

INSTRUCTIONS FOR CANDIDATES

April 26, 2015

Total Marks - 375

Duration 2.30 p.m. - 5.30 p.m.

- 1) The Question Paper consists of multiple choice objective type questions with **4 options** out of which only one is correct.
- 2) The questions will be displayed on the screen one at a time. Candidate can use the **View QP** feature to view the complete question paper at a time.
- 3) The test will be made available only in **English**.
- 4) Question paper will have two sections: **Section A and Section B**.
- 5) **All 75 question in Section A are compulsory. However, candidates can attempt less number of questions if they wish.**
- 6) **Answer any 50 questions out of 200 questions from Section B. In case you want to attempt any new question i.e. 51<sup>st</sup> question then you will have to clear response of any of the previous questions and so on.**
- 7) Each question carries **3 marks**; for every wrong answer, one mark will be deducted **(-1 negative marking)**.
- 8) The examination duration is **180 minutes**. Questions can be answered in any order you like to.
- 9) **Submit button will be enabled after the completion of exam i.e. the candidate has to sit for the entire duration of the exam.**
- 10) The candidates are requested to follow the instructions of the "Test Administrator" carefully. If any candidate does not follow the instructions / rules, it would be treated as a case of misconduct / adoption of unfair means.
- 11) The candidates may ask the Test Administrator about their doubts or questions only before the commencement of the test. No query shall be entertained after the commencement of the examination.
- 12) After the expiry of 180 minutes, the candidates will not be able to attempt any question or check their answers. The answers of the candidate would be saved automatically by the computer system even if he/ she have not clicked the "Submit" button.
- 13) Please note that under no circumstances should a candidate click on any of the 'keyboard keys' once the exam starts.

## SECTION-A

Q 1	From a group of 7 women and 6 men, 5 persons are required to form a selection committee in which at least 3 women should be there. How many are the possibilities?
Option 1	765
Option 2	657
Option 3	567
Option 4	756

Q 2	Two trains, one from Delhi to Pune and the other from Pune to Delhi, start at the same time from their respective stations. After they meet, the trains reach their appropriate destinations after 4 hours and 9 hours respectively. The ratio of their speeds is:
Option 1	9:4
Option 2	3:2
Option 3	4:3
Option 4	5:4

Q 3	A container has a mixture of kerosene and water in a ratio of 7 : 5. When 9 litres of mixture are taken off and the container is filled with 9 litres of water, the ratio between kerosene and water becomes 7 : 9. How many litres of kerosene were initially in the container?
Option 1	11
Option 2	16
Option 3	21
Option 4	26

Q 4	The missing number in the series 40, 120, 60, 180, 90, ____, 135 is
Option 1	110
Option 2	270
Option 3	105
Option 4	210

Q 5	If a rectangle was called a circle, a circle a point, a point a triangle and a triangle a square, the shape of a wheel would be a
Option 1	rectangle
Option 2	circle
Option 3	point
Option 4	triangle

Q 6	Six persons A, B, C, D, E and F are standing in a circle facing the centre of the circle. B is between F and C, A is between E and D, F is to the left of D. Who is between A and F?
Option 1	B
Option 2	C
Option 3	D
Option 4	E

Q 7	The molecular weight of a protein is 30 kDa. The minimal length of mRNA encoding this polypeptide will be close to
Option 1	800
Option 2	900
Option 3	1000
Option 4	300

Q 8	What is the amount of protein required to prepare 5 ml of 1 $\mu$ M solution (Mol. Wt. of protein is 25 kDa)?
Option 1	125 $\mu$ g
Option 2	125 ng
Option 3	250 $\mu$ g
Option 4	12.5 $\mu$ g

Q 9	Calculate the concentration of NADH solution, whose $A_{340\text{nm}} = 0.8$ O.D. (optical path length is 10 mm, NADH molar extinction coefficient is $\epsilon_{340} = 6220$ )
Option 1	128.6 $\mu$ M
Option 2	12.86 nM
Option 3	1.286 $\mu$ M
Option 4	1.28 nM

Q 10	Identify the pair that best expresses the relationship similar to that expressed in: MENTOR:GUIDANCE
Option 1	Philanthropist : Arguments
Option 2	Philosopher : Donation
Option 3	Physician : Treatment
Option 4	Physicist : Succour

Q 11	If counting was done in base 5 (instead of 10) so that 5 (in base 10) would be written as 10 (in base 5), 6 (in base 10) would be written as 11 (in base 5), then 89 (in base 10) will be written as which of the following numbers in base 5?
Option 1	234
Option 2	324
Option 3	423
Option 4	432

Q 12	If there are 3 children in a family, then the probability that there is only one girl child in the family is
Option 1	2/3
Option 2	1/3
Option 3	3/25
Option 4	3/8

Q 13	A student's average marks (arithmetic mean) on three tests is 80. Which of the following CANNOT be the number of tests on which (s)he earned exactly 80 marks?
Option 1	0
Option 2	1
Option 3	2
Option 4	3

Q 14	If $0 < a < b < 1$ , which of the following is INCORRECT?
Option 1	$a - b < 0$
Option 2	$\frac{1}{ab} > 1$
Option 3	$\frac{1}{b} - \frac{1}{a} > 0$
Option 4	$ab < \frac{a^2 + b^2}{2}$

Q 15	If 25% of 260 equals 6.5% of $10^a$ , what is a?
Option 1	0
Option 2	1
Option 3	2
Option 4	3

Q 16	Complete the following sentence from the options provided. Few other plants can grow beneath the canopy of a tree, whose leaves and pods produce a natural herbicide that leaches into the surrounding soil, _____ other plants that might compete for water and nutrients.
Option 1	inhibiting
Option 2	distinguishing
Option 3	nourishing
Option 4	refreshing

Q 17	<p>The data below are from a Meselson-Stahl type of experiment. Which model of DNA replication is supported by the results shown in the table below?</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Generation</th> <th>% Heavy DNA</th> <th>% Hybrid DNA</th> <th>% light DNA</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>100</td> <td>0</td> <td>0</td> </tr> <tr> <td>2</td> <td>50</td> <td>0</td> <td>50</td> </tr> <tr> <td>3</td> <td>25</td> <td>0</td> <td>75</td> </tr> <tr> <td>4</td> <td>12.5</td> <td>0</td> <td>87.5</td> </tr> </tbody> </table>	Generation	% Heavy DNA	% Hybrid DNA	% light DNA	1	100	0	0	2	50	0	50	3	25	0	75	4	12.5	0	87.5
Generation	% Heavy DNA	% Hybrid DNA	% light DNA																		
1	100	0	0																		
2	50	0	50																		
3	25	0	75																		
4	12.5	0	87.5																		
Option 1	DNA replication is semi-conservative																				
Option 2	DNA replication is conservative																				
Option 3	DNA replication is dispersive																				
Option 4	DNA replication is random																				

Q 18	<p>How many triangles are present in this figure?</p> <div style="text-align: center;"> </div>
Option 1	8
Option 2	10
Option 3	12
Option 4	14

Q 19	A man goes to the house of Sita, who is the neighbor of Geeta, who has a daughter named Meera. Ashu is Aman's father and is married to Anjali, who is sister of Geeta. How is Meera related to Anjali?
Option 1	Niece
Option 2	Cousin
Option 3	Sister
Option 4	Aunt

Q 20	What will come in place of (*) in the following number series? 19, 26, 40, 68, 124 (*)
Option 1	256
Option 2	238
Option 3	246
Option 4	236

Q 21	Fifty-three percent of a number is 358 less than the square of 26. What is the value of three-fourth of 23 per cent of that number?
Option 1	109.5
Option 2	113.5
Option 3	101.5
Option 4	103.5

Q 22	A cube is painted on all sides using yellow and black color such that opposite faces are painted in different color. This cube is cut into 27 smaller cubes of equal sizes. How many smaller cubes will have only one face colored?
Option 1	3
Option 2	6
Option 3	8
Option 4	12

Q 23	A man fills a basket with eggs in such a way that the number of eggs added on each successive day is the same as the number already present in the basket. This way the basket gets completely filled in 24 days. After how many days the basket was 1 / 4th full?
Option 1	6
Option 2	12
Option 3	17
Option 4	22

Q 24	Seema goes 30 km towards North from a fixed point, then after turning to her right she goes 15 km. After this she turns right again and goes another 30 km. How far and in what direction is she from her starting point?
Option 1	45 km East
Option 2	15 km East
Option 3	45 km West
Option 4	15 km West

Q 25	Find the odd one out:
Option 1	77
Option 2	36
Option 3	65
Option 4	3

Q 26	Th1 response is characterized by the secretion of which of the following combinations of cytokines?
Option 1	IL4 and IL17
Option 2	IFN- $\gamma$ and IL12
Option 3	IL1- $\beta$ AND IL12
Option 4	IFN- $\gamma$

Q 27	In hybridoma production, aminopterin is added after fusion to
Option 1	ensure monoclonality of the cultures that survive .
Option 2	cause the death of non -antibody secreting hybrids.
Option 3	cause the death of unfused myeloma cells.
Option 4	cause the death of unfused splenic cells.

Q 28	An alpha-helical conformation of a globular protein can be determined by
Option 1	Atomic force microscopy
Option 2	Electron microscopy
Option 3	Ultraviolet-visible absorbance spectroscopy
Option 4	Circular dichroism

Q 29	The athymic nude (nu/nu) mice are difficult to breed and maintain because the homozygous (nu/nu) females are sterile. How will you propagate it to get maximum nude (nu/nu) mice progeny.
Option 1	by mating of normal males to heterozygous (nu/+) females.
Option 2	by mating homozygous (nu/nu) males to heterozygous (nu/+) females.
Option 3	by mating of heterozygous (nu/+) males to heterozygous (nu/+) females.
Option 4	by mating of heterozygous (nu/+) males to normal females.

Q 30	The base sequence of a short piece of DNA is AGCTTACG. During replication, a transition mutation occurs in the complementary strand synthesized on this piece of DNA. Which of the following is mutated complementary strand?
Option 1	T C G A A T C G
Option 2	T C G A A T G C
Option 3	C G C G A G C T
Option 4	U C G A A G U C

Q 31	Uncoupling of LDL receptors with their ligands occur at which of the following compartments?
Option 1	Late endosome
Option 2	Recycling endosome
Option 3	Early endosome
Option 4	Lysosome

Q 32	Transport of cargo from nucleus to cytoplasm through nuclear pore is regulated by
Option 1	Ras GTPase
Option 2	Rab GTPase
Option 3	Rho GTPase
Option 4	Ran GTPase

Q 33	Which one of the following is a cobalt containing vitamin?
Option 1	Vitamin B <sub>2</sub>
Option 2	Vitamin B <sub>4</sub>
Option 3	Vitamin B <sub>6</sub>
Option 4	Vitamin B <sub>12</sub>

Q 34	Brefeldin A inhibits protein transport from
Option 1	ER to Golgi apparatus
Option 2	Golgi apparatus to ER
Option 3	Golgi apparatus to nucleus
Option 4	Golgi apparatus to mitochondria

Q 35	Which one of the following diseases is caused by a bacteria ?
Option 1	Measles
Option 2	Tetanus
Option 3	Marek's disease
Option 4	Mumps

Q 36	Which one of the following antibiotics is used to demonstrate the new/fresh protein synthesis in response to an inducer/ upon induction in a microbial system?
Option 1	Chloramphenicol
Option 2	Carbenicillin
Option 3	Ampicillin
Option 4	Tetracyclin

Q 37	Both somatic hypermutation and isotype switching depend upon a highly specific enzyme of adaptive immunity that is made only by B cells proliferating in response to antigen. The name of the enzyme is
Option 1	Rag1 recombinase
Option 2	Activation induced cytidine deaminase
Option 3	Terminal deoxynucleotidyl transferase
Option 4	Cre recombinase

Q 38	AGO proteins are associated with
Option 1	Histone complex
Option 2	RNAi effector complex
Option 3	SOS mechanisms
Option 4	Tryptophan operon

Q 39	The fusion between protoplasts can be enhanced by subjecting them to
Option 1	High temperature
Option 2	Low temperature
Option 3	High electric current
Option 4	High light intensity

Q 40	If a nucleotide sequence encoding a protein is known and a homologous protein to be identified, which of the following will be the best analysis tool?
Option 1	BLASTp
Option 2	BLASTn
Option 3	BLASTx
Option 4	tBLASTn

Q 41	The concentration of which of the following plays an important role in somatic embryogenesis?
Option 1	NH <sub>4</sub>
Option 2	NO <sup>-</sup>
Option 3	K <sup>+</sup>
Option 4	PO <sup>3-</sup>

Q 42	Simple sequence repeats (SSRs) markers are derived from
Option 1	Non-coding sequences only
Option 2	Coding sequences only
Option 3	Both coding and non-coding sequences
Option 4	Only from promoter sequences

Q 43	Which of the following enzymes are required for making plant protoplasts?
Option 1	Cellulase and proteinase
Option 2	Cellulase and pectinase
Option 3	Cellulase and amylase
Option 4	Amylase and pectinase

Q 44	The floral dip method is commonly used for
Option 1	Proteomics
Option 2	Genetic transformation
Option 3	Crossing
Option 4	DNA isolation

Q 45	Impeller Reynolds number is given by
Option 1	$DV\rho/\mu$
Option 2	$D^2N\rho/\mu$
Option 3	$D^2V\rho/\mu$
Option 4	$DN\rho/\mu$

Q 46	Continuous cultivation is carried out in 10 L working volume. If $0.2 \text{ h}^{-1}$ dilution rate has to be maintained, then the feed rate will be
Option 1	2L/h
Option 2	400 mL/h
Option 3	400 mL/min
Option 4	5 L/h

Q 47	If the doubling time of an organism is 0.693 h, the specific growth rate will be
Option 1	$1 \text{ h}^{-1}$
Option 2	$1 \text{ min}^{-1}$
Option 3	$0.1 \text{ h}^{-1}$
Option 4	$10 \text{ min}^{-1}$

Q 48	Aeration in a fermentor is expressed as VVM. What will be the VVM if air is sparged at 2000 L/min with a working volume 10 m <sup>3</sup> ?
Option 1	0.2
Option 2	0.5
Option 3	1
Option 4	1.2

Q 49	Rate of centrifugation of a particle in a centrifuge is increased by
Option 1	Decreasing the particle diameter
Option 2	Increasing the centrifuge speed
Option 3	Decreasing the density difference between the particle and liquid
Option 4	Increasing the viscosity of suspended fluid



Q 50	In a batch process of solvent-solvent extraction, higher percentage of extraction is ensured when the whole solvent for extraction is added
Option 1	Once at a time
Option 2	Twice in equal volume
Option 3	Thrice in equal volume
Option 4	Four times in equal volume

Q 51	Which one of the following is true during the separation of biomolecules by reversed phase chromatography ?
Option 1	Stationary phase is less polar than the mobile phase
Option 2	Stationary phase is more polar than the mobile phase
Option 3	Both the stationary and the mobile phase are having the same polarity
Option 4	Polarity of the mobile phase does not play any role

Q 52	In ultrafiltration, identify which one of the following relationships between transmembrane pressure (TMP) and flux (F) is CORRECT
Option 1	For water, initially F increases with TMP and remains constant
Option 2	For water, F always increases with TMP
Option 3	For water, F always decreases with TMP
Option 4	For water, initially F decreases with TMP and remains constant

Q 53	Identify the INCORRECT match
Option 1	Koch-Germ theory
Option 2	Pasteur-blood clotting theory
Option 3	Halsted-modern surgical principles
Option 4	Lavoisier-oxygen theory of combustion

Q 54	The first smallpox vaccine is an example of
Option 1	Heat killed vaccine
Option 2	Chemically attenuated vaccine
Option 3	Live vaccine
Option 4	Vaccine with adjuvant

Q 55	ELISPOT assay is traditionally used for measuring
Option 1	Frequency of T cell responses
Option 2	Frequency of B cell responses
Option 3	Cytokine concentration in serum
Option 4	Antibody titre in serum

Q 56	'Fertility factor' is related to 'conjugation' in the same way as 'bacteriophage P1' to
Option 1	Transformation
Option 2	Transduction
Option 3	Efflux
Option 4	Transposition

Q 57	Hemorrhage in the brain tissue with loss of consciousness is known as
Option 1	Hematoma
Option 2	Hemoptysis
Option 3	Hematemesis
Option 4	Apoplexy

Q 58	Which one of the following methods is frequently used to create transgenic animals?
Option 1	Particle bombardment
Option 2	Nuclear micro-injection
Option 3	Nuclear fusion
Option 4	Nucleo-cytoplasmic transplantation

Q 59	Which of the following is an atypical signaling receptor?
Option 1	Cytokine receptor
Option 2	Chemokine receptor
Option 3	T-cell receptor
Option 4	Mannose receptor

Q 60	The critical regulatory site in the circuit of emotions is
Option 1	Hippocampus
Option 2	Cingulate gyrus
Option 3	Amygdala
Option 4	Fornix

Q 61	Which glial cells participate in the re-uptake mechanism of neurotransmitter from the synaptic cleft?
Option 1	Microglia
Option 2	Oligodendroglia
Option 3	Radial Glia
Option 4	Astroglia

Q 62	Red data book contains data of ....
Option 1	all plant species
Option 2	all animal species
Option 3	economically important species
Option 4	threatened species

Q 63	Conservation within the natural habitat is .....
Option 1	in situ conservation
Option 2	ex situ conservation
Option 3	in vivo conservation
Option 4	ex vivo conservation

Q 64	MAB program stands for...
Option 1	Man and biotechnology
Option 2	Material and biology
Option 3	Man and biology
Option 4	Man and biosphere

Q 65	Marine organisms that require oxygen levels typically in the range of 2-10 % for growth would be classed under
Option 1	facultative anaerobes
Option 2	aerotolerant anaerobes
Option 3	obligate aerobes
Option 4	microaerophiles

Q 66	Along which plate boundaries do the majority of the world's earthquakes occur?
Option 1	divergent
Option 2	transform
Option 3	convergent
Option 4	divergent as well as transform

Q 67	Which of the following will increase the salinity of a particular area of coastal water?
Option 1	Thawing of ice
Option 2	Precipitation
Option 3	River input
Option 4	Freezing of water

Q 68	An individual has the genotype <i>AaBbccddEe</i> . Assuming independent assortment what frequency of gametes will have the genotype <i>abcde</i> ?
Option 1	1/4
Option 2	1/8
Option 3	1/16
Option 4	1/32

Q 69	If the DNA content of a cell in G <sub>1</sub> phase of cell cycle is 'C', what will be its content after meiosis is completed?
Option 1	$\frac{1}{4} C$
Option 2	$\frac{1}{2} C$
Option 3	C
Option 4	2C

Q 70	Which type of chemical mutagen is incorporated into the genome by DNA polymerase during replication?
Option 1	Alkylating agents
Option 2	Base analogs
Option 3	Deaminating agents
Option 4	Intercalating agents

Q 71	Which of the following constitutes a necessary and sufficient condition for two proteins to be considered homologous?
Option 1	The sequences of the proteins must show greater than 50% identity in a Global alignment
Option 2	The sequences of the proteins must show greater than 50% identity in a local alignment
Option 3	The proteins should have diverged from a common ancestor
Option 4	The proteins should have very similar structure and function

Q 72	Boiling a mixture of butter, water and eggs, results in a homogenous suspension; However if the eggs are omitted, then the butter and the water separate out. Which component, present in the egg, is responsible for this behaviour?
Option 1	Albumin
Option 2	DNA
Option 3	Various salts of sodium and magnesium that are present in eggs
Option 4	Lecithin

Q 73	Cooking meat in presence of cut pieces of Papaya fruit results in unusually tender meat. What enzyme, present in the Papaya fruit is responsible for this?
Option 1	Pepsin
Option 2	Papain
Option 3	Papase
Option 4	Papaverine

Q 74	Which of the following peptide sequences will match the sequence motif GXX[SVP]XXG?
Option 1	PGQRVGGGR
Option 2	GPQRVGGGR
Option 3	PGQRQYGGGG
Option 4	PGQRFYGGPR

Q 75	In Mass Spectroscopy, a quadrupole mass filter does which of the following?
Option 1	It makes possible the detection of four times larger ions than normal.
Option 2	It specifically filters out those complex ions that have two positive and two negative charges.
Option 3	It specifically allows ions with two positive and two negative charges and blocks the rest.
Option 4	It allows only those ions which have a specific $m/z$ ratio to pass through.

## SECTION - B

Q 76	If maltose and monosodium glutamate (MSG) are added to a vinegar and palmitic acid and shaken, the mixture will eventually separate into two phases of different density and polarity. Where will most of the sucrose and the MSG be located following phase separation?
Option 1	Both will concentrate in the vinegar.
Option 2	Both will concentrate in the oil.
Option 3	Maltose will concentrate in the oil and MSG will concentrate in the vinegar.
Option 4	Maltose will concentrate in the vinegar and MSG will concentrate in the oil.

Q 77	A slide of macrophage was stained by immunofluorescence using a monoclonal antibody for TAP1/TAP2 complex. Which of the following intracellular compartments would exhibit positive staining with this antibody?
Option 1	Cell surface
Option 2	Endoplasmic reticulum
Option 3	Golgi apparatus
Option 4	Mitochondria

Q 78	Which of the following disorder is not X-linked?
Option 1	Color blindness
Option 2	Rett syndrome
Option 3	Hutchinson muscular dystrophy
Option 4	Swyers syndrome

Q 79	$\alpha$ -amanitin inhibits
Option 1	RNA polymerase I
Option 2	RNA polymerase II
Option 3	DNA polymerase I
Option 4	DNA polymerase II

Q 80	Nullisomy is the term used for the condition when an organism has
Option 1	One additional chromosome than normal
Option 2	One less chromosome than normal
Option 3	Loss of one homologous pair of chromosome
Option 4	Loss of two heterologous chromosomes

Q 81	Tunicamycin blocks
Option 1	N-linked glycosylation
Option 2	O-linked glycosylation
Option 3	Phosphorylation
Option 4	Methylation

Q 82	Which of the following cannot be used in finding the interaction between miRNA and mRNA?
Option 1	TargetScan
Option 2	StarBase
Option 3	PAR- CLIP
Option 4	miRanda

Q 83	H1N1, H1N2, H2N1, H3N1 and H3N2 are subtypes of which influenza virus?
Option 1	influenza A
Option 2	influenza B
Option 3	influenza C
Option 4	influenza D

Q 84	A mother and a father, both CF (cystic fibrosis) carriers, have two children that do not suffer from CF. The probability of a third pregnancy producing a child with the disease is
Option 1	None
Option 2	1:4
Option 3	1:3
Option 4	1:1

Q 85	The overall reaction catalyzed by the electron transport chain is
Option 1	<b>Glucose</b> + ATP → Glucose -6-phosphate + ADP
Option 2	<b>ATP+GDP-&gt; ADP + GTP</b>
Option 3	<b>NADH + H<sup>+</sup> + ½ O<sub>2</sub> --&gt; NADP<sup>+</sup> + H<sub>2</sub>O</b>
Option 4	<b>ATP + H<sub>2</sub>O --&gt; ADP + H<sub>2</sub>PO<sub>4</sub></b>

Q 86	DNA polymerase III of <i>E. coli</i> is
Option 1	required for <i>de novo</i> synthesis of new strands of DNA
Option 2	involved in the repair of damaged DNA
Option 3	required to restart a replication fork
Option 4	involved DNA recombination

Q 87	The protection against smallpox afforded by prior infection with cowpox represents
Option 1	antigenic specificity.
Option 2	antigenic cross-reactivity.
Option 3	innate immunity.
Option 4	passive protection.

Q 88	Internalized antigens are targeted to which of the following compartments for generation of appropriate peptide for presentation on the cell surface along with MHC molecule
Option 1	Lysosomes
Option 2	Endosome
Option 3	Endoplasmic reticulum
Option 4	Golgi

Q 89	In which receptor system, both receptor and ligand are recycled back to membrane
Option 1	LDL receptor
Option 2	Mannose receptor
Option 3	Transferrin receptor
Option 4	Insulin receptor

Q 90	GTP binding proteins are active in GTP bound form. Which of the following protein converts the GTP bound form to GDP bound form.
Option 1	Guanine nucleotide exchange factor
Option 2	GTPase activating protein
Option 3	Guanine nucleotide dissociation inhibitor
Option 4	Guanine nucleotide dissociation factor

Q 91	Which enzyme is used to remove the phosphate group from 5' end of the DNA?
Option 1	Polynucleotide kinase
Option 2	Terminal phosphoryl transferase
Option 3	Alkaline phosphatase
Option 4	Lyases

Q 92	Which one of the following techniques is suitable for the large scale purification of isozymes (A and B) that are differing from each other by a single positive charged amino acid?
Option 1	Chromatofocusing
Option 2	Gel filtration chromatography
Option 3	Native PAGE
Option 4	Analytical isoelectric focusing

Q 93	Glycogen and cellulose are
Option 1	Helical and beta-sheet structure, respectively
Option 2	Helical structures but with different degree of helicity
Option 3	Beta-sheet structures
Option 4	Helical but glycogen is extensively branched molecule

Q 94	Which one of the following factors influences the binding of oxygen to hemoglobin?
Option 1	concentration of $\text{HCO}_3^-$
Option 2	partial pressure of oxygen
Option 3	concentration of hemoglobin
Option 4	concentration of 2,3-bisphosphoglycerate

Q 95	Which one of the following DNA viruses has part of its life cycle involving Reverse Transcriptase enzyme, which is a hallmark of Retroviruses?
Option 1	Epstein-Barr Virus
Option 2	Herpes Simplex Virus
Option 3	Hepatitis B Virus
Option 4	Hepatitis C Virus

Q 96	Cells are broken to release the contents by using various enzymes. Which of the following combination is FALSE?
Option 1	Lysozyme – bacteria
Option 2	Cellulase – plant cell
Option 3	Chitinase – fungus
Option 4	Cellulase – bacteria

Q 97	Which of the following enzymes is required to release the tension imposed by uncoiling of strands?
Option 1	Endonuclease
Option 2	DNA ligase
Option 3	DNA gyrase
Option 4	DNA helicase

Q 98	DNA fingerprinting is based on
Option 1	Occurrence of VNTR's
Option 2	Knowledge of human karyotype
Option 3	Cloned DNA
Option 4	Recombinant DNA

Q 99	The DNA sequence is ATG. What would be the sequence of bases in anticodon of tRNA
Option 1	CAU
Option 2	AUG
Option 3	UAC
Option 4	TAC

Q 100	All <u>except</u> one of the following are true about the protein kinase A (PKA) pathway
Option 1	PKA phosphorylates proteins at serine or threonine residues
Option 2	PKA phosphorylates proteins at tyrosine residues
Option 3	PKA is activated by cAMP
Option 4	PKA is activated by binding of epinephrine to a transmembrane receptor without enzyme activity

Q 101	A T- cytotoxic cell can be induced to mount a cytotoxic attack on a virus-infected cell if it binds to a cell displaying
Option 1	insufficient MHCI
Option 2	insufficient MHCII.
Option 3	MHC I bearing foreign antigen.
Option 4	MHC II bearing foreign antigen.

Q 102	Testosterone hormone, necessary for spermatogenesis, is secreted by
Option 1	sertoli cells
Option 2	leydig cells
Option 3	spermatozoa
Option 4	cowpers gland

Q 103	Which of the following processes occurs in the formation of disulfide bridge between two cystiene residues?
Option 1	Reduction of sulfhydral group
Option 2	Electrostatic interaction
Option 3	Oxidation of sulfhydral group
Option 4	Hydrogen bond

Q 104	In Ramchandran plot, the values of dihedral angle ( $\psi$ ) is based on rotation around.
Option 1	N-C <sup><math>\alpha</math></sup> bond
Option 2	C <sup><math>\alpha</math></sup> -C' bond
Option 3	C'-N bond
Option 4	N-H bond

Q 105	Which one of the following antibiotics attaches to 50S ribosome and inhibits peptidyl-transferase activity?
Option 1	Penicillin
Option 2	Chloramphenicol
Option 3	Trimethoprim
Option 4	Amphotericin

Q 106	The cytological representation of Klinefelter syndrome is
Option 1	44A + XO
Option 2	44A + XXO
Option 3	44A + XXY
Option 4	43A + XYY

Q 107	A chromosome on which T-cell receptor alpha chain gene rearrangement has occurred lacks which of the following gene segments?
Option 1	Joining
Option 2	Diversity
Option 3	Variable
Option 4	Constant

Q 108	Which one of the following molecule yields higher amount of free energy?
Option 1	Phosphoenolpyruvate
Option 2	Glycerate-1, 3-bisphosphate
Option 3	Acetyl phosphate
Option 4	Phosphocreatine

Q 109	Which region of mRNA contains Shine-Dalgarno sequence?
Option 1	5' untranslated region
Option 2	Protein coding region
Option 3	3' untranslated region
Option 4	Promoter region

Q 110	$\alpha$ -D glucose and E-D glucose are
Option 1	Epimers
Option 2	Keto-aldose isomers
Option 3	Anomers
Option 4	Optical isomers

Q 111	Which of the following statements is NOT true for eukaryotic DNA replication?
Option 1	It has multiple origins
Option 2	It is synchronized to phases of cell cycle
Option 3	It does not involve Okazaki fragment
Option 4	It requires licensing of Pre-replicative complex



Q 112	In vitro characterization of <i>E. coli</i> DNA polymerase shows an error rate of $10^{-6}$ - $10^{-7}$ per base pair. However, <i>in vivo</i> , the observed mutation rate is $10^{-9}$ - $10^{-10}$ per base. Such discrepancy is because:
Option 1	<i>In vitro</i> assays for DNA polymerase is less precise than <i>in vivo</i> assays.
Option 2	<i>E. coli</i> has a mechanism of removing such erroneous incorporation of bases.
Option 3	The mechanism by which DNA polymerase amplifies linear DNA used <i>in vitro</i> is different from that of circular DNA <i>in vivo</i> .
Option 4	The reason for such discrepancy is not known yet.

Q 113	The molecular formulae of deoxyribose sugar and ribose sugar, respectively, are
Option 1	C <sub>5</sub> H <sub>10</sub> O <sub>4</sub> and C <sub>5</sub> H <sub>10</sub> O <sub>6</sub>
Option 2	C <sub>5</sub> H <sub>10</sub> O <sub>4</sub> and C <sub>5</sub> H <sub>10</sub> O <sub>5</sub>
Option 3	C <sub>5</sub> H <sub>10</sub> O <sub>5</sub> and C <sub>5</sub> H <sub>10</sub> O <sub>4</sub>
Option 4	C <sub>5</sub> H <sub>10</sub> O <sub>5</sub> and C <sub>6</sub> H <sub>10</sub> O <sub>4</sub>

Q 114	Usually intracellular pathogens avoid their transport to lysosome for their survival in the host cell. But which of the following intracellular pathogens survives in the lysosomes?
Option 1	<i>Legionella</i>
Option 2	<i>Salmonella</i>
Option 3	<i>Mycobacterium</i>
Option 4	<i>Leishmania</i>

Q 115	When Hfr strain of <i>E. coli</i> is crossed with F <sup>-</sup> strain, recombinant obtained are
Option 1	always F <sup>+</sup>
Option 2	always HFr <sup>+</sup>
Option 3	rarely F <sup>+</sup>
Option 4	rarely HFr <sup>+</sup>

Q 116	Archea is considered as a separate group from bacteria and eukaryotes, based on
Option 1	genome sequence.
Option 2	16S rRNA gene sequence.
Option 3	23S rRNA gene sequence.
Option 4	EFTu sequence.

Q 117	How many grams of NaCl will be required to make 10 ml of 10 millimolar solution (MW of NaCl = 58.5)
Option 1	0.585 g
Option 2	0.0585 g
Option 3	0.00585 g
Option 4	0.000585 g

Q 118	Keratin intermediate filaments are synthesized in the cytoplasm of cells. Disulfide bonds cannot be formed in the cytoplasm. However, the keratin fibers in the skin are cross-linked by disulfide bonds. This is because
Option 1	Keratin fibers get transported via endoplasmic reticulum and Golgi to the skin surface
Option 2	Keratinocytes have an oxidizing cytosol
Option 3	Keratin crosslinking happens in dead cells whose contents are oxidized
Option 4	Secreted enzymes of the skin cells form the disulfide bonds after secretion of keratin fibers

Q 119	Which of the following plays a role in changing the antigen binding site of a B cell after antigenic stimulation?
Option 1	Junctional diversity
Option 2	Combinatorial diversity
Option 3	Germline diversity
Option 4	Somatic hypermutation

Q 120	What region of an mRNA is most commonly associated with transcript destabilization?
Option 1	The 5' untranslated region
Option 2	The 3' untranslated region
Option 3	The exonic coding regions
Option 4	The intronic regions

Q 121	Which type of replication requires a break in the nucleotide strand to get started?
Option 1	Theta replication
Option 2	Rolling circle replication
Option 3	Linear eukaryotic replication
Option 4	Theta and linear replication

Q 122	Mismatch repair in bacteria distinguishes between old and new strands of DNA on the basis of
Option 1	Differences in base composition of the two strands
Option 2	Modification of histone proteins
Option 3	Base analogs on the new strand
Option 4	Methyl groups on the old strand

Q 123	Why does the Environmental Protection Agency closely monitors the release of transgenic bacteria used for agricultural purposes?
Option 1	They want to monitor the destruction of crops by the GMOs
Option 2	They want to observe the effect the GMOs have on crops
Option 3	They want to ensure the GMOs do not proliferate in the environment and pose a threat to humans
Option 4	They want to ensure that people are aware that GMOs may have played a role in the production of a particular food product

Q 124	Which of the following events occurs first in the differentiation sequence of human B cells in the bone marrow?
Option 1	Immunoglobulin light chain rearrangement
Option 2	Immunoglobulin heavy chain rearrangement
Option 3	Surface IgD and IgM present on the B cell
Option 4	Surface IgM present on the B cell

Q 125	A zoo blot helps to detect DNA sequences that
Option 1	Are mutating at a fast rate.
Option 2	Are conserved between species.
Option 3	Are lost due to species extinction.
Option 4	Are processed pseudogenes.

Q 126	Addition of which of the following can prevent the precocious germination of the embryos during embryo culture?
Option 1	Cytokinin
Option 2	Sucrose
Option 3	Ammonium chloride
Option 4	Calcium chloride

Q 127	Which of the following techniques can be used to create diploid homozygous plants in a short span (few months to a year)?
Option 1	Cloning
Option 2	Anther culture
Option 3	Selfing
Option 4	Grafting

Q 128	In plant tissue culture experiments, “conditioned medium” refers to a medium in which
Option 1	all the nutrients are added in optimum concentration
Option 2	all the nutrients are added in high concentration for luxuriant growth
Option 3	media in which the plant cells have been grown for about 48 hrs and cells are filtered out
Option 4	plant cells have been grown for about 48 hrs and new cell cultures are added to it.

Q 129	An intron containing <i>n-glucuronidase</i> ( <i>gus</i> -intron) is used as a reporter gene to assess plant transformation. The intron is introduced to:
Option 1	prevent any expression in the bacterial cells
Option 2	stabilize the <i>gus</i> transcript
Option 3	allow for alternate splicing
Option 4	use it as a target for <i>in situ</i> hybridization for spatial localization of the transcript

Q 130	Which one of the following is true about epigenetic changes?
Option 1	Changes are caused by deletion and are heritable
Option 2	Changes are caused by mutation and are heritable
Option 3	Changes are caused by mutation but are not heritable
Option 4	Changes are caused by DNA methylation and are heritable

Q 131	A cross between two true breeding lines, one with dark blue flowers and the other with bright white flowers produces F1 offspring that are light blue. When the F1 progenies are selfed, a 1:2:1 ratio of dark blue to light blue to white flowers is observed. What genetic phenomenon is consistent with these results?
Option 1	epistasis
Option 2	incomplete dominance
Option 3	co-dominance
Option 4	inbreeding depression

Q 132	In a tissue culture experiment, a student desires to have more differentiation of shoots. Which of the following plant growth hormone ratios should be used?
Option 1	High cytokinin to auxin
Option 2	High auxin to cytokinin
Option 3	High gibberellin to cytokinin
Option 4	High gibberellin to auxin

Q 133	A yeast mutant shows decreased expression of 5.8S rRNA, 5S rRNA and <i>cdc2</i> mRNA. In which of the following might mutation lie?
Option 1	TATA binding protein (TBP)
Option 2	Upstream binding factor (UBF)
Option 3	RNA polymerase III
Option 4	RNA polymerase I

Q 134	Photosynthesis is a:
Option 1	Reductive, endergonic, catabolic process
Option 2	Reductive, endergonic, anabolic process
Option 3	Reductive, exergonic, catabolic process
Option 4	Reductive, exergonic, anabolic process

Q 135	Which of the following statements about a genomic library is INCORRECT?
Option 1	The genomic library will be representative if they contain all the genes in an organism
Option 2	The genomic library must be prepared from cDNA
Option 3	The DNA must be fragmented to an appropriate size to be cloned in suitable vector
Option 4	Genomic libraries should contain a minimum number of recombinant clones if they are to contain all the genes in an organism

Q 136	Which one of the following statements CORRECTLY describes the sequential steps in cDNA cloning?
Option 1	reverse transcription of mRNA, second strand synthesis, cDNA end modification, ligation to vector
Option 2	mRNA preparation, cDNA synthesis using reverse transcriptase, second strand synthesis using terminal transferase, ligation to vector
Option 3	mRNA synthesis using RNA polymerase, reverse transcription of mRNA, second strand synthesis, ligation to vector
Option 4	double stranded cDNA synthesis, restriction enzyme digestion, addition of linkers, ligation to vector

Q 137	Hygromycin B, generally used as a selection marker in plant transformation protocols is
Option 1	an aminocyclitol antibiotic produced by <i>Streptomyces hygroscopicus</i>
Option 2	an aminoglycoside bacteriocidal antibiotic isolated from the bacterium <i>Streptomyces kanamyceticus</i>
Option 3	a beta-lactam antibiotic that is part of the amino-penicillin family and is roughly equivalent to amoxicillin in terms of activity
Option 4	an ammonium butanoate antibody produced by <i>Streptomyces hygroscopicus</i>

Q 138	Which of the following statements about transcription in <i>E. coli</i> is CORRECT?
Option 1	The -10 sequence is always exactly 10 bp upstream from the transcription start site
Option 2	The initiating nucleotide is always a G
Option 3	The intervening sequence between -35 and -10 sequences is highly conserved
Option 4	The distance between the -35 and -10 sequences is critical for transcription efficiency

Q 139	In an <i>in vitro</i> culture experiment the colour of explants turned brown just after 24 hours of sub-culturing. This is due to the
Option 1	Release of antioxidant from explants
Option 2	Release of phenolic compounds from explants
Option 3	Deficiency of nutrients
Option 4	Deficiency of hormones in the medium

Q 140	To avoid the somaclonal variation in the development of transgenic plants which one of the following is preferred?
Option 1	Direct regeneration
Option 2	Regeneration through somatic embryos
Option 3	Regeneration through calli
Option 4	Regeneration through immature embryos

Q 141	The transplastomic lines have no risk of gene escape through pollens since the
Option 1	Pollens degenerate before fertilization
Option 2	Transformed mitochondrial DNA is lost during pollen maturation
Option 3	Transformed chloroplast DNA is lost during pollen maturation
Option 4	Transformed genomic DNA is maternally inherited

Q 142	Among the following, which one is NOT a common method of haploid plant production?
Option 1	Embryo rescue of inter-specific crosses
Option 2	Anther culture
Option 3	Ovule culture
Option 4	Colchicine treatment

Q 143	Which one of the following statements about the M13 bacteriophage is INCORRECT?
Option 1	It mediates transduction
Option 2	It is a single-stranded DNA phage
Option 3	It produces progeny without lysing the host cell
Option 4	It is useful in sequencing strategies

Q 144	Which of the following are flowering hormones?
Option 1	Ethylene and florigen
Option 2	Florigen and vernalin
Option 3	Vernalin and Auxin
Option 4	Ethylene and Auxin

Q 145	Which of the following genes are constitutively expressed and control the plant-induced activation of other <i>vir</i> genes?
Option 1	<i>vir A</i> and <i>vir G</i>
Option 2	<i>vir C</i> and <i>vir D</i>
Option 3	<i>vir A</i> and <i>vir B</i>
Option 4	<i>vir B</i> and <i>vir E</i>

Q 146	In case of gametophytic incompatibility system, the self incompatibility phenotype of the pollen is determined by
Option 1	haploid genotype of the pollen
Option 2	haploid genotype of the anther
Option 3	diploid genotype of the pollen
Option 4	diploid genotype of the anther

Q 147	High frequency heterokaryon formation is observed during protoplast fusion by the addition of
Option 1	Glycerol
Option 2	PEG
Option 3	NaNO <sub>3</sub>
Option 4	DMSO

Q 148	Somatic embryo induction generally occurs in presence of the two growth regulators namely
Option 1	Auxin & Cytokinin
Option 2	Auxin & Abscissic acid
Option 3	Cytokinin & Ethylene
Option 4	Cytokinin & Gibberellins

Q 149	A molecular biology student genetically engineered <i>Arabidopsis thaliana</i> to harbour <i>bar</i> gene. The resulting transgenic plant is expected to be resistant to
Option 1	DL-Phosphinothricin
Option 2	Changes in osmotic pressure
Option 3	Barium stress
Option 4	Imidazolinone

Q 150	Which one of the following statements about haploids is INCORRECT?
Option 1	They help in shortening of breeding cycle
Option 2	Using haploids, it is possible to obtain exclusively male plants in dioecious species
Option 3	Haploids are useful in isolation and detection of mutants.
Option 4	Haploid plants cannot be used for gene transfer

Q 151	Refugia approach in cultivation of Bt cotton is used to minimize
Option 1	Contamination of Bt gene in non-Bt cotton
Option 2	Bt gene flow in other crops
Option 3	Damage by pest
Option 4	Emergence of virulent biotypes

Q 152	In which method of plant transformation would multicopy integration be a common feature?
Option 1	Particle bombardment
Option 2	Protoplast fusion
Option 3	Agrobacterium mediated
Option 4	In planta

Q 153	Which one of the following techniques will help to overcome a pre fertilization barrier between the two species?
Option 1	Embryo rescue
Option 2	Protoplast fusion
Option 3	Ovary culture
Option 4	Embryo implantation

Q 154	Genes located in which one of the following do not follow Mendel's laws? (i) Nucleus (ii) Chloroplast (iii) Mitochondria (iv) Cytoplasm
Option 1	Both (i) and (ii)
Option 2	Both(i) and (iii)
Option 3	Both (ii) and (iii)
Option 4	Both (iv) and (i)

Q 155	Seedless fruits may arise as a result of
Option 1	Parthenocarpy
Option 2	Sexual reproduction
Option 3	Autogamy
Option 4	Allogamy

Q 156	An aluminium pot contains water that is kept steadily boiling (100 °C). The bottom surface of the pot, which is 0.012 m thick and $1.5 \times 10^4 \text{ mm}^2$ in area, is maintained at a temperature of 102 °C by an electric heating unit. Find the rate at which heat is transferred through the bottom surface. Given $k_{Al} = 235 \text{ W.m}^{-1}.\text{K}^{-1}$
Option 1	480.3 W
Option 2	587.5 W
Option 3	640.2 W
Option 4	820.1 W

Q 157	What happens to the viscosity of non-Newtonian fermentation broth upon scale-up?
Option 1	Viscosity increases
Option 2	Viscosity decreases
Option 3	Viscosity does not change
Option 4	Initially viscosity decreases and then increases

Q 158	<p>Estimate the theoretical growth yield coefficient (<math>Y_{X/S}</math>) for ethanol fermentation by <i>S. cerevisiae</i> as described by the following overall reaction:</p> $\text{C}_6\text{H}_{12}\text{O}_6 \longrightarrow 2 \text{C}_2\text{H}_5\text{OH} + 2 \text{CO}_2$ <p>Given <math>Y_{X/ATP} = 10.5 \text{ gdw/mol ATP}</math> and glycolysis yields 2ATP/mol of glucose in Yeast</p>
Option 1	0.224 gdw/g glucose
Option 2	0.117 gdw/g glucose
Option 3	0.334 gdw/g glucose
Option 4	0.45 gdw/g glucose

Q 159	Which one of the following is true in the scale-up of medium sterilization?
Option 1	It is an independent process in terms of quality of medium
Option 2	It is an independent process in terms of both quality of medium and number of contaminants
Option 3	It is a dependent process in terms of both quality of medium and number of contaminants
Option 4	It is a dependent process in terms of quality of medium and independent process in terms of number of microorganisms.

Q 160	In order to extract Penicillin G from fermentation broth, the pH of the broth is adjusted to pH 2.5. This is done because:
Option 1	Most of the Penicillin is in neutral uncharged form at this pH and hence extraction is better.
Option 2	Most of the Penicillin is in ionic form and hence extraction is better.
Option 3	Penicillin is highly stable at this pH
Option 4	Most of the enzymes are precipitated at this pH, which increases the extraction efficiency of Penicillin.

Q 161	Dynamic kinetic resolution of a racemic mixture of alcohol ensures its _____ percent conversion to one enantiomer:
Option 1	100
Option 2	50
Option 3	75
Option 4	25

Q 162	Very low values of $K_m$ may cause
Option 1	Product inhibition
Option 2	Substrate inhibition
Option 3	Enzyme denaturation
Option 4	Substrate induction

Q 163	In the stoichiometric equation given below identify which one of the following corresponds to oxygen balance: $C_w H_x O_y N_z + a O_2 + b H_g O_h N_i \rightarrow c CH_\alpha O_\beta N_\delta + d CO_2 + e H_2O$
Option 1	$w = c + d$
Option 2	$x + bg = c\alpha + 2e$
Option 3	$y + 2a + bh = c\beta + 2d + e$
Option 4	$z + bi = c\delta$

Q 164	If the $\Delta G$ of the reaction $A \rightarrow B$ is $-40$ kJ/mol, under standard conditions the reaction
Option 1	is at equilibrium.
Option 2	will never reach equilibrium.
Option 3	will not occur spontaneously.
Option 4	will proceed spontaneously from left to right

Q 165	Salting out of proteins results in
Option 1	large increase in enthalpy
Option 2	$\Delta G$ being positive
Option 3	small decrease in entropy
Option 4	$\Delta G$ being negative

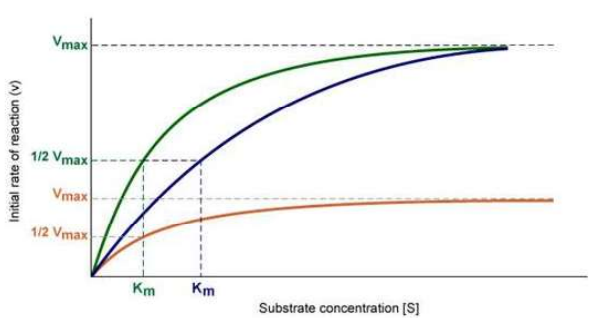
Q 166	The specific productivity ( $q_p$ ) of an enzyme production is fitted linearly with specific growth rate ( $\mu$ ) of a fungal organism according to the equation $q_p = \alpha\mu + \beta$ . The estimated values of constants $\alpha$ and $\beta$ are 0.0006 and 25 respectively. The enzyme production kinetics is
Option 1	growth associated
Option 2	non-growth associated
Option 3	dependent on specific growth rate
Option 4	partially growth associated

Q 167	The partition coefficient of a solute between the stationary phase and the mobile phase is denoted by the
Option 1	capacity factor
Option 2	efficiency
Option 3	height of an equivalent theoretical plate (HETP)
Option 4	zone spreading

Q 168	A fermentor with volume $V$ is vigorously agitated with an impeller of diameter $D_i$ , rotating at an rpm of $n$ . Mixing time $t_m$ in the reactor maximally decreases with
Option 1	increase in $D_i$ alone
Option 2	increase in both $D_i$ and rpm
Option 3	increase in both $D_i$ and rpm and decrease in volume of the reactor
Option 4	decrease in both $D_i$ and rpm and increase in volume of the reactor

Q 169	Identify which one of the following is true of a typical drying curve
Option 1	The moisture content would remain constant throughout the drying period
Option 2	The rate of drying would remain constant throughout the drying period
Option 3	The product temperature will remain constant with time and then decrease
Option 4	The falling rate period is followed by constant rate period



<p>Q 170</p>	<p>Upon addition of reversible inhibitors to an enzymatic reaction following MM kinetics, the following velocity profiles are generated as shown in the figure below (indicated in Red, green and blue line). The red line velocity profile indicates that the reaction is</p> 
<p>Option 1</p>	<p>Un-competitively inhibited</p>
<p>Option 2</p>	<p>Non-competitively inhibited</p>
<p>Option 3</p>	<p>Competitively inhibited</p>
<p>Option 4</p>	<p>Enzyme is not inhibited</p>

<p>Q 171</p>	<p>Common name for Hexadecanoic acid is</p>
<p>Option 1</p>	<p>Myristic acid</p>
<p>Option 2</p>	<p>Palmitic acid</p>
<p>Option 3</p>	<p>Stearic acid</p>
<p>Option 4</p>	<p>Oleic acid</p>

<p>Q 172</p>	<p>The interaction between a solute and a solvent is determined by the balance of forces between solvent molecules, between solute molecules and between solute and solvent molecules. If the sum of two self-interactions balance the cross-interactions, the solvent is referred to as a(n)</p>
<p>Option 1</p>	<p>eta solvent</p>
<p>Option 2</p>	<p>beta solvent</p>
<p>Option 3</p>	<p>theta solvent</p>
<p>Option 4</p>	<p>zeta solvent</p>

<p>Q 173</p>	<p>Given in the table is the list of compounds being produced by the organisms. With appropriate matching indicate which one of the following combinations is most appropriate.</p> <table data-bbox="503 1596 1282 1774" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: left;">PRODUCT</th> <th style="text-align: left;">ORGANISM</th> </tr> </thead> <tbody> <tr> <td>1 Propionic acid</td> <td>A Clostridium acetobutylicum</td> </tr> <tr> <td>2 Butanol</td> <td>B Clostridium propionicum</td> </tr> <tr> <td>3 Citric acid</td> <td>C Gluconobacter oxydans</td> </tr> <tr> <td>4 Gluconic acid</td> <td>D Aspergillus niger</td> </tr> </tbody> </table>	PRODUCT	ORGANISM	1 Propionic acid	A Clostridium acetobutylicum	2 Butanol	B Clostridium propionicum	3 Citric acid	C Gluconobacter oxydans	4 Gluconic acid	D Aspergillus niger
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<p>Option 3</p>	<p>1-C, 2-D, 3-A, 4-B</p>										
<p>Option 4</p>	<p>1-B, 2-A, 3-D, 4-C</p>										

Q 174	One advantage of using <i>Pichia pastoris</i> as a protein expression platform over <i>Saccharomyces cerevisiae</i> is that the former
Option 1	has a faster growth rate
Option 2	cannot grow over a wide pH range
Option 3	produces very high levels of ethanol
Option 4	secretes very low level of endogenous proteins

Q 175	The synthesis of aspartame may be carried out in organic solvents using
Option 1	phenylalanine ammonia lyase
Option 2	argininosuccinate synthetase
Option 3	thermolysin
Option 4	<i>Candida antarctica</i> lipase B

Q 176	The water content in solid state fermentation is
Option 1	Between 40-60%
Option 2	Between 20-40%
Option 3	Between 10-20%
Option 4	Between 5-10%

Q 177	When considering submerged fermentation system oxygen transfer is considered to be a more important factor than the supply of other nutrients. Which one of the following statements is correct?
Option 1	Oxygen has a much lower solubility in water than sugars and nutrients
Option 2	Oxygen has a much higher solubility in water than sugars and nutrients
Option 3	Oxygen has similar solubility in water like sugar and other nutrients
Option 4	Oxygen diffuses more slowly compared to other nutrients

Q 178	Which one of the following sugars is not only non-reducing sugar but also does not exhibit muta-rotation
Option 1	Glucose
Option 2	Maltose
Option 3	Sucrose
Option 4	Lactose

Q 179	Calculate the overall order of a reaction which has rate expression: Rate = k [A] <sup>1/2</sup> [B] <sup>3/2</sup>
Option 1	First order
Option 2	Second order
Option 3	Half order
Option 4	Zero order

Q 180	<p>Match the microbial enzymes from Group A with appropriate application processes from Group B</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>Group A</p> <ol style="list-style-type: none"> <li>1. Pectinase</li> <li>2. Glucose isomerase</li> <li>3. Amylase</li> <li>4. Protease</li> </ol> </td> <td style="width: 50%; vertical-align: top;"> <p>Group B</p> <ol style="list-style-type: none"> <li>a. Meat tenderizing</li> <li>b. Bread making</li> <li>c. high fructose corn syrup</li> <li>d. Fruit juice clarification</li> </ol> </td> </tr> </table>	<p>Group A</p> <ol style="list-style-type: none"> <li>1. Pectinase</li> <li>2. Glucose isomerase</li> <li>3. Amylase</li> <li>4. Protease</li> </ol>	<p>Group B</p> <ol style="list-style-type: none"> <li>a. Meat tenderizing</li> <li>b. Bread making</li> <li>c. high fructose corn syrup</li> <li>d. Fruit juice clarification</li> </ol>
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Option 1	1-c, 2-d, 3-a, 4-b		
Option 2	1-d, 2-c, 3-b, 4-a		
Option 3	1-d, 2-b, 3-c, 4-a		
Option 4	1-b, 2-a, 3-c, 4-d		

Q 181	Which one of the following statements is FALSE. Microbial secondary metabolites are
Option 1	not essential for growth
Option 2	produced in higher amount as compared to primary metabolites
Option 3	always produced in the exponential phase of the growth
Option 4	biodegradable

Q 182	Rate of centrifugal sedimentation is a
Option 1	square function with respect to rpm
Option 2	linear function with respect to rpm
Option 3	square function with respect to rotor diameter
Option 4	cubic function with respect to rotor diameter

Q 183	The advantage of chemostat with cell recycle system over a simple chemostat is that it can be
Option 1	operated at lower dilution rate
Option 2	used for achieving higher cell mass
Option 3	adapted for achieving higher specific productivity
Option 4	adapted for achieving higher specific oxygen uptake rate

Q 184	Which one of the following amino acids is the most effective contributor of protein buffer?
Option 1	Alanine
Option 2	Glycine
Option 3	Histidine
Option 4	Arginine

Q 185	Fluorescence microscopy is based on the ability of certain molecules to
Option 1	absorb light of a constant wavelength
Option 2	absorb light of many different wavelengths
Option 3	absorb light at a given wavelength and then emit light of a longer wavelength
Option 4	absorb light at a given wavelength and then emit light at shorter wavelength

Q 186	Hemorrhagic lymphadenitis is seen in
Option 1	Tuberculosis
Option 2	Actinomycosis
Option 3	Glanders
Option 4	Anthrax

Q 187	In equine infectious anemia, central nervous system shows
Option 1	Cytoplasmic vacuolation in neurons
Option 2	Intranuclear inclusions
Option 3	Non-purulent encephalomyelitis
Option 4	Infiltration of neutrophils

Q 188	Hjarre's disease in poultry is caused by
Option 1	<i>Mycoplasma gallisepticum</i>
Option 2	Mucoid strain of <i>E. coli</i>
Option 3	Newcastle disease virus
Option 4	<i>Mycobacterium avium</i>

Q 189	After infection of cattle, <i>Dictyocaulus viviparus</i> larvae reach the lungs via
Option 1	Intestine, portal vein, liver, heart, lung
Option 2	Intestine, abdominal cavity, liver, heart, lung
Option 3	Intestine, lymphatics, mesenteric lymph nodes, thoracic duct, heart, lungs
Option 4	Intestine, abdominal cavity, thoracic duct, heart, lungs

Q 190	Which one of the following is found in overloaded rumen?
Option 1	High rumen pH and high plasma phosphorus
Option 2	Low plasma phosphorus and low packed cell volume
Option 3	Low rumen pH and high plasma sodium
Option 4	Low rumen pH and high plasma lactate

Q 191	Pressing of head against wall by cow is the clinical symptom of
Option 1	Babesiosis
Option 2	Theileriosis
Option 3	Trypanosomiasis
Option 4	Toxoplasmosis

Q 192	Which one of the following factors released from damaged tissue initiate a chain of clotting events?
Option 1	Thrombin
Option 2	Prothrombin
Option 3	Tissue thromboplastin
Option 4	Fibrin

Q 193	Which one of the following breeds of cattle is known as a milch breed?
Option 1	Hariana
Option 2	Gir
Option 3	Kankrej
Option 4	Amritmahal

Q 194	Tarry color blood from natural orifice is a symptom of
Option 1	Anthrax
Option 2	Strangle
Option 3	Hemorrhagic septicemia
Option 4	Tuberculosis

Q 195	Which one of following cartilages lacks a distinct perichondrium in horse?
Option 1	Hyaline cartilage
Option 2	Elastic cartilage
Option 3	Fibrocartilage
Option 4	Cartilage of the appendicular skeleton

Q 196	Creutzfeldt-Jakob disease is caused by
Option 1	PrP <sup>C</sup>
Option 2	PrP <sup>Sc</sup>
Option 3	West Nile virus
Option 4	Varicella-Zoster virus

Q 197	The natural reservoir of Ebola virus is
Option 1	Fruit bat
Option 2	Dog
Option 3	Sheep
Option 4	Pig

Q 198	A disease diagnostic assay with high specificity should yield
Option 1	more false positives
Option 2	fewer false negatives
Option 3	fewer false positives
Option 4	more false negatives

Q 199	Which one of the following statements is INCORRECT for cystic fibrosis?
Option 1	It results in the reduced secretion of sodium chloride in sweat
Option 2	It results in the increased secretion of sodium chloride in sweat
Option 3	It is an autosomal recessive disease
Option 4	It results in build up of mucus

Q 200	Drug resistance among bacteria involved in hospital infections is commonly due to
Option 1	Multi drug therapy
Option 2	Probiotic bacteria
Option 3	Transfer of resistance genes
Option 4	Mutation in target genes

Q 201	Vaccine is available for all except one of the following pathogens
Option 1	<i>Bordetella pertussis</i>
Option 2	<i>Haemophilus influenzae</i> type b
Option 3	<i>Clostridium tetani</i>
Option 4	<i>Helicobacter pylori</i>

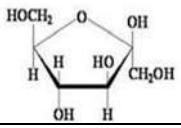
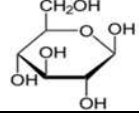
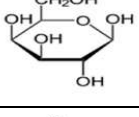
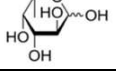
Q 202	Toxic shock syndrome is caused by
Option 1	TNF- $\alpha$
Option 2	TGF- $\beta$
Option 3	Interferon- $\gamma$
Option 4	Interleukin-1

Q 203	BCG vaccine_____
Option 1	is an attenuated <i>M. tuberculosis</i> strain
Option 2	reduces the incidence of tubercular meningitis
Option 3	induces protective CMI response against atypical mycobacteria
Option 4	protects against pulmonary tuberculosis

Q 204	Which one of the following is commonly used to prevent microbial growth in polyclonal sera?
Option 1	DMSO
Option 2	Polyethylene glycol
Option 3	Sodium azide
Option 4	Glycerol

Q 205	The prescribed treatment for swine flu is
Option 1	Azacytidine
Option 2	Oseltamivir
Option 3	Lamivudine
Option 4	Acyclovir

Q 206	A chimeric therapeutic monoclonal antibody consists of
Option 1	Human constant region and mouse variable region
Option 2	Mouse constant region and human variable region
Option 3	Human constant and variable regions with CDR loops of mouse origin
Option 4	One side mouse variable region and other side human variable region

Q 207	In individuals with galactosemia, the enzymes needed for further metabolism of which one of the following sugars is severely diminished or missing entirely?
Option 1	
Option 2	
Option 3	
Option 4	

Q 208	Which one of the following is INCORRECT about Fragile X syndrome?
Option 1	Father to son transmission
Option 2	Presence of CGG repeats
Option 3	Presence of CAG repeats
Option 4	Symptoms of Mental retardation

Q 209	Which one of the following statements is true about superantigens?
Option 1	They are processed in the cytosol
Option 2	They are processed in endosomes
Option 3	They do not require processing
Option 4	They are processed in the lysosome

Q 210	Retrograde transport may be used for
Option 1	nerve path tracing
Option 2	determining nerve fiber diameter
Option 3	determining soma size
Option 4	estimating number of dendrites

Q 211	The conscious state of an individual may be best understood by studying ones
Option 1	electromyogram
Option 2	electrocardiogram
Option 3	electroretinogram
Option 4	electroencephalogram

Q 212	Acetylcholine is released by exocytosis of synaptic vesicles; this release is triggered by
Option 1	Na <sup>+</sup>
Option 2	Ca <sup>2+</sup>
Option 3	K <sup>+</sup>
Option 4	Cl <sup>-</sup>

Q 213	Resting membrane potential of a neuron range between
Option 1	60 mv to 70 mv
Option 2	-60 mv to -70 mv
Option 3	100 mv to 110 mv
Option 4	0 mv

Q 214	The pathological hallmark of Huntington's disease is
Option 1	The degeneration of the substantia nigra
Option 2	The degeneration of globus pallidus
Option 3	The degeneration of striatum
Option 4	The degeneration of sub-thalamic nucleus

Q 215	The patterning of the nervous system along the anterior-posterior axis in embryo is controlled by
Option 1	Pax genes
Option 2	Hox genes
Option 3	SHH signaling
Option 4	BMP signaling

Q 216	Approximately, 50% of total world plant species are present in...
Option 1	tropical rain forest
Option 2	temperate rain forest
Option 3	temperate deciduous forest
Option 4	coral reefs

Q 217	The process of mineralization of environmental pollutants by wild microbes is referred as ...
Option 1	biotransformation
Option 2	bioremediation
Option 3	bioadsorption
Option 4	bioaugmentation

Q 218	Which one of the following is readily available source of nitrogen to plant?
Option 1	Amide fertilizers
Option 2	Ammonia fertilizers
Option 3	Nitrate fertilizers
Option 4	Ammonium phosphate fertilizer

Q 219	Root nodules are pink due to ....
Option 1	haemoglobin
Option 2	leghaemoglobin
Option 3	myoglobin
Option 4	phytocyanin

Q 220	Which of the following is a GM phytoremediator plant?
Option 1	<i>Populus</i>
Option 2	<i>Portulaca</i>
Option 3	<i>Brassicca</i>
Option 4	<i>Helianthus</i>

Q 221	Which one of the following terms represents the recycling of settled decomposer bacteria in sewage treatment plant?
Option 1	Cyclic treatment
Option 2	Primary treatment
Option 3	Activated sludge treatment
Option 4	Tertiary treatment

Q 222	The relationship between species A and species B is described as commensalism. This means that.....
Option 1	both species suffer
Option 2	both species benefit
Option 3	one species benefits and the other species suffers
Option 4	one species benefits and the other species is unaffected

Q 223	Which one of the following is the best indicator of SO <sub>2</sub> pollution?
Option 1	Bryophyte
Option 2	Pteridophyte
Option 3	Lichen
Option 4	Algae

Q 224	Which one of the following groups of enzymes is primarily involved in microbial bioremediation?
Option 1	Hydrolases
Option 2	Transferases
Option 3	Oxidoreductases
Option 4	Mutase

Q 225	Why catalase is induced in microbes during exposure to the pollutants?
Option 1	Because it involve in biotransformation of that pollutant.
Option 2	Because of oxidative stress produced due to exposure of pollutant.
Option 3	Pollutants are general inducers of catalase
Option 4	Because catalase in involved in the metabolism of metabolite generated from pollutants.

Q 226	The solute concentration of the body fluids of some marine organisms are maintained the same as that of the external medium in which the organism lives. Such organisms are referred to as
Option 1	stenohaline
Option 2	osmoconformers
Option 3	euryhaline
Option 4	osmoregulators

Q 227	Remote sensing is done in the microwave channels by virtue of
Option 1	emission.
Option 2	reflection.
Option 3	scattering.
Option 4	diffraction

Q 228	Which of the following drugs was not isolated from a natural source?
Option 1	Artemisinin
Option 2	Isoniazid
Option 3	Quinine
Option 4	Morphine

Q 229	Antifreeze molecules that prevent intracellular ice formation in marine organisms are generally
Option 1	calcium salts
Option 2	glycoproteins
Option 3	membrane phospholipids
Option 4	long chain alcohols



Q 230	Which term refers to the distance that the wind travels across open water?
Option 1	Fetch
Option 2	Current
Option 3	Throw or Reach
Option 4	Drift

Q 231	The typical residence time of water in the oceans is of the order of
Option 1	3,500 years
Option 2	1,000 years
Option 3	10,000 years
Option 4	350 years

Q 232	The spring bloom of phytoplankton in the surface waters of high latitude oceans occurs when
Option 1	zooplankton grazing declines as large copepods go into diapause.
Option 2	the mixed layer depth becomes shallower than the critical depth.
Option 3	increased wind mixing injects nutrients into the surface waters.
Option 4	nutrients are regenerated rapidly by zooplankton grazers.

Q 233	The vertical movement of lithosphere to accommodate additional weight or removal of weight is called
Option 1	isometric rebounding.
Option 2	interval submersion.
Option 3	isostatic adjustment.
Option 4	isotonic positioning.

Q 234	Which family of motile bacteria with polar flagella is predominant in coastal and marine environments?
Option 1	Enterococcaceae
Option 2	Vibrionaceae
Option 3	Lactobacillales
Option 4	Staphylococcaceae

Q 235	Which is the oceanic zone that extends from the low tide line to the edge of the continental shelf?
Option 1	intertidal zone
Option 2	open ocean zone
Option 3	neritic zone
Option 4	abyssal zone

Q 236	Evidence of past climate conditions is best revealed by studying
Option 1	metal sulphide deposits.
Option 2	lagoon features.
Option 3	deep sea sediments.
Option 4	rock formations.

Q 237	The gases making highest relative contribution to "green house gases" are
Option 1	NO <sub>2</sub> and CO <sub>2</sub>
Option 2	CFC and NO <sub>2</sub>
Option 3	CO <sub>2</sub> and CH <sub>4</sub>
Option 4	NO <sub>2</sub> and CH <sub>4</sub>

Q 238	Which of the following types of coral reefs (given below as 1-3) are found in India? 1. Atoll 2. Fringing 3. Barrier
Option 1	1 & 2 only
Option 2	1, 2 & 3
Option 3	2 & 3 only
Option 4	1 & 3 only

Q 239	What part of a tidal cycle has minimal current?
Option 1	Ebb tide
Option 2	Slack tide
Option 3	Flood tide
Option 4	Lunar tide

Q 240	What is the function of nucleators in freeze-tolerant animals?
Option 1	To prohibit the formation of ice crystals within cells.
Option 2	Act as hormones that induce changes in the expression of enzyme proteins that are more tolerant of cold temperatures.
Option 3	To control the location and kinetics of ice crystal growth.
Option 4	To increase the metabolic rate of the animal to keep it from freezing.

Q 241	The most effective Foul release coatings presently used in the marine environment are
Option 1	biocides such as lead, arsenic and mercury.
Option 2	tributyltin compounds
Option 3	fluoropolymer and silicone based polymer coatings.
Option 4	spray coatings.

Q 242	The first marine derived cancer drug, "Cytosar-U" used for the treatment of leukemia and lymphoma was isolated from
Option 1	Indian sea hare.
Option 2	a Caribbean sea sponge.
Option 3	southeast asian corals.
Option 4	Australian waters.

Q 243	Altemicidin isolated from <i>Streptomyces sioyaensis</i> SA 1758 has antitumor activity and has been widely used in aquaculture
Option 1	for the control of <i>Alteromonas</i> sp.
Option 2	as an iron chelator.
Option 3	due to its toxicity to <i>Artemia salina</i> .
Option 4	to clear up organic carbon.

Q 244	A marine bryozoan, normally causing a problem as a biofouler on boats, harbors this bacterium that has shown promise in cancer treatment and also as a memory enhancer for patients with Alzheimer's disease:
Option 1	<i>Bugula neritina</i>
Option 2	<i>Bugula dentate</i>
Option 3	<i>Cephalosporium acremonium</i>
Option 4	<i>Ectoprocta</i> sp

Q 245	A system incorporating unilateral eye stalk ablation, high salinity, good water quality and optimum temperature can
Option 1	induce maturation in male crustaceans in captivity.
Option 2	induce maturation in female crustaceans in captivity.
Option 3	maintain viability in juveniles in captivity.
Option 4	facilitate mortality in mature adults.

Q 246	Which of the following can help determine if two mutations are allelic?
Option 1	Lack of recombination between the two mutations
Option 2	The two mutants do not complement each other
Option 3	Suppression of one mutation by the other
Option 4	Co-segregation of the two mutations

Q 247	An individual has the genotype <i>AaBb</i> . The two genes are linked in cis and is 5cM apart. What percentage of gametes will have the genotype <i>ab</i> ?
Option 1	2.5
Option 2	5.0
Option 3	47.5
Option 4	90.0

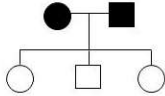
Q 248	An E. coli mating between Hfr <i>trp<sup>+</sup> his<sup>+</sup> str<sup>S</sup></i> and F <sup>+</sup> <i>trp<sup>+</sup> his<sup>+</sup> str<sup>R</sup></i> was allowed to proceed for 30 minutes. The mixture was plated on medium containing either (i) streptomycin + histidine or (ii) streptomycin + tryptophan. Replica plating revealed that in the first case 'i' 48 out of 104 colonies were his <sup>+</sup> while in the second case 'ii' 10 out of 70 colonies were trp <sup>-</sup> . Which of the following is the best representation of the location of the trp and his genes relative to the origin of transfer (>) of the Hfr chromosome?
Option 1	: .....his.....>.....trp.....
Option 2	: .....>...trp.....his.....
Option 3	: .....trp.....his.....>.....
Option 4	: .....his.....trp.....>.....

Q 249	Color blindness is an X- linked recessive character. A color blind man and his wife with normal vision have a colour-blind daughter. What is the probability that their new born son would be colour-blind?
Option 1	0
Option 2	1/4
Option 3	1/2
Option 4	1

Q 250	Alkaptonuria is a metabolic disorder controlled by a recessive autosomal allele. The frequency of Alkaptonuria in an ethnic population is about 1 in million persons. What is the proportion of heterozygous 'carriers' in the population?
Option 1	1 in 1000
Option 2	1 in 500
Option 3	1 in 10,000
Option 4	1 in 100

Q 251	Of a population of cells undergoing meiosis, 1% of the cells undergo recombination between genes <i>A</i> and <i>B</i> . What is the distance between the two genes?
Option 1	0.5kb
Option 2	1.0kb
Option 3	0.5cM
Option 4	1.0cM

Q 252	Variation in which types of repeat sequence commonly arise by replication slippage?
Option 1	Microsatellites
Option 2	Minisatellites
Option 3	Retrotransposons
Option 4	DNA transposon

Q 253	<p>One form of congenital deafness in human is inherited as a recessive condition and controlled by two independent genes (A and B). In the pedigree depicted below, two deaf individuals have children with normal hearing ability.</p>  <p>What would be the probable genotypes of the deaf parents?</p>
Option 1	<i>AaBb</i> and <i>AaBb</i>
Option 2	<i>aaBB</i> and <i>AABB</i>
Option 3	<i>aaBB</i> and <i>AAbb</i>
Option 4	<i>Aabb</i> and <i>aABB</i>

Q 254	Genetic relatedness between mothers and daughters in haplodiploid organisms is
Option 1	1
Option 2	0.75
Option 3	0.5
Option 4	0.25

Q 255	In a family, among the siblings, there is a heterozygous girl for haemophilia, a normal boy, a haemophilic girl and a haemophilic boy. Which of the following genotypes would be attributed to the parents?
Option 1	$XX$ and $^nXy$
Option 2	$^nXX$ and $XY$
Option 3	$^nX^nX$ and $^nXY$
Option 4	$^nXX$ and $^nXY$

Q 256	Which among the following is a proper definition of a SMILES string ?
Option 1	A SMILES string is a 1-dimensional representation of the 2-dimensional structure of a molecule.
Option 2	A SMILES string is a 2-dimensional representation of the 3-dimensional structure of a molecule.
Option 3	A SMILES string is a 1-dimensional representation of the 3-dimensional structure of a molecule.
Option 4	A SMILES string is a 2-dimensional representation of the 3-dimensional structure of a molecule.

Q 257	Which of the following is a correct statement regarding sensitivity and specificity of a search algorithm?
Option 1	Sensitivity is the ability to detect true positives and specificity is the ability to reject false positives.
Option 2	Sensitivity is the ability to reject false positives and specificity is the ability to detect true positives.
Option 3	Sensitivity is ability to simultaneously detect true positives and reject false positives, while specificity the ability to simultaneously reject true negatives as well as false negatives.
Option 4	Sensitivity is the ability to reject true negatives and specificity is the ability to reject false negatives.

Q 258	Which of the following statements is true for the BLAST algorithm for sequence comparison?
Option 1	It is a heuristic algorithm.
Option 2	BLAST alignments are guaranteed to be the best possible alignment subject to the correctness of the scoring function.
Option 3	The size of the sequence alphabet has no effect on the efficiency of the BLAST algorithm.
Option 4	The algorithmic complexity is given by $O(n \log n)$ where $n$ is the number of sequences in the database.

Q 259	A mixture containing L-Aspartate, D-Aspartate and L-Lysine was set up for crystallization and produced a single crystal belonging to space group P2/m (Primitive cell with a 2-fold rotation axis and a mirror plane perpendicular to the rotation axis). Which of the following is the most likely composition of the crystal?
Option 1	L-Aspartate and D-Aspartate in equal proportions without any L-Lysine
Option 2	All three components in equal proportions.
Option 3	L-Aspartate, D-Aspartate and L-Lysine in the ratio 1:1:2
Option 4	It is not possible to predict the composition of the crystal from the information given.

Q 260	Which of the following statements best describe the significance of the Temperature factor (B-factor) column in a PDB file?
Option 1	The B-factor signifies the positional uncertainty of a particular atom in a crystal structure due to the inherent dynamics of the atom.
Option 2	The B-factor signifies the positional uncertainty of a particular atom in the crystal structure, which may be due to refinement errors besides the inherent dynamics of the atom.
Option 3	The B-factor specifies the average of the two temperatures in which the molecule was crystallized and the temperature in which X-ray diffraction data was collected from the crystal.
Option 4	The B-factor is an inherent property of the atom and is not related to any other parameter like temperature or dynamics.

Q 261	Peaks in $^1\text{H}$ -NMR spectra are often split into multiplets due to spin-spin coupling with neighbouring protons. Surprisingly, peaks in $^{13}\text{C}$ -NMR spectra appear much simpler with very little evidence of $^{13}\text{C}$ - $^{13}\text{C}$ coupling. Which one of the following statements offers the best explanation for the above observation?
Option 1	The value of the Magnetogyric ratio ( $g$ ) for $^{13}\text{C}$ is much smaller than the corresponding value for $^1\text{H}$ . As a result $^{13}\text{C}$ - $^{13}\text{C}$ couplings have an extremely small magnitude and are not detectable.
Option 2	The natural abundance of the $^{13}\text{C}$ nucleus is very small ( $\sim 1.1\%$ ) hence the chance of finding a neighbouring $^{13}\text{C}$ nucleus for spin-spin coupling is very small.
Option 3	The presence of $^{12}\text{C}$ nuclei in the vicinity, inhibit spin-spin coupling between $^{13}\text{C}$ - $^{13}\text{C}$ neighbours.
Option 4	$^{13}\text{C}$ - $^{13}\text{C}$ coupling constants are so large that the multiplets appear as separate single peaks.

Q 262	For any molecule with $N$ atoms ( $N \geq 3$ ), the minimum number of internal coordinates (bond lengths, bond angles and dihedral angles) sufficient to describe the structure of the molecule is given by:
Option 1	$3N - 6$
Option 2	$3N - 5$
Option 3	$3N - 4$
Option 4	$3N$

Q 263	A scientist screening for monoclonal antibodies against a protein antigen isolates two antibodies, the first of which recognizes a conformational epitope in the form of an D- helix in the protein, and a second one that also recognizes a conformational epitope, but in the form of just one strand in a multi-stranded E-sheet. The scientist then synthesizes small peptides with the same sequences corresponding to the two epitopes and tests for binding with antibodies. Which of the following is the most likely outcome of her experiments?
Option 1	The first antibody recognizes the $\alpha$ -helical epitope but the second antibody fails to recognize the E-strand epitope.
Option 2	The first antibody fails to recognize the D-helical epitope but the second antibody successfully recognizes its E-strand epitope.
Option 3	Both antibodies successfully recognize their respective epitopes.
Option 4	Both antibodies fail to recognize their respective epitopes.

Q 264	Which of the following cases will most likely lead to sequence specific recognition of DNA by a protein?
Option 1	When the protein binds through the minor groove of DNA.
Option 2	When the protein binds through the major groove of DNA.
Option 3	When the protein binds with the phosphate groups avoiding both the minor and major grooves.
Option 4	Sequence specific DNA binding by proteins has no relationship with groove preference.

Q 265	Which of the following algorithms is most likely to be used as an optimizer for Docking calculations?
Option 1	4 <sup>th</sup> - order Runge-Kutta algorithm
Option 2	Maximum Parsimony algorithm
Option 3	Genetic Algorithm
Option 4	Biochemical Algorithm

Q 266	A certain chemical carcinogen causes a lethal chemical modification in DNA bases with a probability of $10^{-7}$ . It was found that if cultured human cells are treated with this compound then approximately 1% of the amount added makes its way to the nucleus and attacks the chromosomes. What is the approximate probability of obtaining at least one base modification event per cell, if cultured human cells are treated with the compound at a concentration of 1mmol/cell.
Option 1	0
Option 2	0.1
Option 3	0.5
Option 4	1

Q 267	When $p$ and $q$ are lengths of sequences, the computational complexity of the Smith-Waterman algorithm is
Option 1	$O(pq)$
Option 2	$O(p + q)$
Option 3	$O(q \log p)$
Option 4	$O(pq)$

Q 268	Which among the following is a measure of similarity between two chemical structures of small molecules?
Option 1	RMSD
Option 2	Tanimoto coefficient
Option 3	E-value
Option 4	P-value

Q 269	A closed circular DNA molecule is treated with saturating concentrations of an intercalator followed by treatment with topoisomerase until it is completely relaxed. If the intercalator is now removed by dialysis, the DNA molecule will become
Option 1	Positively supercoiled
Option 2	It will become negatively supercoiled
Option 3	It will remain relaxed without any change in supercoiling.
Option 4	Exactly half the molecules will become positively supercoiled and the other half will become negatively supercoiled, so that there is no net change in supercoiling.
Q 270	Which among the following amino acids has at least ONE asymmetric carbon atom in its side-chain?
Option 1	Valine
Option 2	Isoleucine
Option 3	Tryptophan
Option 4	Histidine
Q 271	A right handed D-helix made up of L-amino acids has $\phi, \psi$ angles of $-60$ and $-40$ degrees respectively. Which of the following will be the $\phi, \psi$ angles of a left handed D-helix made up of D-amino acids only?
Option 1	$+60$ and $+40$ degrees
Option 2	$-60$ and $+40$ degrees
Option 3	$+60$ and $-40$ degrees
Option 4	cannot be predicted
Q 272	The membrane permeability of Dimethyl urea is:
Option 1	Less than that of urea
Option 2	More than that of urea
Option 3	Comparable to that of urea
Option 4	Depends on the properties of the membrane
Q 273	Which of the following statements is true with respect to the formation of disulfide bonds in a protein produced by eukaryotic cells?
Option 1	Disulfide bonds are formed inside the endoplasmic reticulum (ER) or outside the cell in contact with the atmosphere.
Option 2	Disulfide bonds are formed outside the ER but within the cytosol.
Option 3	Disulfide bonds are formed within the ER but the process continues within the Golgi complex.
Option 4	Disulfide bonds are formed only within the nucleus.
Q 274	Circular dichroic spectra of some proteins show a strong negative ellipticity band at 200 nm. Which of the following secondary structures is characterized by the presence of this band?
Option 1	S-helix structure
Option 2	intrinsically disordered structure
Option 3	D-helical structure
Option 4	$\beta$ -sheet structure
Q 275	Water has a high dielectric constant of 80 in contrast with many non-polar solvents having very low dielectric constants. Due to this property the electrostatic interactions between various side-chains of amino acids in proteins after their transfer from non- polar solvent to water would:
Option 1	Decrease
Option 2	Increase
Option 3	Remain unaffected
Option 4	Attain a value of zero