and for 4 d. f. is 9.488]	15	CO4

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END SEM EXAMINATION
School of Health & Allied Sciences

Program	Bachelor of Science (Biotechnology)		
Subject Name	Bioprocess Technology	Semester	IV
		Year	April 2024
Time: 3 Hour Max. Marks : 60	• Start writing from 2nd page onwards; don't Write on the 1st Page Backside • Answer all Questions of Section A (Compulsory) • Answer Any Four out of Six of Section B • Answer Any Two out of Four of Section C • Possession of Mobile Phones or any kind of Written Material, Arguments with the Invigilator or Discussing with Co-Student will comes under Unfair Means and will Result in the Cancellation of the Papers.		

Section A (Each question Carry 01 Mark from Q1-i to Q1-x) – 10 Marks

Q. No. 1	QUESTIONS	Marks	COs
i	Which of the following is an upstream process? a) Product recovery b) Product purification c) Media formulation d) Cell lysis	01	C2
ii	Fermentor in which the impellers are replaced by the constant flow of gas? a) Airlift fermentor b) Tower fermentor c) CSTR d) Perfusion bioreactor	01	C1
iii	The choice of recovery process is based on a) Location of the product b) Magnitude of biohazard c) Market potential d) All of above	01	C3
iv	Which of the following is not the factor affecting the value of KLa? a) Bubble size b) Temperature c) Solubility d) PH	01	C2

v	Which of the following devices is used for pressure measurement? a) Diaphragm gauge b) Pressure bellows c) Strain gaugesss d) All the above	01	C2
vi	What is the dilution rate (D)? a) D = F/V b) D = V/F c) D = μF d) D = μD	01	C2
vii	Soyabean, peptone and tryptone are used in industry as a) Carbon source b) Carbon and nitrogen source c) Nitrogen source d) Mineral source	01	C3
viii	Which of the following sensor penetrates into the fermentor? a) Exhaust-gas analyzers b) PH electrodes c) Tachometers d) Load cells	01	C2
ix	Penicillin production occurs in which growth phase? a) Lag phase b) Log phase c) Stationary phase d) Death phase	01	C3
x	The Fed-batch culture is a/an _____ culture system. a) Open b) Closed c) Isolated d) Semi-closed	01	C1

Section B (Answer any FOUR out of SIX) – 20 Marks
(Each question Carry 5 Marks)

Q. No.	QUESTIONS	Marks	COs
2	Write short notes on a) Mass transfer coefficient b) Single cell Protein	05	C3
3	Describe the methods of air sterilization. How air is supply to fermentor?	05	C2
4	Describe different factors affecting KLa.	05	C2
5	Differentiate between Packed bed volume and fluidised bed bioreactor.	05	C1
6	How would you estimate specific growth rate of Batch culture?	05	C3
7	Draw a flowchart to represent a bioprocess.	05	C3

Section C (Answer any Two out of Four) – 30 Marks-
(Each question Carry 15 Marks)

Q. No.	QUESTIONS	Marks	COs
8	Give an account on aseptic operation and containment s of a fermentor	15	C2
9	Discuss various common components of upstream and down stream	15	C3
10	Discuss the microbial growth in batch and continuous system of fermentation.	15	C3
11	Discuss various types of Bioreactors with labeled diagram.	15	C1

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ARKA JAIN University, Jharkhand — NAAC GRADE A — ACCREDITED UNIVERSITY

END SEM EXAMINATION
School of Health & Allied Science

Program	Bachelor of Science (Biotechnology)		
Subject Name	Chemistry II	Semester	IV
		Year	April 2024
Time: 3 Hour Max. Marks : 60	• Start writing from 2nd page onwards; don't Write on the 1st Page Backside • Answer all Questions of Section A (Compulsory) • Answer Any Four out of Six of Section B • Answer Any Two out of Four of Section C • Possession of Mobile Phones or any kind of Written Material, Arguments with the Invigilator or Discussing with Co-Student will comes under Unfair Means and will Result in the Cancellation of the Papers.		

Section A (Each question Carry 01 Marks from Q1- i to Q1-x) – 10 Marks

Q. No. 1	QUESTIONS	Marks	COs
i	Which of the following is a Lewis base a) HCl b) HF c) HNO3 d) NH3	01	CO2
ii	Which one of the following compounds has sp2 hybridization? a) CO2 b) SO2 c) N2O d) CO	01	CO1
iii	Among the following, the maximum covalent character is shown by the compound a) FeCl2 b) SnCl2 c) AlCl3 d) MgCl2	01	CO1
iv	Ammonia molecule is formed by the following hybrid orbitals: a) dsp2 b) Sp3 c) Sp3d d) d2sp	01	CO1

v	Oxygen molecule shows the property of: a) Diamagnetism b) Paramagnetism c) Ferromagnetism d) None of these	01	CO1
vi	Among the following species, the diamagnetic molecules is: a) NO b) O2 c) CO d) B2	01	CO3
vii	According to Molecular orbital theory, which of the following will not be a viable molecule? a) He_2^{2+} b) He_2^{+} c) H_2^{-} d) H_2^{2-}	01	CO3
viii	Resonance occurs due to a) Delocalization of lone pair of electrons b) Delocalization of sigma- electrons c) Delocalization of pie-electrons d) Oscillation of a proton	01	CO3
ix	Which of following compounds has sp2 hybridization? a) CO2 b) SO2 c) N2O d) CO	01	CO2
x	Which of the following molecules contain one lone pair of electrons on the central atom? a) X+Y- b) X-Y+ c) X-Y d) X→Y	01	CO2

Section B (Answer any FOUR out of SIX) – 20 Marks
(Each question Carry 5 Marks)

Q. No.	QUESTIONS	Marks	COs
2	On the basis of VSEPR Theory predict the shapes of z	05	CO1
3	What are limitations of VSEPR Theory?	05	CO2
4	What is Co valency? Write the properties of covalent bond.	05	CO3
5	Give reason for the following: - NF_3 is pyramidal while BF_3 triangular planar. - Bond angle in H_20 is larger than H_2S.	05	CO3
6	Give the lewis dot symbol of the following: a) Lithium (Li+) b) Chloride (Cl-) c) O2- d) Nitrite (N-3) e) Magnesium (Mg2+)	05	CO4
7	Write the characteristics of bonding MO and antibonding MO.	05	CO4

Section C (Answer any Two out of Four) – 30 Marks-
(Each question Carry 15 Marks)

Q. No.	QUESTIONS	Marks	COs
8	What do you understand by hybridization? Explain the various types of hybridization involving s and p orbitals.	15	CO2
9	Draw the molecular orbital diagram of O_2 molecule. How would you explain the paramagnetic nature of the molecule on the basis of this diagram?	15	CO3
10	Explain: i. The bond angle in methane in 109.28' ii. Ethene is a planar molecule. iii. Ethyne is a linear molecular.	15	CO4
11	1. Explain why: i. NH3 has a bond angle equal to 107°? ii. Lone pair-lone pair repulsion is more than the bond pair bond pair repulsion? iii. H2O molecule is not linear although it is of the AB2 type	15	CO4