Biotechnology Eligibility Test-2014

(BET-2014) for DBT-JRF Fellowship

Government of India, Ministry of Science & Technology,

Department of Biotechnology, New Delhi

(Coordinated by NCCS, Pune)

April 20, 2014 **Total Marks - 375** **Duration 10.00 a.m. - 1.00 p.m.**

1. The Question Paper consists of multiple choice objective type questions with 4 options out of which only one is correct.

2. **All 75 question in Section A are compulsory.**

3. **Answer any 50 questions from Section B.**

4. In case more than 50 are attempted in Section B, only first 50 will be considered.

5. Each question carries 3 marks; for every wrong answer, one mark will be deducted

(-1 negative marking).

6. The examination duration is **180 minutes**. Questions can be answered in any order you like to.

About Question Paper:

1. Only one question will be displayed on the computer screen at a time. To attempt next question the candidates should click on **"Next"** or to go back click on **"Previous"** button provided at the bottom of the screen

2. The candidates will be given "Sample Test Questions" for practice purpose before they start answering the actual "Examination Questions".

3. The candidate should click with the mouse on the correct choice, from given 4 options for the right Answer. In case, the candidate does not wish to attempt the question it can be left blank.

4. The candidate can choose to change the option of a question later by selecting a new option in case he/she wishes to. In case student does not want to answer the question,

he/she can deselect the answer by clicking the **"Erase Answer"** link provided against the question.

5. The questions can be answered in any order within the given time frame.

6. **The list of attempted and un-attempted questions is shown in the right side of the screen. You can click on any of the attempted ones to revise the answers in case you wish so.**

7. To move back and forth between questions, candidates should use the "Next"/ "Previous" button/ or should click on the question number displayed at the right side of the screen.

8. The answers will be saved whenever the candidate goes for next question, by clicking on "Next"/ "Previous" button

9. After the expiry of 180 minutes, if the candidates is not able to attempt any question or click the answers a nil result will be saved automatically by the computer system even if he/ she does not click the "Preview Submit" button.

10. If a student finishes the paper within the stipulated time, he/she can end the examination by clicking the PREVIEW SUBMIT button. **Once the submission is done, the examination cannot be restarted.** So please be careful before pressing **PREVIEW SUBMIT** button. However, students will not be allowed to leave the examination hall till the end of the stipulated time.

SECTION - A

Q1	Question/ Options	Mr. X, Mr. Y and Mr. Z went to a fruit shop to purchase apples and oranges at a fixed price for each orange and apple. The transaction amount for each purchase was noted. (I) Mr. X purchased 8 oranges and 4 apples (II) Mr. Y purchased 16 oranges and 8 apples (III) Mr. Z purchased 6 oranges and 5 apples. The individual prices of oranges and apples can be obtained by which one of the following?
	Option 1	(I) and (II)
	Option 2	(I) and (III) or (II) and (III)
	Option 3	(I), (II) and(III)
	Option 4	Insufficient data.

Q2	Question/ Options	A watch repair man noticed that the clock under repair showed 12 minutes slow at 10:00 PM. He made an adjustment and went home. Next day at 10:00 AM, the clock showed 10:12 AM. At what time the clock would have shown the correct time?
	Option 1	3:48 AM
	Option 2	4:00 AM
	Option 3	4:12 AM
	Option 4	5.00 AM

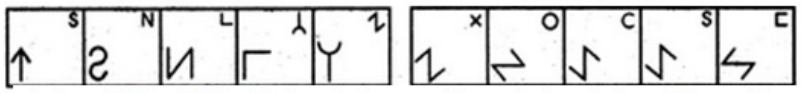
Q3	Question/ Options	In a class of 15, the mean marks for a unit examination was 25 with a standard deviation 0. The correct interpretation is:
	Option 1	Half the class had scores less than 25
	Option 2	There was a high correlation between ability and grade
	Option 3	Everyone had a score of exactly 25.
	Option 4	Half the class had 0's and half had 25s

Q4	Question/ Options	A person travelled 3 km towards west and continued walking 4 km towards north. The shortest distance from the point of starting to current position is
	Option 1	7 km
	Option 2	5 km
	Option 3	1 km
	Option 4	2 km

Q5	Question/ Options	Mohan is 18th from either end of a row of boys? How many boys are there in that row ?
	Option 1	26
	Option 2	32
	Option 3	37
	Option 4	35

Q6	Question/ Options	'Soldier' is related to 'Army' in the same way as 'Pupil' is related to _____
	Option 1	Education
	Option 2	Teacher
	Option 3	Student
	Option 4	Class

Q7	Question/ Options	What should come in the place of 'X' in the following series: 3, 8, 6, 14, X, 20 ?
	Option 1	11
	Option 2	10
	Option 3	8
	Option 4	9

Q8	Question/ Options	Select a figure from amongst the Answer Figures which will continue the same series as established by the five Problem Figures. Problem Figures: Answer Figures:  (A) (B) (C) (D) (E) (1) (2) (3) (4) (5)
	Option 1	1
	Option 2	2
	Option 3	3
	Option 4	4

Q9	Question/ Options	Based on the following assumptions I. Conveyance allowance will not help in bringing punctuality. II. Discipline and reward should always go hand in hand. The CEO of a company issues the following statement: "In order to bring punctuality in our office, we must provide conveyance allowance to our employees." Which of the above assumptions is implied?
	Option 1	Only I
	Option 2	Only II
	Option 3	Either I or II
	Option 4	Neither I nor II

Q10	Question/ Options	A man has some buffaloes and ducks. If the number of heads is 70 and the number of legs is 200, then the number of buffaloes is
	Option 1	30
	Option 2	40
	Option 3	20
	Option 4	70

Q11	Question/ Options	Identify the pair that best expresses the relationship similar to that expressed in Day : Week.
	Option 1	Foot : Inch
	Option 2	Second : Time
	Option 3	Time : Duration
	Option 4	Acre : Hectare

Q12	Question/ Options	A 300 bp long B- form of plasmid DNA has 20 complete turns. This DNA molecule is:
	Option 1	Positively supercoiled
	Option 2	Negatively supercoiled
	Option 3	Relaxed
	Option 4	Cannot be predicted

Q13	Question/ Options	Which one of the following sequences is a palindrome?
	Option 1	5' ACGGATTCGC 3'
	Option 2	5' ATGCCG 3'
	Option 3	5' CCATT 3'
	Option 4	5'AGGCCT3'

Q14	Question/ Options	The nucleotide sequence in an mRNA is 5' UAA AUG ACC CAU UGG UCU CGU UAG AAA AAA 3'. Assuming that ribosomes could translate this mRNA, how many amino acids long would you expect the resulting polypeptide chain to be?
	Option 1	6
	Option 2	7
	Option 3	10
	Option 4	5

Q15	Question/ Options	The difference between two numbers is 4 and the difference of their squares is 152. The sum of these two numbers is
	Option 1	44
	Option 2	38
	Option 3	30
	Option 4	40

Q16	Question/ Options	One ml of NADH solution gave absorbance of 0.31 O.D. at 340 nm wavelength with 1 cm cuvette path length. Calculate the molarity of NADH in this solution. (ε340=6220 M^{-1} cm^{-1}, mol wt. of NADH = 663 Da)
	Option 1	50 μM
	Option 2	50 nM
	Option 3	5μM
	Option 4	500 nM

Q17	Question/ Options	Number of molecules present in 1 ml of 250 µg per ml solution of 10 kDa protein will be - (Avogadro's number is 6.022×10^{23} molecules per mole)
	Option 1	1.50×10^{16}
	Option 2	15.0×10^{16}
	Option 3	0.15×10^{16}
	Option 4	150×10^{16}

Q18	Question/ Options	A producer must select a pair consisting of one lead actor and one supporting actor from 6 candidates. The number of possible pairs that could be selected are:
	Option 1	15
	Option 2	30
	Option 3	12
	Option 4	36

Q19	Question/ Options	Read the following passage and answer questions given at the end of the passage: Although the schooling of fish is a familiar form of animal social behavior, how the school is formed and maintained is only beginning to be understood in detail. It had been thought that each fish maintains its position chiefly by means of vision. Our work has shown that, as each fish maintains its position, the lateral line, an organ sensitive to transitory changes in water displacement, is as important as vision. In each species a fish has a "preferred" distance and angle from its nearest neighbor. The ideal separation and bearing, however, are not maintained rigidly. The result is a probabilistic arrangement that appears like a random aggregation. The tendency of the fish to remain at the preferred distance and angle, however, serves to maintain the structure. Each fish having established its position uses its eyes and its lateral lines simultaneously to measure the speed of all the other fish in the school. It then adjusts its own speed to match a weighted average that emphasizes the contribution of nearby fish. According to the above passage, the structure of a fish school is dependent on which of the following?
	Option 1	Rigidly formed random aggregations
	Option 2	Measurements of a weighted average by individual fish.
	Option 3	Instructions from a "leader fish" usually found to be swimming at the head of the school.
	Option 4	The answer is not clear at present.

Q20	Question/ Options	Read the following passage and answer questions given at the end of the passage: Although the schooling of fish is a familiar form of animal social behavior, how the school is formed and maintained is only beginning to be understood in detail. It had been thought that each fish maintains its position chiefly by means of vision. Our work has shown that, as each fish maintains its position, the lateral line, an organ sensitive to transitory changes in water displacement, is as important as vision. In each species a fish has a "preferred" distance and angle from its nearest neighbor. The ideal separation and bearing, however, are not maintained rigidly. The result is a probabilistic arrangement that appears like a random aggregation. The tendency of the fish to remain at the preferred distance and angle, however, serves to maintain the structure. Each fish having established its position uses its eyes and its lateral lines simultaneously to measure the speed of all the other fish in the school. It then adjusts its own speed to match a weighted average that emphasizes the contribution of nearby fish. The passage suggests that, after establishing its position in the school formation, an individual fish will subsequently
	Option 1	Maintain its preferred position primarily by visual and auditory means.
	Option 2	Rigorously avoid changes that would interfere with the overall structure of the school.
	Option 3	Make continuous sensory readjustments to its position within the school.
	Option 4	Surrender its ability to make quick instinctive judgements.

Q21	Question/ Options	The Budh International circuit length is 5.1 km. One Formula 1 driver made 61.5 rounds and stopped the race. What is the net displacement from start light?
	Option 1	313.65
	Option 2	311.1
	Option 3	2.55
	Option 4	0

Q22	Question/ Options	On a bright sunny day, a healthy person (with perfect eyesight) walking on a tar road saw the legs of a deer were "blurred or wavy" on the surface, far ahead of him. This unusual image formation is because of:
	Option 1	Total internal reflection of the light.
	Option 2	Total external reflection of the light into the medium
	Option 3	Total absorption of the light into the surface because of black surface.
	Option 4	Total emission of light from the surface

Q23	Question/ Options	In which one of the following situations, the entropy may be maximum?
	Option 1	A class full of students without the teacher being present
	Option 2	A class full of students with teacher being present
	Option 3	A class full of students answering an annual examination monitored by video camera
	Option 4	An empty class room

Q24	Question/ Options	What is the pH of 10^{-8} M solution of HCl?
	Option 1	6.959
	Option 2	8.121
	Option 3	5.876
	Option 4	6.367

Q25	Question/ Options	You have induced a rare mutation in a microbe which in special media has 50% higher specific growth rate (2/3rd the doubling time) of the normal cells. If the mutation frequency is $1X10^{-6}$, how many generations of the normal culture are needed for the populations of mutant and normal cells to be equal?
	Option 1	20
	Option 2	40
	Option 3	60
	Option 4	80

Q26	Question/ Options	The two most common processes that lead to production of multiple functional proteins from same DNA sequences are:
	Option 1	RNA editing and alternative splicing
	Option 2	Differential protein folding and protein splicing
	Option 3	Differential poly adenylation of 3' UTR and capping
	Option 4	Differential usage of enhancers and suppressors

Q27	Question/ Options	Which of the following statements is false?
	Option 1	The potassium channel allows potassium ions through the plasma membrane.
	Option 2	Porin allows chloride ions to pass through the plasma membrane
	Option 3	Thermogenin allows H+ to pass from the inner mitochondrial membrane to the matrix
	Option 4	The gap junction channel allows ions to pass from the cytosol of one cell to that of the other

Q28	Question/ Options	Which of the following statements about the glycolysis pathway in the cytosol is incorrect?
	Option 1	It makes ATP
	Option 2	It makes acetyl-CoA
	Option 3	It interacts with the pentose phosphate pathway
	Option 4	It can feed to gluconeogenesis.

Q29	Question/ Options	The trp operon is transcribed when
	Option 1	tryptophan concentration in the cell is high
	Option 2	the trp repressor is bound to tryptophan or a similar shaped molecule
	Option 3	tryptophan is bound to its aporepressor
	Option 4	the appropriate corepressor is absent

Q30	Question/ Options	Glycosylation of protein occurs in the
	Option 1	peroxisome
	Option 2	mitochondrion.
	Option 3	Lysosome
	Option 4	endoplasmic reticulum.

Q31	Question/ Options	PMSF (a serine protease inhibitor) inhibits which of the following:
	Option 1	Chymotrypsin
	Option 2	Pepsins
	Option 3	Papain
	Option 4	Renins

Q32	Question/ Options	Innate immunity is mediated by:
	Option 1	Toll like receptors
	Option 2	G protein coupled receptors
	Option 3	Integrins
	Option 4	FGF receptor

Q33	Question/ Options	Humans have 23 pairs of chromosomes, while our closest relatives, chimpanzees, have 24. Chromosome studies indicate that at some point early in human evolution, two chromosomes simultaneously broke into a large portion and a small portion. The large parts combined to form a large chromosome, and the small parts combined to form a much smaller chromosome (which was subsequently lost). This important chromosomal change could best be described as
	Option 1	nondisjunction followed by deletion
	Option 2	translocation followed by deletion
	Option 3	duplication followed by deletion
	Option 4	translocation followed by inversion

Q34	Question/ Options	Transgenic organisms carry the transgene in:
	Option 1	Gametes only
	Option 2	Somatic cells only
	Option 3	Both gametes and somatic cells
	Option 4	The recipient cell only

Q35	Question/ Options	What is a pseudogene?
	Option 1	An unidentified gene located within a gene family
	Option 2	Mobile genetic elements that act like real genes.
	Option 3	A gene with the same sequence as another gene in the same organism.
	Option 4	A coding region that cannot be translated into a functional protein

Q36	Question/ Options	An operon is a
	Option 1	regulatory molecule that turns genes on and off
	Option 2	cluster of regulatory sequences controlling transcription of protein-coding genes.
	Option 3	cluster of genes that are coordinately regulated
	Option 4	promoter, an operator, and a group of linked structural genes

Q37	Question/ Options	Pyrosequencing uses which of the following:
	Option 1	emulsion PCR
	Option 2	ligation based PCR
	Option 3	Nick translation
	Option 4	Inverse PCR

Q38	Question/ Options	Necrotrophic plant pathogens
	Option 1	Are Pathogens which kill cells of the host plants
	Option 2	Cause minimum cellular damage
	Option 3	Keep the cells alive
	Option 4	cause mildews and rusts

Q39	Question/ Options	Transgenic crops occupying the largest cultivated area in the world are tolerant to
	Option 1	Herbicide
	Option 2	Insect
	Option 3	Viral disease
	Option 4	Drought

Q40	Question/ Options	Which one of the following techniques is used to detect SNPs?
	Option 1	SSCP
	Option 2	SSR
	Option 3	RT-PCR
	Option 4	DAF

Q41	Question/ Options	Which one of the following phytochrome genes in *Arabidopsis thaliana* is responsible for hypocotyl elongation, flowering and seed germination?
	Option 1	PHYB
	Option 2	PHYC
	Option 3	PHYD
	Option 4	PHYE

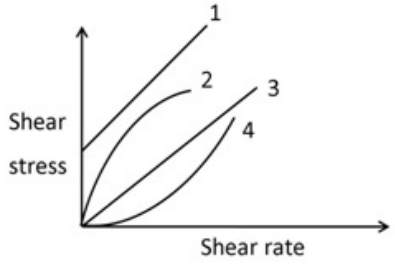
Q42	Question/ Options	Bread wheat *Triticum aestivium* is
	Option 1	An Autohexaploid
	Option 2	An Allohexaploid
	Option 3	An Allotetetraploid
	Option 4	A Diploid

Q43	Question/ Options	The Cytokinin receptor is
	Option 1	A G-protein coupled receptor
	Option 2	A tyrosine kinase
	Option 3	An acidic cytosolic protein
	Option 4	A two component histidine kinase

Q44	Question/ Options	The br2 (Brachytic 2) gene encodes a P-glycoprotein required for normal auxin transport in corn. Which one of the following describes the phenotype of br2 mutants?
	Option 1	Long internodes
	Option 2	Short internodes
	Option 3	Broad leaves
	Option 4	Tapering leaves

Q45	Question/ Options	A pipe having an outside diameter do and an inside diameter dI is used to transport a hot fluid. Heat transfer occurs radially outwards. The area for heat transfer per unit length of the pipe in given by
	Option 1	π (dI +do)/2
	Option 2	$2\pi\sqrt{}$(do dI)
	Option 3	π (do - dI) / ln(do/ dI)
	Option 4	do/dI

Q46	Question/ Options	What is the generation time of a bacterial population that increases from 100 cells to 100,000 cells in 3 hours of growth?
	Option 1	22 min
	Option 2	18 min
	Option 3	60 min
	Option 4	40 min

Q47	Question/ Options	Based on the flow behavior of fluids depicted in the following figure, choose the correct option. 
	Option 1	1- Bingham , 2- Newtonian , 4- Dilatant
	Option 2	1- Bingham, 2- Pseudoplastic, 4- Dilatant
	Option 3	1- Newtonian , 2- Pseudoplastic, 4- Newtonian
	Option 4	1- Newtonian, 2- Bingham, 4- Pseudoplastic

Q48	Question/ Options	Cells are grown in a CSTR at Steady state at two dilution rates $0.1h^{-1}$ and $0.5h^{-1}$ and the steady state concentrations are as follows: Dilution rate (h^{-1}) | Cell mass conc. X (g/l) | Substrate conc. S (g/l) | Product conc. P (g/l) 0.1 | 5 | 0.22 | 1 0.5 | 5 | 2.0 | 0.2 If the inlet substrate concentration is 20 g/l, the cells follow Monod growth kinetics and product formation kinetics is modeled as both growth associated and non-growth associated kinetics given by the equation; $q_p = \alpha\mu + \beta$ then answer the following questions: The best estimate of maximum specific growth rate is:
	Option 1	0.6
	Option 2	1
	Option 3	1.4
	Option 4	2

Q49	Question/ Options	Which transparent bioplastic is produced by fermentation?
	Option 1	Polyhydroxybutyrate
	Option 2	Starch
	Option 3	Polylactate
	Option 4	Polyvinyl chloride

Q50	Question/ Options	In any centrifugal separator, the separation efficiency is a function of
	Option 1	Radius of the rotor
	Option 2	Rotational speed of rotor
	Option 3	Both the radius and speed of the rotor
	Option 4	Both the load and radius of the rotor

Q51	Question/ Options	A green process of solvent extraction of biomolecules is
	Option 1	Solvent–solvent extraction
	Option 2	Reactive extraction
	Option 3	Supercritical fluid extraction
	Option 4	Solid-liquid extraction

Q52	Question/ Options	For a given fluid, as the pipe diameter increases, the pumping cost
	Option 1	Decreases
	Option 2	Increases
	Option 3	Remains the same
	Option 4	May increase or decrease, depending upon whether the fluid is Newtonian or non-Newtonian

Q53	Question/ Options	The critical regulatory site in the circuit of emotions is:
	Option 1	Hippocampus
	Option 2	Cingulate gyrus
	Option 3	Amygdala
	Option 4	Fornix

Q54	Question/ Options	Which one of the following is the most populous in the CNS?
	Option 1	Pyramidal neurons
	Option 2	Motor neurons
	Option 3	Granule cells
	Option 4	Purkinje neurons

Q55	Question/ Options	Huntington's disease (HD) is caused by degeneration of neurons in the _____, leading clinically to involuntary movements (chorea), psychiatric symptoms and dementia.
	Option 1	basal ganglia followed by cortical regions
	Option 2	cortical regions followed by basal ganglia
	Option 3	cortical regions alone
	Option 4	basal ganglia alone

Q56	Question/ Options	The function of the pyloric sphincter is to prevent the backflow of material from the
	Option 1	Esophagus to the mouth
	Option 2	Duodenum to the stomach
	Option 3	Stomach to the esophagus
	Option 4	Colon to the small intestine

Q57	Question/ Options	Which of the following types of stem cells have a highest risk of teratoma formation?
	Option 1	Hematopoietic stem cells
	Option 2	Embryonic stem cells
	Option 3	Spermatogonial stem cells
	Option 4	Mesenchymal stem cells

Q58	Question/ Options	Which one of the following cell types is the most characteristic component of the early stages of acute inflammatory reaction?
	Option 1	Eosinophils
	Option 2	Neutrophils
	Option 3	Basophils
	Option 4	Monocytes

Q59	Question/ Options	Severe combined immunodeficiency mice and nude mice differ in which of the following cellular components?
	Option 1	B lymphocytes
	Option 2	T lymphocytes
	Option 3	Macrophages
	Option 4	Natural killer cells

Q60	Question/ Options	Smallest lipid containing enveloped animal virus belongs to
	Option 1	Coronaviridae
	Option 2	Togaviridae
	Option 3	Flaviviridae
	Option 4	Bunyaviridae

Q61	Question/ Options	Which one of the following characteristic cells is found in granulomatous inflammation?
	Option 1	Myofibroblast
	Option 2	Plasma cell
	Option 3	Histocyte
	Option 4	Epithelioid cell

Q62	Question/ Options	Role of diatoms in the oceans is
	Option 1	Primary production
	Option 2	Secondary production
	Option 3	Tertiary production
	Option 4	Nitrification

Q63	Question/ Options	One of the free living aerobic nitrogen fixing bacterium in the Oceans is
	Option 1	Rhizobium
	Option 2	Azotobacter
	Option 3	Clostridium
	Option 4	Bacillus

Q64	Question/ Options	The prominent group of microorganism involved in marine bio-corrosion is
	Option 1	Sulphate reducing bacteria
	Option 2	Sulphur oxidizing bacteria
	Option 3	Iron oxidizing bacteria
	Option 4	Sulphide oxidizing bacteria

Q65	Question/ Options	"Green house effect" with respect to global warming refers to
	Option 1	Cooling and moist condition
	Option 2	Warming effect
	Option 3	Increased rainfall and greenery
	Option 4	Desertification

Q66	Question/ Options	A high BOD value in aquatic environment is indicative of
	Option 1	A pollution free system
	Option 2	A highly polluted system due to excess of nutrients
	Option 3	A highly polluted system due to abundant heterotrophs
	Option 4	A highly pure water with abundance of autotrophs

Q67	Question/ Options	Primary productivity at the climax stage of a succession is
	Option 1	Higher than consumption
	Option 2	Lower than the consumption
	Option 3	Equal to consumption
	Option 4	Not related to consumption

Q68	Question/ Options	You have isolated an Indian strain of a phage Φx174. You measure the nucleotide base content of the phage and find the following result: A-40%, G- 10%. What are the likely percentage contents of T and C?
	Option 1	It cannot be predicted from the given data
	Option 2	T-40% and C-10%
	Option 3	C-40% and T-10%
	Option 4	Both 25% each

Q69	Question/ Options	Cluster analysis in DNA microarray experiments refers to
	Option 1	Genes that are clustered together in the genome
	Option 2	Cluster of probes that are used to monitor gene expression
	Option 3	Genes that are likely to work in concert in the cell
	Option 4	Clusters of cDNAs printed on microarray chip

Q70	Question/ Options	A sample of a homo-multimeric protein containing one atom of iron per polypeptide which amounts to 0.56% by weight. Gel filtration indicates that the molecular weight of the multimer is 20 kDa. The maximum number of subunits that the protein may have is (Assume that the atomic weight of Fe is 56)
	Option 1	2
	Option 2	3
	Option 3	4
	Option 4	5

Q71	Question/ Options	A tri-peptide has an amino acid composition (Lys, Phe, Pro). Dansyl chloride treatment produces Dns-Phe. The peptide is not cleaved by trypsin. The primary structure of the peptide is:
	Option 1	Phe-Pro-Lys
	Option 2	Lys-Pro-Phe
	Option 3	Pro-Lys-Phe
	Option 4	Pro-Phe-Lys

Q72	Question/ Options	You have been given two unlabelled samples of PTH-Lysine which has been derivatized either in the α-NH_2 or in the ε-NH_2group. Which one of the following techniques may be used to distinguish between these two?
	Option 1	pH titrations
	Option 2	UV absorption spectroscopy
	Option 3	Fluorescence spectroscopy
	Option 4	Osmotic pressure measurements

Q73	Question/ Options	Polytene chromosome is generated due to
	Option 1	Extensive transcription
	Option 2	Pairing of homologous chromosome
	Option 3	Repeated DNA replication in DNA without segregation
	Option 4	Failure of DNA replication

Q74	Question/ Options	If a man of blood group AB marries a woman of blood group A whose father was of blood group O, to what different blood groups can this man and woman expect their children to belong?
	Option 1	A, AB, B
	Option 2	A, AB
	Option 3	AB, O
	Option 4	A, O, B

Q75	Question/ Options	A human male (XY) carrying an allele for a trait on the X chromosome is
	Option 1	hemizygous
	Option 2	homozygous
	Option 3	heterozygous
	Option 4	monozygous

SECTION - B

Q76	Question/ Options	Positive feedback is operating
	Option 1	When adenosine monophosphate activates phosphofructokinase
	Option 2	When cAMP activates transcription of the *lac* operon
	Option 3	When tryptophan inhibits transcription of the *trp* operon
	Option 4	When N-acyl-HSL promotes transcription of the *lux* operon

Q77	Question/ Options	Consider a typical hepatocyte, the major cell type in the liver. It is roughly a cube of 15 μm on a side. Assume the density of cell is 1.03gm/ml and 20% of total weight of which is occupied by protein which is having 400 amino acids (mol wt=50,000g/mol). The total no. of molecules of that protein present in the hepatocyte will be
	Option 1	$8.3x10^9$
	Option 2	$7.3\ x10^9$
	Option 3	$6.3x10^9$
	Option 4	$5.3x10^9$

Q78	Question/ Options	Process of formation of ATP from ADP while harvesting the photon is referred as
	Option 1	Photophosphorylation
	Option 2	Photorespiration
	Option 3	Phosphorylation
	Option 4	Respiration

Q79	Question/ Options	Match the Enzyme from Group A with the respective Class in Group B Group A / Group B 1. Cytochrome P-450 — a. Hydrolase 2. Alkaline phosphatase — b. Oxido-reductase 3. Phosphoglucomutase — c. Transferase 4. Hexokinase — d. Isomerases
	Option 1	1a, 2c, 3d, 4b
	Option 2	1c, 2a, 3d, 4b
	Option 3	1b, 2a, 3d, 4c
	Option 4	1b, 2c, 3a, 4d

Q80	Question/ Options	Match the Cofactor in Group A with appropriate 'group carried in activated form' in Group B Group A / Group B 1. FMNH2 — a. Acyl 2. Lipoamide — b. Methyl 3. Thiamine pyrophosphate — c. Aldehyde 4. S-Adenosylmethionine — d. Electron
	Option 1	1d, 2a, 3c, 4b
	Option 2	1c, 2a, 3d, 4b
	Option 3	1d, 2b, 3a, 4c
	Option 4	1b, 2c, 3d, 4a

Q81	Question/ Options	There are four conserved homologous motifs within the Bcl-2 family: BH1, BH2, BH3, and BH4; which among these is critical for Bcl-2 family heterodimerization?
	Option 1	BH-1
	Option 2	BH-2
	Option 3	BH-3
	Option 4	BH-4

Q82	Question/ Options	What will be the charge of the protein having pH less than its pI value,?
	Option 1	Positive
	Option 2	Negative
	Option 3	One
	Option 4	Zero

Q83	Question/ Options	Ammonium sulfate is the most suitable salt for protein precipitation, because
	Option 1	It is kosmotropic and falls on the left side of Hofmeister series
	Option 2	It is chaotropic and falls on the right side of Hofmeister series
	Option 3	It is kosmotropic and falls on right side of Hofmeister series
	Option 4	It is chaotropic and falls on left side of Hofmeister series

Q84	Question/ Options	There are two protein molecules S and M. They have the same molecular weight, same charge and are structurally very similar but vary in certain domains. How will you separate S and M?
	Option 1	Affinity Chromatography
	Option 2	Ion-exchange Chromatography
	Option 3	Thin Layer Chromatography
	Option 4	Poly-acrylamide Gel Electrophoresis

Q85	Question/ Options	What provides the information necessary to specify the three-dimensional shape of a protein?
	Option 1	The protein's peptide bonds
	Option 2	The protein's interactions with other polypeptides
	Option 3	The protein's amino acid sequence
	Option 4	The protein's interaction with molecular chaperones

Q86	Question/ Options	Those portions of a transmembrane protein that cross the lipid bilayer usually consist of which secondary structures?
	Option 1	A beta sheet with mostly polar side chains
	Option 2	A beta sheet with mostly nonpolar side chains
	Option 3	A helix with mostly polar side chains
	Option 4	A helix with mostly nonpolar side chains

Q87	Question/ Options	Which one among the following suits to protein families?
	Option 1	Proteins found in organisms of the same taxonomic family.
	Option 2	Groups of proteins with the same functions.
	Option 3	Evolutionarily related proteins that are similar in amino acid sequence and three-dimensional conformation.
	Option 4	The amino acid sequence is highly homologous but must perform different functions.

Q88	Question/ Options	Which of the following determines the specificity of an antibody towards an antigen?
	Option 1	The amino acid loops in its variable domain
	Option 2	The amino acid loops in its constant domain
	Option 3	Its Y-shaped structure
	Option 4	The concentration of antibodies and antigens

Q89	Question/ Options	An allosteric inhibitor affects the active site of an enzyme by which of the following?
	Option 1	It binds to the active site, preventing substrate molecules from binding there.
	Option 2	It binds to a second site, resulting in a conformational change which makes the active site of the enzyme less accommodating to the substrate.
	Option 3	It modifies the substrate in such a way that it cannot bind to the enzyme.
	Option 4	It carries a chemical modification to the enzyme, which prevents the progress of further reaction.

Q90	Question/ Options	Phosphorylation controls the protein activity by which one of the following reasons?
	Option 1	It adds energy to a protein.
	Option 2	It can induce conformational changes in target protein.
	Option 3	Two negative charges of phosphate group prevents other negatively charged molecules from interacting with the protein.
	Option 4	Phosphate group degrades the target proteins.

Q91	Question/ Options	Which of the following classes of enzymes add a phosphate group to another protein?
	Option 1	Oxido-reductase
	Option 2	Isomerase
	Option 3	Transferase
	Option 4	Ligase

Q92	Question/ Options	The reaction between dihydroxyacetone phosphate and glyceraldehyde 3-phosphate to form fructose 1,6-bisphosphate is best described as
	Option 1	An aldol condensation reaction
	Option 2	Grignard reaction
	Option 3	Free radical reaction
	Option 4	Hydrolytic reaction

Q93	Question/ Options	In the following options which has the most reduced form of carbon atom
	Option 1	R-CH3
	Option 2	R-COOH
	Option 3	R-CHO
	Option 4	R-CH2OH

Q94	Question/ Options	The similarities between mitogenic stimulation by EGF and depolarization of the membrane of skeletal muscle cell by acetylcholine are
	Option 1	Essential early step, an ion flux across the plasma membrane receptor
	Option 2	Ligand mediated coformational change in the receptor of responding cell
	Option 3	Occurs independently without ligand or simulation.
	Option 4	Mainly dependent on regulatory RNA binding sequences.

Q95	Question/ Options	The KDEL sequence of the ER luminal proteins is responsible for
	Option 1	Translocation of the proteins into the ER lumen
	Option 2	Insertion of proteins into the membrane of the ER
	Option 3	Quality control in the ER
	Option 4	Retrieval of ER luminal proteins from the golgi

Q96	Question/ Options	The direction of a chemical reaction is best predicted by
	Option 1	Entrophy change
	Option 2	Enthalphy Change
	Option 3	Energy of activation change
	Option 4	Free energy change

Q97	Question/ Options	1g of rice flour from 1kg pack is mixed in 100 ml of sterile water. Aliquot from this solution was dispensed in test tube in order to make dilution of 5X to make final volume of 10 ml.1 ml of this solution was then poured on sterile nutrient agar plate. 5 colonies were observed after 24 hours of incubation. What is the viable count of bacterial cell in the rice flour sample?
	Option 1	2,500 cells per kg
	Option 2	25, 00, 000 cells per kg
	Option 3	250 cells per kg
	Option 4	25,000 cells per kg

Q98	Question/ Options	Which of the following is false about the *E. Coli* Lac operon?
	Option 1	It is polycistronic
	Option 2	It is an example of negative control
	Option 3	The presence of lactose acts as an inducer
	Option 4	The repressor binds to the promoter

Q99	Question/ Options	A substance exists in protonated form with a pKa 4.7. The percentage of the protonated form at pH 5.7 will be close to
	Option 1	10
	Option 2	9
	Option 3	99
	Option 4	50

Q100	Question/ Options	Most of the dry mass in a tree trunk is originally derived from
	Option 1	The soil
	Option 2	CO_2
	Option 3	Light energy
	Option 4	Glucose

Q101	Question/ Options	You have examined 10000 cells in a culture and found that only 2 cells were in mitosis. Therefore the mitotic index is
	Option 1	20000
	Option 2	0.0002
	Option 3	0.0001
	Option 4	10000

Q102	Question/ Options	In vitro coupled transcription and translation systems have been developed that use reticulocyte or wheat germ lysates to specifically translate a defined cDNA. Using this technique, you have translated a gene of your interest. However, when you run SDS-PAGE to check for the translated product, you see many bands from the top to the bottom of the gel. This could be due to the following reasons
	Option 1	The translated protein got degraded
	Option 2	Since it is an in vitro system, it could read the cDNA in all the frames
	Option 3	There are a number of endogenous proteins present in the wheat germ and reticulocyte lysates
	Option 4	Reticulocyte lysates and wheat germ lysates have lysosomes that have taken up many proteins by endocytosis that show up on the gel

Q103	Question/ Options	Cell cycle controller is robust and adaptable. Additionally, it functions like a switch to ensure unidirectional cell cycle. This switch like behavior can be achieved by which one of the following mechanisms
	Option 1	Gradual increase in cyclin-dependent kinase activities in different phases of the cell cycle
	Option 2	Gradual increase in cyclin-dependent kinase synthesis in different phases of the cell cycle
	Option 3	Negative feedback loops to regulate the activity of cyclin-dependent kinases
	Option 4	Positive feedback loops to regulate the activity of cyclin-dependent kinases

Q104	Question/ Options	Colchicine treatment blocks the polymerization of microtubules whereas Taxol blocks the depolymerization of microtubules. Treatment with either colchicine or taxol ultimately results in cell death. It is possible to achieve the same result even though the actions of both agents are opposite because they
	Option 1	block signaling from microtubules
	Option 2	block transcription of microtubules
	Option 3	block translation of microtubules
	Option 4	block mitosis

Q105	Question/ Options	In mammals, average lengths of transcription factor binding sequences are quite short i.e., ~7 base pairs. Hence, the frequency of occurrence of such sites in the entire genome is very high vis-a-vis the total number of genes present therein. However, the specificity of transcription is still achieved
	Option 1	as specificity of those target sequences are further defined by their adjoining sequences.
	Option 2	because of pair wise occurrence of those target sites in the promoters.
	Option 3	as mammalian transcription factors are highly evolved with built in capability of recognizing only the promoter associated target sites.
	Option 4	as the recognition of target sequences in mammals is guided by auxiliary factors that ensures their target specificity.

Q106	Question/ Options	Cell division cycle is divided into 4 phases G1, S, G2 and M. Standard eukaryotic cell cycles are of 12 hr or longer duration. Early embryonic cell cycles are extremely rapid having time duration of less than an hour. Which of the following phases are drastically reduced in embryonic cell cycles?
	Option 1	G1 & G2
	Option 2	G1 & S
	Option 3	M & S
	Option 4	G2 & M

Q107	Question/ Options	Recognition of intracellular pathogens in innate immune cells involves
	Option 1	Toll-like receptors
	Option 2	Antibody
	Option 3	NOD-like receptors (NLRs)
	Option 4	Natural killer T cells

Q108	Question/ Options	In complementation tests, Benzer simultaneously infected *E.coli* cells with two phages, each of which carried a different mutation. What conclusion did he make when the progeny phage produced normal plaques?
	Option 1	The mutations occurred at the same locus
	Option 2	The mutations occurred at different loci
	Option 3	The mutations occurred close together on the chromosome
	Option 4	The genes were in the cis configuration

Q109	Question/ Options	Discontinuous replication is a result of which property of DNA?
	Option 1	Complementary bases
	Option 2	Charged phosphate group
	Option 3	Antiparallel nucleotide strands
	Option 4	Five- carbon sugar

Q110	Question/ Options	Primers are synthesized where on the lagging strand?
	Option 1	at the 5' end of the newly synthesized strand
	Option 2	at the 3' end of the newly synthesized strand
	Option 3	at the beginning of every Okazaki fragment
	Option 4	at multiple places within an Okazaki fragment

Q111	Question/ Options	Which one of the following is the difference between the core promoter and the regulatory promoter?
	Option 1	Only the core promoter has consensus sequences
	Option 2	The regulatory promoter is farther upstream of the gene
	Option 3	Transcription factors bind to the core promoter; transcriptional activator proteins bind to the regulatory promoter
	Option 4	Both 2 and 3

Q112	Question/ Options	In the *trp* operon, what happens to the *trp* repressor in the absence of tryptophan?
	Option 1	It binds to the operator and represses transcription
	Option 2	It cannot bind to the operator and transcription takes place
	Option 3	It binds to the regulator gene and represses transcription
	Option 4	It cannot bind to the regulator gene and transcription takes place

Q113	Question/ Options	Which one of the following is the correct order of mutagenesis screen?
	Option 1	Positional cloning, mutagenesis, identify mutants, verify genetic basis
	Option 2	Mutagenesis, positional cloning, identify mutants, verify genetic basis
	Option 3	Mutagenesis, identify mutants, verify genetic basis, positional cloning
	Option 4	Identify mutants, positional cloning, mutagenesis, verify genetic basis

Q114	Question/ Options	In area of high GC content of the human genome
	Option 1	Gene density tends to be low
	Option 2	Gene density tends to be high
	Option 3	Gene density is variable
	Option 4	Genes tends to have fewer introns

Q115	Question/ Options	The bases A,G,U,C,I (inosine) all occur at 5' position of anticodons in tRNAs. What is the minimum number of tRNAs required to recognize all codons of amino acids specified by codons with complete degeneracy?
	Option 1	one
	Option 2	two
	Option 3	three
	Option 4	four

Q116	Question/ Options	Which of the following cell surface markers is used to identify the B cells from blood samples?
	Option 1	CD3
	Option 2	CD4
	Option 3	CD25
	Option 4	CD19

Q117	Question/ Options	Administration of the DPT vaccine (diphtheria toxoid, pertussis products, and tetanus toxoid) would stimulate which of the following types of immunity?
	Option 1	Artificial active
	Option 2	Artificial passive
	Option 3	Natural active
	Option 4	Natural passive

Q118	Question/ Options	Loss of which of the following classes of molecules on the surface of a tumor cell target would result in reduced susceptibility to killing by host immune cells?
	Option 1	CD3
	Option 2	CD4
	Option 3	MHC class I
	Option 4	MHC class II

Q119	Question/ Options	Genes for 16S and 28S rRNA are transcribed by
	Option 1	DNA polymerase
	Option 2	RNA polymerase II
	Option 3	RNA polymerase I
	Option 4	RNA polymerase III

Q120	Question/ Options	In cancer condition, genes can be either repressed or over-expressed. Repression of genes by DNA methylation depends on
	Option 1	High CpG density
	Option 2	Promoter strength
	Option 3	High CpG density and Promoter strength
	Option 4	Low CpG density

Q121	Question/ Options	Which type of inhibition requires binding of one or more substrates to enzyme before the inhibitor can bind:
	Option 1	Uncompetitive inhibition
	Option 2	Noncompetitive inhibition
	Option 3	Mixed inhibition
	Option 4	competitive inhibition

Q122	Question/ Options	The genes, which remain confined to differential region of Y-chromosome, are
	Option 1	Autosomal genes
	Option 2	Holandric genes
	Option 3	Completely sex-linked genes
	Option 4	Mutant genes.

Q123	Question/ Options	Blastopore is
	Option 1	Opening of neural tube
	Option 2	Opening of gastrocoel
	Option 3	Future anterior end of embryo
	Option 4	Found in blastula

Q124	Question/ Options	Arp, profilin, and villin are all
	Option 1	Cell adhesion molecules.
	Option 2	Molecular motors.
	Option 3	Actin-binding proteins.
	Option 4	Intermediate filament proteins.

Q125	Question/ Options	Cdk1 can only be fully active when
	Option 1	It is phosphorylated on threonine 14.
	Option 2	It is phosphorylated on tyrosine 15.
	Option 3	It is bound to cyclin A.
	Option 4	It is dephosphorylated by Cdc25.

Q126	Question/ Options	Which one of following statements about Bt cotton cultivation in India is NOT TRUE?
	Option 1	Farmers cultivating Bt cotton are benefitted from higher return
	Option 2	Pesticide consumption on cotton is significantly reduced
	Option 3	India became an exporter of cotton
	Option 4	The cotton cultivation in India is free from bollworm menace

Q127	Question/ Options	The latest version of Golden rice contains the following transgenes
	Option 1	Three genes, one from Erwinia and two from daffodil
	Option 2	Two genes, one each from Erwinia and daffodil
	Option 3	Two genes, one each from maize and Erwinia
	Option 4	Three genes one each from maize, rice and Erwinia

Q128	Question/ Options	Which one of the following studies is NOT needed for the biosafety assessment of GM crops?
	Option 1	human and animal safety studies
	Option 2	gene flow analysis
	Option 3	soil microflora, natural enemies of the pest
	Option 4	micronutrient uptake by plants

Q129	Question/ Options	Which one of the following steps is NOT true for production of artificial seeds by desiccated system?
	Option 1	Somatic embryos are first hardened to withstand desiccation
	Option 2	Hardened somatic embryos are encapsulated in a suitable coating material
	Option 3	Somatic embryos may be hardened by either coating/treating mature somatic embryos with a suitable polymer, followed by drying during their maturation phase
	Option 4	Somatic embryos can be planted directly in the field

Q130	Question/ Options	Absorption of which one of the following nutrients in human intestine is interfered by phytate present in seeds?
	Option 1	Nitrate
	Option 2	Sulphur
	Option 3	Iron
	Option 4	Phosphate

Q131	Question/ Options	The following are the key resources needed for efficient marker-assisted germplasm enhancement: i) Suitable characterised genetic markers and the necessary information for multiplexing ii) High-density molecular maps and densely spread markers iii) Established marker–trait associations for traits of agronomic importance iv) High-throughput genotyping systems. Now rank the key resources in the right order of requirement
	Option 1	iii, i, ii, iv
	Option 2	i, ii, iii, iv
	Option 3	iv, iii, ii, i
	Option 4	iv, i, ii, iii

Q132	Question/ Options	Which one of the following methods is highly amenable for automation in most of the genotyping studies?
	Option 1	RFLP
	Option 2	AFLP
	Option 3	ISSR
	Option 4	SNPs

Q133	Question/ Options	A patch clamp device is used to
	Option 1	measure the strength of an electrochemical gradient
	Option 2	study the properties of individual neurotransmitters
	Option 3	infuse different kinds of ions into exons
	Option 4	study the properties of individual membrane channels

Q134	Question/ Options	Which one of the following is a component in the signaling pathway stimulated by receptor tyrosine kinases?
	Option 1	Adenylate cyclase
	Option 2	Janus kinase
	Option 3	Autophosphorylating receptor
	Option 4	Ras activating protein

Q135	Question/ Options	A mutation that inactivates the cytochrome b/f complex would
	Option 1	inhibit movement of electrons from PSII to PSI
	Option 2	inhibit movement of electrons from PSI to PSII
	Option 3	inhibit reduction of quinone
	Option 4	promote formation of NADPH

Q136	Question/ Options	How many ATP molecules are required for the conversion of one N_2 to $2NH_4^+$ during biological nitrogen fixation?
	Option 1	8
	Option 2	10
	Option 3	12
	Option 4	16

Q137	Question/ Options	Which of the following bacterial gene can be used for increasing starch content in potato?
	Option 1	Sucrose phosphate synthase
	Option 2	ADP Glucose pyrophosphorylase
	Option 3	Polygalactouranase
	Option 4	Aspartate kinase

Q138	Question/ Options	Which one of the following options describe the term "Transplastomics" correctly?
	Option 1	Targeting genes into the chloroplast.
	Option 2	Providing exceptionally low yield of protein products.
	Option 3	Targeting genes expressed in pollens.
	Option 4	Generating transgenic plants resistant to viral infections.

Q139	Question/ Options	The electrons from excited chlorophyll molecule of photosystem II are accepted first by
	Option 1	Ferredoxin
	Option 2	Cytochrome-b
	Option 3	Cytochrome- f
	Option 4	Quinone

Q140	Question/ Options	Which one of the following agents stimulates direct DNA uptake by protoplasts?
	Option 1	Polyethylene glycol
	Option 2	Lipofectamine
	Option 3	Calcium chloride
	Option 4	Mannitol

Q141	Question/ Options	Transgenic plants expressing barnase or barstar genes are used for
	Option 1	Insect resistance
	Option 2	Hybrid seed production
	Option 3	Stress tolerance
	Option 4	Inhibit pollen flow

Q142	Question/ Options	The presence of polyadenylation signals in the wild type *CRY1Ac* gene from *Bacillus thuringiensis* prevented expression of appropriate amount of CRY1Ac protein in transgenic plants. What was done to overcome this problem?
	Option 1	The *CRY1Ac* gene was expressed under a strong promoter like CaMV 35S
	Option 2	The CRY1Ac protein was targeted to the chloroplast
	Option 3	The *CRY1Ac* gene sequence was modified taking help of codon degeneracy
	Option 4	The *CRY1Ac* gene was fused to *CRY1Ac* gene

Q143	Question/ Options	The following are some of the genes and DNA sequences important for Agrobacterium-mediated transformation of plants: i. gene conferring resistance to an antibiotic under a promoter expressed in plants ii. T-DNA border sequences iii. vir genes iv. a reporter gene like β-glucuronidase under CaMV 35S promoter. Which of the above features in combination given below are present on a binary vector and minimally required for transfer of T-DNA from Agrobacterium to plant cell and positive selection of the transformants?
	Option 1	(i) and (ii)
	Option 2	(i), (ii) and (iii)
	Option 3	(ii) and (iv)
	Option 4	(ii), (iii) and (iv)

Q144	Question/ Options	Which one of the following hormone ratios usually promote shoot formation from callus?
	Option 1	High abscisic acid to auxin
	Option 2	Low auxin to cytokinin
	Option 3	High auxin to cytokinin
	Option 4	Low abscisic acid to auxin

Q145	Question/ Options	Which one of the following dyes can be used to test the viability of cultured plant cells?
	Option 1	Fluorescein diacetate
	Option 2	Acetocarmine
	Option 3	Aceto-orcein
	Option 4	Giemsa stain

Q146	Question/ Options	The two Vir proteins with nuclear localization signals which help in movement of T-DNA to plant nucleus are
	Option 1	VirA and VirG
	Option 2	VirD1 and VirE1
	Option 3	VirD2 and VirE2
	Option 4	VirD1 and VirD2

Q147	Question/ Options	Which one of the following statements is NOT TRUE for *Agrobacterium* mediated plant transformation?
	Option 1	*vir* genes are essential for gene transfer
	Option 2	T-DNA border are essential for gene transfer
	Option 3	Genes for hormone and opine synthesis are essential for gene transfer
	Option 4	Plant exudates from wounded region acts as positive chemotaxis during gene transfer

Q148	Question/ Options	The breeding method for conventionally transferring cytoplasm from one genotype to the other is
	Option 1	Pedigree
	Option 2	Recurrent selection
	Option 3	Back cross
	Option 4	Bulk selection

Q149	Question/ Options	Detaselling is a method of emasculation followed in _____
	Option 1	Cotton
	Option 2	Sorghum
	Option 3	Bajra
	Option 4	Maize

Q150	Question/ Options	A mechanism where stamens and pistils of hermaphrodite flowers may mature at different times leading to cross pollination is _____
	Option 1	Dicliny
	Option 2	Dichogamy
	Option 3	Protogamy
	Option 4	Heterogamy

Q151	Question/ Options	Which one of the following amino acids is an example of a compatible osmolyte in response to a range of environmental stresses?
	Option 1	Lysine
	Option 2	Glycine
	Option 3	Proline
	Option 4	Leucine

Q152	Question/ Options	The principal signal molecule involved in induced systemic resistance in plants is
	Option 1	Malic acid
	Option 2	Salicylic acid
	Option 3	Jasmonic acid
	Option 4	Benzoic acid

Q153	Question/ Options	International treaty in the field of the protection of the new variety of plants and rights of the breeders is
	Option 1	PPV & FR act
	Option 2	UPOV
	Option 3	Cartagena protocol
	Option 4	Suigeneris system

Q154	Question/ Options	The revised Genebank Standards for Plant Genetic Resources for Food and Agriculture were endorsed at the 14th Regular Session of the CGRFA, at
	Option 1	Rome, in 2013
	Option 2	Geneva , in 2010
	Option 3	Indonesia, 2004
	Option 4	Brazil, 2002

Q155	Question/ Options	Gluconoacetobacter diazotrophicus is predominantly found in
	Option 1	Rhizosphere
	Option 2	Phyllosphere
	Option 3	Endorhizosphere
	Option 4	Spermosphere

Q156	Question/ Options	A system in which there is exchange of energy but not of mass, is called a/an _____ system.
	Option 1	Open
	Option 2	Isolated
	Option 3	Insulated
	Option 4	Closed

Q157	Question/ Options	The second law of thermodynamics is concerned with
	Option 1	non-cyclic processes only.
	Option 2	amount of energy transferred.
	Option 3	irreversible processes only.
	Option 4	direction of energy transfer.

Q158	Question/ Options	The oxygen transfer rate in an aerobic fermentation process does not depend on the
	Option 1	Driving force [difference of DO concentration (C* - CL)] in the system
	Option 2	Interfacial transfer area of bubbles
	Option 3	Temperature of the fermentation broth
	Option 4	Volume of the fermentation broth

Q159	Question/ Options	A culture is grown in a flask and after 120 h there were 1.0 $x10^6$cells/ml. After 270 h there were 1.0 $x10^9$ cells/ml, the specific growth rate of the organisms is
	Option 1	2.0 h^{-1}
	Option 2	0.69 h^{-1}
	Option 3	0.14 h^{-1}
	Option 4	3.0 h^{-1}

Q160	Question/ Options	In a CSTR at steady state of volume 1L, the feed rate of a compound A is 1L/h. The exit concentration of A is 50% of the inlet concentration and the rate of conversion of A to products is a first order reaction given by dCA/dt= k CA . The value of k is
	Option 1	0.5 h^{-1}
	Option 2	1.0 h^{-1}
	Option 3	1.5 h^{-1}
	Option 4	2.0 h^{-1}

Q161	Question/ Options	Which of the following processes provides the best effluent quality for water reuse?
	Option 1	Conventional activated sludge process with media filters.
	Option 2	Trickling filters.
	Option 3	Membrane bioreactor.
	Option 4	Aerated lagoons.

Q162	Question/ Options	In any centrifugal separator the separation efficiency is a……..
	Option 1	Linear function of agitation
	Option 2	Square function of radius
	Option 3	Linear function of radius and square function of the rotor speed.
	Option 4	Square function of radius and linear function of the rotor speed

Q163	Question/ Options	In aqueous two phase separation systems, a phase diagram is prepared at constant :
	Option 1	pressure and volumes
	Option 2	pH and temperature
	Option 3	viscosity and mass
	Option 4	volumes and density

Q164	Question/ Options	For preparative chromatography, a simple scale up principle which can be used without significantly affecting resolution by
	Option 1	increasing length of the column
	Option 2	decreasing length of the column
	Option 3	increasing diameter of the column
	Option 4	decreasing diameter of the column

Q165	Question/ Options	Penicillin is extracted using isoamylacetate in a counter current extractor. Before the extraction, pH of the aqueous solution is adjusted to pH 2.5. This is done as penicillin
	Option 1	is more soluble at pH 2.5 in its ionic from
	Option 2	is more soluble at pH 2.5 in its non-ionic form
	Option 3	is more stable at pH 2.5
	Option 4	isoamylacetate is stable at pH 2.5

Q166	Question/ Options	In an adsorption column for the separation of antibiotics, a sharp break through curve indicates
	Option 1	more unused bed capacity
	Option 2	less unused bed capacity
	Option 3	unused bed capacity does not change at all with sharpness of the peak
	Option 4	a high affinity of the antibiotic to the column matrix

Q167	Question/ Options	Which of the following is not a desired property of the membranes used for separation
	Option 1	Selectivity
	Option 2	Mechanical Strength
	Option 3	High porosity
	Option 4	Resistance to fouling

Q168	Question/ Options	Identify which of the following is NOT considered as a criterion for scale up of fermentation processes
	Option 1	power input/unit volume
	Option 2	K_La
	Option 3	Impeller tip velocity
	Option 4	Aeration rate

Q169	Question/ Options	If agitator energy input per unit volume of the fermentor is kept constant during scale up, the factor that would always decrease upon increasing size of the fermenter is
	Option 1	rpm
	Option 2	aeration rate
	Option 3	tip velocity
	Option 4	K_La

Q170	Question/ Options	For a given thickness of the head closing the end of cylindrical vessel, which of the following can withstand the highest pressure ?
	Option 1	Hemispherical
	Option 2	Torispherical
	Option 3	Ellipsoidal
	Option 4	Flat plate

Q171	Question/ Options	A mechanical seal is used for
	Option 1	pipelines handling large pressure drops.
	Option 2	prevention of fluid leakage around moving parts.
	Option 3	used in machinery to prevent leakage of current
	Option 4	used in joints of pipe lines to prevent leakage of fluids

Q172	Question/ Options	Which of the following elements is not included in the scope of market analysis ?
	Option 1	Competition from other manufactures.
	Option 2	Product distribution.
	Option 3	Opportunities
	Option 4	Economics

Q173	Question/ Options	"Break-even point" is the point of intersection of
	Option 1	fixed cost and total cost.
	Option 2	total cost and sales revenue.
	Option 3	fixed cost and sales revenue.
	Option 4	fixed cost and variable cost

Q174	Question/ Options	Fumaric acid is produced from Malic acid using Fumarase. Calculate standard heat of reaction for the following transformation: $C_4H_6O_5 \rightarrow C_4H_4O_4 + H_2O$ Given: $(\Delta hc°)$malic acid= -1328.8 kJ/gmol $(\Delta hc°)$Fumaric acid= -1334.0 kJ/gmol
	Option 1	-8.2kJ /gmol
	Option 2	8.2 kJ/gmol
	Option 3	5.2 kJ /gmol
	Option 4	-5.2 kJ/gmol

Q175	Question/ Options	Air at 104.2 kPa at 37°C with a relative humidity of 60% is cooled at the same pressure to 29°C. The cooled air has a higher_____
	Option 1	dew point.
	Option 2	absolute humidity.
	Option 3	relative humidity
	Option 4	wet bulb temperature.

Q176	Question/ Options	An enzyme having Km values of $2.5x10^{-5}$M and $2.5x10^{-7}$M for the substrates S1 and S2, respectively, is added to a solution consisting of 100 nano moles of both S1 and S2. Which of the following statement is correct?
	Option 1	Most of the active sites of the enzyme will be occupied by S1
	Option 2	Most of the active sites of the enzyme will be occupied by S2
	Option 3	The active sites of the enzyme will be occupied equally by S1 & S2
	Option 4	Occupation of active sites has no relation to the value of Km

Q177	Question/ Options	Which of the following only permits uni-directional fluid flow?
	Option 1	Gate valve
	Option 2	Butterfly valve
	Option 3	Globe valve
	Option 4	Ball valve

Q178	Question/ Options	The internal temperature in the refrigerator is 280 K and the external temperature is 300K. The theoretical maximum value of coefficient of performance is
	Option 1	0.933
	Option 2	1.071
	Option 3	14
	Option 4	25

Q179	Question/ Options	Concentrated feeding in a Fed batch system is used to get
	Option 1	Higher product concentration in the reactor
	Option 2	Higher product yield/unit substrate
	Option 3	Higher product yield/unit cell mass
	Option 4	Reduced by product formation

Q180	Question/ Options	A digestible linear polysaccharide abundantly found in cereals having α-1,4 linkages in its structure is
	Option 1	Pectin
	Option 2	Amylopectin
	Option 3	Amylose
	Option 4	Inulin

Q181	Question/ Options	A prominent prebiotic substance is:
	Option 1	Starch
	Option 2	Pectin
	Option 3	Fructo oligosaccharide
	Option 4	Cellulose

Q182	Question/ Options	Considering the importance of moisture content of food in promoting microbial growth, which one of the following statements is true
	Option 1	Gram negative bacteria are more sensitive to low a_w values than Gram positive bacteria
	Option 2	Gram positive bacteria are more sensitive to low a_w values than Gram negative bacteria
	Option 3	Both are equally sensitive to low a_w values
	Option 4	Both are unaffected by a_w values

Q183	Question/ Options	The rate of cell disintegration in high pressure homogenizer primarily depends on the
	Option 1	Number of cycles
	Option 2	Pressure drop across the homogenizer
	Option 3	Both on the number of cycles and pressure drop
	Option 4	Temperature

Q184	Question/ Options	Which one of the following statements is FALSE?
	Option 1	For incompressible cakes, resistance in the cake is assumed to be directly proportional to the amount of cake deposited
	Option 2	For constant pressure filtration with compressible cake, the specific cake resistance is constant
	Option 3	Compared to the cake resistance, the filter membrane resistance is usually negligible for broth filtration.
	Option 4	The mass of cake deposited per unit area is a function of time in batch operation and concentration of solids in the broth

Q185	Question/ Options	In a counter current single pass heat exchanger, cooling water enter at 0°C and leaves at 20°C. Hot water enters from the other side at 60°C at a flow rate which is half of the cooling water flow rate. Assuming there is no heat loss, what is the Log Mean Temperature Difference?
	Option 1	20.7
	Option 2	30.2
	Option 3	34.8
	Option 4	40.4

Q186	Question/ Options	The Pyramidal neurons in the cerebral cortex are found in
	Option 1	Layer V & VI
	Option 2	Layer II & IV
	Option 3	Layer III & V
	Option 4	Layer III & VI

Q187	Question/ Options	Which one of the following types of 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

Q188	Question/ Options	Cerebrospinal fluid is produced by
	Option 1	Astrocytes and ependymal cells
	Option 2	Chroid plexus and ependymal cells
	Option 3	Radial glial cells
	Option 4	Spinal cord

Q189	Question/ Options	Saccadic eye movement
	Option 1	Shifts fovea rapidly to a new visual target
	Option 2	Keeps the image of the moving target on the foves
	Option 3	Moves the eyes in opposite direction to position the image on both fovea
	Option 4	Holds image stationary during head rotation or transfer

Q190	Question/ Options	Which part of the brain integrates autonomic, endocrine and behavioral responses?
	Option 1	cerebellum
	Option 2	brain stem
	Option 3	hypothalamus
	Option 4	cerebrum

Q191	Question/ Options	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	Segment polarity genes
	Option 4	Pair rule genes

Q192	Question/ Options	All the neurons in the basal ganglionic nuclei are inhibitory except in
	Option 1	Globus pallidus external segment
	Option 2	Globus pallidus internal segment
	Option 3	Sub-thalamic nucleus
	Option 4	Lentiform nucleus

Q193	Question/ Options	Tay–Sachs disease is due to a defect in the enzyme _____ and _____ as its substrate:
	Option 1	GM2-ganglioside (and) Hexosaminidase A
	Option 2	GM2-ganglioside, asialo-GM2-ganglioside, globoside (and) Hexosaminidases A and B
	Option 3	Glucosylceramidase (and) Glucosylceramide
	Option 4	GM2-ganglioside (and) Hexosaminidase A and B

Q194	Question/ Options	Which one of the following causes stunted growth and severe fasting hypoglycemia with ketonuria?
	Option 1	Glycogen synthetase deficiency
	Option 2	Phosphoglycerate kinase deficiency
	Option 3	pyruvate-carboxylase deficiency
	Option 4	protein malnutrition

Q195	Question/ Options	Which one of the following techniques is of highest resolution for detection of chromosomal alterations?
	Option 1	PCR
	Option 2	CGH
	Option 3	G-banding
	Option 4	C-banding

Q196	Question/ Options	*E. coli* bacteria are beneficial to humans because they
	Option 1	Convert pepsinogen to pepsin
	Option 2	Produce vitamins and amino acids
	Option 3	Absorb water from the large intestine
	Option 4	Synthesize urea from the breakdown of amino acids

Q197	Question/ Options	Which of the following reporters can be used for magnetic resonance imaging?
	Option 1	Luciferase
	Option 2	Herpes Simplex Virus-1 thymidine kinase
	Option 3	Green fluorescence protein (GFP)
	Option 4	Transferrin receptor.

Q198	Question/ Options	Which one of the following statements forms the basis for the increased circulatory life time for a sialylated recombinant therapeutic protein?
	Option 1	Increased molecular size due to post translational modification reduces the movement of the glycoproteins
	Option 2	Sialic acid terminated glycans are not recognized by asialoglycoprotein receptors of hepatocytes
	Option 3	Sialylation increases the structural stability of the glycoprotein
	Option 4	Sialylation blocks the enzyme cleavage sites of the glycoprotein

Q199	Question/ Options	Which one 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

Q200	Question/ Options	Rostral is an anatomical term meaning towards the
	Option 1	Nose
	Option 2	Forehead
	Option 3	Chest
	Option 4	Foot

Q201	Question/ Options	Phlebitis is the inflammation of
	Option 1	Lung
	Option 2	Vein
	Option 3	Liver
	Option 4	Lip

Q202	Question/ Options	Mucosal immunity is preferentially stimulated if an immunogen is administered
	Option 1	Intravenously
	Option 2	Intramuscularly
	Option 3	Intradermally
	Option 4	Orally

Q203	Question/ Options	An example of lysogeny in animals could be
	Option 1	Slow viral infections
	Option 2	Latent viral infections
	Option 3	T-even bacteriophages
	Option 4	Infections resulting in cell death

Q204	Question/ Options	Which one of the following is the earliest site of hematopoiesis in the embryo?
	Option 1	Bone Marrow
	Option 2	Liver
	Option 3	Yolk Sac
	Option 4	Thymus

Q205	Question/ Options	Which one of the following viruses contains single stranded DNA as the genome?
	Option 1	Parvo virus
	Option 2	Herpes virus
	Option 3	Adeno virus
	Option 4	Pox virus

Q206	Question/ Options	Which of the following is TRUE regarding the drugs that affect the stability of microtubules used in cancer chemotherapy
	Option 1	Immune system is detatched from functioning
	Option 2	They prevent chromatin condensation
	Option 3	They interfere with mitosis.
	Option 4	They stop the movement of cancer cells into other tissues

Q207	Question/ Options	Therapies of lysosomal and peroxisomal disorders that have shown success in clinical trials with enzyme replacement therapy exclude:
	Option 1	Gaucher's disease type I
	Option 2	Fabry's disease
	Option 3	Pompe's disease
	Option 4	Refsum's disease

Q208	Question/ Options	Lysosomes are thought to play an important role in which of the following processes?
	Option 1	Class I MHC-restricted antigen presentation,
	Option 2	Class II MHC-restricted antigen presentation,
	Option 3	T cell receptor alpha chain rearrangement,
	Option 4	T cell receptor beta chain rearrangement

Q209	Question/ Options	COFAL test is used for the diagnosis of
	Option 1	equine infectious anemia
	Option 2	human immunodeficiency virus
	Option 3	avian leukosis
	Option 4	bovine leukosis

Q210	Question/ Options	Which one of the following animals has a cheek pouch in their mouth and used as an animal model for studying oral cancer?
	Option 1	Guinea pig
	Option 2	Hamster
	Option 3	Swiss mice
	Option 4	Wistar rat

Q211	Question/ Options	Which one of the following protozoan is transmitted by ingestion of ticks?
	Option 1	*Haemoproteus columbae*
	Option 2	*Ehrlichia canis*
	Option 3	*Hepatozoon canis*
	Option 4	*Histomonas meleagridis*

Q212	Question/ Options	The demyelination of the central nervous system white matter produced by the canine distemper virus is an example of:
	Option 1	Fat necrosis
	Option 2	Coagulation necrosis
	Option 3	Zenker's necrosis
	Option 4	Liquefactive necrosis

Q213	Question/ Options	Which one of the following clinical conditions does not have exudates?
	Option 1	Pus
	Option 2	Catarrhal inflammation
	Option 3	Serous inflammation
	Option 4	Granulomatous inflammation

Q214	Question/ Options	BioSteel is a trademark name for a high-strength based fiber material which was made from the recombinant spider silk-like protein extracted from the milk of transgenic
	Option 1	Goats
	Option 2	Sheep
	Option 3	Cow
	Option 4	Buffalo

Q215	Question/ Options	Which of the following protozoan parasites replicates inside a non nucleated human cell
	Option 1	Entamoeba
	Option 2	Leishmania
	Option 3	Trypanosoma
	Option 4	Plasmodium

Q216	Question/ Options	Hypophysation refers to
	Option 1	Injection of growth hormone
	Option 2	Injection of gonadotropins
	Option 3	Injection of pituitary gland extract
	Option 4	Injection of leutinizing hormone

Q217	Question/ Options	The term "Mitotic gynogen" refers to
	Option 1	A fish that has only a female parent whose diploidy status is restored by preventing the first mitosis of oocytes.
	Option 2	A fish that has only a male parent whose diploidy status is restored by preventing the first mitosis of oocytes.
	Option 3	A fish that has only a female parent whose diploidy status is restored by preventing the first meiosis of oocytes.
	Option 4	A fish that has only a male parent whose diploidy status is restored by preventing the first meiosis of oocytes.

Q218	Question/ Options	In animal cell culture, CO2 incubator is used for maintaining open culture system. What is the function of CO2?
	Option 1	It serves as a Carbon source to the cells.
	Option 2	It maintains the temperature via green house effect
	Option 3	It dissolves in the medium and generates carbonic acid and regulates the pH to neutrality
	Option 4	It dissolves in the medium and generates carbonic acid and regulates the pH to alkaline side.

Q219	Question/ Options	Which one of the following is a fish cell line?
	Option 1	VERO
	Option 2	HeLa
	Option 3	RTG -2
	Option 4	HepG2

Q220	Question/ Options	Photosynthetic sulphur bacteria get hydrogen ions for CO2 reduction from
	Option 1	Water
	Option 2	Hydrogen sulphide
	Option 3	Molecular hydrogen
	Option 4	Hydrogen peroxide

Q221	Question/ Options	White spot syndrome virus is transmitted
	Option 1	Vertically
	Option 2	Horizontally
	Option 3	Both vertically and horizontally
	Option 4	Through a vector

Q222	Question/ Options	Ziconotide, a synthetic bioactive peptide originally isolated from the marine snail *Conus magus* is used as an
	Option 1	Analgesic agent
	Option 2	Anticancer agent
	Option 3	Antiviral agent
	Option 4	Anti inflammatory agent

Q223	Question/ Options	Which of the following is a bioluminescent bacterium?
	Option 1	*Vibrio harveyi*
	Option 2	*Vibrio parahaemolyticus*
	Option 3	*Vibrio choleara*
	Option 4	*Vibrio splendidus*

Q224	Question/ Options	The site of production of Gonad Inhibiting Hormone (GIH) in crustaceans is
	Option 1	Thoracic ganglion
	Option 2	X-organ
	Option 3	Hepatopancreas
	Option 4	Y-organ

Q225	Question/ Options	In bony fishes, Immunoglobulin IgM is secreted as a
	Option 1	Monomer
	Option 2	Dimer
	Option 3	Tetramer
	Option 4	Pentamer

Q226	Question/ Options	Which one of the following electron acceptors used by the bacteria is mainly responsible for microbial induction of marine corrosion?
	Option 1	O_2
	Option 2	NO_3^-
	Option 3	SO_4^{2-}
	Option 4	CO_2

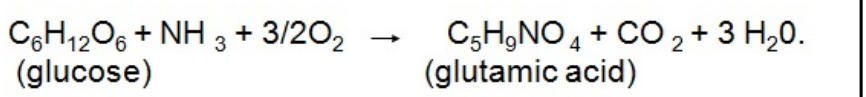
Q227	Question/ Options	Which one of the following methods is used to identify the sites in a genome that are occupied *in vivo* by a gene regulatory protein?
	Option 1	Chromatin immunoprecipitation (ChIP)
	Option 2	Gel mobility shift assay
	Option 3	Methylation interference assay
	Option 4	Phage display library

Q228	Question/ Options	The class of immunoglobulin found in fish is
	Option 1	IgD
	Option 2	IgA
	Option 3	IgM
	Option 4	IgG

Q229	Question/ Options	Besides nitrogen fixation the heterocysts of cyanobacteria also contribute to
	Option 1	Photosynthesis and ATP production
	Option 2	The functioning of photosystem II
	Option 3	ATP production
	Option 4	Generation of oxygen

Q230	Question/ Options	The enzyme involved in hydrogen production from biophotolysis in green algae is
	Option 1	Nitrogenase
	Option 2	Fe-Fe hydrogenase
	Option 3	Ni-Fe hydorgenase
	Option 4	Both Ni-Fe and Fe-Fe hydrogenases

Q231	Question/ Options	The compound used for the preferential removal of diatoms from microalgal cultures is
	Option 1	Penicillin
	Option 2	Copper sulfate
	Option 3	Germanium dioxide
	Option 4	Potassium tellurite

Q232	Question/ Options	The overall reaction for microbial conversion of glucose to L-glutamic acid is:  ($C_6H_{12}O_6$ (glucose) + NH_3 + 3/2O_2 → $C_5H_9NO_4$ (glutamic acid) + CO_2 + 3 H_2O.) What mass of oxygen is required to produce 49 g glutamic acid? Molecular weight of glutamic acid=147
	Option 1	16 g
	Option 2	8.15 g
	Option 3	10.45g
	Option 4	20 g

Q233	Question/ Options	Which one of the following databases allows users to search marine species datasets from all of the world's oceans?
	Option 1	KEGG
	Option 2	OBIS
	Option 3	PDB
	Option 4	Uniprot

Q234	Question/ Options	N2 fixation requires large amounts of energy, since there is high activation energy for breaking the triple bond of the N_2. If so, how many molecules of ATP are required for reducing one molecule of nitrogen?
	Option 1	12
	Option 2	18
	Option 3	16
	Option 4	24

Q235	Question/ Options	Marine environment has abundance of osmotrophs. Osmotrophs are defined as organisms which obtains nutrients and energy via passive or active transport of
	Option 1	Low molecular weight substrates across cell membrane
	Option 2	High molecular weight substrates across cell membrane
	Option 3	Dissolved organic matter across cell membrane
	Option 4	Particulate organic matter across cell membrane

Q236	Question/ Options	Most endangered species are victims of
	Option 1	greenhouse warming.
	Option 2	habitat destruction.
	Option 3	overhunting.
	Option 4	competition with introduced species

Q237	Question/ Options	The Ozone layer saves from lethal UV. It mainly absorbs-
	Option 1	UV-A
	Option 2	UV-B
	Option 3	UV-A & B
	Option 4	UV-A & C

Q238	Question/ Options	Total energy available for work at equilibrium is termed as
	Option 1	Free energy
	Option 2	Entropy
	Option 3	Activation energy
	Option 4	Enthalpy

Q239	Question/ Options	Global warming is due to:
	Option 1	Absorption of UV by Ozone
	Option 2	Absorption of IR by CO2
	Option 3	Absorption of IR by ozone
	Option 4	Absorption of UV by CO2

Q240	Question/ Options	In a pond ecosystem, net productivity by zooplankton is 'p' and biomass consumed by small fishes is 'c', then the ratio of c/p is termed as
	Option 1	Assimilation efficiency
	Option 2	Net secondary productivity
	Option 3	Consumption efficiency
	Option 4	Conversion efficiency

Q241	Question/ Options	Two species or populations are competing for the exact same resources, and one will eventually exclude the other. What is the technical term for this?
	Option 1	Predation
	Option 2	Competitive exclusion
	Option 3	Coevolution
	Option 4	Mutualism

Q242	Question/ Options	Which of the following processes is most capable of slowing global warming?
	Option 1	Decomposition
	Option 2	Respiration
	Option 3	Photosynthesis
	Option 4	Chemosynthesis

Q243	Question/ Options	Ecosytem is mainly concerned with
	Option 1	energy flow and nutrient recycling
	Option 2	Population
	Option 3	Community
	Option 4	Species

Q244	Question/ Options	An organism with the ability to withstand changes to biotic and abiotic environmental factors is said to have _____
	Option 1	Tolerance
	Option 2	a pioneer community
	Option 3	limiting factors
	Option 4	secondary succession

Q245	Question/ Options	An undersea volcano in the Hawaiian Islands chain erupts, forming a new island in the Pacific Ocean. Over the course of time, which of these would most likely be the first species to survive on the new island?
	Option 1	Lichens
	Option 2	Grasses
	Option 3	Mammals
	Option 4	Birds

Q246	Question/ Options	A certain membrane protein is known to contain a single membrane spanning α-helix of length 72 amino acids. A scientist makes deletion mutants of this protein by reducing the length of this α-helix. What would be the minimum length of the α-helix that will still keep the membrane protein active?
	Option 1	18
	Option 2	36
	Option 3	72
	Option 4	64

Q247	Question/ Options	A compound X inhibits an enzyme A competitively. A small concentration of X increases the enzyme's activity while higher concentration inhibits the activity significantly. This indicates that the enzyme
	Option 1	Is allosteric
	Option 2	Is made up of more than one subunit
	Option 3	Contains disulfide bonds
	Option 4	Is a hetero-oligomer

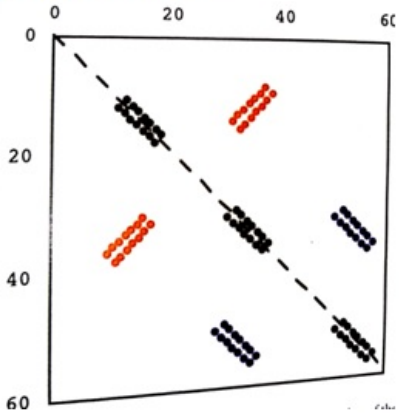
Q248	Question/ Options	It is observed that in a multiple sequence alignment of homologous proteins, there is an absolutely conserved Glycine residue at a particular position. Crystal structure analysis of a representative protein shows that the Φ and Ψ angles of this residue occurs in the bottom right quadrant of the Ramachandran map. What is the evolutionary basis of conservation of this Glycine residue?
	Option 1	No other amino acid can occupy this position in the Ramachandran map and hence mutation at this position can be structurally destabilizing
	Option 2	Change of Gly into any other amino acid, changes the chirality of the enzyme, which can functionally deleterious
	Option 3	Gly does not prefer any particular secondary structure, and change into any other amino acid will change the overall secondary structure of the enzyme
	Option 4	Replacement of Gly by any other amino acid changes the overall charge of the protein

Q249	Question/ Options	Which of the following terms will have to be taken into consideration for developing a potential function for docking simulation?
	Option 1	hydrogen bonding, van der Waal's and electrostatic interaction terms
	Option 2	Bond, angle and dihedral terms
	Option 3	Dihedral and hydrogen bonding terms
	Option 4	Bond, angle and hydrogen bonding terms

Q250	Question/ Options	You are interested in a particular enzyme that is expressed in various human tissues. You have isolated the protein from the brain, liver and kidneys. After a lot of experimentation you determine that the liver protein has three domains A, B and C occurring in sequential order. Domain B is the catalytic domain and the other two have regulatory function. The kidney protein has only domains A and B in that order and the brain protein has domains B and C. You then proceed to determine the primary structure of the proteins using chemical methods and find that the amino acid sequence of the three domains are completely identical regardless of the source from which they were isolated. You then ask the question whether the three different proteins have all originated from the same gene by means of alternative splicing, or they could be products of different genes. Having the experimentally determined protein sequences and knowing the sequence of the human genome, which one of the following bioinformatic method you will use to answer the question above.
	Option 1	TBLASTN using the protein sequence as query and the human genome sequence as database.
	Option 2	TBLASTX using the protein sequence as query and the human genome sequence as database.
	Option 3	BLASTN using the protein sequence as query and the human genome sequence as reference.
	Option 4	BLASTP using the protein sequence as query and the human genome sequence as reference.

Q251	Question/ Options	When p and q are lengths of sequences, the computational complexity of the Needleman and Wunsch algorithm is
	Option 1	O(pq)
	Option 2	O(p+q)
	Option 3	O (q log p)
	Option 4	O (p^q)

Q252	Question/ Options	Given the following Table of joint and marginal probabilities: A1 A2 B1 0.24 0.06 B2 0.21 0.49 What is the value of P(B2|A1)?
	Option 1	0.467
	Option 2	0.533
	Option 3	0
	Option 4	1

Q253	Question/ Options	In the following figure, identify the parallel and anti-parallel β-strands in a protein structure 
	Option 1	Residues 30-40 in anti-parallel beta strands and residues 50-60 in parallel beta strands
	Option 2	Residues 30-40 in parallel beta strands and residues 50-60 in anti-paralle beta strands
	Option 3	Residues 10-20 in parallel beta strands and residues 30-40 in anti-parallel beta strands
	Option 4	Residues 10-20 in anti-parallel beta strands and residues 30-40 in parallel beta strands

Q254	Question/ Options	The E. coli ribosomal release factor gene has an in-frame stop codon in the middle of the protein coding sequence. Mutating the stop codon in this gene makes the protein non-functional. Which one of the following is an adequate explanation for this observation?
	Option 1	When the intracellular concentration of this protein is low, ribosomes jump over the stop codon and synthesize the full length protein. When it is high, the protein itself facilitates release of its mRNA from the ribosomes at the stop codon
	Option 2	The gene is a pseudo gene
	Option 3	In this case, the stop codon is not a real stop codon, but codes for an unnatural amino acid essential for the function of the protein
	Option 4	The stop codon is involved in secondary structure of the mRNA

Q255	Question/ Options	A protein has three domains P, Q, and R, whereas another protein has three domains R, S and Q in that order. The preferred alignment algorithm for these two proteins will be
	Option 1	Local alignment
	Option 2	Global alignment
	Option 3	Both algorithms will give the same results
	Option 4	None of the methods are suitable in this case

Q256	Question/ Options	PAM120, PAM80 and PAM60 scoring matrices are most suitable for aligning sequences with
	Option 1	40%, 50% and 60% similarity respectively
	Option 2	60%, 50% and 40% similarity respectively
	Option 3	60%, 40% and 50% similarity respectively
	Option 4	The usefulness of PAM matrices have no relationship with similarities of sequences to be aligned

Q257	Question/ Options	Which of the following descriptors would be a suitable set for QSAR analysis?
	Option 1	logP, molecular volume, Hammet σ and π constants, molar refractivity, polar surface area
	Option 2	logP, number of synthetic steps, polar surface area, molar refractivity
	Option 3	logP, number of nitrogen atoms, Hammet σ and π constants, molar refractivity, polar surface area
	Option 4	molecular weight, molecular volume, molecular surface area.

Q258	Question/ Options	A closed circular plasmid of length 5000 base pairs is completely relaxed in aqueous buffer. If the plasmid is put in 80% ethanol so that it transforms to A-form DNA, what will be the status of its superhelicity?
	Option 1	It will become 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.

Q259	Question/ Options	How many edges meet at every branch node in a phylogenetic tree?
	Option 1	1
	Option 2	2
	Option 3	3
	Option 4	4

Q260	Question/ Options	Which one of the following proteins can be used as a template for structure prediction by homology modelling?
	Option 1	pdb|1TLH|B: Identities = 39/66 (59%), Positives = 51/66 (77%), Expect = 3e-16
	Option 2	pdb|1DQL|H: Identities = 9/15 (60%), Positives = 12/15 (80%), Expect = 9.9
	Option 3	pdb|1L9U|H:Identities = 173/333(51%), Positives = 233/333(69%), Expect = 2e-89
	Option 4	pdb|1RP3|A: Identities = 56/206 (27%), Positives = 98/206 (47%), Expect = 2e-05

Q261	Question/ Options	In a pairwise alignment, an optimal alignment is the one that
	Option 1	either minimizes the implied number of evolutionary changes or minimizes a particular scoring function.
	Option 2	either maximizes the implied number of evolutionary changes or minimizes a particular scoring function.
	Option 3	either minimizes the implied number of evolutionary changes or maximizes a particular scoring function.
	Option 4	either maximizes the implied number of evolutionary changes or maximizes a particular scoring function.

Q262	Question/ Options	Which one of the following correctly specifies the order of helices according to their radius?
	Option 1	pi helix>alpha helix>3_{10} helix
	Option 2	3_{10} helix>alpha helix>pi helix
	Option 3	3_{10}helix>pihelix>alpha helix
	Option 4	alpha helix> 3_{10}helix> pi helix

Q263	Question/ Options	In protein sequence analysis, Twilight zone refers to the evolutionary distance corresponding to about
	Option 1	60% identity between two proteins
	Option 2	90% identity between two proteins
	Option 3	30% identity between two proteins
	Option 4	85% identity between two proteins

Q264	Question/ Options	The double-helical structure of DNA was first obtained using
	Option 1	Fiber diffraction only
	Option 2	Fiber diffraction and molecular modeling
	Option 3	X-ray diffraction from single crystals
	Option 4	Diffraction from single crystals and molecular modeling

Q265	Question/ Options	Molecular dynamics differs from molecular mechanics by taking account of the
	Option 1	velocities of the constituent particles
	Option 2	effect of the solvent medium
	Option 3	non-bonded interactions
	Option 4	periodic boundary condition

Q266	Question/ Options	An organism has 10 pairs of chromosomes. If all the genes in this organism were mapped how many linkage groups would be observed?
	Option 1	10
	Option 2	20
	Option 3	40
	Option 4	Cannot be predicted

Q267	Question/ Options	In a genetic map two genes A and B are 60 cM apart. If an individual heterozygous for the two genes (AaBb) is test-crossed, what percentage of the progeny will have the genotype aabb?
	Option 1	60
	Option 2	30
	Option 3	25
	Option 4	12.5

Q268	Question/ Options	The following can be used as DNA markers: a. Restriction Fragment Length Polymorphism b. Amplified Fragment Length Polymorphism c. Randomly Amplified Polymorphic DNA d. Microsatellites. Which of the above can be used to distinguish a heterozygote from a homozygote.
	Option 1	(a) and (c)
	Option 2	(b) and (c)
	Option 3	(b) and (d)
	Option 4	(a) and (d)

Q269	Question/ Options	The following events lead to changes in the DNA: a. Inversion b. Recombination c. Translocation d. Transition. Which of the above can lead to changes in the linkage map of an organism?
	Option 1	Only (b)
	Option 2	(a) and (c)
	Option 3	(b) and (d)
	Option 4	(a), (b) and (c)

Q270	Question/ Options	The following are terms which are used to describe sequence identities a. Homologs b. Paralogs c. Orthologs d. Analogs. Which of the above can be used to describe the relationship between a myoglobin gene from human and that from a mouse?
	Option 1	Only (b)
	Option 2	Only (c)
	Option 3	(a) and (b)
	Option 4	(a) and (c)

Q271	Question/ Options	To make a linkage map in Drosophila, a three-point test cross was carried out. The parental cross was between homozygous flies of genotype a+c and +b+. The double crossovers obtained after the test cross had the genotype a++ and +cb. What is the order of the three genes?
	Option 1	c a b
	Option 2	a b c
	Option 3	a c b
	Option 4	a b c or a c b

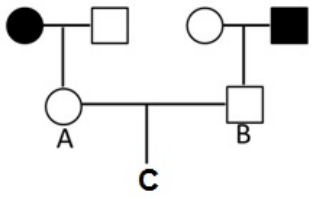
Q272	Question/ Options	Mouse-human somatic cell hybridization led to a number of cell clones in which all mouse chromosomes are present, but only certain human chromosomes are retained. The results are summarized below. The table indicates three such clones. '+' indicates presence of human chromosomes and '-' for those that are absent. All other human chromosomes are absent.

Hybrid clone	Human chromosomes							
	1	2	3	4	5	6	7	8
A	+	+	+	+	-	-	-	-
B	+	+	-	-	+	+	-	-
C	+	-	+	-	+	-	+	-

If an enzyme activity was present only in clone C, the allele encoding the enzyme is present on chromosome

	Option 1	2
	Option 2	3
	Option 3	6
	Option 4	7

Q273	Question/ Options	The following pedigree shows the inheritance of an autosomal recessive trait What is the probability that a child (C) born to individuals A and B will show the trait?



	Option 1	1/2
	Option 2	1/4
	Option 3	1/9
	Option 4	1/16

Q274	Question/ Options	Assume a population in Hardy-Weinberg equilibrium for alleles at an autosomal recessive disease locus. The frequency of mutant allele 'q' is 1/50. The fraction of the population representing carriers of the disease is closest to
	Option 1	$(1/50)^2$
	Option 2	1/25
	Option 3	(1/25)2
	Option 4	1/50

Q275	Question/ Options	A subset of informative SNPs that may be used as good representative of the rest of the SNPs is called as tag-SNPS. The following is a set of SNPs representing four haplotypes. Of the four shaded SNPs (a to d) which of the following combinations can be used as a tag-SNP for the four haplotypes? 1. C T C A A A G T A C G G T T C A G G C 2. T T G A T T G C G C A A C A G T A A T 3. C C C G A T C T G T G A T A C T G G T 4. T C G A T T C C G C G G T T C A G A C (a) (b) (c) (d)
	Option 1	(a) and (b)
	Option 2	(c) and (d)
	Option 3	(a), (b) and (c)
	Option 4	(b), (c) and (d)