

BioTecNika.Org Proudly presents IISc 2012
Paper with solutions. Over 70% of
Questions were asked from the
curriculum followed by BioTecNika for
CSIR / GATE / IISc Aspirants as well as
AIMNET 2011 Test Series

IISc Ph.D Entrance

www.BioTecNika.Org

Authored by: Dr Neha Suman, Rekha R
Shambhu, Rehna Krishnan, Shridhar
Paranjape

- 1.) Which one of the following is an anaplerotic reaction?
 - a. Conversion of Pyruvate to acetyl CoA
 - b. Conversion of Pyruvate to lactic acid
 - c. Conversion of Pyruvate to oxaloacetate
 - d. Conversion of Pyruvate to acetaldehyde
- 2.) Under anaerobic conditions, the primary purpose of fermentation in yeast is:
 - a. Generation of a proton gradient for ATP synthesis
 - b. Oxidation of glucose to generate reduced electron carriers
 - c. Synthesis of ethanol
 - d. Regeneration of NAD⁺ from NADH
- 3.) Which one of the following techniques is used for the subcellular localization of proteins without lysing the cells?
 - a. Western blotting
 - b. Immunofluorescence
 - c. Differential centrifugation
 - d. ELISA
- 4.) The Polio vaccine used in the pulse polio eradication program in India consists of:
 - a. Inactivated polio virus
 - b. Attenuated polio virus
 - c. Recombinant polio virus
 - d. Polio virus antigens produced in yeast cells
- 5.) The enzyme Dicer plays a key role in:
 - a. RNA Splicing
 - b. RNA Interference
 - c. RNA Transport
 - d. RNA Storage
- 6.) Which one of the following compounds is a positive allosteric regulator of the enzyme pyruvate carboxylase?
 - a. Biotin
 - b. Acetyl CoA
 - c. Oxaloacetate
 - d. ATP
- 7.) What is the most common genetic cause of Down Syndrome?
 - a. Meiotic nondisjunction
 - b. Autosomal Dominant inheritance
 - c. X-Linked recessive inheritance
 - d. Monosomy 2
- 8.) A DNA Chip contains a set of random hexanucleotide probes. Out of the $4^6 = 4096$ probes, how many will form perfect complementary duplexes with sequences within the single stranded target DNA: 5' – GAACTGCATTGATA-3'?
 - a. 20
 - b. 9
 - c. 6
 - d. 3
- 9.) In Human female somatic cells:
 - a. The paternally derived X chromosome is preferentially inactivated
 - b. The maternally derived X chromosome is preferentially inactivated
 - c. One of the X chromosomes is inactivated randomly in cells
 - d. One of the X chromosomes is lost
- 10.) A purified protein appears as a single strand of 60 kDa when subjected to reducing SDS-PAGE. In a size exclusion chromatography experiment, this protein elutes between alcohol dehydrogenase (160 kDa) and beta amylase (190 kDa).

- kDa). How many identical subunits is this protein composed of?
- 1
 - 2
 - 3
 - 5
- 11.) The invariant chain plays an important role in functioning of:
- T cell Receptors
 - B Cell receptors
 - MHC Class I
 - MHC Class II
- 12.) The Walker motifs present in proteins are important for:
- Lysosomal targeting
 - Nuclear targeting
 - ER Retention
 - ATP Binding
- 13.) Immune response in *Drosophila melanogaster* is primarily mediated by:
- T Cell Receptors
 - B Cell Receptors
 - Antibodies
 - Anti Microbial peptides
- 14.) A small molecule diffuses from the cytosol of one cell to the mitochondrial matrix of the neighbouring cell. How many membranes does it traverse?
- Two
 - Three
 - Four
 - Five
- 15.) Pain hydrolysis of one IgG molecule will result in:
- One Fc fragment and one F(ab')₂ fragment
 - One Fc Fragment and two Fab fragment
 - One Fc fragment and one Fab fragment
 - One F(ab')₂ fragment and one Fab fragment
- 16.) Antibodies are generated by:
- Gene rearrangements before antigenic exposure in B cells
 - Gene rearrangements after antigenic exposure in B cells
 - Gene rearrangements before antigenic exposure to T Cells
 - Transcription of a single immunoglobulin gene
- 17.) The amplitude of the neuronal action potential will be smaller if the
- Nerve is stimulated during the relative refractory period
 - Extracellular Na⁺ concentration is increased
 - Resting membrane potential is made more negative
 - Stimulus intensity is increased
- 18.) A series of traffic lights in a long road are located at a constant distance between two successive traffic signals. It is advised that if you are driving your vehicle at the uniform speed of 48 Km / Hr you will have continuous green signal in the successive traffic lights and you will encounter traffic lights every 10 minutes. Suppose you have travelled 64 KM how many traffic lights you would have encountered?
- 4
 - 8
 - 12
 - 16
- 19.) At time $t=0$, a set of three points A, B and C forms an equilateral triangle of side 6 cm. If two of the sides of the triangle are decreasing at the rate of 0.1 cm/sec and the third side is increasing at the rate of 0.1 cm/sec, How long will it take for the system to just cease to form a triangle ?
- 30 Seconds

- b. 20 Seconds
c. 10 Seconds
d. 1 seconds
- 20.) A candidate appearing for IISc Entrance is confident of correct answers for only 40 out of 100 Questions. For the remaining 60 questions the candidate makes random choices from 4 possible answers for each question. Assuming equal distribution of right answers, estimate the marks obtained by this candidate:
- a. 40
b. 45
c. 50
d. 55
- 21.) A balloon is perfectly spherical. 2 Points on the surface of the balloon pass through the centre of the balloon. The balloon is pressed against these 2 points with the force applied towards the centre of the balloon till the 2 points meet so that the balloon is now in the shape of the 2 spheres of equal size. The ratio of the diameters of the spheres before and after compression is
- a. 1:2
b. $1:2^{1/2}$
c. $1:2^{1/3}$
d. 1:4
- 22.) Best estimate of the perimeter (in angstroms) of cyclopentane
- a. 6.5
b. 7.5
c. 5.0
d. 10.0
- 23.) Side chain of which one of the following amino acids has the longest reach from its C-alpha atom?
- a. Cys
b. Leu
c. Val
d. Ser
- 24.) A Fibrous protein can be distinguished from a globular protein of the same mass by
- a. SDS-PAGE analysis
b. Emission at 340 nm
c. Absorption at 280 nm
d. Size exclusion chromatography
- 25.) A peptide composed entirely of d-Amino acids can be distinguished from one composed entirely of l-amino acids by
- a. Change in the UV absorption maxima
b. Change in fluorescence maxima
c. Difference in the circular dichroism spectrum
d. Differential mobility in SDS-PAGE
- 26.) A freshly isolated protein has been identified as a histone. Which of the following properties would hold true for this protein?
- a. $pI > 7$
b. $pI = 7$
c. $pI < 7$
d. Composed mostly of hydrophobic residues
- 27.) The scattering of X Rays by the atoms C,N,H,S,O follows the order (Most to least)
- a. $S > O > N > C > H$
b. $O > S > N > C > H$
c. $H > C > N > O > S$
d. $S > O > C > N > H$
- 28.) When double stranded DNA becomes single stranded DNA, Its absorption at 260 nm
- a. Increases
b. Decreases
c. Does not change
d. Becomes zero

- 29.) The force between 2 electric charges separated by a distance r is
- Directly proportional to r
 - Inversely proportional to r
 - Inversely proportional to r^2
 - Independent of r
- 30.) The Line $y=x$ intersects the circle $x^2 + y^2 = 2$
- (0,0), (2,2)
 - (1,1), (-1,-1)
 - (0,0), ($2^{1/2}$, $2^{1/2}$)
 - (1,1), ($2^{1/2}$, $-2^{1/2}$)
- 31.) Which of the following is correct?
 $\log_{10} 100$
- $2(\log_{10} 10)$
 - $10 (\log_{10} 10)$
 - $\log_{100} 10$
 - $(\log_{10} 10) / 2$
- 32.) The Avogadro number is $6.022 \times 10^{23} \text{ mol}^{-1}$. This means that 6.022×10^{23} atoms are present in
- 1 gram of carbon
 - 6 grams of carbon
 - 12 grams of carbon
 - 120 grams of carbon
- 33.) The Optimum pH for an enzyme catalysed reaction was found to be 4. The amino acid residue at the active site responsible for such a profile is
- Lysine
 - Tyrosine
 - Cysteine
 - Aspartic acid
- 34.) Which one of the following amino acid cannot be estimated correctly when a protein is subjected to acid hydrolysis followed by amino acid analysis?
- Leu
 - Ala
 - Asn
 - Gly
- 35.) In Proteins, N-Linked oligosaccharides are attached to :
- Glutamine
 - Arginine
 - Lysine
 - Asparagine
- 36.) What percentage of total RNA in mammalian cells is mRNA?
- 10-15%
 - <5%
 - 20-30%
 - 30-40%
- 37.) Addition of Ciprofloxacin to the growing culture of E. Coli has its immediate effect on:
- Replication and Transcription
 - Lipid Biosynthesis
 - Cell Wall Synthesis
 - Protein Synthesis
- 38.) The E. Coli DNA Polymerase III ensures fidelity of nucleotide incorporation by its
- 5' to 3' exonuclease activity
 - 3' to 5' exonuclease activity
 - Both the 5' to 3' and 3' to 5' exonuclease activities
 - Association with DnaB
- 39.) E. Coli takes 40 Min to duplicate its genome of 4.6 Million base pairs. To achieve this, the rate at which the DNA helicase would unwind the parent DNA in rpm is:
- 2750
 - 5500
 - 11000
 - 22000
- 40.) From the following compounds, identify the direct inhibitor of prokaryotic transcription
- Spectinomycin
 - Cycloheximide
 - Rifampicin
 - Nalidixic acid

- 41.) A Salt Bridge in a protein can be formed between
- Aspartic acid and lysine
 - Lysine and arginine
 - Cysteine and cysteine
 - Serine and glutamic acid
- 42.) What is the mol weight of a polyadenylic acid chain with 100 residues of AMP ? (Consider Mol weight of AMP as 300 Da)
- 29900
 - 30000
 - 24600
 - 29218
- 43.) Which one of the following reagents can be used to distinguish between single stranded DNA and single stranded RNA in solution?
- Sulfuric acid
 - Potassium Hydroxide
 - Sodium Dodecyl sulphate
 - Sodium deoxycholate
- 44.) Removal of gene activity A from a linear results in higher than normal levels of transcripts from gene B. A reasonable hypothesis would be that
- Gene B must act upstream of gene A
 - Gene A has no relation to transcripts of Gene B
 - Gene B acts downstream of gene A and is regulated by A directly or indirectly
 - The increase in transcript B abundance in an experimental error.
- 45.) To clone eukaryotic chromosomal DNA sequences that can function as origins of replications, the most facile approach would be to:
- Label dividing cells with DNA binding dyes
 - Inject random DNA segments into living cells and examine their fate
 - Create a genomic DNA library in a plasmid with a selection marker, transform the same and screen for transformants with stable plasmids
 - Set up a biochemical assay for origin of replication
- 46.) The following Plant hormone is synthesized from an amino acid precursor:
- Ethylene
 - Auuxin
 - Cytokinin
 - Abscissic acid
- 47.) Random Priming technique for preparing DNA probe involves the labelling of 6 mer oligonucleotides. What is the number of possible random combinations when all the four nucleotides are used in the reaction?
- 1024
 - 4096
 - 4000
 - 6000
- 48.) River's postulate is applicable to
- Only Plant viral diseases
 - Only parasitic diseases
 - Both Plant and animal viral disease
 - Bacterial diseases
- 49.) An auxotrophic mutant arises spontaneously in a wild type E.Coli culture growing in a nutrient rich medium. Which one of the following techniques should be used To ensure the isolation of the auxotrophic mutant
- Replica Plating
 - Streaking for single colonies

- c. Direct Microscopic observations
- d. Antibiotic selection

50.) An E. coli mutant constitutive for lac operon was mated with a wild type strain. The merodiploid obtained was inducible by lactose. This observation indicates that the original mutation is:

- a. Cis-Dominant
- b. Co-Dominant
- c. Recessive
- d. Trans Dominant

Rely on Us for CSIR NET, GATE , DBT, ICMR,
IISc Ph.D Entrance Coaching and Preparation
Kits

**BioTecNika Info Labs Pvt
Ltd,**

**#2628, 4th Floor, 27th
Main, Sector -1, HSR
Layout, Bangalore –
560102**

**Ph: 080-32494384, 0888-
4122-400, 0888-4122-
500, 0888-4122-600,
0888-4122-700, 0888-
4122-800**