

(2 Hrs 30 min)

- N.B.:** 1) All questions are compulsory.  
2) Figures to the right indicate full marks.  
3) Draw neat labelled diagrams wherever necessary.

**Q. 1) Choose the correct option from the following and rewrite the sentence (ANY 15) 15**

- National Botanic Garden is situated in \_\_\_\_\_.  
a. Lucknow  
b. Sibpur, Howrah  
c. Bangalore  
d. Dehradun
- The main programme of BSI is \_\_\_\_\_.  
a. Preparation of animal lists found in India  
b. Preparation of plant and animal lists found in India  
c. Preparation of a detailed account of plant resources in India  
d. Preparation of Red List Data
- John Hutchinson a British botanist associated with \_\_\_\_\_.  
a. Royal Botanic garden Kew  
b. Botanical Survey of India  
c. Biological studies of India  
d. Biological science Institute
- Family Rhamnaceae belongs to series \_\_\_\_\_.  
a. Disciflorae  
b. Calyciflorae  
c. Thalamiflorae  
d. Polyflorae
- \_\_\_\_\_ is a plant belonging to family Combretaceae.  
a. *Ricinus*  
b. *Terminalia*  
c. *Canna*  
d. *Calatropis*
- \_\_\_\_\_ is the example of floating but rooted hydrophyte.  
a. *Typha*  
b. *Pistia*  
c. *Nymphaea*  
d. *Hydrilla*
- The shade loving plants are known as \_\_\_\_\_.  
a. Epiphytes  
b. Hygrophytes  
c. Sciophytes  
d. Xerophytes
- The presence of velamen tissue is the ecological adaptation found in \_\_\_\_\_.  
a. Hygrophytes  
b. Xerophytes  
c. Epiphytes  
d. Halophytes
- The presence of inverted T-shaped hairs on lower epidermis of leaves is the characteristic of plant \_\_\_\_\_.  
a. *Eicchornia*  
b. *Vanda*  
c. *Nerium*  
d. *Avicennia*
- Sesuvium* is an example of \_\_\_\_\_.  
a. Halophyte  
b. Hygrophyte  
c. Xerophyte  
d. Sciophyte
- In a circinotropous ovule, the funicle and the micropyle are \_\_\_\_\_.  
a. At the same end  
b. At opposite ends  
c. At right angles to each other  
d. In the same plane

12. In a hemitropous ovule, the embryo sac is \_\_\_\_\_.
- a. Straight  
b. Curved  
c. Circular  
d. Spiral
13. Double fertilization is a process unique to \_\_\_\_\_.
- a. Gymnosperms  
b. Angiosperms  
c. Bryophytes  
d. Pteridophytes
14. Double fertilization involves the fusion of \_\_\_\_\_.
- a. Two male gametes with the egg nucleus  
b. Two male gametes with the polar nuclei  
c. One male gamete with the egg nucleus and one male gamete with the polar nuclei  
d. One male gamete with the egg nucleus and one male gamete with the synergids
15. The fusion of a male gamete with the polar nuclei results in the formation of the \_\_\_\_\_.
- a. Zygote  
b. Endosperm  
c. Embryo  
d. Seed
16. \_\_\_\_\_ refers to the replacement of species along a gradient of habitats or communities.
- a. Alpha  
b. Beta  
c. Gamma  
d. Sigma
17. \_\_\_\_\_ tree is found in tropical rainforests.
- a. Mahogany  
b. Teak  
c. Sal  
d. Peepal
18. Mangrove forest is found in the \_\_\_\_\_ phytogeographical region.
- a. Deccan Plateau  
b. Gangetic plain  
c. Indus plain  
d. Andaman and Nicobar
19. \_\_\_\_\_ one of the richest vegetation zones that covers flat land of Delhi, whole of U.P., Bihar, & West Bengal and also a part of Orissa in India.
- a. Eastern Himalaya  
b. Western Himalaya  
c. Gangetic Plain  
d. Deccan Plateau
20. According to D. Chattarjee (1962), India can be divided into \_\_\_\_\_ phytogeographical regions.
- a. 1  
b. 4  
c. 6  
d. 9

**Q. 2) Answer the following questions (ANY TWO)**

**15**

- a) Write a note on the working of Botanical Survey of India. Add a note about its regional branches.
- b) Classify the family Asclepiadaceae giving reasons and mention the botanical names and economic importance of any two plants from the same family.
- c) Explain with neat labelled diagrams the morphological features of Family Cannaceae. Give its economic importance and floral formula.
- d) Give an outline of Hutchinson's system of classification. State the Merits and demerits of Hutchinson's system of classification.

Q. 3) Answer the following questions (ANY TWO)

15

- Compare external and internal features of Mesophytes and Xerophytes.
- What are Sciophytes? With suitable examples describe the modifications seen therein.
- What are Epiphytes? Describe the various ecological modifications observed in them with suitable examples.
- Citing suitable examples, describe the morphological and anatomical adaptations shown by Floating hydrophytes towards the aquatic ecosystem.

Q. 4) Answer the following questions (ANY TWO)

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- Describe the structure of megasporangium and explain the process of formation of megaspore in angiosperm.
- Explain with a neat labelled diagram the various types of ovules studied by you.
- Explain the stages in the development of *Capsella* type of embryo.
- What is double fertilization? Describe the process with the help of a neat labelled diagram.

Q. 5) Answer the following questions (ANY TWO)

15

- Write a note on importance and Status of Biodiversity.
- Discuss the different measures that can be adopted for Conservation of Biodiversity.
- Explain the different molecular methods used for assessing genetic diversity.
- Define Forests. Briefly describe any two forest types studied by you.

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Duration 2 Hrs 30 Minutes

Total Marks: 75

- N.B.: 1. All questions are compulsory.  
2. Figures to the right indicate full marks.  
3. Draw neat and labeled diagram wherever necessary.

- Q. 1 Choose the correct option from the following and rewrite the sentence (any fifteen) 15
- 1 DNA strand is partially digested for sequencing at one of the following sites \_\_\_\_\_.  
a. G+C.                      b. G+T                      c. A+T                      d. A+G
- 2 Pyrosequencing is a method of DNA sequencing is based on the \_\_\_\_\_ principle.  
a. sequencing by cleavage                      b. sequencing by polymerization                      c. sequencing by synthesis                      d. sequencing by denaturation
- 3 PCR technique is invented by \_\_\_\_\_.  
a. E. Southern                      b. Watson                      c. Kary Mullis                      d. Maxam and Gilbert
- 4 DNA barcodes consist of a standardized short sequence of DNA \_\_\_\_\_.  
a. 1000-10000 bp                      b. 400-800 bp                      c. 200-400 bp                      d. 100-200 bp
- 5 The chloroplast genome is usually between \_\_\_\_\_ in length.  
a. 100-200KB                      b. 1.2 - 1.8 MB                      c. 100-1000 MB                      d. 120-160 KB
- 6 SIB and EBI collaboratively maintained the following protein database.  
a. MIPS                      b. SWISS-PROT                      c. PIR                      d. PDB
- 7 Expressed Sequence Tags includes \_\_\_\_\_.  
a. Short cDNA sequence                      b. Single pass sequence                      c. Artificially generated DNA sequence                      d. DNA sequence with coding and non-coding region
- 8 Select the correct hierarchy levels of SCOP classification.  
a. Family > Subfamily > Fold                      b. Family > Superfamily > Fold                      c. Fold > Subfamily > Family                      d. Fold > Family > Superfamily
- 9 Scoring matrix commonly used in BLAST is \_\_\_\_\_.  
a. PAM Matrix                      b. BLOSUM 80                      c. BLOSUM 62                      d. MD Matrix
- 10 In CLUSTAL W, the scores obtained are used to produce a tree by the \_\_\_\_\_ method.  
a. OMEGA                      b. UPGMA                      c. BLAST                      d. WPGMA

- 11 Champaca oil is obtained from the \_\_\_\_\_ of *Michelia champaca*.  
 a. Roots                      b. Leaves                      c. Bark                      d. flowers
- 12 Khus oil is extracted from the roots of \_\_\_\_\_.  
 a. *Vetiveria zizanoides*                      b. *Cymbopogon citratus*                      c. *Cymbopogon nardus*                      d. *Acorus calamus*
- 13 Lemon grass oil is a source of \_\_\_\_\_.  
 a. Insect repellent                      b. fibres                      c. edible oil                      d. Citric acid
- 14 The seed oil of \_\_\_\_\_ is an example of semi-drying oil.  
 a. *Glycine max*                      b. *Sesamum indicum*                      c. *Linum usitassimum*                      d. *Piper longum*
- 15 Coconut oil is extracted from the \_\_\_\_\_ of *Cocos nucifera*.  
 a. Roots                      b. Leaves                      c. Inflorescence                      d. Nuts
- 16 In osmotic drying \_\_\_\_\_ are generally used as a solute for fruits and vegetables.  
 b. a. Vinegar, sugar syrup                      b. Table salt, sugar                      c. Sugar syrup, brine                      d. Citric acid, vinegar
- 17 Freeze-drying, or lyophilization process removes \_\_\_\_\_ from fruits and vegetables.  
 a. Heat                      b. Protein                      c. Moisture                      d. Carbohydrates
- 18 \_\_\_\_\_ process involves change of state in the refrigerant to absorb heat from the freezing food.  
 a. Cryogenic Freezing                      b. Vacuum drying                      c. Canning                      d. Pickling
- 19 Which of the following in jam/jelly is responsible formation of gel?  
 a. Sugar                      b. Pectin                      c. Acid                      d. Water
- 20 TSS stands for \_\_\_\_\_.  
 a. Total soluble solids                      b. Total suspended solid                      c. Total soluble sugar                      d. Total sugar solubility

Q. 2 Answer the following questions (Any two).

- a) Describe Dideoxy chain termination method of DNA sequencing. 7.5
- b) Give the applications of polymerase chain reaction technique. 7.5
- c) Describe any two commonly used chloroplast DNA sequences used in plant DNA barcoding. 7.5
- d) Discuss the present status and significance of DNA barcoding in plants. 7.5

- Q. 3 Answer the following questions (Any two).
- a) Give an account of different sections of a typical database record. 7.5
  - b) Give a detailed account of DDBJ, EMBL and GenBank as nucleic acid databases. 7.5
  - c) How does comparison of protein structure help in function prediction? 7.5
  - d) What is Phylogenetic analysis? How does it explain the evolution of organisms and organs. 7.5
- Q. 4 Answer the following questions (Any two).
- a) Write an account on the useful methods for extraction of essential oils. 7.5
  - b) Elaborate the source, method of extraction and uses of the Rose oil. 7.5
  - c) Explain the source, plant part used and extraction process for Olive oil, add a note on its utility. 7.5
  - d) Give an explanatory note on Palm oil. 7.5
- Q. 5 Answer the following questions (Any two).
- a) Define freezing. Explain the different freezing methods used in food preservation techniques. 7.5
  - b) Define food preservative. Describe various types of preservative used for food preservation. 7.5
  - c) Explain the methods of candid fruit preparation. 7.5
  - d) With reference to Jellies, explain how sugar concentrates are made. 7.5
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2 Hours 30 minutes

Total Marks: 75

N.B.:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Draw neat labelled diagrams wherever necessary.
- 4) Use of log tables and non-programmable calculators is allowed.

Q.1 Choose the correct option for the following multiple-choice questions: (Any fifteen) 15

1. \_\_\_\_\_ inhibitors usually bind covalently to the enzyme and destroy the functional group in the active site.  
a) Uncompetitive b) Non-competitive c) Competitive d) Irreversible
2. The "lock and key" model of the enzyme was proposed by \_\_\_\_\_.  
a) Fisher b) Sanger c) Nicholson d) Gossett
3. Lipids form about \_\_\_\_\_ percent of the cell content.  
a) 5 b) 6.5 c) 3.5 d) 4.5
4. Enzymes are largely \_\_\_\_\_ in their chemical nature.  
a) Carbohydrate b) Fats c) Proteinaceous d) Nucleic acid
5. \_\_\_\_\_ is common cane or table sugar.  
a) Glucose b) Maltose c) Sucrose d) Fructose
6. What is the main source of energy for chemoautotrophic nitrifying bacteria like Nitrosomonas and Nitrobacter?  
a) Sunlight b) Oxidation of nitrogen compounds  
c) Organic carbon compounds d) Decomposition of dead organisms
7. Which molecule secreted by legume roots attracts Rhizobium for initiating root nodule formation?  
a) Cytokinin b) Flavonoids c) Nod factors d) Leghaemoglobin
8. Which type of nitrogenase enzyme is the most commonly studied in nitrogen-fixing bacteria like Rhizobia?  
a) Vanadium nitrogenase b) Iron-only nitrogenase  
c) Molybdenum nitrogenase d) Sulphur-only nitrogenase
9. \_\_\_\_\_ coenzyme is required for the activity of nitrate reductase?  
a) FADH<sub>2</sub> b) NADH or NADPH c) ATP d) Ferredoxin
10. Which physiological process is primarily regulated by auxins and involves the suppression of lateral bud growth?  
a) Root initiation b) Parthenocarpy c) Apical dominance d) Cell elongation
11. The genes located close together on the same chromosome are said to \_\_\_\_\_ genes.  
a) linked b) unlinked c) equal d) unequal
12. A \_\_\_\_\_ shows the position of known genes relative to each other in terms of recombination frequency.  
a) somatic map b) molecular map c) DNA map d) linkage map

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13. Ionizing radiation produces \_\_\_\_\_  
a) thymine dimers b) ATP c) free radicals d) antioxidants
14. The mutation occurring in the gametic cells is known as \_\_\_\_\_ mutation.  
a) somatic b) germinal c) sudden d) essential
15. The Ames test determines the \_\_\_\_\_ effect of a compound.  
a) Mutagenic b) Mitogenic c) Apoptotic d) natural
16. In a simple linear regression model, which variable is considered the independent variable?  
a) The variable that is being predicted  
b) The variable that is used to predict  
c) The variable that influences the regression line  
d) The error term
17. In the relationship between hours studied and exam scores, what is the dependent variable?  
a) Hours studied b) Exam scores c) Study method d) Type of exam
18. What is the first step in hypothesis testing?  
a) Collect the information  
b) State the null and alternative hypotheses  
c) Calculate the p-value  
d) Draw a conclusion
19. What does the acronym ANOVA stand for?  
a) Analysis of Variables  
b) Analysis of Variance  
c) Automated Numerical Optimization and Validation  
d) Average Variance
20. What is the null hypothesis in an unpaired t-test?  
a) The means of the two groups are equal  
b) The variances of the two groups are equal  
c) The two groups have no correlation  
d) The sample means are significantly different

**Q.2 Answer the following: (Any Two)**

**A.** Describe the Classification of enzymes according to IUB classification with examples.

**B.** Compare and contrast the mechanisms of competitive, and non-competitive in enzyme kinetics.

**C.** Explain the chemical structures of Starch and Cellulose.

**D.** Define proteins and describe their general structure. How are they classified?

**Paper / Subject Code: 17035 / Botany: Form & Function III (R-2020)**

**Q.3 Answer the following: (Any Two)**

- Describe the Physiological effects and commercial applications of Gibberellins.
- Explain the process of root nodule formation in leguminous plants.
- Explain the role of Nitrate Reductase (NR) and Nitrite reductase in Nitrogen fixation.
- Give a brief account of Auxins as plant growth regulators.

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**Q.4 Answer the following: (Any Two)**

- What are mutations? Explain Silent and Frameshift mutations with suitable examples.
- What are Base analogues? Explain how 5-bromouracil (5Bu), a thymine analogue, leads to mutations during DNA replication.
- Explain the cause and symptoms of the metabolic disorder Phenylketonuria (PKU).
- The following three recessive genes are found in corn: *b*, brittle endosperm; *g*, glossy leaf; *r*, ragged seedling. A trihybrid of unknown origin is test-crossed, producing the following offspring:

15

<i>b g r</i>	430
<i>B G R</i>	440
<i>b G r</i>	5
<i>B g R</i>	5
<i>B g r</i>	35
<i>b G R</i>	30
<i>b g R</i>	28
<i>B G r</i>	27
Total	1,000

- Determine the order of these genes on the chromosome.
- Calculate the map distances between the genes.

**Q.5 Answer the following: (Any Two)**

15

- Compute regression coefficients  $b_{xy}$  and  $b_{yx}$  for X and Y: (1,2), (2,3), (3,5), (4,8), (5,7).
- A researcher is comparing the test scores of two groups of students: Group A, which studied using a traditional method, and Group B, which used an online learning platform. The test scores of both groups were recorded, and the following data was obtained:  
**Group A** (Traditional Method): Mean score = 75, Standard deviation = 8, Sample size = 15  
**Group B** (Online Learning Platform): Mean score = 80, Standard deviation = 10, Sample size = 18  
 The researcher calculated the pooled (combined) Standard deviation = 9.15.  
 Calculate Standard error and t value.  
 Using an unpaired t-test with a significance level of  $\alpha=0.05$ , test whether there is a significant difference in the mean test scores between the two groups. The critical value for  $t_{0.05,31}$  is 2.042.

- C. An IQ test was conducted for 09 persons before and after they were trained and the results are given below:

Candidates	1	2	3	4	5	6	7	8	9
IQ before training	120	110	120	123	127	116	132	129	132
IQ after training	130	120	118	125	123	118	136	133	136

Use paired t-test (Given  $t_{0.05, 8} = 2.31$ )

- D. The three (L, M, N) maize varieties are grown on 4 plots and allocated completely at random which are given in the table:

Varieties	I	II	III	IV
L	10	6	8	9
M	9	7	7	5
N	4	7	6	6

Using a one-way ANOVA, test at the 5% significance level test the significance of the difference between the yield of varieties. (Given  $F_{tab}$  at df (2,9) at 5% = 4.26)



