WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 6th Semester Examination, 2022

BOTADSE06T-BOTANY (DSE3/4)

Time Allotted: 2 Hours   Full Marks: 40

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.

1.   Answer the following questions briefly: 1×16 =16
  (a) Differentiate between primary data and secondary data.

  (b) Why is standard deviation also known as root mean square deviation?

  (c) If the arithmetic mean of x, $x+3$, $x+6$, $x+9$ and $x+12$ is 10, what is the value of x?

  (d) How does an attribute differ from a parameter?

  (e) What do you mean by level of significance?

  (f) If the mode and median coincide, then what will be the shape of a normal curve?

  (g) Chi-square test value _____ with the increase in the degree of freedom (decreases / increases).

  (h) Write one difference between alternative hypothesis and null hypothesis.

  (i) Find the median of the first ten prime numbers.

  (j) Find the mean of the first 10 multiples of 3.

  (k) What do you mean by sampling error?

  (l) Work out the second quartile for the given series of 10, 12, 13, 15, 17, 19, 21 and 27.

  (m) If in a calculation, there is 3 degree of freedom, write the number of classes present there.

  (n) Define co-efficient of variation.

  (o) What are the different types of correlation present between two sets of variable?

  (p) The mean of the number 6, y, 7, x, 14 is 8. Express y value in terms of x.

2.   Answer any *eight* questions from the following: 3×8 = 24

  (a) "Arithmetic mean is the best measure of the central tendency and is widely used". Comment on this statement and give reasons in support of your view.

  (b) With the help of a flowchart, explain the different steps involved in performing a student 't' test.

(c) If the mean of the following distribution is 24, find the value of 'a'.

0-10	10-20	20-30	30-40	40-50
7	a	8	10	5

(d) Given two lines of regression $x + 3y = 11$ and $2x + y = 7$. Find the coefficient of correlation between x and y.

(e) The mean height of 8 plants is 152 cm. Two more plants of height 143 cm and 156 cm are included later in the group. What is the new mean height of the plant?

(f) The weight of 10 students are given below in kg: 2+1
39, 43, 36, 38, 46, 51, 33, 44, 44, 43. Find the mode of this data. Is there more than 1 mode? If yes, why?

(g) From the following two equations, find out the mean value of the variable x and y; if we assume $x = \bar{x}$ and $y = \bar{y}$
$$2x + 5y - 4 = 0 \text{ and } x + 7y + 6 = 0 .$$

(h) The following results were obtained in an experiment involving shape of the seeds and the colour of pods as follows:

Round yellow = 317, round green = 109, wrinkled yellow = 102, wrinkled green = 32. Test whether the ratio of 9:3:3:1 is maintained or not.

[Table value at 5% level of significance is 7.81]

(i) What do you understand by the term frequency distribution? Define frequency   1+1+1
curve and frequency polygon.

(j) Find the value of f_1 and f_2 in the following frequency distribution table, if $n = 100$ and the median is 32.

0-10	10-20	20-30	30-40	40-50	50-60
10	f_1	25	30	f_2	10

(k) How population is defined in a biometrical analysis? Which is the most widely   1+2
used measure of dispersion and why?

(l) If each of the observation x_1, x_2, x_3 ...... x_n is increased by 'a', where 'a' is a negative or positive number, show that the variance remains unchanged.

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WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 6th Semester Examination, 2022

BOTADSE05T-BOTANY (DSE3/4)

## BIOINFORMATICS

Time Allotted: 2 Hours   Full Marks: 40

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.

1.   Answer ***all*** the following questions briefly: 1×16 = 16

   (a) What is a cladogram?

   (b) Define orthologs.

   (c) What is dynamic programming?

   (d) What is CLUSTAL W?

   (e) Name a software used to create phylogenetic tree.

   (f) Define FASTA.

   (g) Name the NCBI database for transcriptomic data.

   (h) Name two tools used in phylogenetic analysis.

   (i) What is consensus sequence?

   (j) Define molecular docking.

   (k) What is MSA?

   (l) In the diagram which node represents the most recent common ancestor for organism B and C?
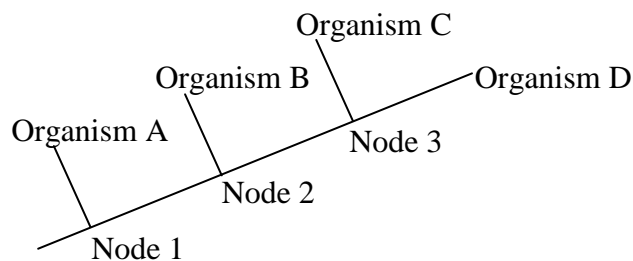
   (m) What is e-value of alignment score?

   (n) Which kind of mutation is more likely to be encountered: Transition or transversion?

   (o) Expand DDBJ.

   (p) Define topology.

2.   Answer any *eight* questions from the following: 3×8 = 24

  (a) What is PIR? Describe the various resources of PIR.   1+2

  (b) What do you understand by sequence alignment? Differentiate between global and local alignment.   1+2

  (c) Discuss the importance of publically available biological databases in Bioinformatics.   3

  (d) State principle of parsimony. What are the basic premises of concept of biological parsimony?   1+2

  (e) What is Bootstrap test? What are its application and limitations?   1+2

  (f) What is bioinformatics? Mention its role in crop improvement.   1+2

  (g) Give one example each of (i) Nucleotide database, (ii) Protein database, (iii) Gene expression database.

  (h) What is a BLAST tool used for? What is the format used for submitting a sequence in a search base? Name the type of blast program used for proteins and nucleotide sequences.   1+1+1

  (i) Briefly explain how PAM is derived.   1+2

  (j) What is genomics? How does bioinformatics support genomic research?   1+2

  (k) Explain monophyletic group, paraphyletic group and polyphyletic group with the help of a diagram.   1+1+1

  (l) Define the following terms: 1+1+1

    (i)   Lead compound

    (ii) CADD

    (iii) Virtual screening.

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WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 6th Semester Examination, 2022

BOTADSE04T-BOTANY (DSE3/4)

ANALYTICAL TECHNIQUES IN PLANT SCIENCES

Time Allotted: 2 Hours   Full Marks: 40

The figures in the margin indicate full marks.
Candidates should answer in their own words
and adhere to the word limit as practicable.

প্রান্তিক সীমার মধ্যস্থ সংখ্যাটি পূর্ণ মান নির্দেশ করে।
পরীক্ষার্থীরা নিজের ভাষায় যথা সম্ভব শব্দসীমার মধ্যে
উত্তর করিবে।

1.   Answer the following questions: 1×16 = 16
     নিম্নলিখিত প্রশ্নগুলির উত্তর দাওঃ

   (a) What is negative staining?
       নেগেটিভ স্টেনিং কি ?

   (b) Give full form of FISH.
       FISH-এর পুরো নাম কি ?

   (c) Write the full form of TEM.
       TEM-এর পুরো কথাটি লেখো।

   (d) What is the working principle of Confocal Microscopy?
       কনফোকাল মাইক্রোস্কোপির কার্য পদ্ধতিটি কি ?

   (e) Name one synthetic gel which is used for protein separation.
       প্রোটিন বিশ্লেষণে ব্যবহৃত একটি ''সিন্থেটিক জেল''-এর নাম লেখো।

   (f) What do you mean by Mean deviation in biostatistics?
       জীবপরিসংখ্যানবিদ্যায় গড় বিচ্যুতি বলতে কি বোঝো ?

   (g) Mention two important applications of autoradiography in biological science.
       জীববিদ্যায় অটোরেডিওগ্রাফির দুটি গুরুত্বপূর্ণ প্রয়োগ সম্পর্কে আলোচনা করো।

   (h) What is radioisotope? Give an example.
       তেজক্রিয় আইসোটোপ কি ? একটি উদাহরণ দাও।

   (i) State two application of spectroscopy in biological research.
       জীববিদ্যা গবেষণায় স্পেক্ট্রোস্কোপির দুটি প্রয়োগ উল্লেখ করো।

   (j) What is the full form of HPLC?
       HPLC-এর পুরো নাম লেখো।

(k) What is the working principle of molecular sieve chromatography?

মলিকিউলার সীভ ক্রোমাটোগ্রাফির কার্য পদ্ধতিটি কি ?

(l) What are the mobile phase and stationary phase in TLC?

TLC-তে মোবাইল ফেজ ও স্টেশনারী ফেজ কোনটি ?

(m) For which purpose agarose gel electrophoresis is used?

কি উদ্দেশ্যে অ্যাগারোজ জেল ইলেকট্রোফোরেসিস ব্যবহৃত হয় ?

(n) Define sample and population.

স্যাম্পেল ও পপুলেশন-এর সংজ্ঞা দাও।

(o) What is mode?

মোড কি ?

(p) Define variance.

ভেরিয়েন্স-এর সংজ্ঞা দাও।

2. Answer any *eight* questions from the following: 3×8 = 24

নিম্নলিখিত যে-কোনো *আটটি* প্রশ্নের উত্তর দাওঃ

(a) Write a short note on sample preparation for electron microscopy.

ইলেকট্রন মাইক্রোস্কোপির নমুনা প্রস্তুতির উপর একটি সংক্ষিপ্ত টীকা লেখো।

(b) Discuss about the working principle of flow cytometry.

ফ্লো সাইটোমেট্রির কার্যপ্রণালীটি আলোচনা করো।

(c) Write the differences between normal tabletop centrifuge and ultracentrifuge.

সাধারণ টেবিলটপ সেন্ট্রিফিউজ ও আল্ট্রাসেন্ট্রিফিউজ-এর মধ্যে পার্থক্যগুলি লেখো।

(d) Write a short note on TLC.

TLC-এর উপর টীকা লেখো।

(e) Write down the uses of radioisotope in biological research. Name one fluorescent stain which is used in Fluorescent Microscopy.

রেডিও আইসোটোপের জীববিদ্যায় ব্যবহারগুলি লেখো। ফ্লুরোসেন্ট মাইক্রোস্কোপিতে ব্যবহৃত একটি ফ্লুরোসেন্ট স্টেন-এর নাম লেখো।

(f) Write a short note on 'Agarose Gel Electrophoresis'.

অ্যাগারোজ জেল ইলেক্ট্রোফোরেসিস-এর উপর সংক্ষিপ্ত টীকা লেখো।

(g) State the differences between Ion exchange and Affinity chromatography.

আয়ন এক্সচেঞ্জ ও এফিনিটি ক্রোমাটোগ্রাফির মধ্যে পার্থক্যগুলি লেখো।

(h) Discuss about different methods of Gel Electrophoresis.

জেল ইলেক্ট্রোফোরেসিসের বিভিন্ন পদ্ধতি সম্বন্ধে আলোচনা করো।

(i) What is standard deviation? Discuss with formula.

স্ট্যান্ডার্ড বিচ্যুতি কি ? সূত্রের সাহায্যে বর্ণনা করো।

(j) In laboratory, researchers had repeated some of Mendel's experiment and reported the following results were shown in F_2 generation with seed colour in peas. Yellow coloured seed 115 and green coloured seed 65. Calculate the Goodness of Fit for these data. [1 df = 3.841 at 5% level of table value]

পরীক্ষাগারে গবেষকের, মটর গাছ নিয়ে মেন্ডেলের পরীক্ষার পুনরাবৃত্তি করাকালীন F_2 জনুতে হলুদ বর্ণের বীজ 115টি এবং সবুজ বর্ণের 65টি বীজ পেলেন। এই ফলাফলের উপর ভিত্তিতে "গুডনেস অফ ফিট" নির্ণয় করো।

(k) Define and explain the relationship between mean, median and mode.

Mean, median এবং mode-এর মধ্যে সম্পর্ক সংজ্ঞায়িত করো এবং ব্যাখ্যা করো।

(l) Why standard deviation considered to be the most useful method for measurement of dispersion of a series of data?

কেন স্ট্যান্ডার্ড ডেফিয়েশন ডেটা সিরিজ-এর বিচ্ছুরণ পরিমাপের জন্য সবচেয়ে দরকারী পদ্ধতি হিসেবে বিবেচিত হয় ?

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WEST BENGAL STATE UNIVERSITY

B.Sc. Programme 6th Semester Examination, 2022

BOTGDSE03T-BOTANY (DSE2)

BIOINFORMATICS

Time Allotted: 2 Hours   Full Marks: 40

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Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.

1.   Answer *all* the questions briefly: 1×16 = 16

   (a) What is PIR?

   (b) What is CLUSTAL W?

   (c) What is FASTA?

   (d) Define paralogs.

   (e) What is proteomics?

   (f) Define accession number.

   (g) Expand PAM.

   (h) What is consensus sequence?

   (i) What are primary databases?

   (j) Name two tools used in phylogenetic analysis.

   (k) Which of the following accumulate mutation at higher rate: Noncoding or Coding DNA?

   (l) What is an outgroup?

   (m) What does EMBL stand for?

   (n) Draw a rooted phylogenetic tree.

   (o) What is meant by gap penalty?

   (p) What is the full form of NCBI?

2.   Answer any *eight* questions from the following: 3×8 = 24

   (a) Briefly state the application of bioinformatics.   3

   (b) What is the difference between structural and functional genomics?   3

   (c) What do you understand by sequence alignment? Differentiate between global   1+2
       and local alignment.

(d) Name the tools (at least two) used for pairwise sequence alignment and multiple sequence alignment. 3

(e) Compare the advantages and disadvantages of pairwise and multiple sequence alignment using DNA. 3

(f) Define the different parameters obtained after running BLAST. 3

(g) Name the two methods based on which phylogenetic trees can be constructed. What is the difference between UPGMA and NJ method? 1+2

(h) Explain monophyletic group, paraphyletic group and polyphyletic group with the help of a diagram. 1+1+1

(i) What is bootstrap test? What are its application and limitation? 1+2

(j) Compare PAM and BLOSUM matrices. 3

(k) Define the following terms:

(i) Target in drug designing

(ii) Virtual screening

(iii) Lead optimization.

(l) What is genomics? How does bioinformatics support genomic research?

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WEST BENGAL STATE UNIVERSITY

B.Sc. Programme 6th Semester Examination, 2022

BOTGDSE04T-BOTANY (DSE2)

ANALYTICAL TECHNIQUES IN PLANT SCIENCES

Time Allotted: 2 Hours   Full Marks: 40

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and adhere to the word limit as practicable.

প্রান্তিক সীমার মধ্যস্থ সংখ্যাটি পূর্ণ মান নির্দেশ করে।
পরীক্ষার্থীরা নিজের ভাষায় যথা সম্ভব শব্দসীমার মধ্যে
উত্তর করিবে।

1. Answer the following questions: 1×16 = 16

   নিম্নলিখিত প্রশ্নগুলির উত্তর দাওঃ

   (a) What is negative staining?

   নেগেটিভ স্টেনিং কি ?

   (b) Give full form of FISH.

   FISH-এর পুরো নাম কি ?

   (c) Write the full form of TEM.

   TEM-এর পুরো কথাটি লেখো।

   (d) What is the working principle of Confocal Microscopy?

   কনফোকাল মাইক্রোস্কোপির কার্য পদ্ধতিটি কি ?

   (e) Name one synthetic gel which is used for protein separation.

   প্রোটিন বিশ্লেষণে ব্যবহৃত একটি ''সিন্থেটিক জেল''-এর নাম লেখো।

   (f) What do you mean by Mean deviation in biostatistics?

   জীবপরিসংখ্যানবিদ্যায় গড় বিচ্যুতি বলতে কি বোঝো ?

   (g) Mention two important applications of autoradiography in biological science.

   জীববিদ্যায় অটোরেডিওগ্রাফির দুটি গুরুত্বপূর্ণ প্রয়োগ সম্পর্কে আলোচনা করো।

   (h) What is radioisotope? Give an example.

   তেজস্ক্রিয় আইসোটোপ কি ? একটি উদাহরণ দাও।

   (i) State two application of spectroscopy in biological research.

   জীববিদ্যা গবেষণায় স্পেক্ট্রোস্কোপির দুটি প্রয়োগ উল্লেখ করো।

   (j) What is the full form of HPLC?

   HPLC-এর পুরো নাম লেখো।

(k) What is the working principle of molecular sieve chromatography?

মলিকিউলার সীভ ক্রোমাটোগ্রাফির কার্য পদ্ধতিটি কি ?

(l) What are the mobile phase and stationary phase in TLC?

TLC-তে মোবাইল ফেজ ও স্টেশনারী ফেজ কোনটি ?

(m) For which purpose agarose gel electrophoresis is used?

কি উদ্দেশ্যে অ্যাগারোজ জেল ইলেকট্রোফোরেসিস ব্যবহৃত হয় ?

(n) Define sample and population.

স্যাম্পল ও পপুলেশন-এর সংজ্ঞা দাও।

(o) What is mode?

মোড কি ?

(p) Define variance.

ভেরিয়েন্স-এর সংজ্ঞা দাও।

2. Answer any *eight* questions from the following: $3 \times 8 = 24$

নিম্নলিখিত যে-কোনো *আটটি* প্রশ্নের উত্তর দাওঃ

(a) Write a short note on sample preparation for electron microscopy.

ইলেকট্রন মাইক্রোস্কোপির নমুনা প্রস্তুতির উপর একটি সংক্ষিপ্ত টীকা লেখো।

(b) Discuss about the working principle of flow cytometry.

ফ্লো সাইটোমেট্রির কার্যপ্রণালীটি আলোচনা করো।

(c) Write the differences between normal tabletop centrifuge and ultracentrifuge.

সাধারণ টেবিলটপ সেন্ট্রিফিউজ ও আল্ট্রাসেন্ট্রিফিউজ-এর মধ্যে পার্থক্যগুলি লেখো।

(d) Write a short note on TLC.

TLC-এর উপর টীকা লেখো।

(e) Write down the uses of radioisotope in biological research. Name one fluorescent stain which is used in Fluorescent Microscopy.

রেডিও আইসোটোপের জীববিদ্যায় ব্যবহারগুলি লেখো। ফ্লুরোসেন্ট মাইক্রোস্কোপিতে ব্যবহৃত একটি ফ্লুরোসেন্ট স্টেন-এর নাম লেখো।

(f) Write a short note on 'Agarose Gel Electrophoresis'.

অ্যাগারোজ জেল ইলেক্ট্রোফোরেসিস-এর উপর সংক্ষিপ্ত টীকা লেখো।

(g) State the differences between Ion exchange and Affinity chromatography.

আয়ন এক্সচেঞ্জ ও এফিনিটি ক্রোমাটোগ্রাফির মধ্যে পার্থক্যগুলি লেখো।

(h) Discuss about different methods of Gel Electrophoresis.

জেল ইলেক্ট্রোফোরেসিসের বিভিন্ন পদ্ধতি সম্বন্ধে আলোচনা করো।

(i) What is standard deviation? Discuss with formula.

স্ট্যান্ডার্ড বিচ্যুতি কি ? সূত্রের সাহায্যে বর্ণনা করো।

(j) In laboratory, researchers had repeated some of Mendel's experiment and reported the following results were shown in F_2 generation with seed colour in peas. Yellow coloured seed 115 and green coloured seed 65. Calculate the Goodness of Fit for these data. [1 df = 3.841 at 5% level of table value]

পরীক্ষাগারে গবেষকের, মটর গাছ নিয়ে মেন্ডেলের পরীক্ষার পুনরাবৃত্তি করাকালীন F_2 জনুতে হলুদ বর্ণের বীজ 115টি এবং সবুজ বর্ণের 65টি বীজ পেলেন। এই ফলাফলের উপর ভিত্তিতে "গুডনেস অফ ফিট" নির্ণয় করো।

(k) Define and explain the relationship between mean, median and mode.

Mean, median এবং mode-এর মধ্যে সম্পর্ক সংজ্ঞায়িত করো এবং ব্যাখ্যা করো।

(l) Why standard deviation considered to be the most useful method for measurement of dispersion of a series of data?

কেন স্ট্যান্ডার্ড ডেফিয়েশন ডেটা সিরিজ-এর বিচ্ছুরণ পরিমাপের জন্য সবচেয়ে দরকারী পদ্ধতি হিসেবে বিবেচিত হয় ?

N.B. : *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within* 1 *hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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WEST BENGAL STATE UNIVERSITY
B.Sc. Honours 6th Semester Examination, 2022

BOTACOR13T-Botany (CC13)

Time Allotted: 2 Hours   Full Marks: 40

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.

1.   Answer **all** questions briefly from the following: $1 \times 6 = 6$

   (a) What do you mean by substrate level phosphorylation?

   (b) Write down the structure of ATP.

   (c) What are diazotrophs?

   (d) What is α-oxidation of fatty acids?

   (e) Define biosignalling.

   (f) Name one inhibitor of photosynthetic electron transport chain.

2.   Answer any **eight** questions from the following: $3 \times 8 = 24$

   (a) What do you understand by chloroplast dimorphism in C_4 plants?

   (b) Briefly explain the process of sucrose synthesis.

   (c) Schematically represent Crassulacean acid metabolism.

   (d) Write a short note on mitochondrial electron transport chain.

   (e) State the dual role of RUBISCO.

   (f) Mention three important differences between C_4 and CAM plants.

   (g) Is glycolysis an oxidative process? If yes, then why?

   (h) In schematic form enumerate the oxidation of cytosolic $NADH^+ + H^+$ by malate aspartate shuttle.

   (i) Schematically show the biochemical reactions of triglyceride synthesis.

   (j) Write a note on chemiosmotic theory in relation to ATP synthesis.

   (k) Discuss the role of uncouplers in oxidative phosphorylation.

   (l) Write a note on the receptors involved in signal transduction pathway.

3. Answer any *two* questions from the following: 5×2 = 10

   (a) Give a schematic representation of C_3 cycle mentioning the enzymes involved in each step.

   (b) Write down three irreversible reactions taking place during glycolysis.

   (c) Discuss the infection process during nodule organogenesis in symbiotic nitrogen fixation with illustrations.

   (d) Write down a short note on MAPK cascade.

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WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 6th Semester Examination, 2022

BOTACOR14T-BOTANY (CC14)

PLANT BIOTECHNOLOGY

Time Allotted: 2 Hours   Full Marks: 40

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.

1. Answer the following questions in brief: $1 \times 6 = 6$

    (a) What are fusogens?

    (b) What is colony hybridization?

    (c) What is humulin?

    (d) What is shuttle vector?

    (e) What is palindromic sequence?

    (f) Define electroporation.

2. Answer any *eight* questions from the following: $3 \times 8 = 24$

    (a) What are the prerequisites of an efficient plasmid vector?

    (b) How can micropropagation contribute to germplasm conservation?

    (c) Why is hardening process required before planting tissue cultured plants in the field? Describe the processes. $1\frac{1}{2} + 1\frac{1}{2}$

    (d) What is somatotropin? What are the approved uses of recombinant form of this hormone? $1+2$

    (e) Describe plant tissue culture technique that is used in the production of secondary metabolite.

    (f) What is cryopreservation? Write down the different steps involved in a typical cryopreservation protocol. $1+2$

    (g) Briefly discuss the strategies for the production of edible vaccine in plants. State two advantages of edible vaccine over traditional vaccine. $2+1$

    (h) Write the steps involved in PCR.

    (i) Write the types of restriction enzymes with example.

    (j) Mention the sources and uses of three industrial enzymes.

    (k) Write the steps of gene cloning in bacteria.

    (l) What are the biosafety concerns related to GMO?

3.   Answer any **two** from the following: 5×2 = 10

(a)   Write the application of somatic embryogenesis. Compare hybrid with cybrid.   3+2

(b)   What are transgenic plants? With particular emphasis on 'Golden rice', briefly discuss how nutritional quality of crop plants can be improved using transgenic approach.   1+4

(c)   Why T-DNA from wild type Ti plasmid cannot be used directly as vectors? Briefly discuss, how Ti based vectors are designed for gene transfer in plants.   1+4

(d)   What is restriction mapping? Describe in brief, the experimental procedure in generating restriction maps. How many fragments will be generated in a circular DNA cut with restriction enzyme that has two restriction sites on the DNA?   1+3+1

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