BET 2018
Question Paper

Part A

Question 1 :
10 g of a plant material is extracted in 100mL of a suitable buffer. On performing an assay for amylase activity, 100µl extract produced 6 µmoles glucose in 30 minutes of incubation. One unit of amylase activity is defined as the amount of enzyme required to produce 1µmole of glucose per minute. The amylase activity (units/g) of the material is:
Answers :

1. 60
2. 200
3. 20
4. 600

Question 2 :
Water vapour transmission rate of a packaging film is 4g/m^2/day. A food product is packed in a rectangular pouch measuring 0.12m x 0.16m. The maximum amount of moisture lost in 90 days is:
Answers :

1. 0.15 g
2. 13.82 g
3. 0.04 g
4. 18.34 g

Question 3 :
An essential oil has antimicrobial activity with an MIC of 15 mg/Kg and can be used as a bio-preservative. This activity is lost at the rate of 1% of the remaining concentration, per day. The minimum amount of oil to be added (mg) to 1 Kg of food product that is stored for 30 days is:
Answers :

1. 21.43
2. 17.65
3. 20.28
4. 19.50

Question 4 :
The protein concentration and enzyme activity in 100 mL of a cell free extract is 5 mg/mL and 2 units/mL, respectively. After multiple steps of purification, the final 10 mL fraction contains 4 mg/mL of protein and 15 units/mL of enzyme activity. The fold purification and percentage recovery, respectively is:

Answers :

1. 10 and 75
2. 9.4 and 20
3. 9.4 and 75
4. 10 and 20

Question 5 :
Solvent extraction using ethanol is used to purify a target metabolite from an aqueous broth. The partitioning coefficient is 3. The ratio of solvent to broth that is required to extract 80% of the metabolite in a single step is:

Answers :
1. 0.8:1
2. 2.4:1
3. 2.67:1
4. 1.33:1

Question 6 :
Two experiments were conducted with an enzyme following Michaelis Menten kinetics at substrate concentrations of 0.5 g/l and 1 g/l. If the enzymatic reaction velocity increases approximately 2-fold at the higher substrate concentration, the K_m for the enzyme would be around:

Answers :
1. 0.001 g/l
2. 0.01 g/l
3. 0.1 g/l
4. 1 g/l

Question 7 :
An enzyme is reported to have a K_m of 10 mM and V_{max} of 30 mM/s. Assuming Michaelis Menten kinetics, the reaction velocity at a substrate concentration of 20 mM will be:

Answers :
1. 10 mM/s
2. 15 mM/s
3. 20 mM/s
4. 30 mM/s

Question 8 :
An unbiased coin is tossed 100 times in experiment I and 1000 times in experiment II. Which one of the following statements is most likely to be TRUE regarding the ratio between heads and tails in experiment I and II?

Answers :
1. It will be closer to one in experiment I
2. It will be closer to one in experiment II
3. It will be equal to one in both experiments
4. It will be equally away from one in both experiments

Question 9 :
A random number generator produces a uniform distribution of numbers between -1 and 1. The probability that a number produced by this generator is between 0.9 and 1 is

Answers :

1. 0.1
2. 0.05
3. Less than 0.05
4. Between 0.05 and 0.1

Question 10 :
Random DNA hexamers containing A, T, G and C are generated by DNA synthesis. The fraction of the hexamers that will have 3 purines followed by 3 pyrimidines is:
Answers :

1. $9/4^6$
2. $1/2^6$
3. $6/4^6$
4. ${}^6C_3/3^6$

Question 11 :
A litre of 18% glucose solution is converted anaerobically into methane and carbon dioxide. The theoretical maximum volume of gases at NTP assuming ideality, produced on complete conversion of the entire glucose would be:
Answers :

1. 112 L
2. 67.2 L
3. 134.4 L
4. 22.4 L

Question 12 :
An STE buffer contains 20% sucrose, 100 mM Tris and 10 mM EDTA. Given the stock solutions – 50% sucrose, 1 M Tris, and 200 mM EDTA, the volumes of the stock solutions required to make 1 litre of the buffer solution are respectively:

Answers :

1. 400 ml, 100 ml, 100 ml
2. 200 ml, 50 ml, 100 ml
3. 400 ml, 100 ml, 50 ml
4. 200 ml, 100 ml, 50 ml

Question 13 :
A and B together can clean a lab in 4 days. Independently, A can clean the lab in 20 days. How many days will it take for B to independently complete the task?

Answers :

1. 4
2. 5
3. 16
4. 12.1

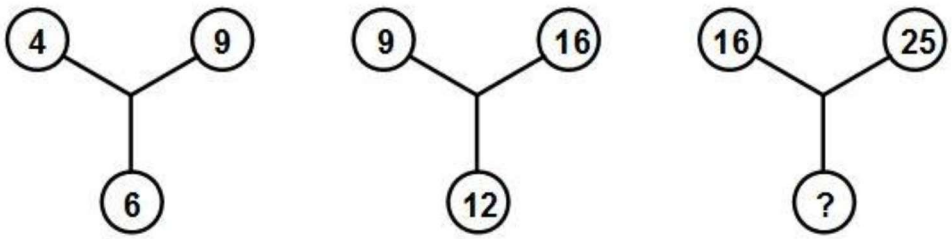
Question 14 :
A boy appears for a test and scores 35% but fails by 10 marks. If he had scored 46% marks, he would have passed by 12 marks. The pass mark is:

Answers :
1. 70
2. 74
3. 80
4. 86

Question 15 :
The mean extracellular cellulase activity of 7 *Bacillus* strains isolated from soil was determined to be 12 IU/mL. A new hyper-producing *Bacillus* isolate was found to have an extracellular activity of 36 IU/mL. If equal volumes of the supernatants of all 8 strains are mixed together, the cellulase activity of the solution will be:

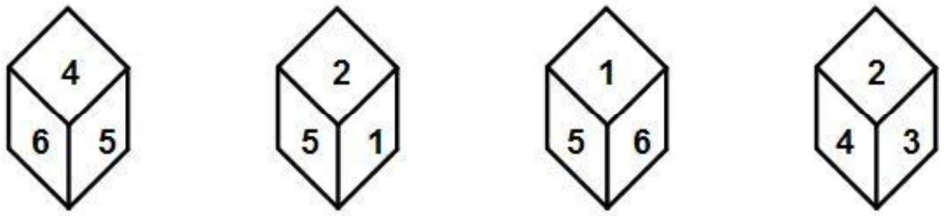
Answers :
1. 13.5
2. 15
3. 16.5
4. 17.5

Question 16 :
Find the missing number in the following series:



Answers :
1. 18
2. 19
3. 20
4. 24

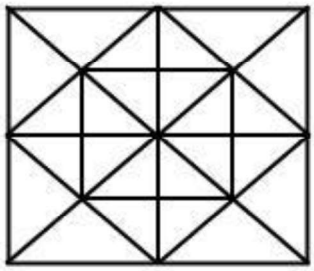
Question 17 :
If the four different positions of a dice are as given below, find the number that is on the face opposite to 4:



Answers :

1. 5
2. 3
3. 2
4. 1

Question 18 :
How many squares are there in the given diagram?



Answers :

1. 10
2. 15
3. 12
4. 14

Question 19 :
A spherical mammalian cell of radius ‘R’ is infected by a single coccus bacterium having 100 times smaller radius. Given that the host cell will lyse when 1/2 of the cell volume is taken up by the bacterium, approximately how many times will the bacterium divide before the host cell is lysed?

Answers :

1. 19
2. $3X10^5$
3. 10^6
4. 40

Question 20 :
Phosphates, carboxylates, sulfonates are esters of phosphoric, carboxylic and sulfonic acids, respectively. Which one of the following statements is NOT true?

Answers :
1. The nucleophile attack occurs at acyl carbon in carbohydrates.
2. The nucleophile attack occurs at the alkyl carbon in sulfonates.
3. The nucleophile attack occurs at the oxygen or phosphorous in phosphates
4. Sulfonates can be easily hydrolysed.

Question 21 :
The prosthetic group present in a acyl carrier protein is:

Answers :
1. CoASH
2. FAD
3. Heme
4. NAD

Question 22 :
Pyran is a:

Answers :
1. Six membered oxygen heterocycle
2. Five membered oxygen heterocycle
3. Six membered nitrogen heterocycle
4. Five membered nitrogen heterocycle

Question 23 :
The number of 1° hydroxyl group present in fructose and glucose are:

Answers :
1. 2 and 1
2. 2 and 2
3. 1 and 2
4. 1 and 1

Question 24 :
During glycolysis, fructose-1,6-diphosphate undergoes _____ to produce two C_3 - fragments.

Answers :
1. Retroaldol reaction
2. Oxidation
3. Isomerisation
4. Hydrolysis

Question 25 :
The core functional unit present in NADH is:

Answers :

1. Pyridine
2. Dihydro Pyridine
3. Purine
4. Pyramidine

Question 26 :
If a completely radioactive double stranded DNA molecule undergoes two rounds of replication in a non-radioactive medium, what will be the radioactivity status of the four resulting molecules?

Answers :

1. Half the number of molecules contains no radioactivity
2. All four molecules contain radioactivity
3. Three out of four molecules contain radioactivity
4. Radioactivity is lost from all four molecules

Question 27 :
In meiosis, an inversion in one member of a pair of homologous chromosomes will most likely lead to which of the following?
Answers :

1. Non-disjunction of the affected chromosome
2. Chromosome with duplications and deficiencies
3. Increased recombination frequency in the inverted region
4. Mispairing of the affected chromosome with a non-homologous chromosome

Question 28 :
In a cross between two black Labrador retrievers the phenotypic ratio of the offspring is 9 black puppies to 3 chocolate puppies to 4 yellow puppies; this is an example of

Answers :

1. Partial recessiveness
2. Incomplete penetrance
3. Incomplete dominance
4. Epistasis

Question 29 :
What will be the probability of obtaining a plant with AaBBCc genotype from trihybrid (AaBbCc) parents?

Answers :

1. 4 out of 64
2. 1 out of 64
3. 8 out of 64
4. 0 out of 64

Question 30 :
The natural primer for reverse transcriptase in RNA tumor viruses is:

Answers :

1. Oligo-dT
2. rRNA
3. 5S RNA
4. tRNA

Question 31 :
Asymmetry of the DNA denaturation - renaturation curve

Answers :

1. is directly proportional to the genomic complexity
2. is inversely proportional to the genomic complexity
3. is directly proportional to the AT content
4. has no correlation with genomic complexity

Question 32 :
'P' is a *cis*-acting element, while 'Q' is a *trans*-acting element. Possible examples of 'P' and 'Q' are:

Answers :

1. Enhancer and transcription factor
2. Transcription factor and operator
3. Promoter and operator
4. Transcription factor and promoter

Question 33 :
In an organism, the amount of DNA per haploid genome is about 1.6×10^9 nucleotide pairs. Given that the length of DNA helix occupied by one nucleotide pair is 3.4 Å, approximately how long a double helix could be formed from this DNA?

Answers :

1. 22 cm
2. 55 cm
3. 1.1meter
4. 2.2 meter

Question 34 :
A hypothetical polypeptide hormone binds to its receptor with an association rate constant (k_a) of 3.0×10^4 M^{-1} sec^{-1} and a dissociation rate constant (k_d) of 6.9×10^{-6} sec^{-1}. What is the equilibrium dissociation constant?

Answers :

1. 4.7×10^9 M^{-1}
2. 2.3×10^{-10} M
3. 2.3×10^{10} M^{-1}
4. 3.3×10^{-6} M

Question 35 :
If a fluorescent dye is injected into the lumen of the endoplasmic reticulum (ER), in which of the following compartments can fluorescence signal be observed?

Answers :
1. ER only
2. Golgi only
3. ER and Golgi
4. ER, Golgi and nuclear envelope

Question 36 :
Which of the following statements about Na^+-K^+ ATPase is correct?

Answers :
1. It is responsible for generating the resting membrane potential
2. It transports Na^+ and K^+ ions down their respective gradients
3. It is responsible for generating an action potential
4. It indirectly regulates the volume of the cell

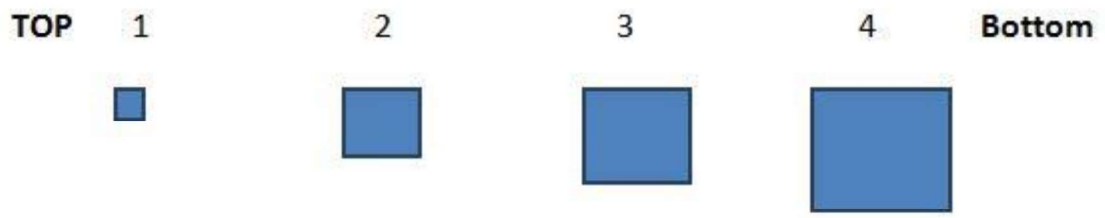
Question 37 :
Protein glycosylation can take place only on the following amino acid(s):

Answers :
1. Asparagine
2. Serine and Threonine
3. Asparagine, serine and threonine
4. Asparagine, serine, threonine and arginine

Question 38 :
Which one of the following organelles disappears during cell division and is regenerated in the daughter cells?

Answers :
1. Endoplasmic reticulum
2. Golgi
3. Mitochondria
4. Peroxisomes

Question 39 :
Cross sectional images of an object taken at fixed intervals from top to bottom reveals the following images (1,2,3,4). Using these images if you had to reconstitute the object, what would be its 3D shape?



Answers :

1. Cube
2. Pyramid
3. Prism
4. Tetrahedral

Question 40 :
In *E. coli*, mismatch during replication is corrected by the mismatch repair (MMR) pathway. For this, the MMR proteins differentiate between the parent and daughter strand by:

Answers :

1. Identifying the methylation on the daughter strand
2. Identifying the methylation on the parent strand
3. Identifying methylation on both strands
4. Identifying lack of methylation on both strands

Question 41 :
Promoter : transcription ::

Answers :

1. Shine-Dalgarno : translation
2. DNA polymerase:replication
3. Ribosome:translation
4. DnaA:replication

Question 42 :
Hair cells in the inner ear act as receptors for which one of the following cues?

Answers :

1. Temperature
2. Chemical
3. Mechanical
4. Orientation

Question 43 :
Which one of the following reactions **DOES NOT** occur in fatty acid synthesis?

Answers :

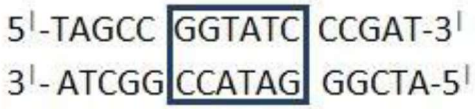
1. Reduction
2. Dehydration
3. Decarboxylation
4. Phosphorylation

Question 44 :
The amino acid that can act both as an acid and a base in an enzyme catalysed reaction is:

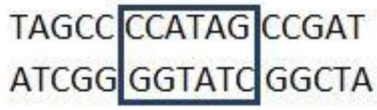
Answers :

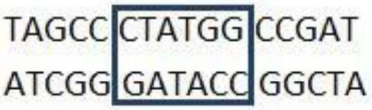
1. Tryptophan
2. Lysine
3. Histidine
4. Aspartic acid

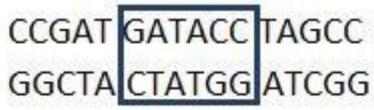
Question 45 :
The DNA sequence in the box undergoes an inversion. What is the final DNA sequence after inversion?

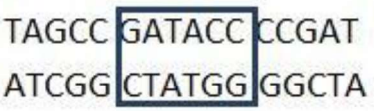


Answers :

1. 

2. 

3. 

4. 

Question 46 :
A DNA with the sequence 5'CGCATCGATCATGCCCTGA…..AGTCCCATTAGATGCC3' needs to be PCR amplified. The reverse primer will have the following sequence:

Answers :
1. 5'GGCATCTA3'
2. 5'TAGATGCC3'
3. 5'GGACTCTA3'
4. 5'CGCATCGA3'

Question 47 :
Gamma phosphate labelled ATP molecule was used to label a DNA fragment using the nick translation protocol. This would result in:

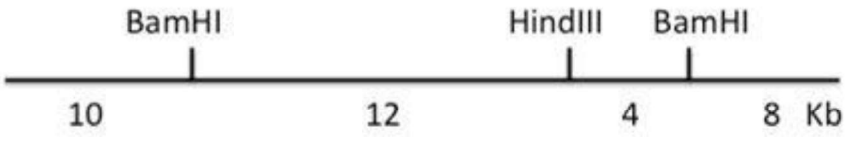
Answers :
1. Labelling at 5'end
2. Labelling at 3'end
3. Labelling at both 3'and 5'ends
4. No labelling of DNA

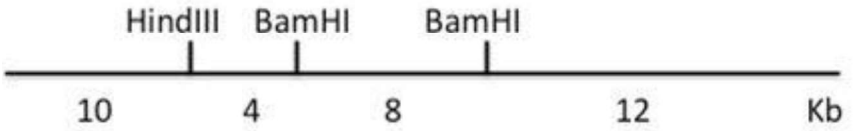
Question 48 :
Taq DNA polymerase differs from the Klenow fragment in having:

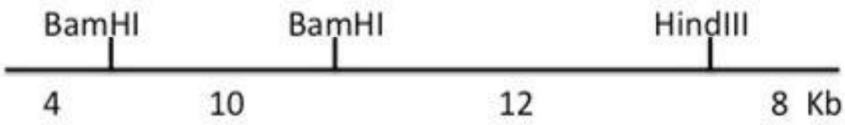
Answers :
1. 5'-3' polymerase activity
2. 5'-3' exonuclease activity
3. 3'-5' exonuclease activity
4. Endonuclease activity

Question 49 :
A 34 Kb linear DNA was digested with *Hind*III and *BamH*I. The fragments obtained on complete digestion were as follows:
HindIII : 14 Kb, 20 Kb
BamHI: 4 Kb, 12 Kb, 18 Kb
HindIII + BamHI: 4 Kb, 10 Kb, 8 Kb, 12 Kb

The appropriate restriction map of the DNA is:

Answers :
1. 

2. 

3. 

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Question 50 :

In an eukaryotic pre-mRNA the number of positions where polyadenylate modifications occur is:

Answers :

1. 5
2. 2
3. 3
4. 4

PART B

Question 51 :
Which one of the following amino acid biosynthesis pathways is affected in folic acid deficiency?

Answers :

1. Aspartate from oxaloacetate & glutamate
2. Glycine from glucose and alanine
3. Glutamate from glucose and ammonia
4. Serine from glucose and alanine

Question 52 :
Which one of the following is **NOT** a part of the recombination signal sequence in VDJ recombination?

Answers :

1. A conserved 7 bp consensus sequence
2. Locus control regions (LCR)
3. A less conserved spacer of either 12 or 23 bp
4. A conserved 9 bp consensus sequence

Question 53 :
The mechanism that permits immunoglobulins to be synthesized either in a membrane bound or secreted form is:

Answers :

1. Allelic exclusion
2. Co-dominant expression
3. Differential RNA processing
4. Class-switch recombination

Question 54 :
The transporter associated with antigen processing (TAP) complex is necessary for the loading of peptides onto class I MHC molecules. The cellular compartment harboring the TAP complex is:

Answers :

1. Mitochondria
2. Golgi apparatus
3. Endoplasmic reticulum
4. Lysosomes

Question 55 :
Hemoglobin is made up of two copies each of α and β globin subunits. The techniques used to establish the stoichiometry of α and β subunits are:

Answers :

1. SDS –PAGE and hydrophobic interaction chromatography

2. Gel filtration chromatography and Ion-exchange chromatography
3. SDS-PAGE and gel filtration chromatography
4. Isoelectric focusing and Native PAGE

Question 56 :
Hot start PCR is performed to

Answers :
1. Expedite the PCR reaction
2. Prevent mutations
3. Prevent primer – dimer formations
4. Minimize non-specific amplification

Question 57 :
A 1 Kb insert (I) is ligated to a 5 Kb vector (V) in a molar ratio of I:V of 5:1, in a reaction volume of 1 mL at a final DNA concentration at 10 µ g/mL. How much of the insert and vector was used in the ligation mixture?

Answers :
1. 5 µg I and 5 µg V
2. 2 µg I and 8 µg V
3. 8 µg I and 2 µg V
4. 3 µg I and 7 µg V

Question 58 :
A human gene is cloned in an *E. coli* expression vector. However, extremely poor protein expression is detected on SDS-PAGE despite high levels of specific mRNA. The most likely explanation is:

Answers :
1. Formation of inclusion bodies
2. Lack of human translation initiation factors
3. Lack of human elongation factors
4. Lack of specific iso-accepting tRNAs

Question 59 :
Aminopterin in HAT medium inhibits:

Answers :
1. Thymidine kinase
2. Hypoxanthine – guanine phosphoribosyl transferase
3. Ribonucleotide reductase
4. Dihydrofolate reductase

Question 60 :
A linear double stranded DNA is self-circularized by ligation with T4 DNA ligase. At which concentration (µg/ml) of DNA would the self-circularization yield be maximum?

Answers :

1. 30
2. 10
3. 5
4. 0.5

Question 61 :
In a cell, a repressor binds to its cognate operator with a $K_D = 10^{-9}$M. The cellular concentration of the repressor is 10^{-8}M. The extent of repressor bound to the operator is:

Answers :

1. 100%
2. 50%
3. 37%
4. 0%

Question 62 :
Among the merodiploids of the *lac* operon in *E. coli*, which one is **NOT** inducible by lactose?

Answers :

1. i^- p o z/ i p o z
2. i^- p o z/ i p^- o z
3. i^- p o^- z/ i p o^- z
4. i p o z/ i p o z^-

Question 63 :
Termination of mRNA transcription in *Saccharomyces cerevisiae* is mediated by:

Answers :

1. Rho-dependent termination
2. Rho-independent termination
3. Polyadenylation signal
4. Sigma factor directed termination

Question 64 :
A *Bacillus* culture growing in a rich medium was shifted to a sporulation medium. Which of the following is expected to occur?

Answers :

1. Genome and transcriptome will change
2. Genome will not change, but transcriptome will change
3. Transcriptome will not change, but proteome will change
4. Genome, transcriptome and proteome will not change

Question 65 :
A DNA fragment digested with *Hind*III and *Eco*RI was ligated with a vector digested with *Hind*III and *Eco*RI sites present in the polylinker of the vector. Upon screening of transformants by digestion with

*Hind*III and *Eco*RI, it was found that all the transformants contained only the self-ligated vector and there was no recombinant clone (containing insert cloned in the vector). This is possibly due to:

Answers :

1. Only one of the restriction enzymes digested the vector
2. Both the restriction enzymes digested the vector
3. Only one of the restriction enzymes digested the insert
4. Both the restriction enzymes digested the insert

Question 66 :
In a cloning experiment, alkaline phosphatase is generally used to dephosphorylate a plasmid vector rather than the insert DNA fragments because:

Answers :

1. Alkaline phosphatase can only dephosphorylate plasmid vector and not insert DNA fragments
2. Vector can self-ligate and form colonies upon introduction into host cells
3. Insert DNA fragments can self-ligate and form colonies upon introduction into host cells
4. Vector cannot ligate to a dephosphorylated insert DNA fragment

Question 67 :
A Yeast plasmid vector has an *Xho*I site in the *LEU*2 marker gene and a *Sal*I site in the *HIS*3 marker gene. A student cloned a gene using the *Sal*I site. How should the student select for the recombinant clone?

Answers :

1. Plate the transformation mixture on leu^- his^- medium
2. Plate the transformation mixture on leu^+ his^+ medium, followed by replica plating on leu^+ his^- medium
3. Plate the transformation mixture on his^+ leu^- medium, followed by replica plating on leu^- his^- medium
4. Plate the transformation mixture on leu^+ his^- medium

Question 68 :
Which of the following statements about IPTG and lactose is **NOT** correct?

Answers :

1. IPTG is an analog of lactose
2. Both IPTG and lactose are inducers of the *lac* operon
3. IPTG is not metabolized while lactose is metabolized by the cells
4. Both IPTG and lactose need permease for entry into the cell

Question 69 :
Which of the following amino acid changes in the active site of an enzyme is **most likely** to change its activity?

Answers :

1. Lys → Arg
2. Leu → Ile

3. Glu → Asp
4. Lys → Pro

Question 70 :
Which of the following statements is NOT correct about enhancers?

Answers :
1. They can function in either orientation
2. They decrease the binding of activators near the promoter
3. They increase the binding of activators near the promoter
4. They can function upstream or downstream of the gene

Question 71 :
In an experiment, two different mutations in a single gene was observed. This gene was cloned. Northern and Western analysis of each mutant (1 and 2) and the wild type gave the following profiles:

What will be the inference from the result?

Answers :
1. Mutant 1 and 2 both have silent mutation at different positions.
2. Mutant 1 has missense mutation and 2 has silent mutation
3. Mutant 1 has missense mutation and 2 has nonsense mutation
4. Mutant 1 has silent mutation and 2 has missense mutation

Question 72 :
The common feature of Rho-independent and Rho-dependent termination of transcription is:

Answers :
1. the active signal lies in the direct repeats in nascent RNA
2. the active signal lies in double stranded DNA template
3. the active signal lies in nascent RNA
4. both require ATP

Question 73 :
During infection by single stranded RNA viruses, host immune system distinguishes viral RNA from the host RNA based on:

Answers :
1. differences in the length of the RNAs
2. specific signals at the 5′ end of the RNAs
3. localization of viral RNA to a particular region in the cell

4. phosphorylation of viral RNA

Question 74 :
The deletion of gene X in mice did not result in any abnormality. Further, to investigate the function of the gene, at least five null mice of the same sex are needed. What is the minimum number of pups from heterozygous parents to be screened to obtain the required number?

Answers :
1. 10
2. 20
3. 40
4. 80

Question 75 :
The Carbon (C_1) of glucose is labelled with ^{14}C (specific activity of 10 mCi/mmole). After one round of glycolysis, the specific activity of radiolabelled pyruvate is:

Answers :
1. 0
2. 10
3. 5
4. 20

Question 76 :
Helicobacter pylori survives in the acidic environment of the stomach because it:

Answers :
1. has acid resistant cell wall
2. releases alkaline compounds
3. produces urease enzyme
4. uses acid as a nutrient

Question 77 :
During DNA replication the newly generated strand remains attached to the template. However, during transcription newly synthesized RNA dissociates from the template. This is achieved by:

Answers :
1. RNase H
2. RNA polymerase itself
3. DNA Polymerase
4. Spontaneous dissociation

Question 78 :
Rag1 null mice are susceptible to infection because:

Answers :
1. RAG1 is a protein involved in innate immune response
2. RAG1 is involved in gene rearrangement in all somatic cells
3. RAG1 is involved in gene rearrangement in T and B cells

4. RAG1 is involved in NK cell generation

Question 79 :
The restriction site for *Van*91I is 5′ CCANNNN↓NTGG 3′. How many times can *Van*91I cut a 4 Mb bacterial genome with 50% GC content?

Answers :
1. ~1000 times
2. ~10 times
3. Once
4. ~100 times

Question 80 :
Phosphorylation of proteins is a typical post-translational modification which modulates their activities. Which one of the following amino acid residues can be phosphorylated?

Answers :
1. Glutamic acid
2. Lysine
3. Asparagine
4. Aspartic acid

Question 81 :
Positive and negative selection markers are utilized to screen for recombinants from wild type populations. Which one of the following can be used for negative selection in bacteria?

Answers :
1. Lac Z
2. β-lactamase
3. Sac B
4. Neomycin aminophosphotransferase

Question 82 :
A mammalian cell culture is treated with cycloheximide. Protein synthesis of cells after treatment was recorded through incorporation of labeled amino acids. In which of the following organelles will fresh protein synthesis be detected?

Answers :
1. Nucleus
2. ER
3. Mitochondria
4. Golgi

Question 83 :
A scientist aims to identify a binding site for a new transcriptional anti-terminator protein. Which one of the following techniques will be most appropriate for this experiment?

Answers :

1. Microarray
2. RNA Sequencing
3. RIP Sequencing
4. ChIP Sequencing

Question 84 :
Primer extension is a technique employed for mapping the:

Answers :

1. Translational start site
2. Transcription factor binding site
3. Transcription initiation site
4. Ribosome binding site

Question 85 :
UGA is **NOT** a stop codon in:

Answers :

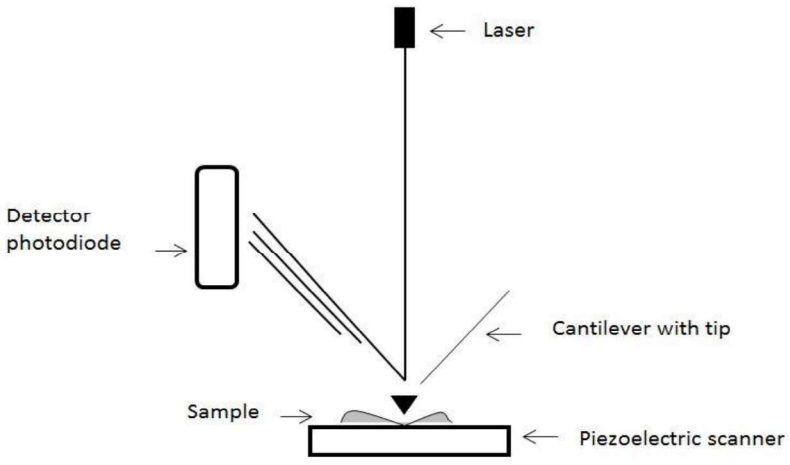
1. Plant nuclear encoded proteins
2. Plant mitochondria
3. Yeast nuclear encoded proteins
4. Yeast mitochondria

Question 86 :
A recombinant plasmid is introduced with adenovirus to specifically label liver cells with GFP. Which gene promoter will be most optimal for specific expression of GFP?

Answers :

1. Catalase
2. α-Mannosidase
3. Cytochrome-P_{450}
4. Amylase

Question 87 :



The schematic represents the basic structural components of a

Answers :

1. Cryo electron microscope
2. Confocal microscope
3. Atomic force microscope
4. Dark field microscope

Question 88 :

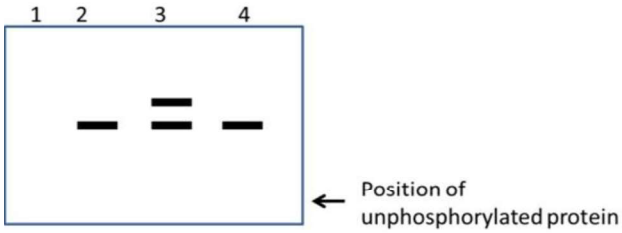
An *in vitro* translation system containing microsomes was used to translate an mRNA encoding a secretory protein lacking the stop codon. Which one of the following outcomes can be expected?

Answers :

1. The protein will not be translated
2. The protein translation will start but stop after some time
3. The protein will be fully synthesized but not incorporated into the microsomal membrane
4. The protein will be synthesized and incorporated into the microsomes but will not be released from the ribosomes

Question 89 :

The result of an *in vitro* phosphorylation assay of a protein using γ-^{32}P ATP in the presence of various kinases is shown below. The bands represent phosphorylated proteins detected.



1. Lane 1: No kinase
2. Lane 2: Kinase 2
3. Lane 3: Kinase 2 followed by inactivation of kinase and subsequent addition of kinase 3
4. Lane 4: Kinase 3 followed by inactivation of kinase and subsequent addition of kinase 2

Based on the autoradiograph shown above it can be concluded that:

Answers :

1. The protein cannot be phosphorylated by any kinase
2. Kinase 3 phosphorylates two sites on the protein
3. Kinase 2 can phosphorylate the protein independent of kinase 3
4. Kinase 3 can phosphorylate the protein independent of kinase 2

Question 90 :

During subcellular fractionation, a protein is recovered in the membrane fraction. However, upon washing the membrane fraction with high salt, the protein is obtained in the soluble fraction. The mode of association of the protein with the membrane is via:

Answers :

1. A transmembrane domain
2. A covalent bond
3. Noncovalent bond
4. A lipid anchor

Question 91 :
Effective oral rehydration therapy requires the presence of both Na^+ and glucose because the intestinal epithelial cells express a:

Answers :

1. Na^+-glucose symporter on their basolateral membrane
2. Na^+-glucose antiporter on their basolateral membrane
3. Na^+-glucose symporter on their apical membrane
4. Na^+-glucose antiporter on their apical membrane

Question 92 :
The Warburg effect in cancers refers to their ability to:

Answers :

1. Perform aerobic glycolysis
2. Perform anaerobic glycolysis
3. Promote angiogenesis
4. Promote angiogenesis and metastasis

Question 93 :
In a migrating cell the relative position of the _____ and the _____ determines the polarity of the cell.

Answers :

1. Nucleus, Golgi
2. Golgi, centriole
3. Nucleus, mitochondria
4. Golgi, mitochondria

Question 94 :
During apoptosis, lipid asymmetry is lost permitting Annexin V to bind to _____ in the outer leaflet of the plasma membrane.

Answers :

1. phosphatidylserine
2. phosphotidylcholine
3. Phosphotidylinositol
4. phosphotidylethanolamine

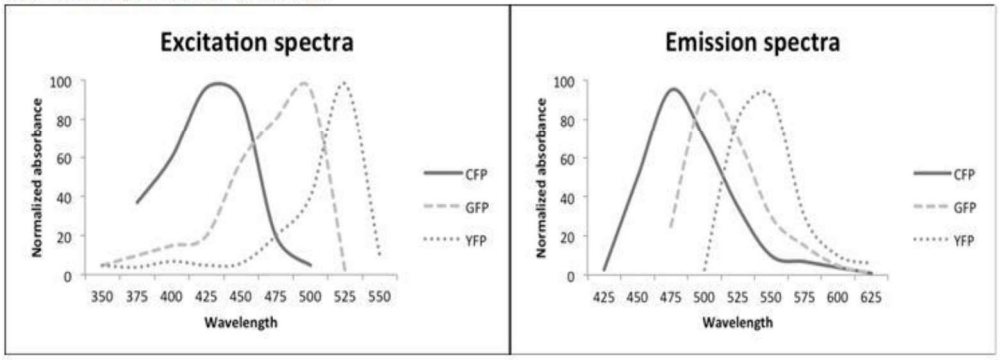
Question 95 :
A cargo has to be delivered from the center of the cell to the cell periphery using the microtubule network. To which protein does it need to be associated with?

Answers :

1. Dynein
2. Kinesin
3. Microtubule associated protein 4
4. Myosin

Question 96 :

The graph below shows the excitation and emission spectra of three fluorophores: CFP, GFP and YFP. If you were to design an experiment to image two fluorescently labelled proteins inside the same cell, which is the best combination to use?



Answers :

1. CFP-GFP as they have overlapping excitation and emission spectra
2. CFP-YFP as they have maximally separate excitation and emission spectra
3. GFP-YFP as they have overlapping excitation and emission spectra
4. Any combination of CFP-GFP-YFP is suitable for imaging two proteins

Question 97 :

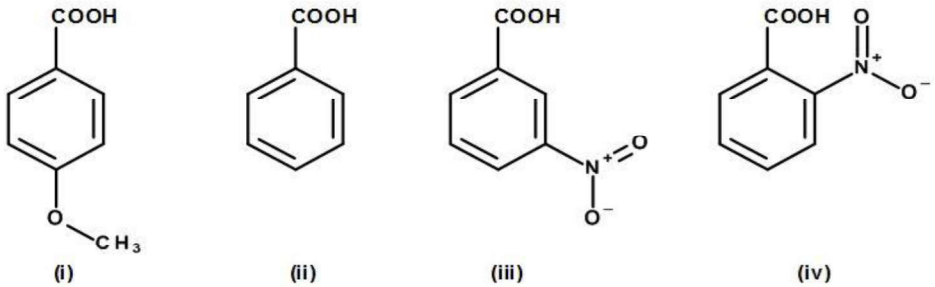
Deamination of which of the following bases will NOT be recognized by the DNA damage repair machinery?

Answers :

1. Cytosine
2. 5-Methyl cytosine
3. Adenine
4. Guanine

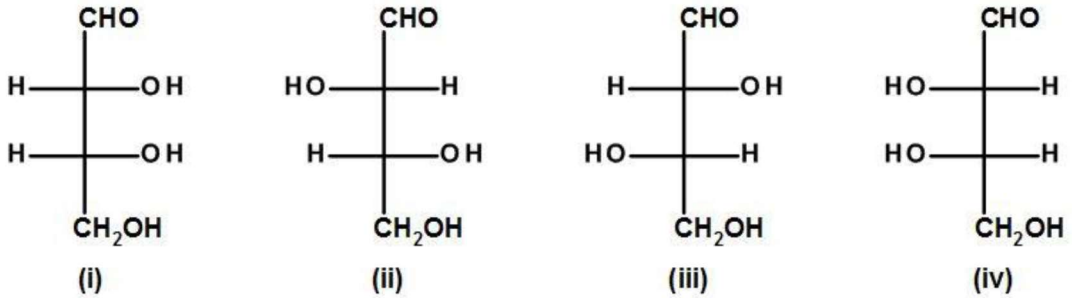
Question 98 :

Arrange the following compounds based on increasing order of acid strength:



Answers :
1. (i) < (ii) < (iii) < (iv)
2. (i) < (ii) < (iv) < (iii)
3. (ii) < (i) < (iv) < (iii)
4. (iv) < (iii) < (ii) < (i)

Question 99 :
Which of the following compound(s) on oxidation gets converted into optically active tartaric acids?



Answers :
1. (ii) and (iii)
2. (i) and (iv)
3. (i), (ii) and (iv)
4. (i), (ii) and (iii)

Question 100 :
Normal bilirubin (4Z, 15Z isomer) undergoes structural isomerisation on absorption of blue-green light (460 – 490 nm). For this reaction, which one of the following statements is **TRUE**?

Answers :
1. It is fast and reversible
2. It is slow but reversible
3. It is fast but irreversible
4. It is slow and irreversible

Question 101 :
SCID mice lack T-cells owing to the:

Answers :
1. Absence of thymus
2. Defect in recombinase genes
3. Defect in expression of pre-TCR
4. Absence of terminal deoxynucleotide transferase

Question 102 :
Anti-human μ chain antibody is specific for epitopes present in the:

Answers :

1. Constant region of the Ig molecule
2. Variable region of the Ig molecule
3. CDR region of the Ig molecule
4. Framework region of the Ig molecule

Question 103 :
Hapten-carrier hypothesis was useful in the designing of the vaccine for:

Answers :

1. *Polio myelitis*
2. *Vibrio cholerae*
3. *Haemophilus influenzae B*
4. *Corynebacterium diphtheriae*

Question 104 :
Tetanus toxoid is a protein that has been chemically treated to retain its:

Answers :

1. Toxicity and antigenicity
2. Toxicity and immunogenicity
3. Immunogenicity and not its toxicity
4. Antigenicity and not its toxicity

Question 105 :
Haemolytic disease of the new born called erythroblastosis fetalis commonly develops in mothers with repeated pregnancies owing to the activation of:

Answers :

1. IgG- secreting memory cells
2. IgE- secreting memory cells
3. Cytotoxic T-cells
4. Natural killer cells

Question 106 :
Human olfactory receptors are:

Answers :

1. Ionotropic receptors
2. G-protein coupled receptors
3. Thermoreceptors
4. Fc receptors

Question 107 :
Primary neurotransmitter that plays a role in sleep, appetite, arousal and mood is:

Answers :

1. Serotonin

2. Acetylcholine
3. Octopamine
4. Glutamate

Question 108 :
For some people it is a popular herb added in food for flavour, but for others it tastes like soap due to a mutation in OR6A2 receptor. The herb is:

Answers :
1. Basil
2. Mint
3. Cilantro
4. Parsley

Question 109 :
Chromosome complement of river *vs* swamp domestic water buffalo is:

Answers :
1. 50 vs 48
2. 52 vs 50
3. 60 vs 58
4. 48 vs 46

Question 110 :
Which one of the following animal diseases was officially declared eradicated by FAO in the year 2011?

Answers :
1. CBPP
2. Dourine
3. African horse sickness
4. Rinderpest

Question 111 :
Peste des petits ruminants (PPR) also known as “goat plague”, a viral disease of goats and sheep is caused by:

Answers :
1. Morbilli virus
2. Flavi virus
3. Reo virus
4. Astro virus

Question 112 :
Which of these is used as a **preferred** inhalation anaesthetic for laboratory animals?

Answers :

1. Isoflurane
2. Nitrous oxide
3. Anaesthetic ether
4. Methoxyflurane

Question 113 :
A1/A2 cow milk are genetic variants of the beta casein milk protein that differ by a single amino acid at position 67. The variants for A1 and A2 are:

Answers :

1. A1-Histidine vs A2-Proline
2. A1-Proline vs A2-Histidine
3. A1-Histidine vs A2-Tyrosine
4. A1-Tyrosine vs A2-Proline

Question 114 :
Dental formula of cattle older than 4 years is:

Answers :

1. 0/2, 0/0, 3/3, 3/3
2. 0/4, 0/0, 3/3, 3/3
3. 2/2, 0/0, 2/2, 4/4
4. 1/1, 0/0, 3/3, 2/2

Question 115 :
In utero microcephaly is caused by:

Answers :

1. Rota virus
2. HIV
3. Borna disease virus
4. Zika virus

Question 116 :
Labels on the tubes containing Fab and $F(ab')_2$ fragments of anti-SRBC were dislodged. Recommend one of the following techniques to identify the correct fragments in the tube:

Answers :

1. Agglutination with SRBC
2. Complement fixation assay with SRBC
3. Rocket electrophoresis with SRBC
4. Reducing SDS-PAGE followed by immunoblotting

Question 117 :
Two cell lines (Vero and SP2/O-Ag14) were cross contaminated. In order to confirm the homogeneity of the cell lines, which of the following approaches would you use?

Answers :

1. Comparative morphological examination of unstained or stained cells
2. Comparative assessment of chromosome number of the cell lines
3. Comparative cell-cycle analysis of the cell lines
4. Comparative flow cytometric analysis of the cell lines

Question 118 :

Match the genus listed in A with the features in B:

A	B
1. *Clostridium*	a. Nosocomial infection
2. *Streptococcus*	b. Growth in Thioglycollate broth
3. *Shigella*	c. Growth in Blood agar
4. *Pseudomonas*	d. Dysentery

Answers :

1. 1-b; 2-c; 3-d; 4-a
2. 1-a; 2-b; 3-c; 4-d
3. 1-d; 2-c; 3-a; 4-b
4. 1-c; 2-a; 3-b; 4-d

Question 119 :

Vitamin D3 formed in the skin is converted to 1,25-dihydroxycholecalciferol in the:

Answers :

1. Muscle and liver
2. Liver and kidney
3. Spleen and kidney
4. Bone and pancreas

Question 120 :

Recently US FDA approved CAR-T treatment is a

Answers :

1. Monoclonal antibody therapy
2. Cell therapy
3. Small molecule therapy
4. Photoactive agent based therapy

Question 121 :

β- Glucans protect aquaculture organisms from various pathogenic strains because they:

Answers :

1. resemble aminoglycoside antibiotics and cause misreading of pathogenic mRNA.
2. enhance immune response and promote growth of prebiotic gut bacteria in aquaculture organisms.
3. adsorb phosphorous and nitrogen from water hampering further proliferation of pathogen strain.
4. are degraded by pathogenic strains to form toxic intermediates.

Question 122 :
Which one of the following is used for culturing *Perna viridis*?

Answers :

1. Raft culture with hanging ropes.
2. Offshore cages and Pens.
3. Irrigated or flow through tanks.
4. Multitrophic recirculatory canal culture cage.

Question 123 :
From the table below, match the pellagic zones with their respective depths and choose the correct option:

	Ocean Zone	Depth
I)	Mesopelagic	w) > 4000 to <6000m
II)	Bathypelagic	x) > 6000 m
III)	Abyssopelagic	y) >200 to <1000m
IV)	Hadopelagic	z) >1000 to <4000m

Answers :

1. I-x; II-w; III-y; IV-z
2. I-w; II-x; III-z; IV-y
3. I-z; II-y; III-x; IV-w
4. I-y; II-z; III-w; IV-x.

Question 124 :
Dead zones in oceans refer to:
Answers :

1. Mariana trench, the deepest part of ocean where living organisms have not been found.
2. hydrothermal vents that have extreme temperatures.
3. neritic zone at the extreme end of continental shelf that is devoid of sunlight.
4. oceanic regions that are extremely hypoxic due to substantial eutrophication.

Question 125 :
Gynogenesis in fishes is achieved by:

Answers :

1. Heat shock treatment at 42°C for 5 min after normal fertilization.
2. Cold shock treatment at 5°C for 10 min after normal fertilization.
3. Fertilization of egg with UV-irradiated sperm followed by heat shock treatment.
4. Treatment of fertilized eggs with cytochalasin.

Question 126 :
A wastewater sample has COD of 1 g/L of which 80% is the BOD. During partial aerobic oxidation only 200 mg of COD was converted to CO_2 and H_2O. The remaining BOD (mg/L) is:
Answers :

1. 800
2. 200
3. 600
4. 1000

Question 127 :
A microbial community has grown on starch anaerobically and it produced a mixture of metabolites with the following composition: glucose, disaccharides, acetate, butyric acid, butanol and carbon dioxide. This microbial community is comprised of:

Answers :

1. *E. coli, Clostridium, Methanosarcina*
2. *E. coli, Bacillus, Saccharomyces*
3. *Acetobacter, Bacillus, Methanosarcina*
4. *Methanosarcina, Methanococcus, E. coli*

Question 128 :
In an air sample, 12% particulate matter is of around 25 nm size, 35% around 10 nm, 30% around 5 nm and remaining are 2.5 nm or smaller. The respiratory particulate matter in this sample is:

Answers :

1. 53%
2. 65%
3. 47%
4. 23%

Question 129 :
A mixture of food waste on inorganic analysis was found to contain Cl^-, SO_4^-, NO_3^-, NH_4^+ ion. Successful anaerobic digestion by a mixed microbial community will result in biogas having the following gases:

Answers :

1. N_2, CO_2, O_2, H_2
2. CH_4, CO_2, N_2, H_2S
3. CH_4, CO_2, N_2, H_2S, H_2
4. H_2, CO_2, N_2, H_2S, Cl_2

Question 130 :
A bioremediation mesocosm experiment has been carried out on a plot with 250 ppm aromatic molecules as contaminants. After 15 days the level of aromatic molecules came down to 100 ppm at a temperature of 48 ± 2°C. The electrical conductance of this site has increased over time because of the

Answers :

1. Accumulation of NaCl
2. Evaporation of aromatics
3. Increase in organic acids
4. Production of CO_2

Question 131 :
Internal coordinates for representation of the three-dimensional structure of a protein consists of:

Answers :

1. bond lengths, bond angles and dihedral angles
2. Cartesian coordinates X, Y and Z for all the atoms
3. spherical polar coordinates R, θ, Φ for all atoms
4. all possible inter atomic distances

Question 132 :
Cis-peptide unit corresponds to the O-C-N-H dihedral angle (degrees) of:

Answers :

1. 0
2. -60
3. 120
4. 180

Question 133 :
Which of the following corresponds to the amino acid pair having maximum and minimum number of allowed conformations in the Ramachandran plot?

Answers :

1. Max: Gly, Min: Pro
2. Max: Pro, Min: Gly
3. Max: Ala, Min: Lys
4. Max: Lys, Min: Ala

Question 134 :
If the energy of a protein structure is calculated using molecular mechanics forcefield, which of the following energy components **CANNOT** have a negative value?

Answers :

1. Bond energy
2. Dihedral energy
3. van der Waals energy
4. Electrostatic energy

Question 135 :
X, Y and Z correspond to three different conformers of an 18-residue peptide, where X: α helix, Y: β strand and Z: 3_{10} helix. Which of the following correspond to the conformers in the decreasing order of end to end distance?

Answers :

1. Y, Z, X
2. X, Y, Z
3. Z, X, Y
4. Y, X, Z

Question 136 :

Which one of the following protein structure prediction methods is based on the principle of locating lowest energy minimum in the conformation space of a protein?

Answers :

1. *Ab initio* structure prediction
2. Threading
3. Fold prediction
4. Homology modeling

Question 137 :

Which one of the following can be used to measure the extent of similarity between the predicted structure of a protein and its experimentally determined structure?

Answers :

1. Root mean square deviation (RMSD)
2. Radius of gyration
3. Solvent accessibility of amino acids
4. Tanimoto coefficient

Question 138 :

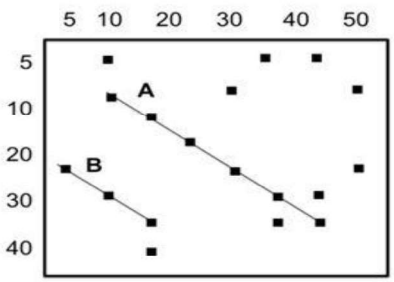
The PROSITE pattern representing the conserved sequence motif for a new family of AMP binding protein is [LIVMFY]-X(2)-[STG]-[STAG]-G-[ST]. You are given a sequence of a 15-amino acid stretch starting from the first residue of the motif. Which one of the following proteins is likely to have AMP binding function?

Answers :

1. LIVMFYNGSTGSTAG
2. MAGTAGSEGYIRHHC
3. LIVMFYSTGSTAGGS
4. LSSTAYTTSALKAAA

Question 139 :

Dot matrix analysis of the amino acid sequences of lambda phage *c*I (horizontal sequence) and phage P22 *c*2 (vertical sequence) repressors is shown below. Which one of the following is correct?



Answers :

1. Line A indicates similar sequences and Line B indicates repeat sequences
2. Line B indicates similar sequences and Line A indicates repeat sequences.
3. Line A indicates similar sequences and Line B indicates inverted repeat sequences
4. Line B indicates similar sequences and Line A indicates repeat sequences.

Question 140 :

An alignment of two protein sequences showing matches, mismatches and gaps (Δ) is given below:

Sequence A	**A G Δ Δ C D E V I G**
Sequence B	**A G E Y C D Δ V I G**

The similarity score (%) for the above alignment will be:

Answers :

1. 14
2. 86
3. 70
4. 100

Question 141 :
Which one of the following is a depiction of the GenBank sequence entry format?

Answers :

1.
```
>YCZ2_YEAST protein in HMR 3' region
MKAVVIEDGKAVVKEGVPIPELEEGFV
GNPTDWAHIDYKVGPQSILGCDAAGQG*
```

2.
```
BASE COUNT 215 A 224 G 263 G 250 T
ORIGIN
Filename, Length of sequence, Date,...
1  GAATTCGATA AATCTCTGGT TTATTGTGCA
51 CTTTGCTGTA AGCATAACTG CAGGGGGCGG
```

3.
```
>P1; ILEC
lexA repressor — Escherichia coli
MKALTARQQEVFDLIRDHISQTGMPPTRAE
IAQRLGFRSPNAAEEHLKALARKGVIEIVS
```

```
LOCUS       name of locus, length and type of sequence.
            classification of organism, data of entry
DEFINITION  description of entry
KEYWORDS    key words for cross referencing this entry
SOURCE      ...
ORGANISM    ...
REFERENCE   ...
COMMENT     ...
FEATURES    ...
BASE COUNT  ...
ORIGIN      text indicating start of sequence
1  GAATTCGATA AATCTCTGGT TTATTGTGCA
51 CTTTGCTGTA AGCATAACTG CAGGGGGCGG
//
```

4.

Question 142 :

Two sequences of comparable length have several regions that align locally, but are separated by other regions that align poorly. Which algorithm can be used to find the highest-scoring alignment between the two sequences?

Answers :

1. Smith-Waterman algorithm
2. Needleman-Wunch algorithm
3. BLAST
4. PHI-BLAST

Question 143 :

A sample genetic code is given below:

Amino Acid	Pro	Val	Gly	His	Asp	Tyr	Thr	Lys
Codon	CCN	GUN	GGN	CAY	GAY	UAY	CAN	AAR

If an amino acid substitution matrix based on genetic code is derived for sequence alignment and analysis from evolutionary studies, which one of the following is **TRUE**?

Answers :

1. Pro is most similar to His
2. Pro is most similar to Thr
3. Gly is most similar to Lys
4. Asp is most similar to Thr

Question 144 :

Which one of the following tools can reliably establish an evolutionary link between two proteins and align them even if they share very low degree of sequence similarity?

Answers :

1. BLAST
2. PSI-BLAST
3. ClustalW
4. FASTA

Question 145 :
Of the two databases A and B, the database A is larger in size than database B. In a BLAST search, a sequence has a highly significant match with the same entry in both the databases. Which of the following is **TRUE**?

Answers :

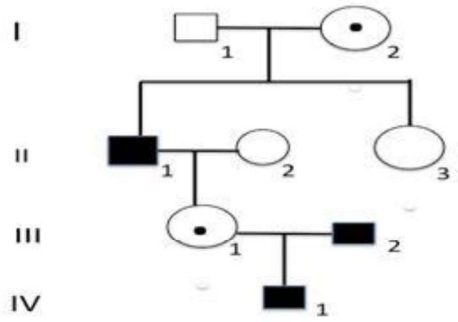
1. Match in Database A will have lower E-value when compared to Database B
2. Match in Database B will have lower E-value when compared to Database A
3. The E-value will be same for both the matches
4. The E-value cannot be compared for such a search

Question 146 :
Parents who appear normal have a child with sickle cell anemia, which is an autosomal recessive trait. The woman becomes pregnant again and is told that she is carrying fraternal twins. What is the probability that both the twins will develop sickle cell anemia?

Answers :

1. 1/16
2. 1/4
3. 1/2
4. 9/16

Question 147 :
The following pedigree shows the inheritance of a human disease. What is the most likely mode of inheritance for this trait and what is the probability that a son of III 1 would be affected by the disease, if III 1 is known to be a carrier.



Answers :

1. Sex-linked recessive; 0.75
2. Autosomal recessive; 0.5
3. Autosomal dominant; 0.75
4. Sex-linked recessive; 0.5

Question 148 :
A 30 Kb candidate gene linked to prostate cancer from a patient was digested with *Xho*I. Following Southern hybridization of the digested products with the full-length gene probe, three bands of 15,

10 and 5 Kb sizes were obtained. However, an identical experiment in normal individuals gave a 15 Kb fragment. This could be due to:

Answers :

1. Presence of SNP in the candidate gene
2. Deletion of a fragment of DNA from the candidate gene
3. The probe could not identify the 10 and 5 Kb fragments
4. The probe could only identify the 15 Kb fragment

Question 149 :
In a given population, 1 out of 400 individuals has cancer caused by a recessive allele '*p*'. Assuming the population is in Hardy-Weinberg equilibrium, what is the expected proportion of individuals who carry the '*p*' allele but do not develop cancer?

Answers :

1. 1/400
2. 19/400
3. 20/200
4. 38/400

Question 150 :
Color blindness in human beings is an X-linked trait. A color-blind man has a 45, X daughter who is also color-blind. The nondisjunction that leads to the 45, X daughter occurred in which parent and in which meiotic division?

Answers :

1. Father; First meiotic division
2. Brother, father and mother; first meiotic division
3. Mother; first meiotic division
4. Father; second meiotic division

Question 151 :
A marker present outside the targeted QTL used to check the crossing over is called:

Answers :

1. Peak marker
2. Background marker
3. Recombinant marker
4. Foreground marker

Question 152 :
Linkage disequilibrium (LD) decay is:

Answers :

1. Much rapid in out-crossing than in selfing species
2. Much rapid in selfing than in out-crossing species
3. Equal in selfing and out-crossing species

4. Not dependent on selfing or out-crossing

Question 153 :
'Gene for gene' hypothesis states that:
Answers :

1. For each resistance gene in the host there is a corresponding gene for virulence in the pathogen conferring host resistance
2. For each resistance gene in the host there is a corresponding gene for avirulence in the pathogen conferring host resistance
3. For each resistance gene in the host there is a corresponding gene for aggressiveness in the pathogen conferring host resistance
4. For each resistance gene in the host there is a corresponding gene for non-aggressiveness in the pathogen conferring host resistance

Question 154 :
In an ordered tetrad analysis, if the two genes are not linked, the …… will be almost equal.

Answers :

1. Parental ditype and non-parental ditype
2. Parental ditype and tetratype
3. Tetratype and non-parental ditype
4. Parental ditype, non-parental ditype and tetratype

Question 155 :
Assume that a marker M1 is present 5 cM away on one side of a gene "X" (a desirable allele of the gene), while marker M2 is present 10 cM away on the other side of the gene. The donor's genotype is M1M1XXM2M2, while the recipient has m1m1xxm2m2 genotype. A cross was made between these two individuals. The F_1 is crossed to recipient. The progeny of this cross had 1000 plants. How many plants from this progeny will have both the markers (M1 & M2) present while the desired gene is absent? (Assume no interference)

Answers :

1. 0
2. 5
3. 10
4. 15

Question 156 :
Maize transgenic for bacterial *CspA* (a RNA chaperone) imparts tolerance to:

Answers :

1. Water stress
2. High temperature stress
3. Salt stress
4. Nutrient stress

Question 157 :
Assume gene "A" is dominant over "a" and "B^1" is codominant over "B^2" in petunia. A cross is made between two individuals – AAB^1B^2 x aaB^1B^2. Assuming that there is no gene interaction, the progeny will segregate in a phenotypic ratio of:

Answers :
1. 9:3:3:1
2. 1:1:1:1
3. 1:2:1
4. 3:1

Question 158 :
A multiline variety is:
Answers :
1. a mixture of isogenic lines that usually confer resistance to a specific disease
2. a single genotype with stacked multiple genes conferring resistance to a specific disease
3. a mixture of pure lines having different traits
4. a collection of germplasm lines

Question 159 :
A variety "X" is a donor for resistance to blast, but it has an undesirable gene for lodging susceptibility that is tightly linked to the blast resistant gene. The best breeding method which has high probability of breaking this linkage is:

Answers :
1. Pedigree method
2. Bulk method
3. Single seed decent method
4. Backcross method

Question 160 :
Upon application of the inhibitor, DBMIB (Dibromothymoquinone) which one of the following events in the chloroplast electron transport chain will **NOT** take place?

Answers :
1. Reduction of reaction centre Q_A
2. Reduction of Plastocyanine (PC)
3. Reduction of Cytb_6f
4. PQ will remain oxidized

Question 161 :
The reduction phase of Calvin-Benson cycle in *Arabidopsis* is inhibited. This can be attributed to the inactivation of:

Answers :
1. Aldolase
2. Triose phosphate isomerase
3. Fructose-1,6-bisphosphatase

4. 3-Phosphoglycerate kinase

Question 162 :
Sucrose-phosphate synthase (SPS) is inhibited by SPS-kinase and activated by SPS-phosphatase. It is known that a high ratio of Glucose-6-phosphate to inorganic phosphate maintains SPS in its active form. Which one of the following statements is true?
Answers :

1. Glucose-6-phosphate inhibits SPS-phosphatase
2. Inorganic phosphate activates SPS-kinase
3. Glucose-6-phosphate inhibits SPS-kinase
4. Inorganic phosphate activates SPS-phosphatase

Question 163 :
The bacterial flagellin activates a typical MAPK cascade consisting of MEKK1-MKK4-MPK6 leading to the activation of ACS6 enzyme involved in ethylene biosynthesis in plants. Which one of the following events will be true in a transgenic *Arabidopsis* plant overexpressing the constitutively active form of MKK4?

Answers :

1. Ethylene responsible genes will be less transcribed in the presence of flagellin stimuli
2. MPK6 will not get activated in the absence of flagellin
3. Flagellin stimuli are not required for the activation of ACS6
4. Flagellin stimuli will be required for ethylene biosynthesis

Question 164 :
Which one of the following statements is correct during gibberellic acid (GA) signal transduction in plants?

Answers :

1. DELLA protein stimulates GA response
2. GID1 does not make complex with DELLA protein
3. Degradation of DELLA protein by 26S proteasomal pathway
4. GID1 proteins get degraded by 26S proteasomal pathway

Question 165 :
In *CLAVATA* (*clv*) mutant of *Arabidopsis*, Shoot Apical Meristem (SAM) size and expression of *WUSCHEL* (*WUS*) is increased. SAM size is reduced in *wus* mutant plants. Choose the correct statement regarding the function of these two genes:

Answers :

1. CLV positively regulate WUS expression and negatively regulate SAM size
2. CLV negatively regulate WUS expression and WUS positively regulate SAM size
3. WUS negatively regulate SAM size and CLV expression
4. WUS and CLV independently regulate SAM size

Question 166 :
Any DNA fragment can be used as a STS marker provided it fulfills one of the following conditions:
Answers :

1. Multilocus nature
2. Single copy
3. Present in repeat regions
4. Telomeric region

Question 167 :
Which one of the following conditions eliminates the possibility of horizontal gene transfer from a transgenic plant?
Answers :

1. Single copy nuclear events
2. Multicopy nuclear events
3. Plastid transformation events
4. Marker free events

Question 168 :
Which one of the following transposition events would increase the DNA content in a given cell?
Answers :

1. *Ac/Ds* elements
2. *Mu* elements
3. *P* elements
4. LINEs

Question 169 :
Flower development in plants is regulated by the ABC model of gene regulation. Members of this gene family are characterized by which one of the following domains?

Answers :

1. C box
2. MADS box
3. WRKY
4. NAC

Question 170 :
In which one of the following PCR assays only one primer is used for amplification?

Answers :

1. SSR
2. SCAR
3. ISSR
4. CAPS

Question 171 :
Gaps in certain regions of the genome have been observed upon sequencing of a xerohalophyte. Which one of the following databases will **NOT** be of any use in filling up these gaps?

Answers :

1. EST database
2. Full length cDNA database
3. RefSeq database
4. QTL database

Question 172 :
One of the most popular genes used for developing rice tolerant to flooding stress is:
Answers :

1. Sub1A
2. LEA
3. HSP70
4. DREB1A

Question 173 :
"Refugia" is a practice commonly employed to control
Answers :

1. Diptera
2. Coleoptera
3. Development of resistance in insects
4. *Bacillus thuringiensis*

Question 174 :
Oat seeds will usually **NOT** germinate when exposed to Red (R) and Far red (FR) light in the following order:
Answers :

1. R → FR → R
2. FR → R → FR
3. R → FR → R → FR → R
4. FR → R → FR → R

Question 175 :
Vir genes are necessary for the transfer of the T-DNA into the host genome. The product of which one of the following genes is tightly associated with the 5' end of the T-strand and helps in nuclear targeting?

Answers :

1. *Vir* A
2. *Vir* G
3. *Vir* E
4. *Vir*D2

Question 176 :
A microorganism following Monod kinetics is grown in a chemostat with working volume of 5 L and inlet substrate concentration of 1g/L. If the μ_{max} and K_s of the organism are 0.5 h^{-1} and 0.25g/L respectively, washout occurs when the flow rate ($L.h^{-1}$) exceeds

Answers :

1. 0.5
2. 1
3. 2
4. 2.5

Question 177 :
How does the rate of a typical chemical reaction vary as a function of temperature?

Answers :

1. $k = A.e^{-\Delta E/RT}$
2. $k = A.\ln(\Delta E/RT)$
3. $k = A.e^{-RT/\Delta E}$
4. $k = A.(\Delta E/RT)$

Question 178 :
An enzyme follows Michaelis-Menten kinetics with the following parameters: V_{max}= 5 mM/s and K_m= 2.5 mM. The reaction velocity would be:

Answers :

1. 2.5 mM/s at all substrate concentration
2. equal to V_{max} at all substrate concentration
3. 1.67 mM/s at a substrate concentration of 1.25 mM
4. 5 mM/s at a substrate concentration of 2.5 mM

Question 179 :
A high cell density fermentation produces recombinant protein product which is 20% of the total cellular protein. The final cell density is 80 OD (1 OD = 0.4g of dry cell wt/L of which 50% is total cellular protein). Then the product concentration (g/L) is:

Answers :

1. 2.4 g/l
2. 3.2 g/l
3. 4.8 g/l
4. 6 g/l

Question 180 :
In a plug flow bioreactor running at steady state, 12.5% cells are recycled back to the inlet. If the cells grow at μ_{max}=1 h^{-1} throughout the length of the reactor (L=124 cm), then the flow velocity should be

Answers :

1. 0.5 cm/min
2. 1cm/min
3. 1.5 cm/min
4. 2cm/min

Question 181 :
In a CSTR, first order reaction takes place converting A to B. If at a dilution rate (D)= 0.5 h^{-1}, 50% of A gets converted to B, then the rate constant 'k' of the reaction is:

Answers :
1. 0.5 h^{-1}
2. 1.0 h^{-1}
3. 0.25 h^{-1}
4. 2.0 h^{-1}

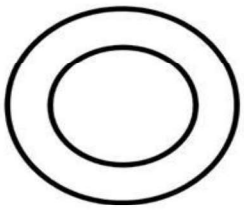
Question 182 :
In a continuous crystallizer, 100 g of a saturated solution of sugar at 85% (w/w) enters the crystallizer and leaves the crystallizer at 70% (w/w). The weight of input solids converted to crystals (g) in the crystallizer is

Answers :
1. 30
2. 50
3. 70
4. 85

Question 183 :
We wish to produce a metabolite 'X' whose biosynthetic pathway is feedback inhibited in the wild type strain. A mutation, which leads to overproduction of X, is discovered in the gene coding for a homodimeric enzyme which catalyses the first step in the biosynthetic pathway of 'X'. This mutation is most likely to occur at:

Answers :
1. the catalytic active site
2. the regulatory site
3. the point of contact between the two monomers
4. in the random coil structure of the protein

Question 184 :
A new spherical resin (of radius 300 μm) has been developed in which only the outer layer is activated to a depth of 100 μm (as shown in figure). The fraction of the activated volume is:



Answers :
1. 1/3
2. 4/9
3. 8/9

4. 19/27

Question 185 :
In a fed batch cultivation, a specific growth rate of 0.2/h needs to be maintained. At the start of fed-batch cultivation, 200 mL/h of media is fed to 1000 mL of working volume. Quasi steady state shall be obtained if:

Answers :
1. flow rate/volume is kept constant at 0.2/h
2. flow rate/volume increases exponentially with time
3. flow rate increases linearly with time
4. flow rate is kept constant

Question 186 :
A recombinant protein is produced in *Escherichia coli* by two stage continuous cultivation at steady state. Upon induction of the culture in stage II, the specific growth rate of the culture decreased considerably. For an input flow rate in stage I of 100mL/h, a steady rate of product formation can only be obtained

Answers :
1. when stage I is larger than stage II
2. when stage I is smaller than stage II
3. when both the stages are of the same size
4. for all possible ratios of the sizes of the two stages

Question 187 :
Consider the scale up of a fermentation from a 10 L to 10,000 L while maintaining geometric similarity. Agitation speed was maintained at 500 rpm in the 10 L fermenter. If scale up is done based on constant tip speed, then the agitation speed in the larger reactor should be …….rpm

Answers :
1. 5000
2. 500
3. 50
4. 5

Question 188 :
A culture can grow independently in two carbon sources, glucose and hexadecane. Identify which one of the following statements is **TRUE**?
Answers :
1. The biomass growth yield is more in hexadecane than in glucose
2. The biomass growth yield is lower in hexadecane than in glucose
3. The oxygen consumed is higher for glucose when compared to hexadecane
4. The CO_2 produced will be more in glucose than in hexadecane

Question 189 :
In mammalian cell culture based monoclonal antibody production, perfusion culture is preferred over continuous stirred tank culture, because the process results in:

Answers :

1. high volumetric productivity
2. high specific productivity per unit biomass
3. maintaining cells in active phase of production
4. retaining the product of interest in the reactor so that higher product concentration is obtained at the end of the process.

Question 190 :

A liquid stream is cooled from 80°C to 30°C in a double pipe heat exchanger as illustrated below:

Fluid flowing counter currently with this stream is heated from 15°C to 30°C. Calculate the log mean temperature difference.

Answers :

1. 18.1° C
2. 29.1° C
3. 19.6° C
4. 32.5° C

Question 191 :

In a typical fermentation process the volumetric oxygen transfer coefficient (K_La) of the system was found to increase after the addition of antifoam agent. The most probable reason for this is:

Answers :

1. the mass transfer coefficient of oxygen (K_L)was increased
2. the interfacial area per unit volume (a) was decreased
3. The increase in the value of oxygen transfer coefficient more than compensated the decrease in the interfacial area per unit volume so that the overall value of K_La was increased
4. The increase in the interfacial area per unit volume more than compensated the decrease in oxygen transfer coefficient so that overall value of K_La was increased

Question 192 :

In a batch microbial fermentation process the dissolved oxygen concentration (DOC) remains almost zero during growth. Which of the following methods will you use for the estimation of oxygen transfer rate while the fermentation is in progress?

Answers :

1. Static gassing out method
2. Dynamic gassing out method
3. Oxygen balance method
4. Sulfide oxidation method

Question 193 :
Two columns of 1 m and 2 m height and of equal diameter are packed with beads containing immobilized enzyme. Substrate was fed to these two columns at flow rates of 10 mL/min (1 m column) and 20 mL /min (2 m column) and the corresponding conversion efficiencies obtained were 30% and 40% respectively. This demonstrates that the reaction is:

Answers :
1. controlled by external mass transfer
2. controlled by internal mass transfer
3. a first order enzymatic reaction
4. a zero order enzymatic reaction

Question 194 :
A food package label displays composition of the food product in g/100g as: protein = 8g, fat= 20g, carbohydrate= 60g (of which sugar is 20g). The calorific value of this product before and after complete replacement of sugar (w/w) by a non-calorific sweetener would be:

Answers :
1. 352 Cal/100g, 272 Cal/100g
2. 452 Cal/100g, 212 Cal/100g
3. 432 Cal/100g, 352 Cal/100g
4. 452 Cal/100g, 372 Cal/100g

Question 195 :
Two sucrose solutions 'A'= 30g/100g and 'B'= 60 g/100 g have to be mixed to prepare 1 kg of 50g/100g sugar syrup. The amounts of 'A' and 'B' solutions to be mixed would be:

Answers :
1. 333 g A + 667 g B
2. 667 g A + 333 g B
3. 500 g A + 500 g B
4. 400 g A + 600 g B

Question 196 :
A food product having water activity of 0.6 is exposed to conditions of 30°C and 70% R.H. This product will tend to _____

Answers :
1. Gain moisture
2. Lose moisture
3. Neither gain, nor lose moisture
4. Initially lose, then gain moisture

Question 197 :
The driving force for mass transfer by molecular diffusion is the difference in
Answers :
1. Potential energy
2. Vapour pressure

3. Gibbs free energy
4. Chemical potential

Question 198 :
Sedimentation efficiency depends on the relative strength of :
Answers :
1. Drag versus centrifugal force
2. Drag versus gravitational force
3. Gravitational versus centrifugal force
4. Gravitational versus electrostatic force

Question 199 :
In anaerobic lactic acid fermentation by bacteria, glucose is partially oxidised to pyruvate followed by reduction to lactate:
Answers :
1. for maintaining proton motive force
2. for cofactor balancing
3. to decrease pH
4. to generate more ATP

Question 200 :
Which one of the following is NOT used for partition based bio-separation?

Answers :
1. Solvent extraction
2. Electrodialysis
3. Salting out
4. Adsorption chromatography