VPM CLASSES

GATE SCIENCE
BIOTECHNOLOGY
SOLVED SAMPLE PAPER
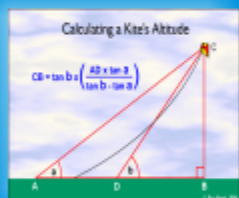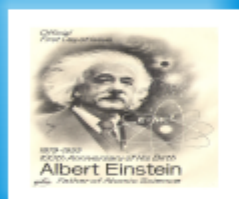
* **DETAILED SOLUTIONS**

GATE - BIOTECHNOLOGY
MOCK TEST PAPER

- There are total of 65 questions in this paper which are of multiple choice type or numerical answer type.

- Questions Q.1 - Q.25 carry 1 mark each. Questions Q.26 - Q.55 carry 2 marks each. The 2 marks questions include two pairs of common data questions and two pairs of linked answer questions depends on the answer to the first question of the pair. If the first question in the linked pair is wrongly answered or is not attempted, then the answer to the second question in the pair will not be evaluated.

- Questions Q. 56 - Q.65 belong to General Aptitude (GA) section and carry a total of 15 marks. Questions Q.56 - Q.60 carry 1 mark each, and questions Q. 61 - Q.65 carry 2 marks each.

- There will be negative marking of 1/3 marks for each wrong answer for 1 mark questions. For all 2 marks questions 2/3 marks will be deducted for each wrong answer. However, in the case of the linked answer question pair, there will be negative marks only for wrong answer to the first question and no negative marks for wrong answer to the second question. There is no negative marking for questions of numerical answer type.

TIME :   3 HOURS

MAX. MARKS :   100

VPM CLASSES
For IIT-JAM, JNU, GATE, NET, NIMCET and Other Entrance Exams

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1.   The non growing rhizobial cells within the root nodules of legumes that devote their entire metabolic capacity in fixing nitrogen are -

(A) Heterocysts

(B) Nodulins

(C) Bacteroids

(D) Leghemoglobin

2.   N - glycosyl linkage joins 1st carbon of Pentose sugar with -

(A) N - 9 of pyrimidine

(B) N - 9 of purine.

(C) N - 3 of pyrimidine

(D) N - 3 of purine

3.   Choose the mismatch pair.

Amino acid   Group present in side chain

(A) Tyrosine   Phenolic group

(B) Arginine   guanidium group

(C) Histidine   aromatic imidazole group.

(D) Cysteine   imino group

4.   True statements about myoglobin include which of the following?

(P) It is a monomeric protein

(Q) It contains four protoheme IX prosthetic group.

(R) The molecule has eight major helical segments.

(S) Oxygen binding exhibits cooperative kinetics.

(A) Q,S

(B) Q,R

(C) P,R

(D) P,Q

5. Which one of the following statements is incorrect?

(A) Salivary α - amylase is an endoamylase

(B) β - amylase is an exoamylase.

(C) α - amylase and β - amylase cleave a ($1 \rightarrow 4$) glycosidic bond.

(D) β - amylase is the most prevalent form of amylase in animals.

6. Expression vectors contain a sequence, not normally found in other vector that is known as-

(A) A ribosome - binding site.

(B) An orisite

(C) A multiple cloning site.

(D) An antibody - resistant marker.

7. Jay - sachs disease characterized by developmental retardation, paralysis and blindness is caused due to the accumulation of –

(A) GM 2 gangliosides

(B) Sphingomyelin

(C) Phosphatidyl choline

(D) Glycosphingolipids .

8. Because the mitochondrial membrane has no transporter for oxaloacetate, before export to the cytosol, the oxaloacetate formed from pyruvate during gluconeogenic pathway must be reduced to malate by mitochondrial.

(A) Malate synthase

(B) Malate dehydrogenase

(C) Malic enzyme

(D) Malate - aspartate shuttle

9. Which of the following compounds is a precursor in the biosynthesis of both cholesterol and β - hydroxy butyrate (a ketone body)?

(A) Farnesyl pyrophosphate

(B) β - hydroxy - β - methylglutaryl coenzyme A (HMG - CoA)

(C) Methyl malonyl CoA

(D) Mevalonate.

10. The effects of a competitive inhibitor on the kinetics of an enzyme reaction include all of the following except -

(A) The Vmax is not changed

(B) Increased concentrations of substrate reverse the inhibition

(C) The km is increased

(D) The inhibitor kinds to a site on the enzyme other than the catalytic site.

11. Which one of the following vitamins contains a thiazole ring in its structure linked to a pyrimidine by methylene bridge?

(A) Vitamin K

(B) Vitamin B_{12}

(C) Vitamin B_1

(D) Vitamin E

12. The polymerase enzyme used in PCR is

(A) DNA Pol a

(B) Taq DNA polymerase

(C) Reverse transcriptase

(D) DNA pol III

13. The advantage of using capillaries in capillary electrophoresis is that they -

(A) Prevent hydrogen bond reformations

(B) Allow very high speed analyses at very low sample sizes

(C) Reduce problems resulting from heating effects

(D) all of the above

14. A technique for defining gene arrangement in very long stretches of DNA (50 - 100 kb) is,

(A) RFLP

(B) Chromosome walking

(C) Nick translation

(D) Southern blotting

15. The SoS repair mechanism is activated by which of the following?

(A) 5 - bromouracil

(B) Acrydine orange

(C) Hydroxylamine

(D) Thymidine dimers

16. The essential initiator protein at the **E. coli** origin of replication is -

(A) Dna A

(B) Dna B

(C) DnaC

(D) Dna E

17. Which of these substrates is best suited for measuring RNA synthesis by RNA polymerase?

(A) γp^{32} ATP

(B) αp^{32} d ATP

(C) γp^{32} α ATP

(D) αp^{32} UTP

18. Which one of the following is considered as an ideal vector for in vivo gene therapy of many nervous disorders?

(A) CFTR

(B) HGPRT

(C) ADA

(D) HSV

19. At initiation of protein synthesis, the two ribosomal subunits combine with mRNA and

(A) Threonine charged tRNA

(B) Methionine charged tRNA

(C) Serine charged tRNA

(D) Proline charged t - RNA

20. Enhancer elements have following properties except:

(A) They are required for the transcription.

(B) Activate transcription of a gene irrespective of their relative position in the DNA chain

(C) They have no polarity (i.e., they can be inverted)

(D) They are non specific for tissues or species.

Q. 21 – Q. 25 are of numerical answer type.

21. When dominant epistasis is operative between two gene loci, the classical 9: 3: 3; 1 ratio become modified into_____.

22. The frequency of recombination between two linked genes cannot exceed. _____

23. A particular recessive disorder is present in one in ten thousand individuals. If the population is in Hardy - weinberg equilibrium, the frequencies of the two alleles are _____.

24. A bacterial culture has an initial cell density of 0.5×10^3 cells/ ml. Its generation time is 20 min. The cell density at the end of 1 hour 40 min is _____.

25. Average thickness of unit membrane is _____.

Common Data for linked answer question Q - 26 & 27

A boy and a girl going to marry decide to have a sweat test for the cystic fibrosis gene because a brother of the man died in this childhood from this disorder. The test revealed the man to be heterozygous and the woman homozygous normal

26. What is the probability that any of their offspring might have cystic fibrosis?

(A) 25%

(B) 50%

(C) All the offsprings

(D) None of the offsprings

27. If a heterozygous grandchild of the couple marries a heterozygous, what is the percent of progeny have the disease?

(A) 50%

(B) 25%

(C) 75%

(D) None of these

28. Match the following

Name of virus	type of genome
1. Polyoma virus	(P) plus ssRNA
2. Polio virus	(Q) linear ds DNA
3. Cauliflower	(R) Circular ds DNA
4. Influenza virus	(S) ds RNA
5. Wound tumor virus	(T) minus SS RNA

	(1)	(2)	(3)	(4)	(5)
(A)	R	P	Q	T	S
(B)	R	T	P	S	Q

(C)   P   R   T   S   Q

(D)   P   S   T   S   Q

29. The function f(x) = x + sin x has

(A) A minimum but no maximum

(B) A maximum but no minimum

(C) Neither maximum nor minimum

(D) Both maximum and minimum

30. The role of the antigen presenting cell in the immune response is all of the following except-

(A) The limited catabolism of polypeptide antigens.

(B) To allow selective association of MHC gene products and peptides.

(C) To supply second signals required to fully activated T cells

(D) To present non - self peptides associated with MHC class II molecules to B - cells.

31. What is an autoimmune disease of human usually involving anti - nuclear antibodies?

(A) Sclerosis

(B) SLE

(C) Rheumatic fever

(D) Myasthenia gravis.

32. Removal of the Bursa of Fabricius from a chicken results in -

(A) A markedly decreased number of circulating T - lymphocytes

(B) Anaemia

(C) A delayed rejection of skin grafts.

(D) Low serum levels of antibodies.

33. If N is the number of cells at a given time (u is the specific growth rate constant rate) with time is given by the formula.

(A) $\dfrac{dt}{dN} = \mu N$

(B) $\dfrac{dt}{dN} = \dfrac{\mu}{N}$

(C) $\dfrac{dN}{dT} = \mu N$

(D) $\dfrac{dN}{dT} = \dfrac{\mu}{N}$

34. Which one of the following processes involves the development of culture systems in stages from laboratory to industry?

(A) Scale - Up

(B) Biotransformation assay

(C) Bioconversion

(D) Biotransposition

35. Match the products in group - I with their producer organism given in group - 2; and select the correct answer from the codes given below the list.

Group I

(P) Ethanol

(Q) L - lysine

(R) Bio pesticide

(S) Vancomycin

Group II

1. Streptomyces orientalis

2. Saccharomyces cerevisial

3. Corynebacterium glutamicum

4. Bacillus thuringiensis

	(P)	(Q)	(R)	(S)
(A)	2	3	4	1
(B)	1	3	2	1
(C)	4	1	2	3
(D)	2	1	4	3

36. During the purification step of industrial enzymes, enzymes can be precipitated by using salts such as –

(A) Mercurous chloride

(B) Potassium chloride

(C) Ammonium sulphate

(D) Silver nitrate

37. Immobilization of enzymes -

(P) Increases the specificity of the enzyme for its reactants.

(Q) Facilitates reuse of the enzyme in batch reactions.

(R) Makes it unsuitable for its use in a continuous reactor system

(S) Decrease the operational cost of the industrial process.

(A) Q,S

(B) Q,R

(C) R,S

(D) P,Q

38. In comparative genomics, among both related and highly divergent plant species like **Arabidopsis** and **Brassica,** there is evidence for conservation of -

(A) Synteny

(B) Collinearity

(C) Chimeraplasty

(D) Both (A) and (B)

39. Plant cell suspension culture is easily initiated by -

(A) Shoot apex

(B) Root apex

(C) Protoplast

(D) Friable callus.

40. The first commercial genetically modified (GM) crop containing BT - toxin gene, developed by particle bombardment method of gene transfer is -

(A) Rice

(B) Wheat

(C) Maize

(D) Barley.

41. Micro propagation is -

(A) Raising of plants from a small tissue in culture

(B) Multiplication of small plants

(C) Propagation of small parts of organism

(D) Indefinite maintenance of an organ and tissue.

42. Animals that have been permanently altered so that they pass foreign genes on to their progeny are called _____ organisms and the foreign genes are called _____.

(A) Transgenic, genomic DNA

(B) Transgenic, transgenes

(C) Transgenic, knockout genes

(D) Knockout, antigen.

Q. 43 – Q. 47 are of numerical answer type.

43. Thickness of biomembrane is _____.

44. Size of the molecules that can pass through plasma memberane is _____.

45. Physiologically active phytochrome is _____.

46. Optimum temperature of seed germination is _____.

47. Critical photoperiod for Henbane plant is _____.

48. $L\{e^{-t}(3\sinh 2t - 5\cosh 2t)\}$ is:

(A) $\dfrac{1-5s}{s^2+2s-3}$

(B) $\dfrac{1-5s}{s^2+3s-3}$

(C) $\dfrac{1-4s}{s^2+3s-3}$

(D) $\dfrac{1-5s}{s^2+2s-5}$

49. In the expansion of $(x+y+z)^{25}$

(A) Every term is of the form $^{25}C_r \cdot {}^rC_k \cdot x^{25-r} \cdot y^{r-k} \cdot z^k$

(B) The coefficient of $x^8\, y^9\, z^9$ is $^{25}C_8\, {}^8C_{17}$

(C) The number of terms is 325

(D) None of these

50. The equation $x^3 - 3x + 4 = 0$ has only one real root. What is its first approximate value as obtained be the method of false position in $(-3, -2)$?

(A) – 2.125

(B) 2.125

(C) –2.812

(D) 2.812

51. Match the following.

(P) Orthologs   (I) Homologs resulting from horizontal transfer of genes

(Q) Paralogs   (II) Homologs derived from Speciation

(R) Xenologs (III) Homologs derived from a common ancestral gene that

under went duplication and divergence

	P	Q	R
(A)	III	II	I
(B)	I	III	II
(C)	II	III	I
(D)	III	I	II

52. Which of the following is multiple sequence alignment tool?

(A) BLAST

(B) Pileup

(C) BLOSUM

(D) eMOTIF

53. The tool used for prediction of protein sorting signals and localization sites?

(A) PSORT

(B) Signal P

(C) Chloro P

(D) Target P

54. Which of the following statement is not true about multiple sequence alignment?

(I) It is a sequence alignment of two or more sequences of nucleic acid or protein.

(II) Primary fours is to identify regions that are highly conserved in identity or similarity

(III) Multiple sequence alignment can be global only.

(IV) Clustal W is a multiple sequence alignment program.

(A) II, III

(B) II, IV

(C) I, III

(D) Only II

55. Choose the mismatch:

(A) PROBE → is a database search tool that is similar to PSI - BLAST but perform more complex and rigorous type of data analysis.

(B) Threading → is an approach to protein fold recognition.

(C) Dot matrix analysis → method of producing multiple alignment

(D) ExPASY → analyze protein sequences and structures and 2 -D gel electrophoresis

56. Conference: Chairman: Newspaper:?

(A) Reporter

(B) Distributor

(C) Printer

(D) Editor

57. What is the antonym of the word "BELITTLE"?

(A) Praise

(B) Flatter

(C) Exaggerate

(D) Adore

58. What is the synonym of the word "INDICT" ?

(A) Condemn

(B) Reprimand

(C) Accuse

(D) Allege

59. When a plot is sold for Rs. 18,700, the owner loses 15%. At what price must that plot be sold in order to gain 15%?

(A) Rs. 21,000

(B) Rs. 22,500

(C) Rs. 25,300

(D) Rs. 25,800

60. The most commonly used bleaching agent is

(A) Alcohol

(B) Carbon dioxide

(C) Chlorine

(D) Sodium chlorine

61. One of the following is not a function of bones.

(A) Place for muscle attachment

(B) Protection of vital organs

(C) Secretion of hormones for calcium regulation in blood and bones

(D) Production of blood corpuscles

62. MUNDANE: SPIRITUAL

(A) Common: ghostly

(B) Worldly: unworldly

(C) Routine: novel

(D) Secular: clerical

63. To err is ...... to forgive divine.

(A) Beastly

(B) Human

(C) Inhuman

(D) Natural

64. The following pie charts exhibit the distribution of the overseas tourist traffic from India. The two charts show the tourist distribution by country and the age profiles of the tourists respectively.

Distribution of Overseas Tourist Traffic from India.
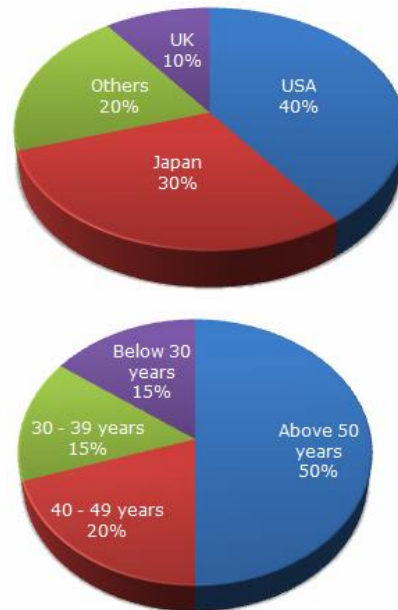
What percentage of Indian tourist went to either USA or UK?

(A) 40 %

(B) 50 %

(C) 60 %

(D) 70 %

65. Look at this series: 14, 28, 20, 40, 32, 64, ... What number should come next?

(A) 52

(B) 56

(C) 96

(D) 128

ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	C	B	D	C	D	A	A	B	B	D	C	B	C	B	D
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	A	A	D	B	D	12 : 3 : 1	50%	0.99, 0.01	16×10^3 cells/ml	75 Å	D	B	A	C	D
Question	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Answer	B	D	C	A	A	C	A	D	D	C	A	B	70 - 90 Å	1 - 15 Å	P_{730}
Question	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Answer	15^0C - 30^0C	11 hrs	A	A	A	C	B	A	C	C	D	C	C	C	C
Question	61	62	63	64	65										
Answer	C	B	B	B	B										

HINTS AND SOLUTIONS

1.(C) The non - growing rhizobial cells within the root nodules of legumes that devote their entire metabolic capacity in fixing nitrogen are known as bacteroids.

2.(B) The glycosidic linkage is from the C- 1 carbon of sugar to the N - 1 nitrogen of pyrimidines or to the N - 9 nitrogen of purines.

3.(D) Cysteine has sulfhydryl group in its side chain.

4.(C) Myoglobin is a monomeric protein which consists of a single polypeptide chain of 153 amino acids residues. The molecule has eight α - helical regions and no β - pleated sheet regions. The heme group consists of a metal ion Fe(II) and an organic part, protoporphyrin.

5.(D) β - amylase is an enzyme found in plants and α - amylase is found in the digestive tract of animals.

6.(A) A ribosome - binding site upstream from the start codon is present in expression vectors, not normally found in other vectors.

7.(A) Jay - sachs disease is caused due to the accumulation of GM 2 gangliosides in the brain and spleen owing to lack of the enzyme hexosaminidase A.

8.(B) Oxaloacetate is reduced to malate by mitochondrial malate dehydrogenase, at the expense of NADH.

Oxaloacetate + NADH + H $^+$ ⇌ α - malate + NAD$^+$

9.(B) HMG - CoA is the precursor in the biosynthesis of both cholesterol and β - hydroxybutyrate (a ketone body).

10.(D) A competitive inhibitor competes with the substrate for the active site of an enzyme while the inhibitor occupies the active site, it prevents binding of the substrate to the enzyme.

11.(C) Vitamin B$_1$ (thiamine) contains a pyrimidine and thiazole ring and they are linked by methylene bridge.

12.(B) A heat Stable Taq DNA polymerase, isolated from the bacterium thermus auaticus is used in the PCR.

13.(C) The advantage of using capillaries in capillary electrophoresis is that they reduce problems resulting from heating effects. Because of the small diameter of the tubing, there is a large surface to volume ratio, which gives enhanced heat dissipation.

14.(B) Chromosome walking is the technique for defining gene arrangement in very long stretches of DNA (50 - 100 Kb).

15.(D) The SoS repair mechanism is activated by the presence of thymidine dimers.

16.(A) The essential initiator protein at the E. coli origin of replication is DnaA. DnaA protein recognizes ori sequence and opens duplex at specific sites in origin.

17.(A) γp^{32} ATP is best suited for measuring RNA synthesis by RNA polymerase.

18.(D) Herpes simplex virus (HSV) is considered as an ideal vector for in vivo gene therapy of many nervous disorders.

19.(B) At initiation, the two ribosomal subunits, combine with mRNA and methionine charged tRNA.

20.(D) Enhancers are segments of DNA that are specific for tissues or species.

21. 12 : 3: 1

When dominant epistasis is operative between two gene loci, the classical 9 : 3 : 3 : 1 ratio becomes modified into 12 : 3 : 1 ratio.

22. 50%

The frequency of recombination between two linked genes cannot exceed 50%, which is the frequency in case of independent segregation.

23. 0.99 , 0.01

if the population is in equilibrium, there should be P^2 of AA + 2pq of Aa + q^2 of aa individuals. Since $\dfrac{1}{10,000}$ shows the recessive trait, this is q^2. therefore, q =

$$\sqrt{\dfrac{1}{10,000}} = \sqrt{0.0001} = 0.01$$

Since $= p + q = 1$

$p = 1 - 0.01 = 0.99$

$P = 0.99$ and $q = 0.01$

24. 16×10^3 cells / ml

1 hour 40 min = 100 minutes

Generation time of bacteria = 20 minutes

i.e., it undergoes 5 generations in 100 minutes

N_0 = number of bacteria at the beginning of time interval

N = The cell density at the end of time interval
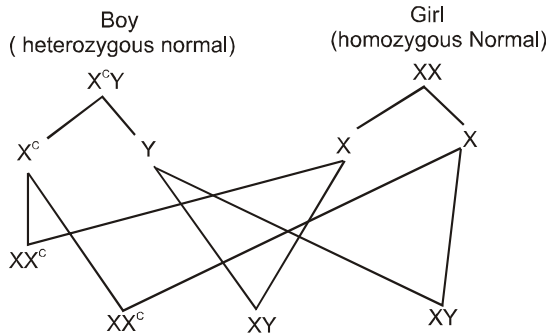
N = number of generations.

Then, $N = N_0 \times 2^n$

$N = 0.5 \times 10^3 \times 2^5$

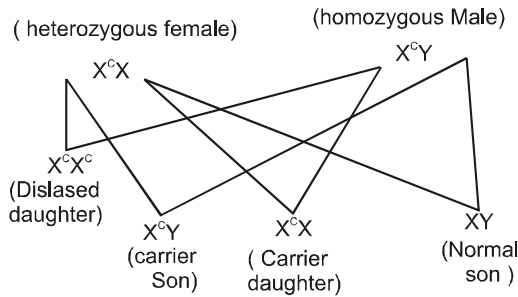$N = 16 \times 10^3$ cells/ ml

25. 75 Å

Average thickness of unit membrane is 75 Å   .

26.(D)

Two carrier daughters, and two normal sons. The probability that any of the offspring might have cystic fibrosis is Nil.

27.(B)

25% progeny may have the disease cystic fibrosis.

28.(A) Polyoma virus → circular ds DNA

Polio virus → plus ss RNA

Cauliflower mosaic virus → linear ds DNA

Influenza virus → minus ss RNA

Wound tumour virus → ds RNA

29.(C) $f(x) = x + \sin x \Rightarrow f'(x) = 1 + \cos x$

Now $f'(x) = 0 \Rightarrow 1 + \cos x = 0 \Rightarrow \cos x = 1 \Rightarrow x = \pi$

Now $f''(x) = -\sin x$. $f''(\pi) = 0$, $f'''(x) = -\cos x$,

$f'''(\pi) = 1 \neq 0$

∴ Neither maximum nor minimum.

30.(D) The role of the antigen - presenting Cell in the immune response is all of the following except to present non - self peptides associated with MHC Class (II) molecules to B - cells.

31.(B) Systemic lupus erythematosus (SLE) is an autoimmune disease of humans usually involving anti - nuclear antibodies

32.(D) Removal of the Bursa of Fabricius from a chicken resultant in low serum levels of antibodies; because it is the primary site of B - Cell maturation in birds.

33.(C) If N is the number of cells at a given time, μ = specific growth rate constant, then the increase in the number of cells with time is given by the formula:-

$$\frac{dN}{dT} = \mu N$$

34.(A) Scale - up involves the development of culture systems in stages (small scale) laboratory to (large scale) industry.

35. (A) Ethanol $\rightarrow$ Saccharomyces cerevisial

L - Lysine $\rightarrow$ corynebacterium glutamicum

Biopesticide $\rightarrow$ Bacillus thuringiensis

Vancomycin $\rightarrow$ Streptomyces orientalis

36.(C) For purification, enzymes can be precipitated by using salts such as ammonium sulphate and organic solvents such as isopropanol, ethanol, acetone.

37.(A) Immobilization of enzymes facilitates reuse of the enzyme in batch reactions and decreases the operational cost of the industrial process.

38.(D) Among both related and highly divergent plant species like **Arabidopsis** and **Brassica**, there is evidence for conservation of synteny (conserved clustering of genes) and collinearity (conserved order of genes or markers).

39.(D) Suspension cultures can be initiated by transferring friable callus to liquid nutrient medium.

40.(C) Maize is the first commercial genetically modified crop which is developed by particle bombardment method of gene transfer.

41.(A) Micropropagation is the raising of plant in a controlled and artificial environment under aseptic conditions, form a small tissue in a defined growth.

42.(B) Animals that have been permanently altered so that they pass foreign genes on to their progeny are called transgenic organisms, and the foreign genes are called transgenes.

43. 70 – 90 Å

Thickness of biomembrane is 70 – 90 Å .

44. 1 – 15 Å

Size of the molecules that can pass through plasma memberane is 1 – 15 Å.

45. P_{730}

Physiologically active phytochrome is P_{730} .

46. 15^0C - 30^0C

Optimum temeperature of seed germination is

47. 11 hrs

Critical photoperiod for Henbane plant is 11 hrs.

48.(A) L {3 sinh 2t – 5 cosh 2t} = $\dfrac{6}{s^2 - 4} - \dfrac{5s}{s^2 - 4} = \dfrac{6 - 5s}{s^2 - 4}$ = f(s) , say

∴   L {e^{-t} (3 sinh 2t – 5 cosh 2t} = f(s + 1) = $\dfrac{6 - 5\,(s+1)}{(s+1)^2 - 4} = \dfrac{1 - 5s}{s^2 + 2s - 3}$.

49.(A) $(x + y + z)^{25}$ = {x + (y + z)}^{25}

= $^{25}C_0 x^{25}$ + $^{25}C_1 x^{24}$ (y + z) + ... + $^{25}C_r x^{25-r}$ (y + z)^r + ... = ... + $^{25}C_r x^{25-r}$. (...+ $^r C_k y^{r-k} z^k$ + ...) + ...

8 + 9 + 9 ≠ 25. So, there is no term like $x^8 y^9 z^9$.

The number of terms

$$= 1 + 2 + 3 +...+ 26 = \dfrac{26 \times 27}{2} = 351.$$

50.(A) Method of false position for Ist approximation

$$x_2 = x_0 - \frac{(x_1 - x_0) \, f(x_0)}{f(x_1) - f(x_0)} \qquad ...(1)$$

Given $x_0 = -3$, $f(x_0) = f(-3) = -27 + 9 + 4 = -14$

$x_1 = -2$, $f(x_1) = f(-2) = -8 + 6 + 4 = 2$

$\therefore \qquad x_2 = -3 - \dfrac{(-2+3)(-14)}{2-(-14)}$

$x_2 = -2.125$.

Hence (A) is correct answer.

51.(C) Paralogous genes $\rightarrow$ genes that have arisen by gene duplication events in an organism and are transmitted to offspring as a gene family.

Orthologous genes $\rightarrow$ A pair of genes in two organisms whose sequences are so strikingly and uniquely similar that they are strongly predicted to have the same function.

Xenologs $\rightarrow$ Homologs resulting from horizontal transfer of genes.

52.(B) Pileup is the multiple sequence alignment program that is part of the Genetic Computer Group package of sequence analysis program.

53.(A) PSORT is a tool for prediction of post - translational modification. It is used for prediction of protein sorting signals and localization sites.

54.(C) A multiple sequence alignment is sequence alignment of three or more sequences of nucleic acid or protein. Multiple sequence alignment can be global or local. In a global, pair wise alignment is extended to include three or more related sequences. Similarly, local conservation of patterns in DNA sequences represents conserved regulatory information in genomes. These patterns may be found by local method designed to search for these conserved domains.

55.(C) Dot - matrix analysis is a method of producing pairwise alignments. It gives an overview of pair - wise sequence similarity.

56.(D) Explanation: As Chairman is the highest authority in a conference similarly Editor is in Newspaper.

57.(C) Belittle means express a negative opinion and exaggerate means to enlarge beyond bounds or the truth**.** So the antonym of Belittle is exaggerate.

58.(C) Indict means accuse formally of a crime. So the synonym of indict is accuse.

59.(C) Explanation:

85 : 18700 = 115 : x

$$x = \left(\frac{18700 \times 115}{85} \right) = 25300$$

Hence, S.P. = Rs. 25,300.

60.(C) The most commonly used bleaching agent is chlorine.

61.(C) The following functions of bones are -

(1) Place for muscle attachment

(2) Protection of vital organs

(3) Production of blood corpuscles

62.(B) Mundane: Spiritual:: Worldly: Unworldly

63.(B) To err is human to forgive divine.

64.(B) Explanation:

(40+10) = 50% (from first chart)

65.(B) Explanation:

This is an alternating multiplication and subtracting series: First, multiply by 2 and then subtract 8.